Sri Lanka Institute of Information Technology

# Title of the Project

## Project Report

Information Technology Project 2017

Project ID: ITP-MET-WE-04


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20/11/2017

# Abstract

This project proposes an inventory control system for Ewing Associates (pvt) Ltd who manufactures purchases and distributes cloths to major exclusive retailers in Colombo. The client needs a computerized system for control their inventory which will be a benefit solution for the problems that they are facing now. This system is developed using C# for windows operation system which is focused in the area of inventory control and generating reports. Currently the company is controlling their inventory using spread sheet .This is an incredibly labor intensive process that no growing business wants to deal with. It requires continuous manual monitoring to ensure every transaction. The company is currently facing problems like mismatched inventory(disappointed customers),too much cash tied up in ware houses, slower sales, less accurate, not user friendly environment, human error, difficult to find and update records, the information is difficult to share. The Computerized inventory control system eliminates paper work, human faults, manual, and speedup process, avoid short falls and minimize transportation and inventory carrying costs.

# Acknowledgement

We would like to express special thanks to the ITP course module lecturer and the project supervisor Mrs.Tharanika Jayakodi who helped us to achieve this level and guided us through this semester with her experience, suggestions and valuable feedbacks to improve the system and the presentation skills; thanks to her comment and advices specially. All that we have done is only due to such supervision and assistance and we would not forget to thank them.

The Management of Ewing Associates (Pvt) Ltd and The Owner Mr. A. M. Muddazzir and the Coordinator Mr. N. K. Jayamuthuke (Warehouse and HR Manager) Support provided in the initial meetings, formal and informal discussions about the business and sharing internal details of the company that helped us to develop the system in much prominent way were of great help. A special thanks goes to my team mates, who come with me from the start till the end and shared resources that they got and make this project a successful one. Finally I would like to thank everyone who helped us achieving the target within the allocated time.

# Declaration

We declare that the this project report or part of it was not a copy of a document done by any organization, university any other institute or a previous student project group at SLIIT and was not copied from the Internet or other sources.

Project Details

| | |
|---|---|
| Project Title | Inventory Control System – Ewing Associates Pvt. Ltd. |
| Project ID | ITP-MET-WE-04 |

Group Members

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# List of Acronyms and Abbreviations

SDLC-System Development Life Cycle

IDE – Integrated Development Environment

GUI – Graphical User interface

DBMS – Database Management System

# 1. Introduction

Ewing Associates (Pvt) Ltd is formed in December 2016. It is a clothes purchasing, manufacturing and distribution company which sells clothes to major exclusive retailers in Sri Lanka. Majority of their customers are located in Colombo. It has 22 employees including 2 Directors. Number of employees in accounts department is 3, inventory department is 4, sales and marketing department is 6, transport and delivery department is 3, maintenance department.

The main aim of this project is to automate and generate certain reports of the inventory control system of this business which is currently done as a manual process using spreadsheets. Automation of inventory control system of this business would bring them huge advantages and solve all most all the problems they undergo currently with their inventory controlling. The Main set of advantages automating this system would bring them are elimination of paper work, minimization of errors (human errors), Process speed up. Elimination of unnecessary extra costs, resource sharing, eliminating inventory tied up costs and ambiguities involved with their inventory controlling.

## 1.1 Problem Statement

Currently the business is controlling their inventory manually and they use spreadsheets as well

When the business purchases stock in bulk from the whole seller and when the business sells the purchased and manufactured stock to their exclusive retailer's mismatches of those stocks are being occurred with what they have recorded in the books they maintain. This would definitely disappoint customers and also would cause extra costs to the business.

Cash flow of the business would not be favorable due to this manual system because when the purchasing process and ordering process is done manually there can always be mistakes related because the calculations are done manually based on their demand and supply so either excess stocks can be always tied within the ware house or less amount of stocks can be there in the warehouse than required quantity and this would cause cash tied up within the business and be an obstacle for cash inflows to the business.

The sales process is slow with the manual process because from the point the business manufactures and purchases goods and up to the point the business sells the goods to their retailers the process is really slow due to the heavy documenting part so the sales process is slower because everything is needed to be done manually.

Maintaining an inventory control system manually would result in many mistakes because you don't have a computer categorizing and totaling figures, you must do this manually. There are lots of calculations involved with this process and if there is a single one figure mistake the outcome would be hazardous. Inventory can be considered as the core of any buying and selling business therefore the transactions should be done and recorded very correctly without any mistakes.

The current process contains a lot of documenting and all the transactions, updates, deletions new entries all are done manually and it is not user friendly at all. Because if a single mistake happens whilst recording the process of altering it would be very difficult and finally all the daybooks would be hard to even look at. Also when dealing with the customers and the sellers the process should be user friendly otherwise it can cause dissatisfactions and would affect the business adversely.

A manual inventory system relies heavily on the actions of people, which increases the possibility of human error. People might forget to record a transaction or simply miscount the number of goods. This results in needless additional orders that increase the company's inventory carrying costs and use up precious storage space. Inaccurate physical counts could also result in not ordering enough of a product, meaning the business could run out of a crucial item at the wrong time

There can be thousands of records within the business due to this manual system the user will find it very difficult to find a record whenever he wants he will have to go through many books to find it and this consumes a lot of time and many other indirect costs as well. Same if he wants to update or delete a record.

When it comes to sharing information with the business stake holders the business has to do it manually and would consume a lot of time and effort because the business has many documents to be shared among the customers, sellers and even with the staff. Therefore when sharing is done manually is relay difficult to that task.

All the employee related documents and files also is maintained manually in this system and it and when it comes to add, delete update any information about an employee it takes another new physical file to be maintained and it takes storage time and effort un necessarily

Also pay sheets are manually generated and employee loans, EPF/ETF, salary advances are also recorded manually. This requires more time and costs to incur by the business

## 1.2 Product Scope

The proposed software will consist of interfaces for Customer Management, Transportation Management, Manufacturing Management, Human resource Management, sales and purchase returns, Stock management, Supplier Management and Maintenance management mainly.

There are several access levels in order to maintain the security and each access level would be granted access to the information with necessary restrictions.

**1) Customer Management**

The Customer Management interface consists of creating, updating and deleting customers to the system in a user friendly manner. And also generation of invoices, applying discounts (basically customer payment handling) and generating reports such as customer wise outstanding report and ageing report

**2) Transport Management**

Transportation Management involves Delivery/pick up scheduling that is finding the available vehicle and driver the stock amount to be transported and adding, updating, deleting vehicle details.

Calculating cost per one vehicle per day and generating reports on that and also recording insurance details

### 3) Manufacturing Management

Manufacturing Management includes handling of raw materials that are used in production. Managing raw materials handles information about manufacturing materials. Production includes all the details about the daily, weekly and monthly production plan and packaging. Job scheduling handles information about the organization workers for production. Monitoring keeps track of finished goods and when the production is transferred to sales it keeps track of it as well.

### 4) Human Resource Management

Human Resource management add and update staff details that is by adding new staff members, changing access permission, changing employee details basically.

Attendance and leave management records all the details relevant to the attendance of employees such as time in and out, number of leaves allocated and already taken and reaming leaves.

Managing staff loans would process the loans, salary advance requests, deduct loans/advances taken.

Payroll is basically managing employee salary, EPF/ETF, no pay deductions, calculating commissions and generating pay sheets. Therefore this would deal with the whole employee management process

### 5) Product returns management

Purchase and Sales returns focus on recording of returning damaged goods to the supplier and getting the refund and sales returns basically recording and managing goods returned to the warehouse by the customers and if the goods are sellable condition and adding back to the stock or if the damaged then calculating a discount rate for particular product and sell those on seasonal sale.

Stock management is mainly on creating, deleting, updating products to the system and stock adjustments that is when the warehouse stock is not equivalent to the stock amount in the system

due to some reasons like (destroyed stocks, stocks robbed, etc.) and assets worth generating reports that to generate reports on the net worth of current assets in the business.

**7) Supplier Management**

Supplier management is addresses the problems on creating, deleting, updating new supplier to the system and creating a purchase order through the system and sending it to the supplier.

Payment to supplier to record all the details of payments to the supplier either cash or cheque details and printing a receipt to get it signed by the supplier. Reorder level calculation will generate a notification by the system when the stocks reach a certain minimum level.

**8) Finance management**

Finance management is handling all the expenses. Admin should be able to add each and every income and expenses to calculate the profit and loss account of the company quarterly or annually and also be able to update, delete those entries whenever needed.

Admin should be able to add, update and delete the company assets, liabilities and equity to prepare the balance sheet for the quarter or year.

Admin should be able to generate the quarter or annual balance sheet report. These reports contain major details regarding assets, liabilities and equity.

## 1.3 Project Report Structure

**1.3.1**

This section describes about the project; the problems associated with it and how we are going to handle it with aid of software development. The scope of the product explains the risk factors associated with the product and the solutions which will resolve the issues faced so far with the old system maintained up to now.

**1.3.2**

Methodology describes about the client, data collection and requirements gathering for the development. The designs of the GUIs along with the basic UML diagrams such as Activity Diagram, Use case diagram along with the Database design provided with the ER and Relational Schema is also provided. The implementation section further describes about any framework used. Finally, testing will explains the result of the testing done on the system checking for the errors and accuracy of the functions.

**1.3.3**

Evaluation describes the methods used in the development also with how the data is analyzed and the outcome of the analysis done. Also this will elaborate the points where analysis became a failure and the reasons for them. The lessons learnt and the future goals such as maintenance and further improvements are also mentioned here.

**1.3.4**

Conclusion is where the summary of this documentation is given. The target for the development of the software, weaknesses, limitations are proposed here along with the benefits of developing the project to the client.

**1.3.5** This section is all about the references referred for the project, provided as the links/books or any other sources referred. Appendix will include the ER Diagram, Activity and sample test cases to prove the efficient functionality of the system.

# 2. Methodology

## 2.1 Requirements and Analysis

### The Client

Ewing Associates (Pvt) Ltd is a company was established in 2016. Company excels their work in providing best services in purchases, manufactures and distributes clothing to its major exclusive retailers in Sri Lanka.

## Reasons for choosing this system –

Ewing Associates (Pvt) Ltd company is already consists of a manual system for all their day to day activities. Main reason for choosing this system for the company is to automate and generate certain reports of the inventory control system of this business which is currently being done as a manual process. The ability to centralize all the functions like Human resource Management, Manufacturing Management, Stock Management, Supplier Management, Customer Management, Product returns Management, Transport Management and Finance Management all combine the respective management functions for accurate outputs.

## Why it's important –

Automated system is implemented to improve the efficiency of the company in many ways like,
Speed – Ability to process product details fast and combine functions to generate accurate

## Outputs -

Reliability – Ability to do all the system transactions accurately without any error.
Secure – Ability to do all the daily activities of the company in secure way.
E.g.: login, password protection.

## Data Gathering

Initially, a brief idea about the client was gained through website, www.ewingassociates.lk with a basic idea. We met the owner of the business for further discussion. As per he stated, we were able to gather a lot more information and requirements for the company. Then he assigned one of his staff to show us the company. That visit was really helpful to gain an overall view about the client and also we got an idea of what we are expected to design for them.

We made a second visit couple of weeks later since our first meeting became unsuccessful.
This time we met Mr. N. K. Jayamuthuke (Warehouse and HR Manager) He stated more about their company's interior details such as salary calculation, price allocation for each service and so on.

## Requirement Gathering

Ewing Associates (Pvt) Ltd Company consists of a manual system for all their day to day activities. The main drawback of the prevailing system is the usage and maintenance of manual log books. The ability to centralize all the functions to create valuable reports is lacking in the manual system. When manual log books are used, there is a major threat to the security of data. Log books could be edited or destroyed accidentally or purposefully.
In such a situation restoring the data and proceeding with regular business activities is impossible. It takes more time for administrator to recreate all the records of the employees manually. Since calculation of salary based on the attendance, total payment for a particular service offered and cost for items purchased are done manually. The prevailing system is prone to errors. It is noted that it is difficult to maintain the employee attendance and inventory of the raw material.

## Performance Requirements

The only way in which systems will meet their performance targets is for them to be specified clearly and unambiguously. If there are performance requirements for the product under various circumstances, state them here and explain their rationale, to help the developers understand the intent and make suitable design choices. As the user types in a keyword the search results are displayed. Make such requirements as specific as possible. You may need to state performance requirements for individual functional requirements or features. As the system required searching on different categories, generating reports depicting financial status, the system must respond within 3 to 5 seconds. Specify the timing relationships for real time systems.

## Safety Requirements

The data of the system would be stored in the local database. The local database could cause to loss of data due to virus attacks, hardware failures. Refer to any external policies or regulations that state safety issues that affect the product's design or use The System would prompt the user to backup. System crashes due to power fail would be minimized by using an UPS.

## Security Requirements

The System must be accessed only by authorized personals to ensure the safety of the information. The authorized personals should be given usernames and passwords. No data should be stored outside the My SQL database. The data could only be manipulated within the system by using the access levels given by the system. Users are responsible for their logins after the system delivery. If the password is forgotten then recovery key will require. The system is used by several users with similar access levels. For instance there can be two Administrators who work in shifts. Identifying the user who is responsible of specific actions is important to maintain a system with integrity.

# Analysis of each function

## Human Resource Management

- Add a new employer's record, edit an existing record or delete employer's record.
- Attendance and Leave management of time in and out, leaves taken and remaining, leave requests, year-end performance review.
- Processing requests and deductions of staff loans and salary advances monthly.
- Adjust the employer's payroll expense.
- Calculating EPF, ETF and other allowances any custom earning or deduction.
- Additions of sales commission, salary increments and generating pay sheets.

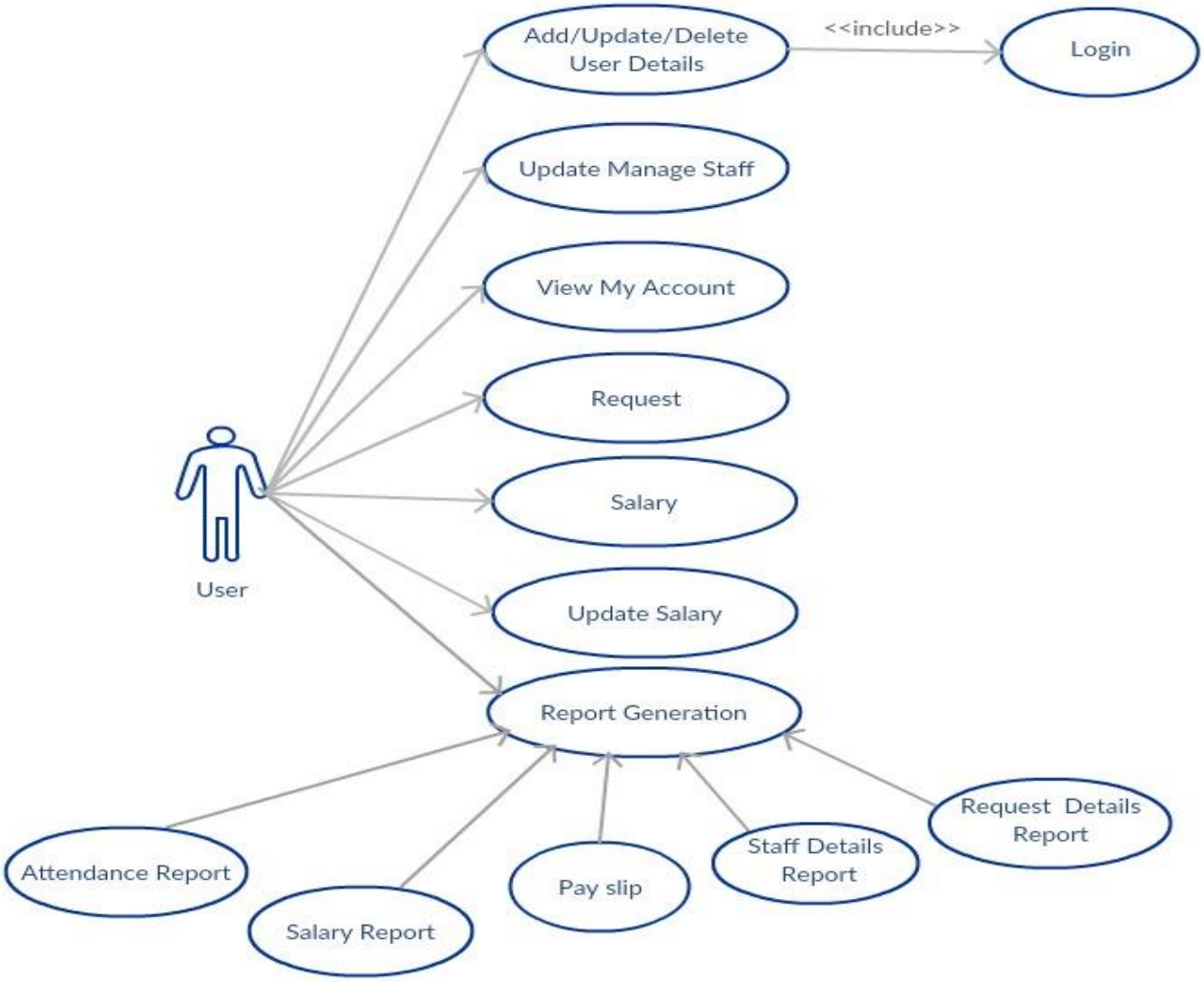


Figure 2.1.1 Use Case for Human resource Management - 1

## Resource

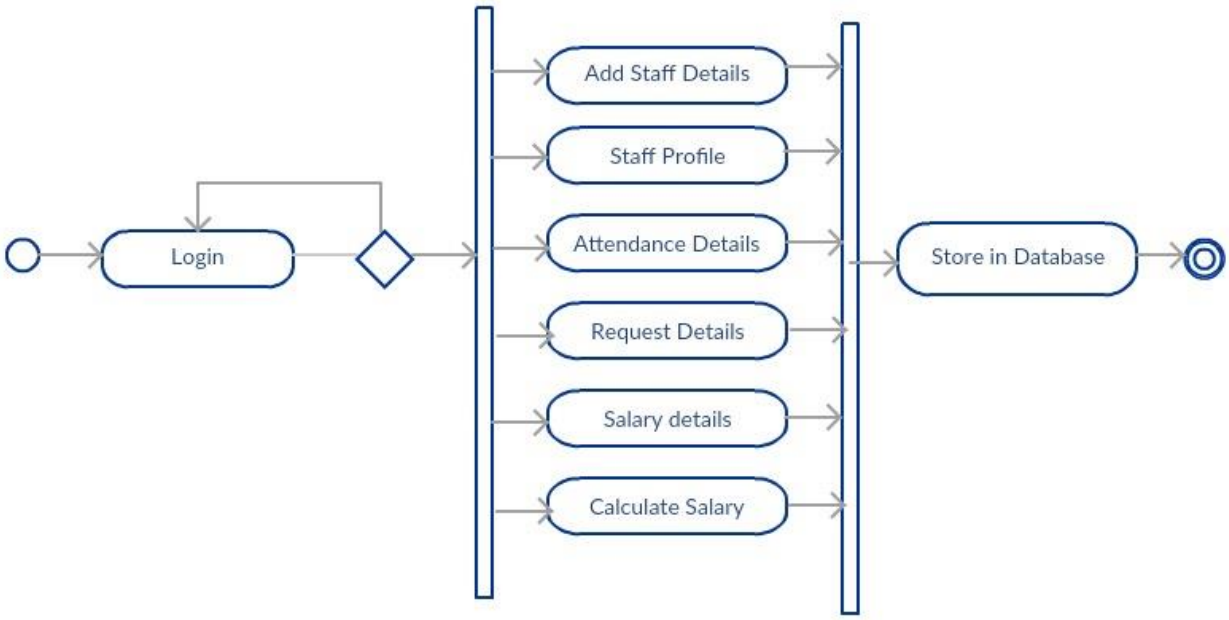


Figure 2.1.2 Activity Diagram for Human resource Management - 1

## Manufacturing Management

- Updating record of purchasing, receiving, storing and transporting raw materials.
- Information about production due to daily, weekly and monthly production.
- Job scheduling information of organizing workers for production and packaging.
- Monitoring details of finished goods and the produced goods transferred to sales.

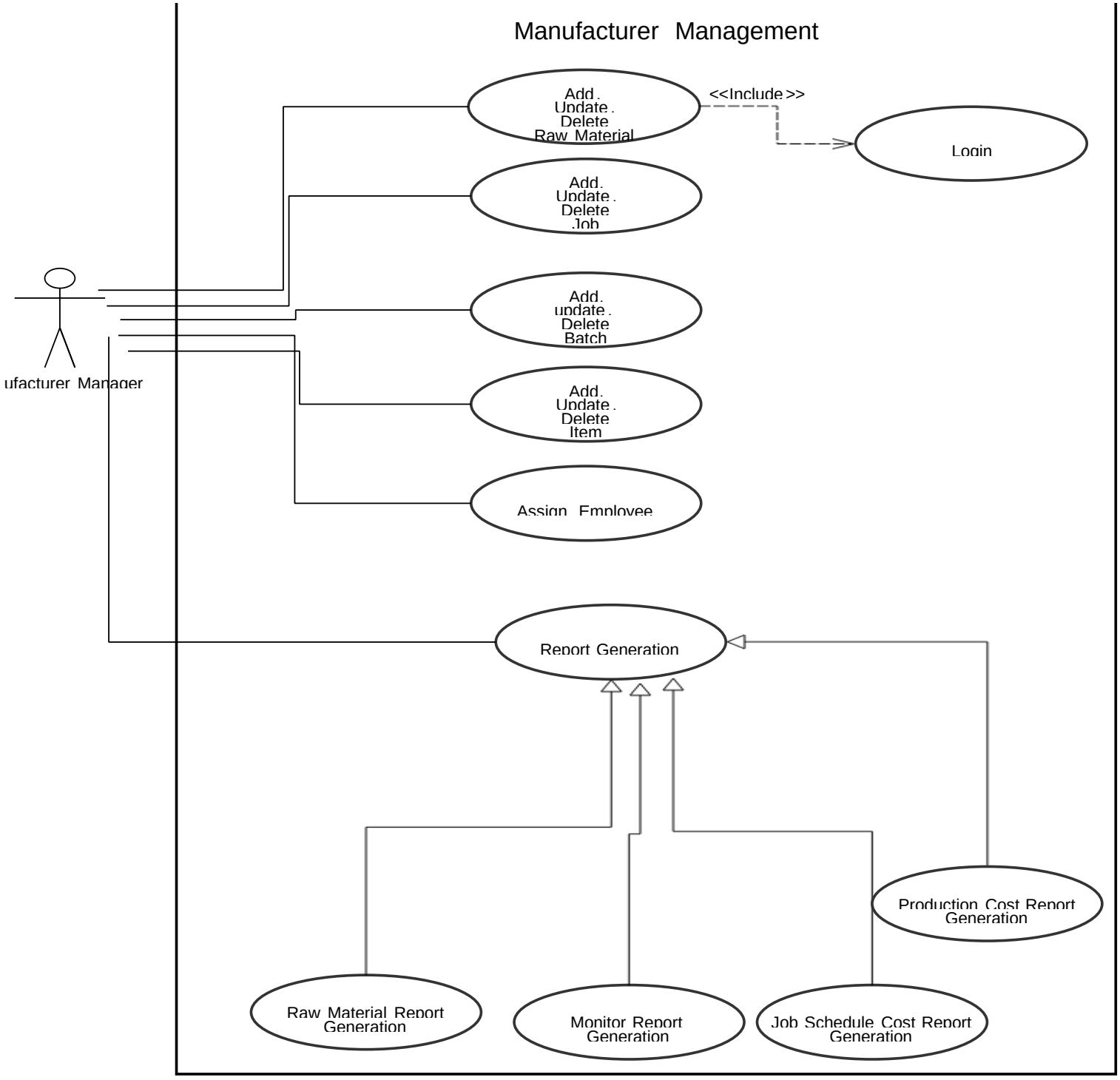


Figure 2.1.3 Use Case for Manufacture Management - 1

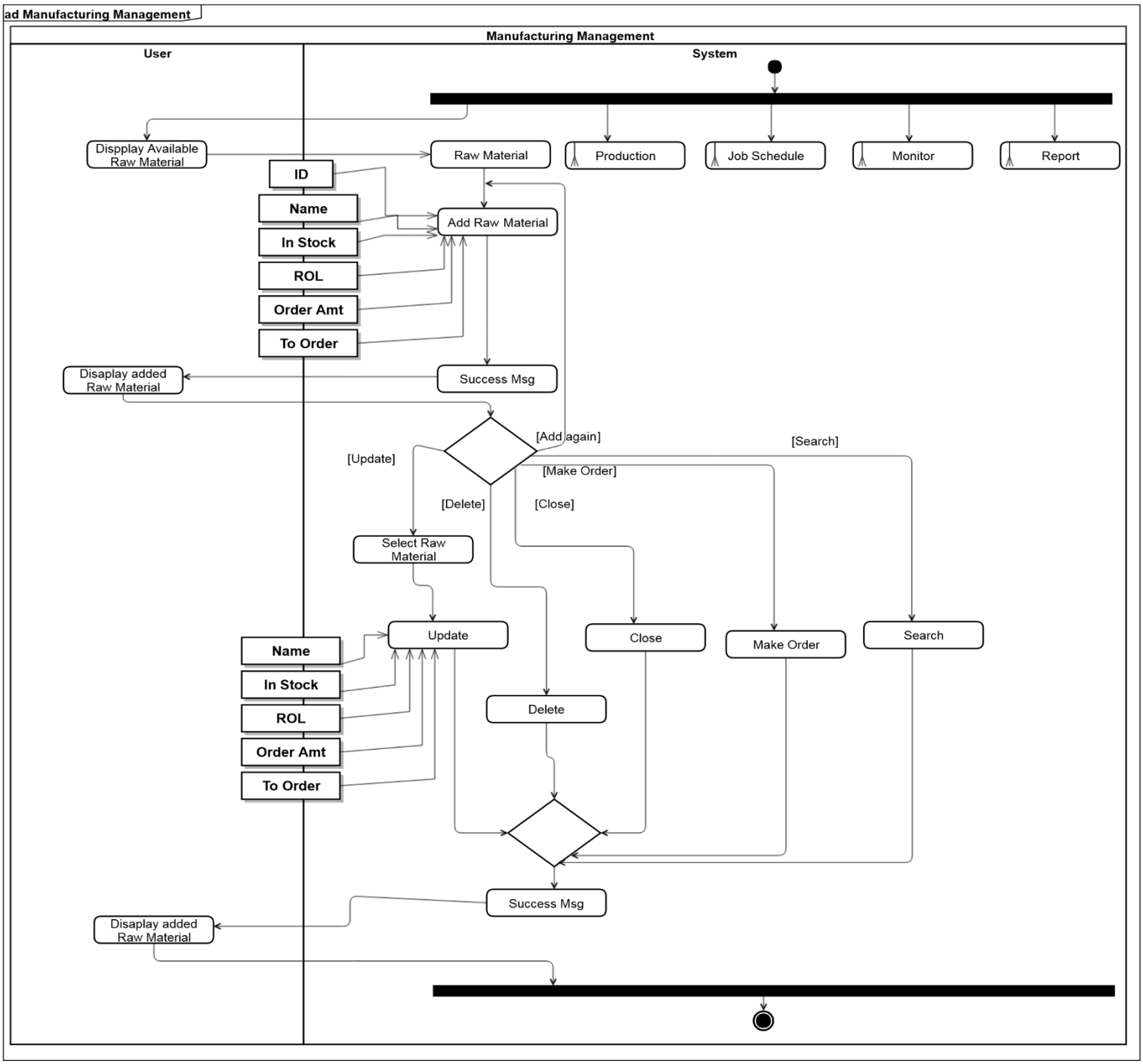


Figure 2.1.4.1 Activity Diagram for Manufacture Management - 1

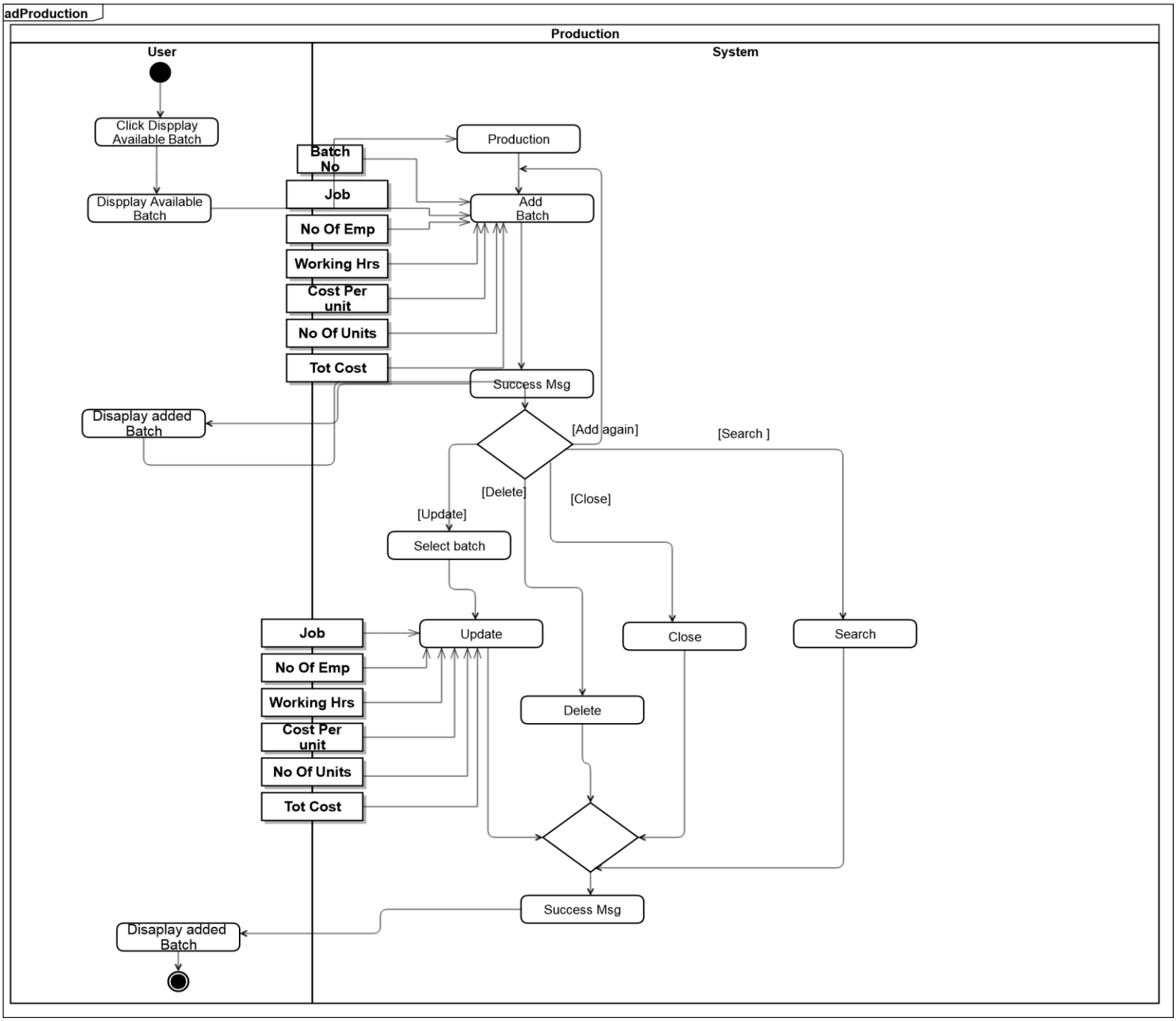


Figure 2.1.4.2 Activity Diagram for Manufacture Management - 2

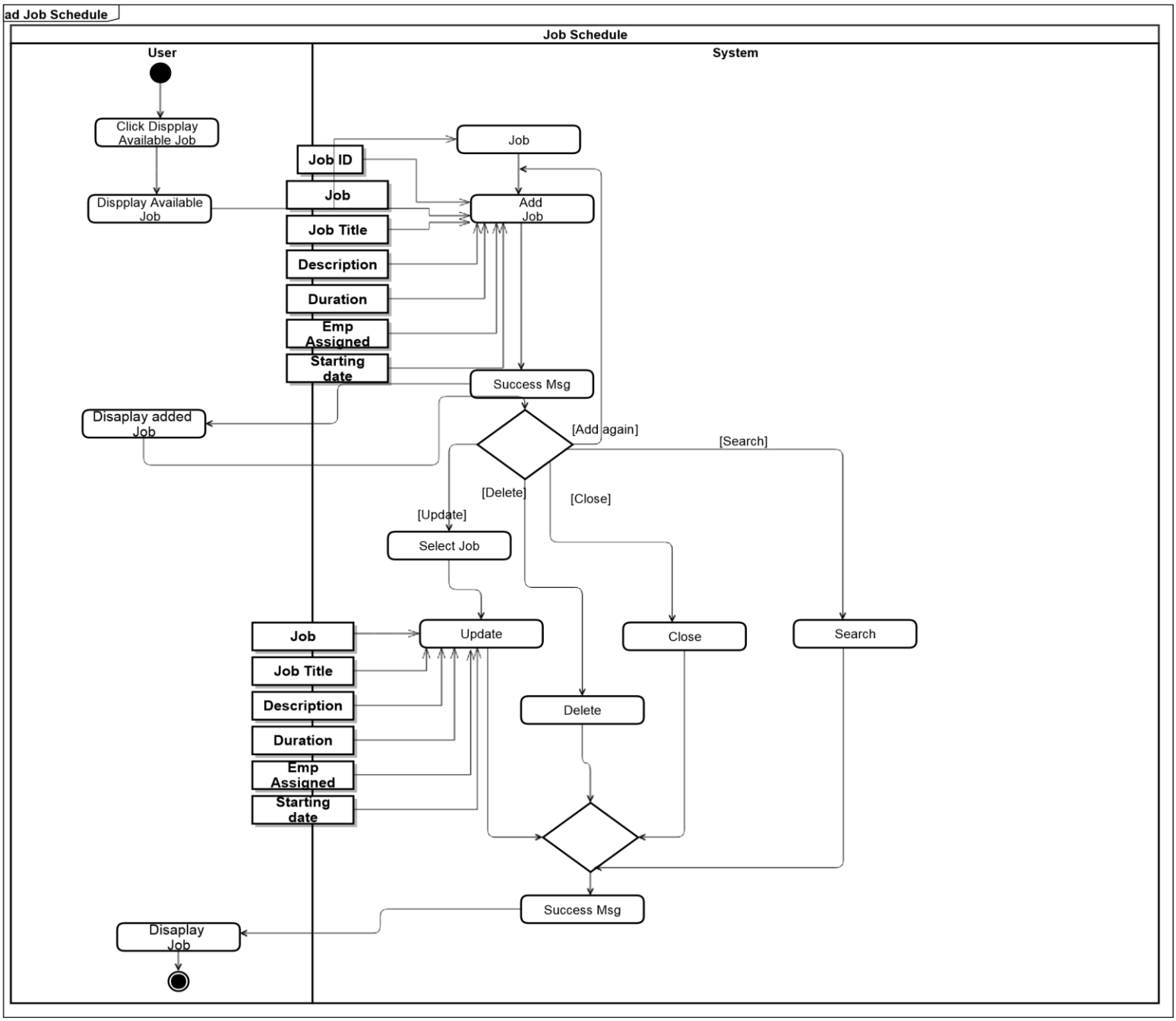


Figure 2.1.4.3 Activity Diagram for Manufacture Management - 3

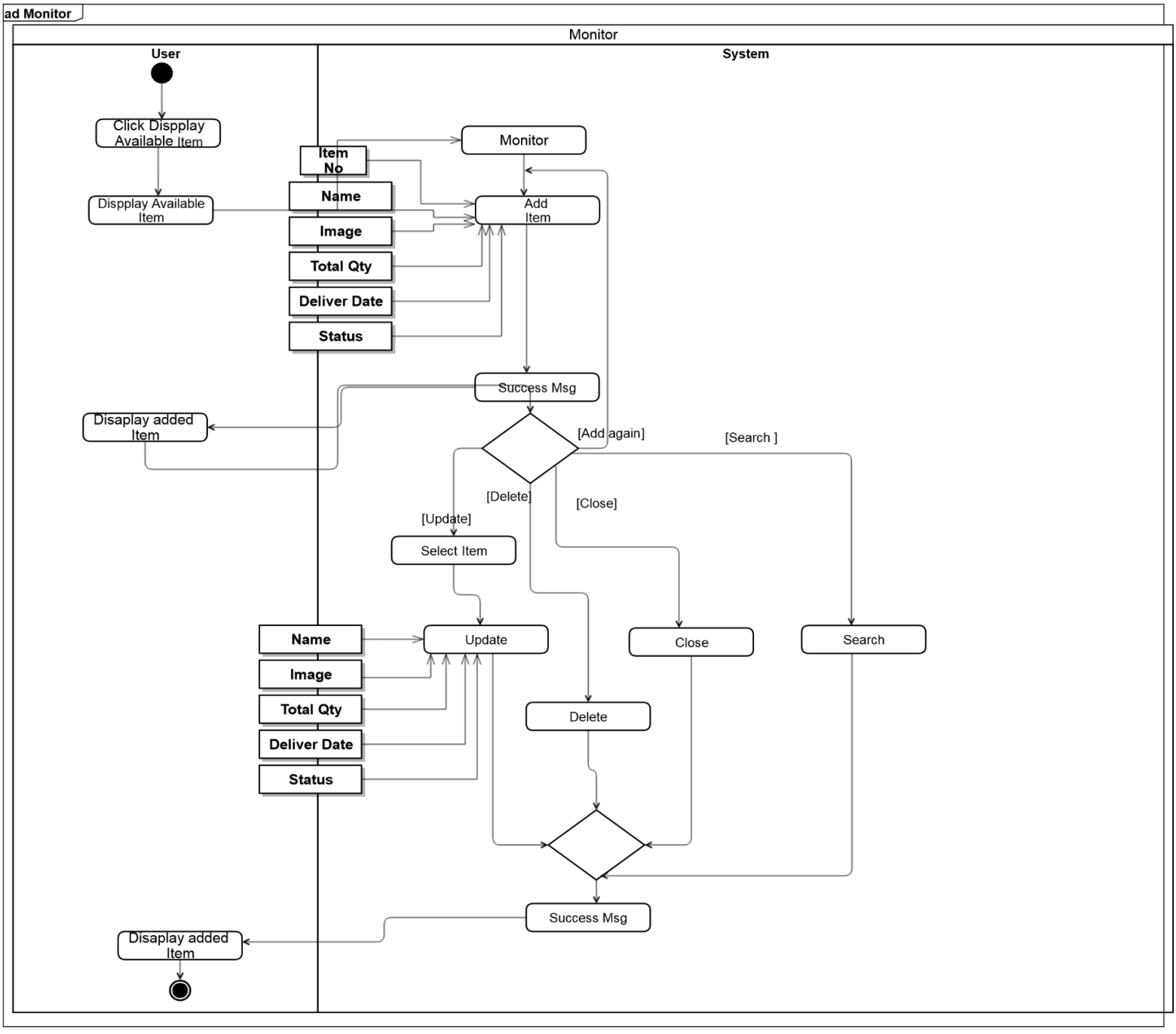


Figure 2.1.4.4 Activity Diagram for Manufacture Management – 4

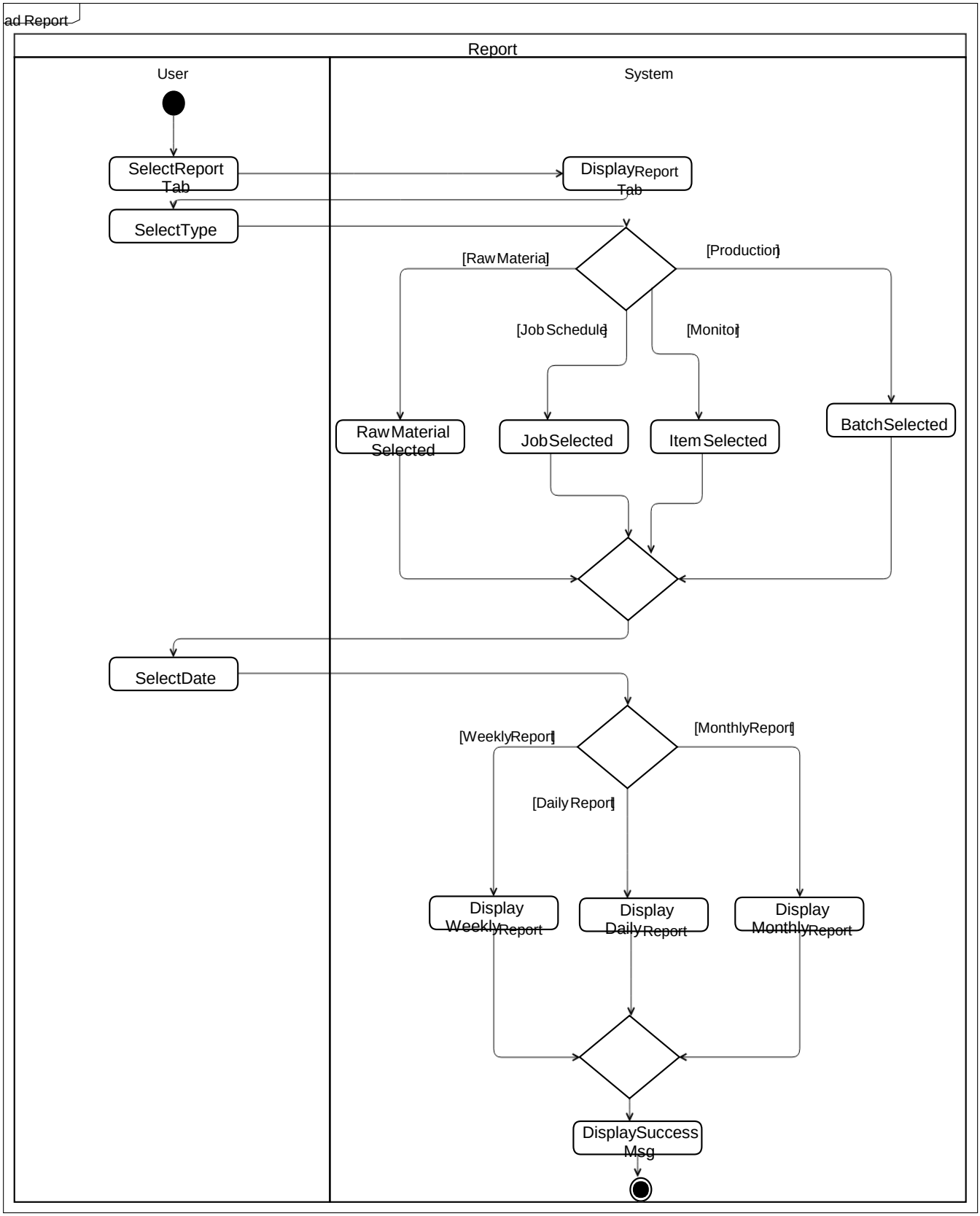


Figure 2.1.4.5 Activity Diagram for Manufacture Management – 5

## Stock Management

- Add a new stock detail, edit an existing detail or delete stock details.
- Maintaining maximum, minimum and Safety Stock level.
- Stock adjustments due to damages, wastages, written-offs, thefts.
- Inventory Valuation on the average price of the stock.

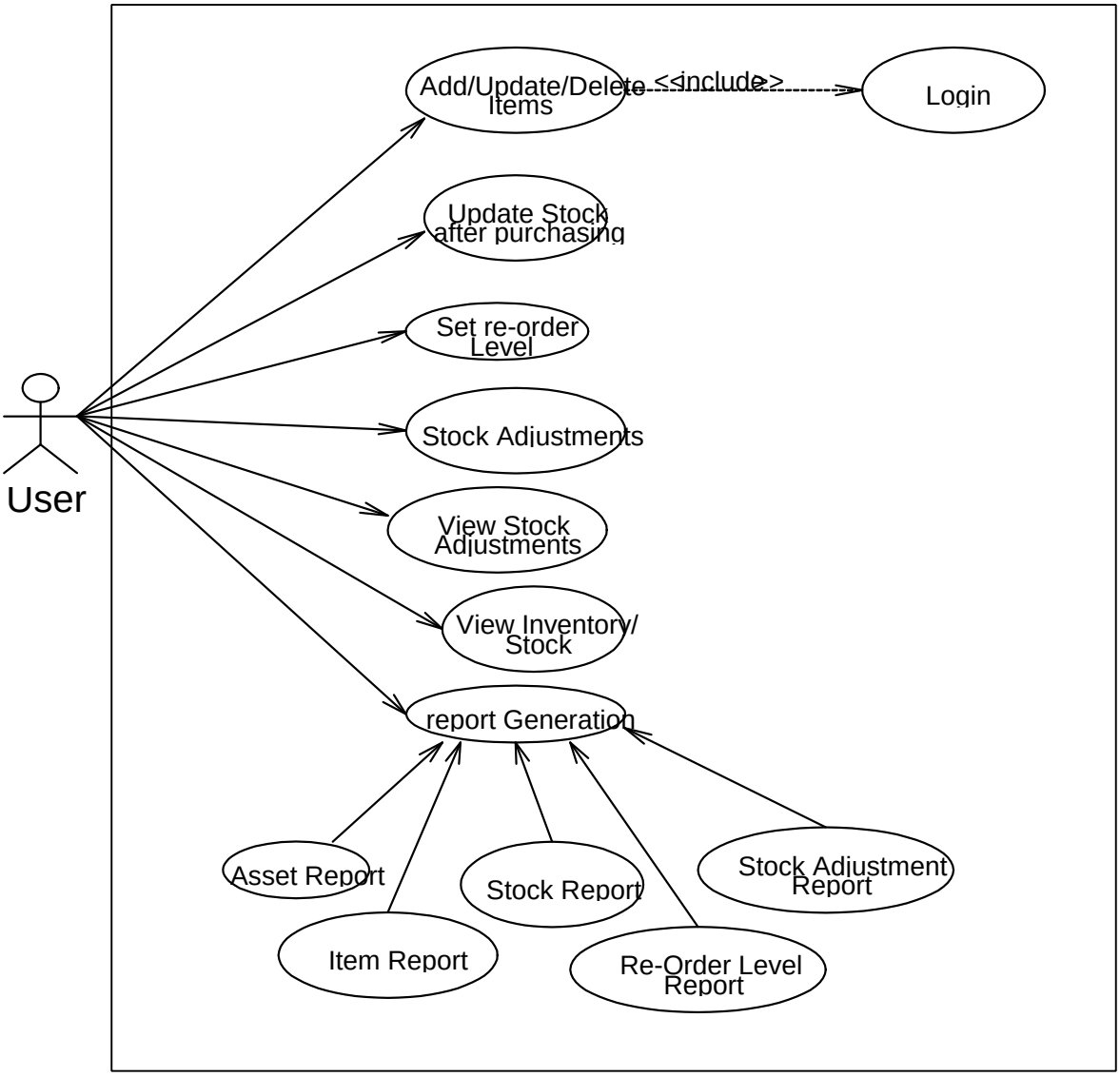


Figure 2.1.5 Use Case Diagram for Stock Management - 1

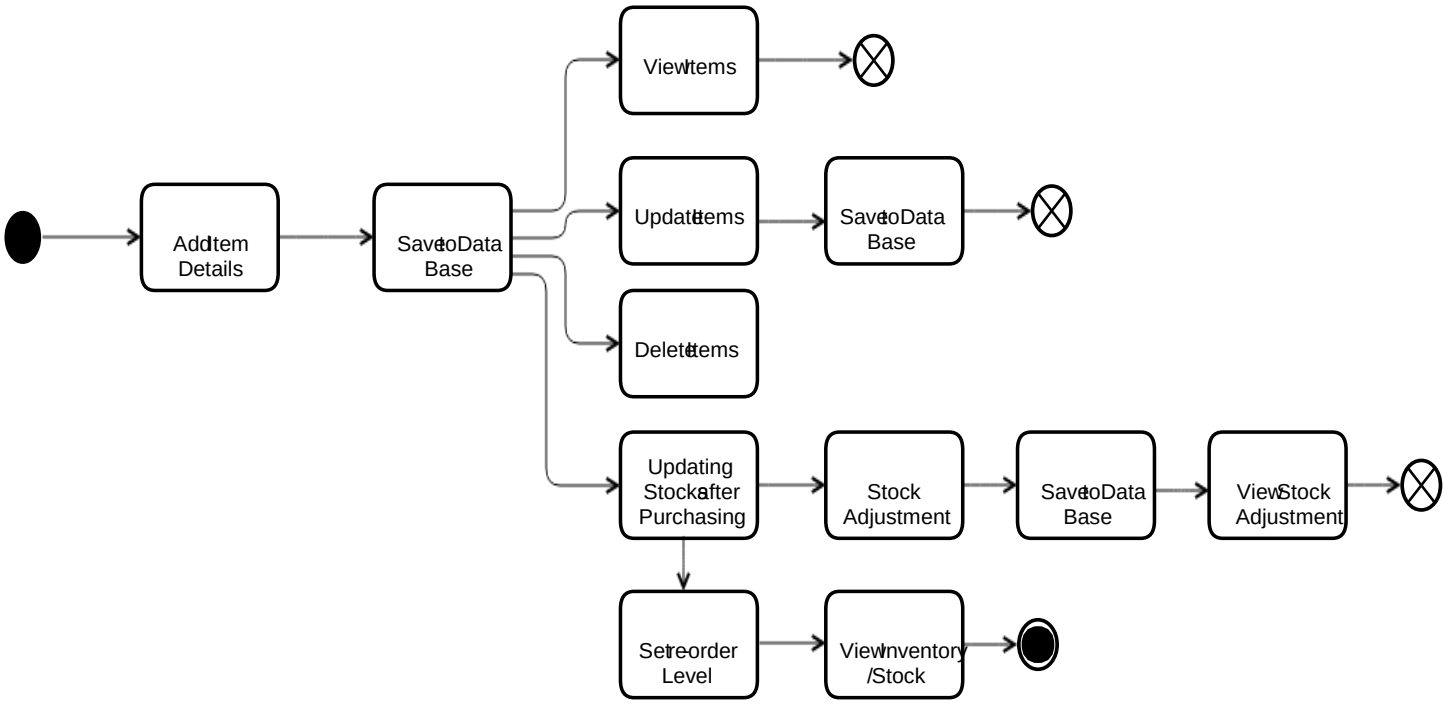


Figure 2.1.6 Activity Diagram for Stock Management - 1

## Supplier Management

- Add a new supplier, edit an existing record or delete a supplier record.
- Purchase Order and Identifying cheapest supplier.
- Surpluses or Deficits on either cash or credit basis.
- Updating existing record of inventory and viewing payment history.


Figure 2.1.7 Use Case Diagram for Supplier Management - 1

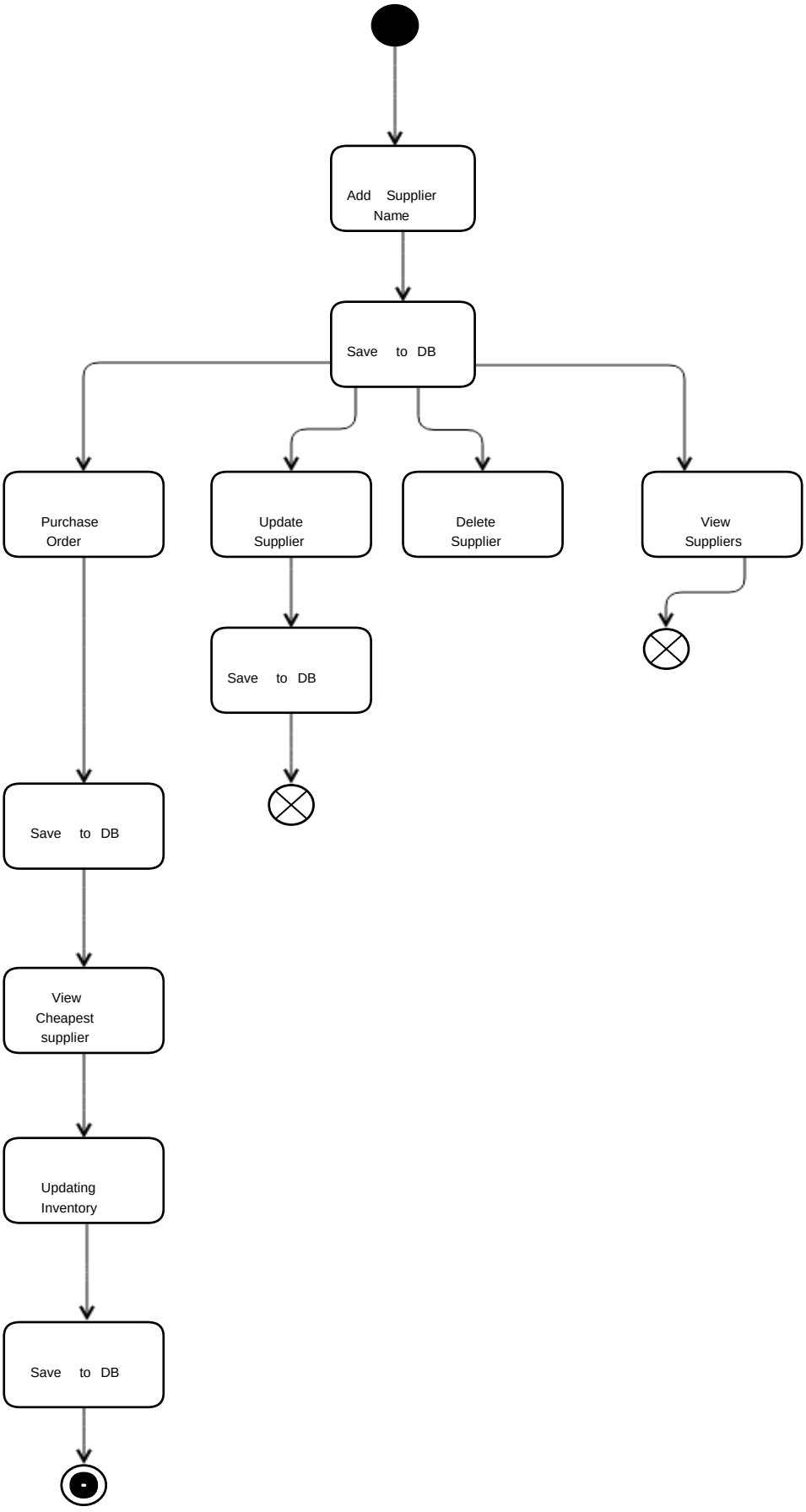


Figure 2.1.8 Activity Diagram for Supplier Management - 1

## Customer Management

- Information about handling of payment discounts (quantity discounts, seasonal discounts, cash discounts)
- Generating Invoices to billing and collecting money.
- **outstanding** statement provides details of all **outstanding customer**
- Ageing report, list of customers, email sent to customers, customer invoices

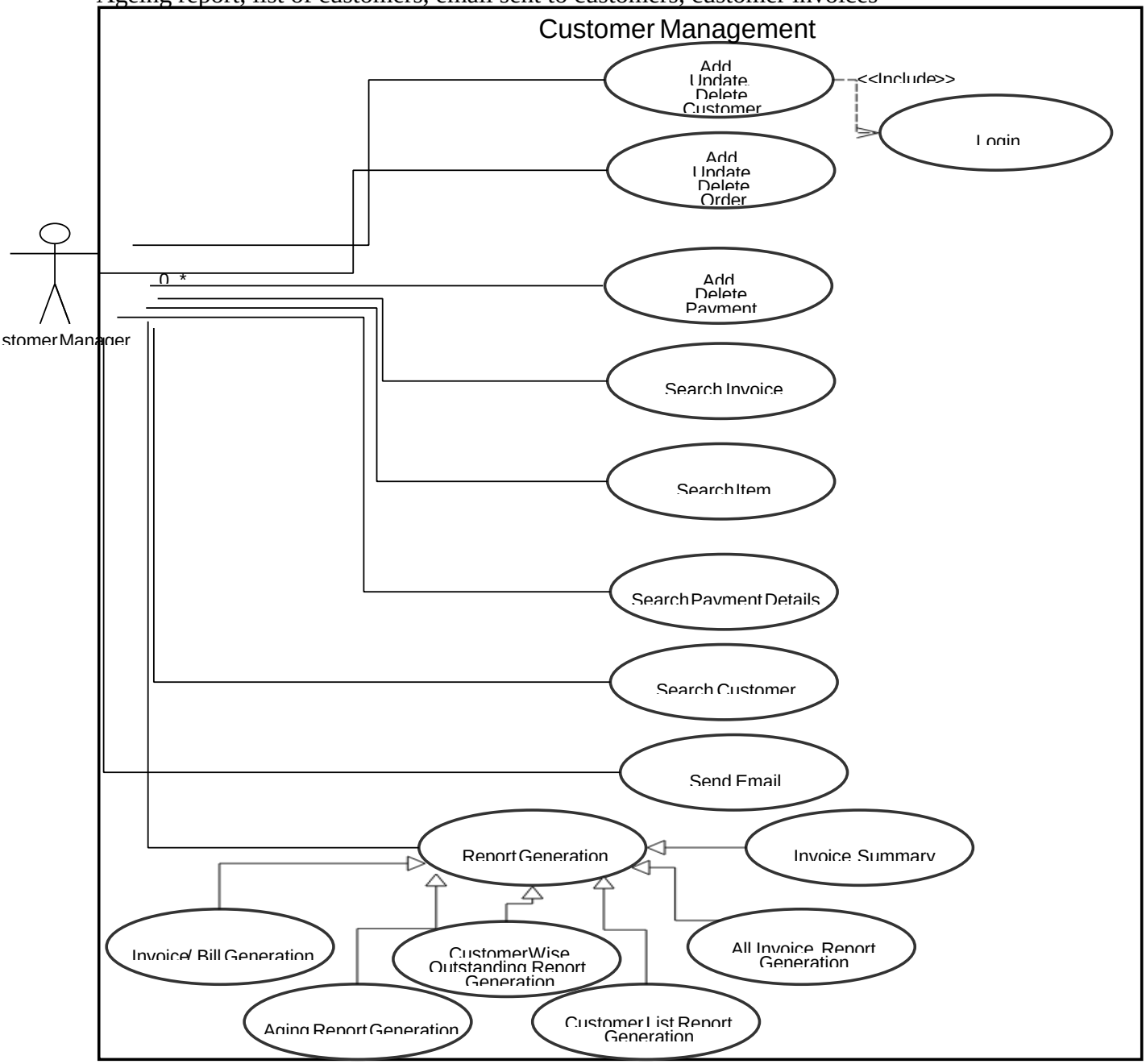


Figure 2.1.9 Use Case Diagram for Customer Management - 1

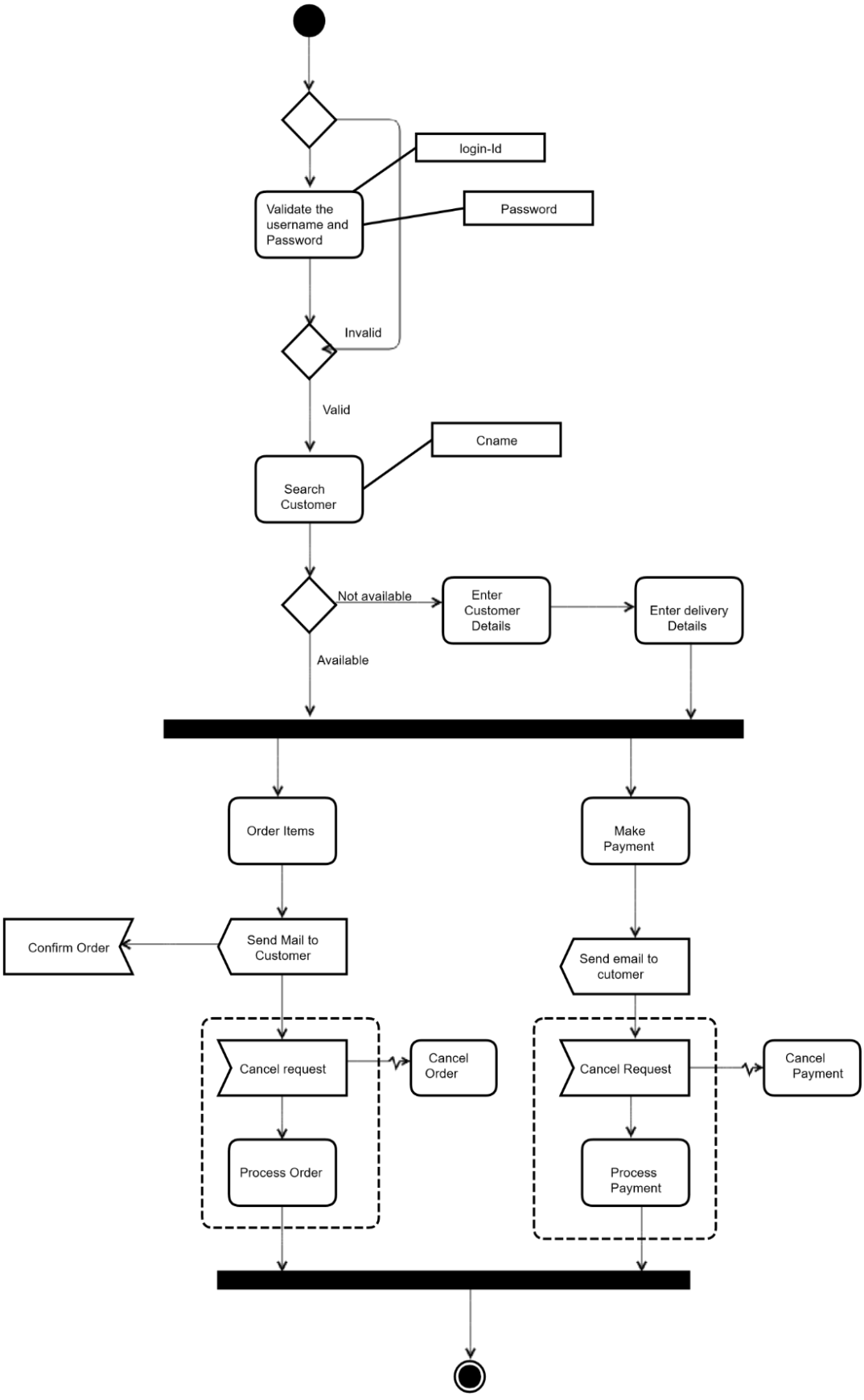


Figure 2.1.10 Activity Diagram for Customer Management - 1

## Product Returns Management

Purchase returns:

- Returning damaged items back to the supplier and getting the money replaced.

Sales returns:

- Checking returns and replacing the product to the customer back.
- Calculating re-selling price and giving discounts to damaged goods.
- Giving credit notes to customers who returned nonmoving goods.

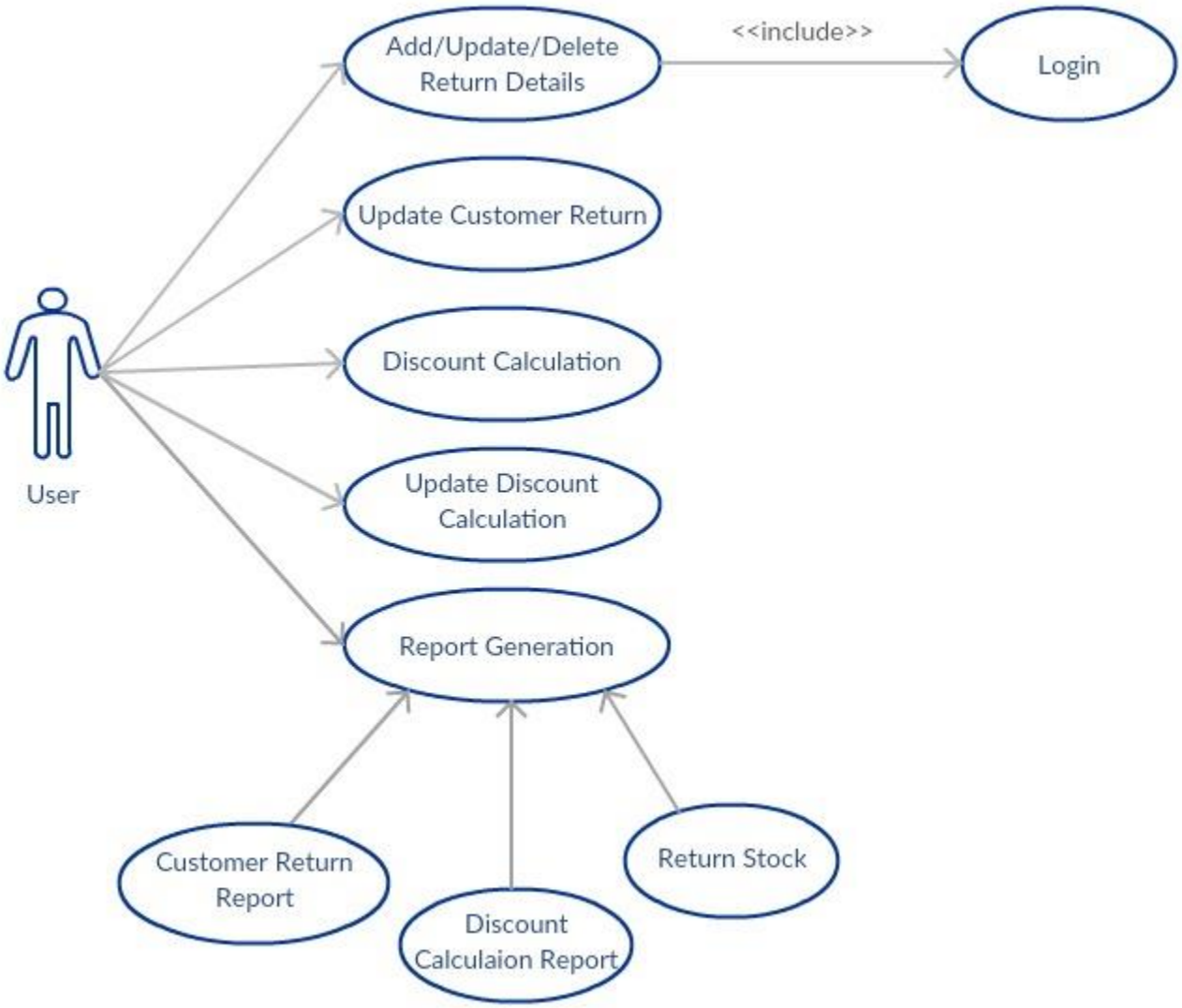


Figure 2.1.11 Use Case Diagram Product Return  Management - 1

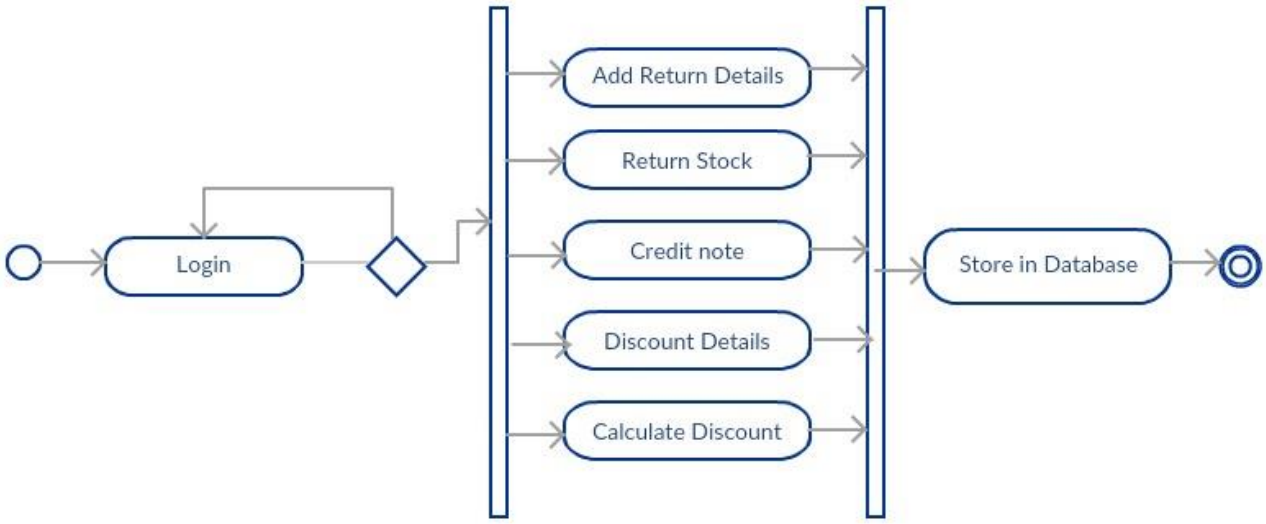


Figure 2.1.12 Activity Diagram Product Return  Management - 1

## Transport Management

- Time scheduling to bring cloths from suppliers and deliver cloths to customers.
- Maintaining insurance details.
- Calculating transportation cost (detention time, loading and unloading times, fuel cost, distance).
- Generating reports for transportation cost per day, vehicle details and servicing details.

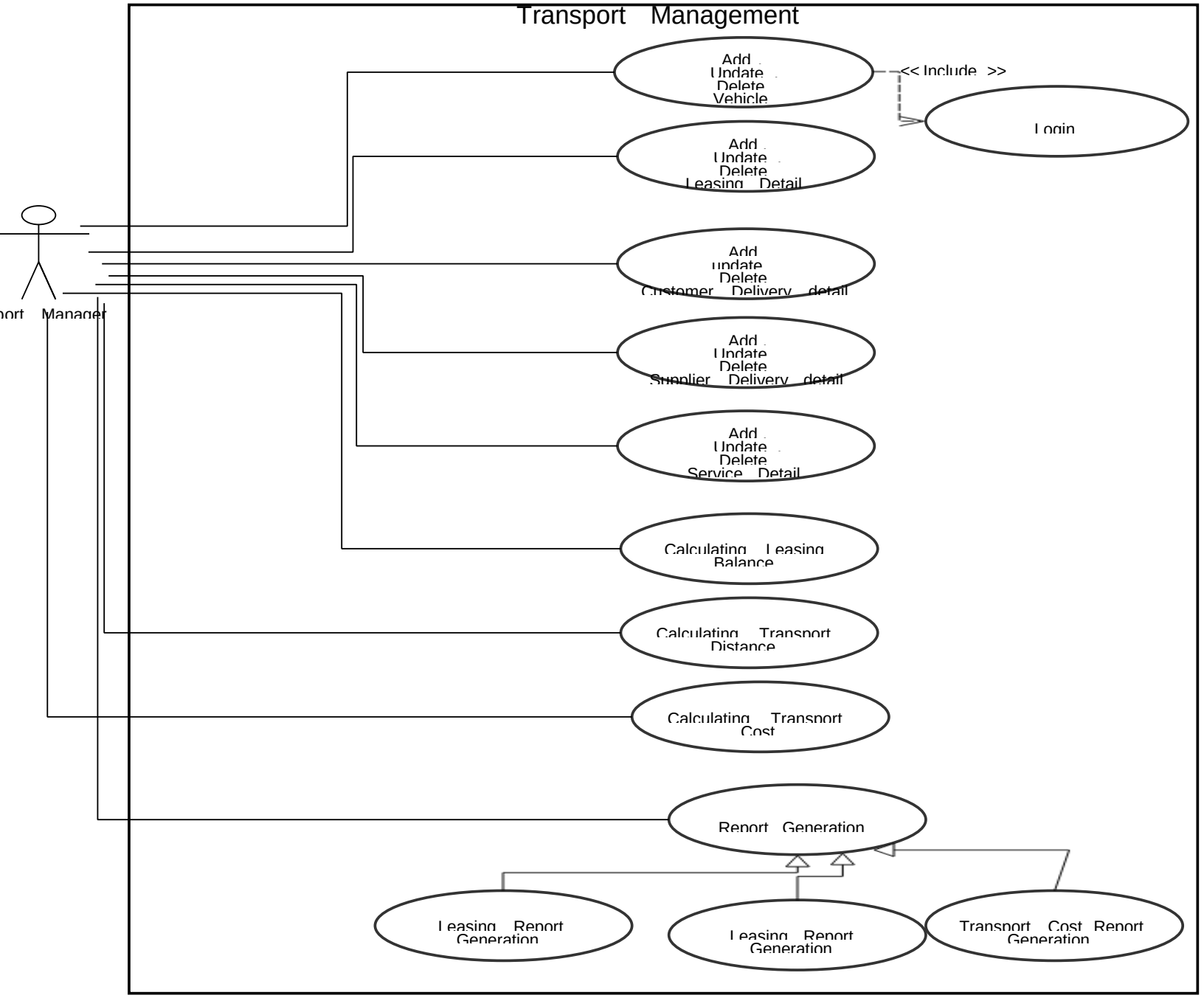


Figure 2.1.13 Use Case Diagram Transport Management - 1

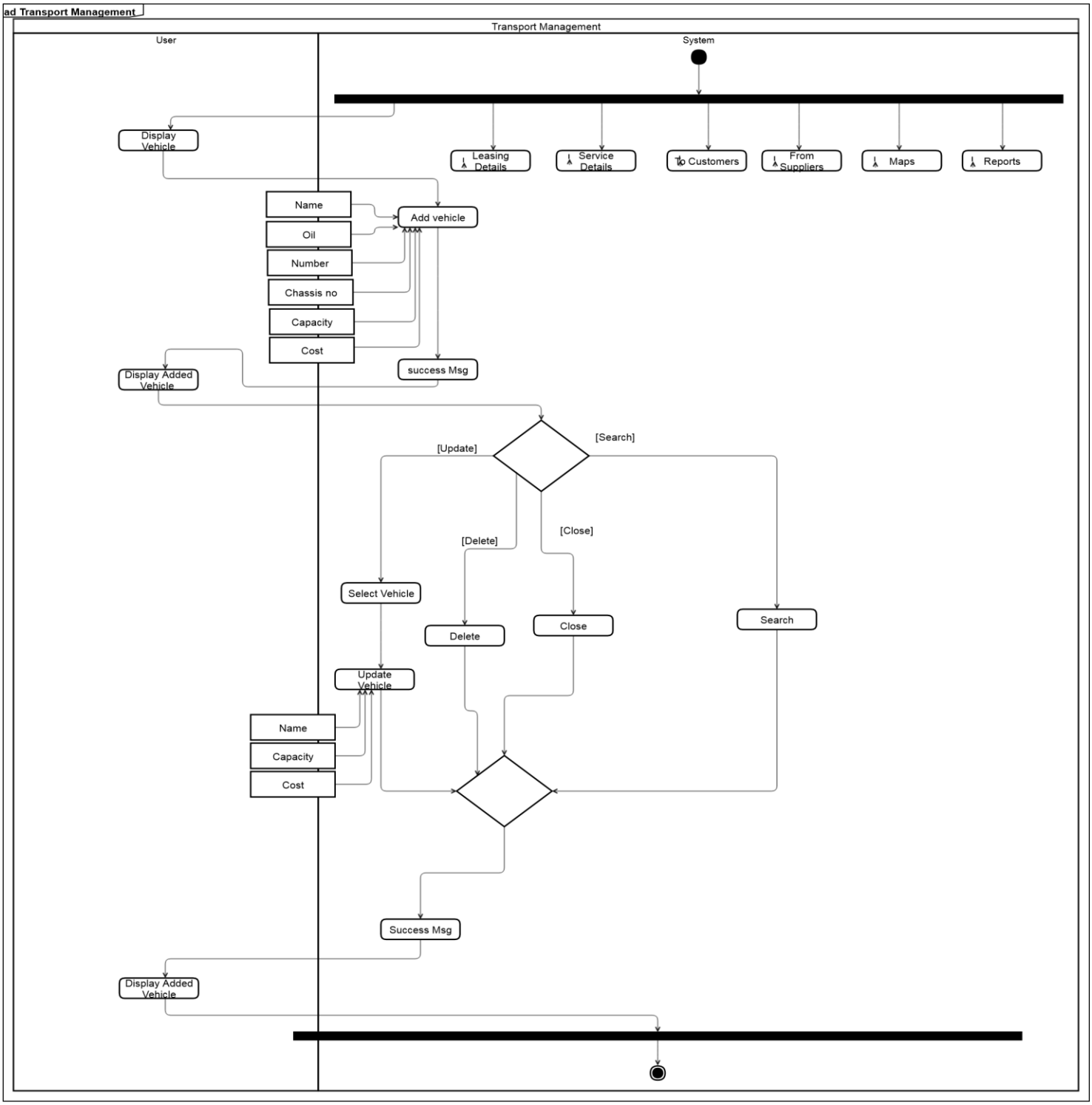


Figure 2.1.14.1 Activity Diagram Transport  Management - 1

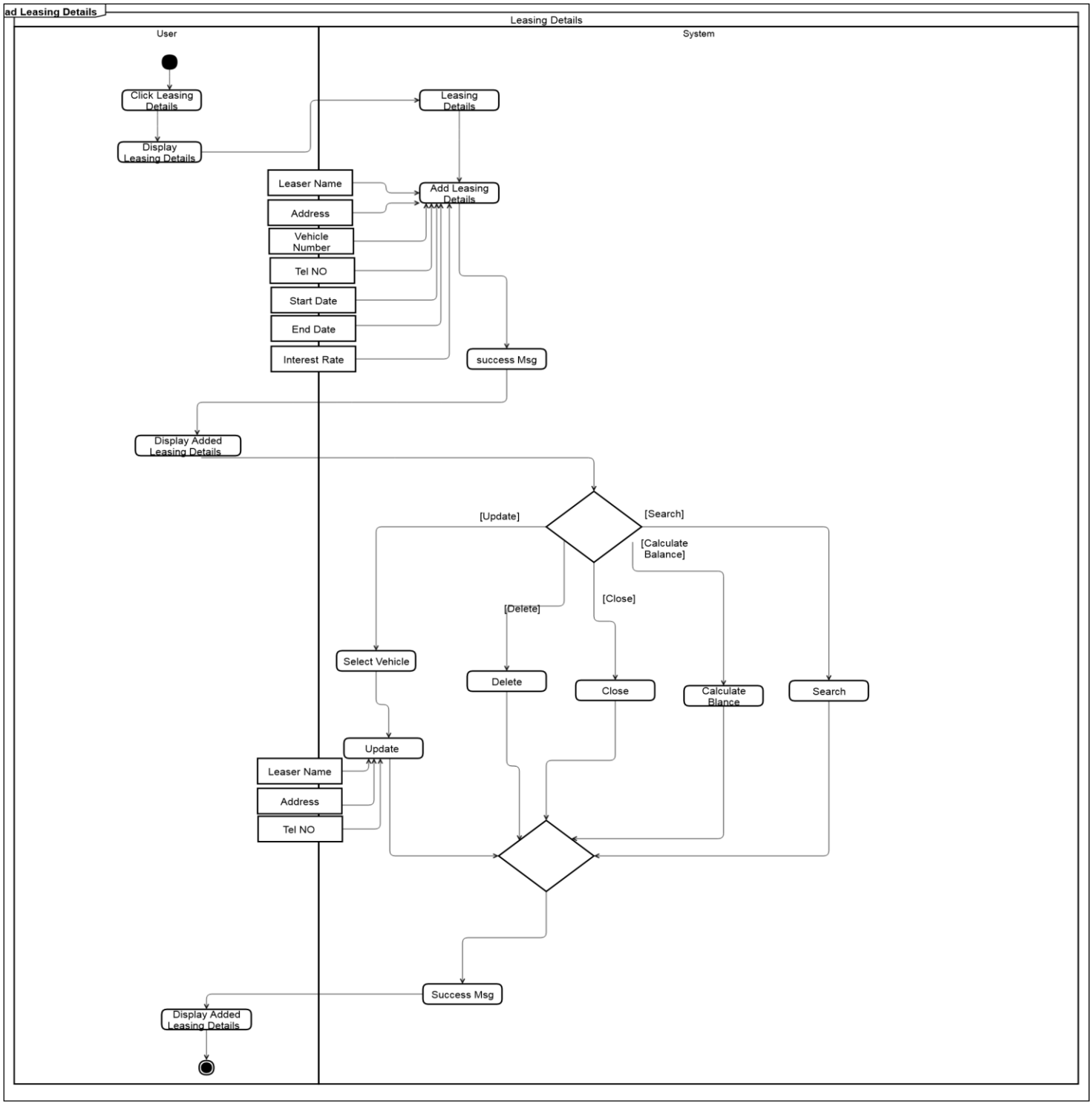


Figure 2.1.14.2 Activity Diagram Transport  Management - 2

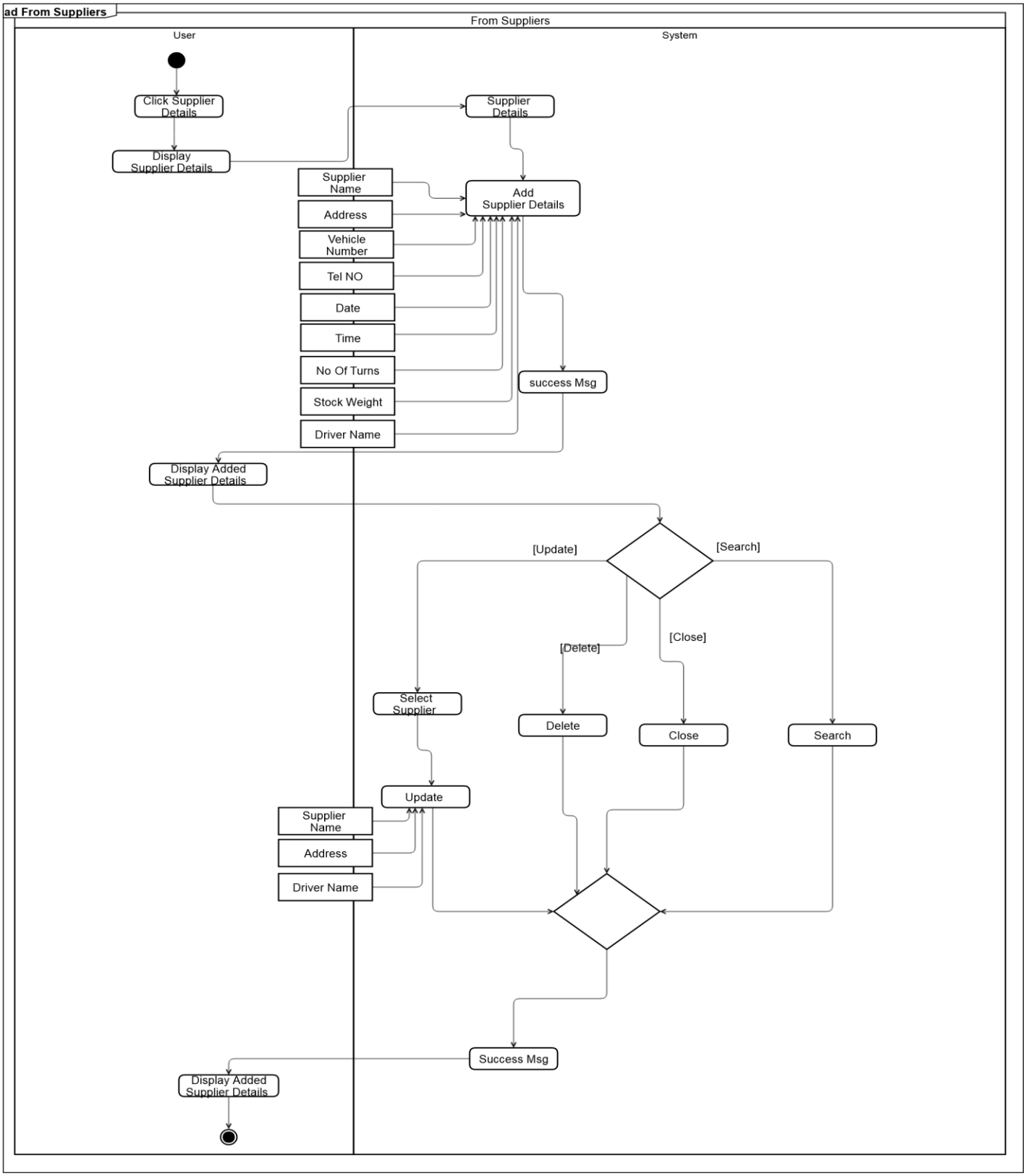


Figure 2.1.14.3 Activity Diagram Transport  Management - 3

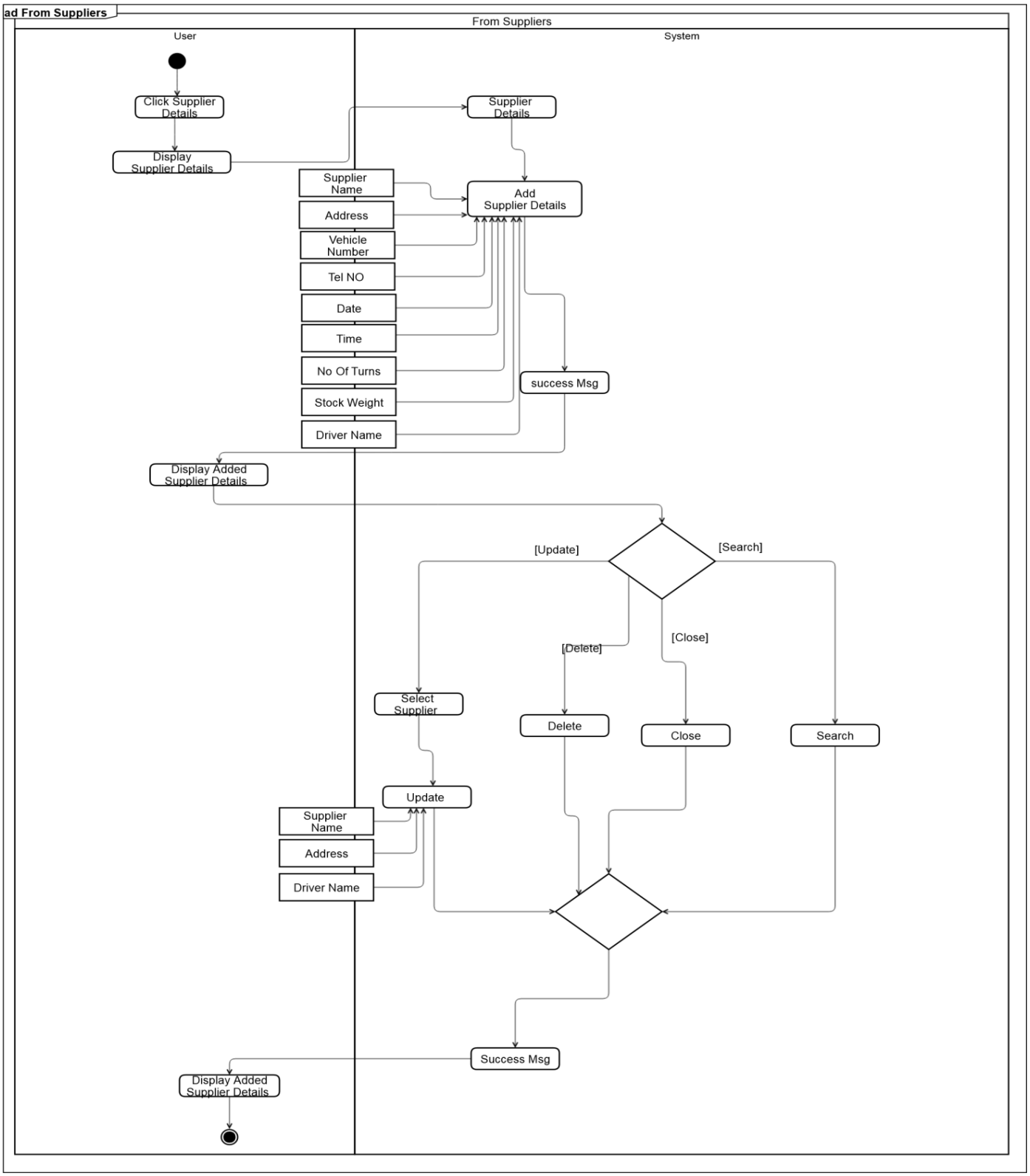


Figure 2.1.14.3 Activity Diagram Transport  Management - 4

## Finance Management

- Add a new incomes and expenses, assets, liabilities and equity details.
- Edit an existing or delete details.
- Calculating profit and loss per quarter annum
- Calculating depreciation of assets
- Generating reports (balance sheet, profit and loss reports)

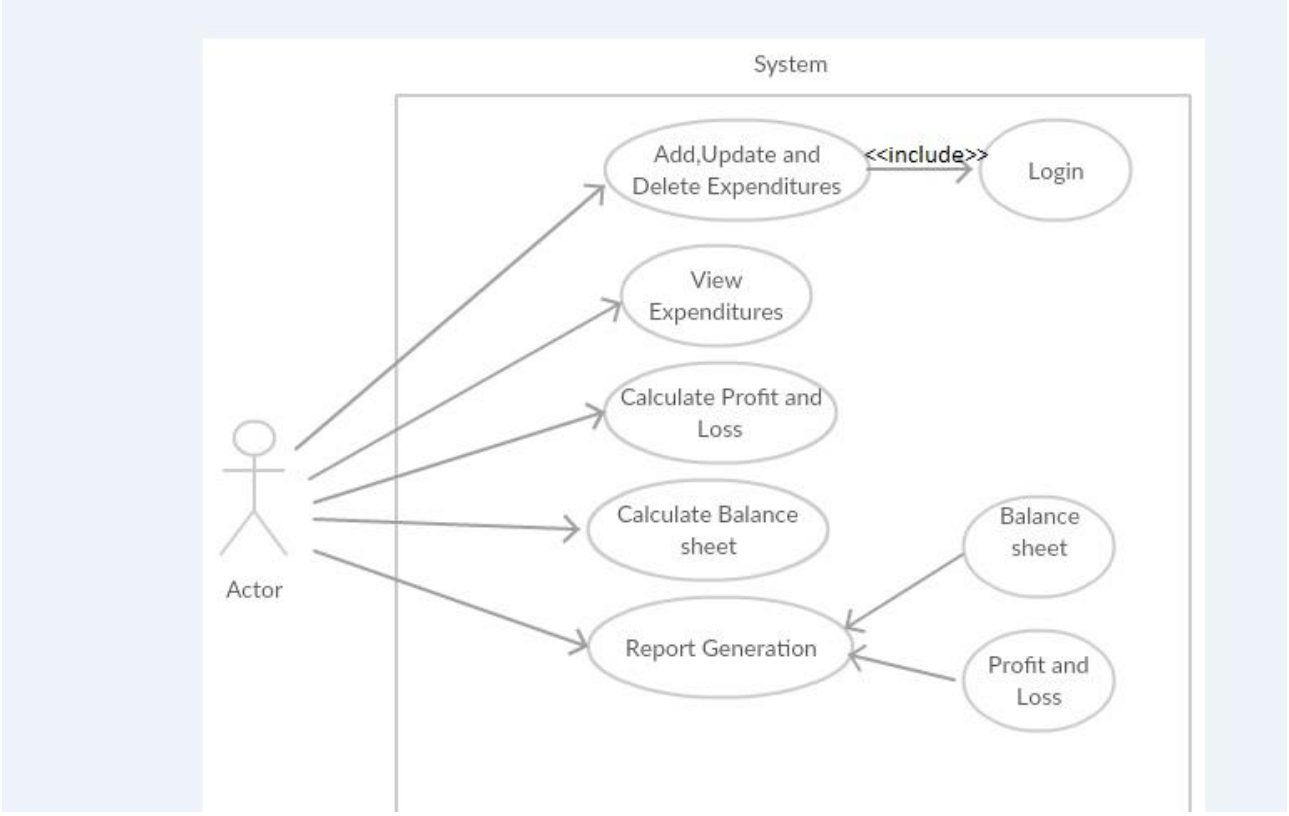


Figure 2.1.14 Use Case Diagram Finance Management - 1

**Hardware Requirements**

- A minimum computer system that will help you access the entire tool in the Course is a Pentium 166 or a higher capacity CPU.

- 128 Megabytes of RAM or Higher.

**Software Requirements**

- Platform you can have windows operating system.
- **C#** Programming language.
- .NET framework 4.0
- My SQL server.

## 2.2 Design

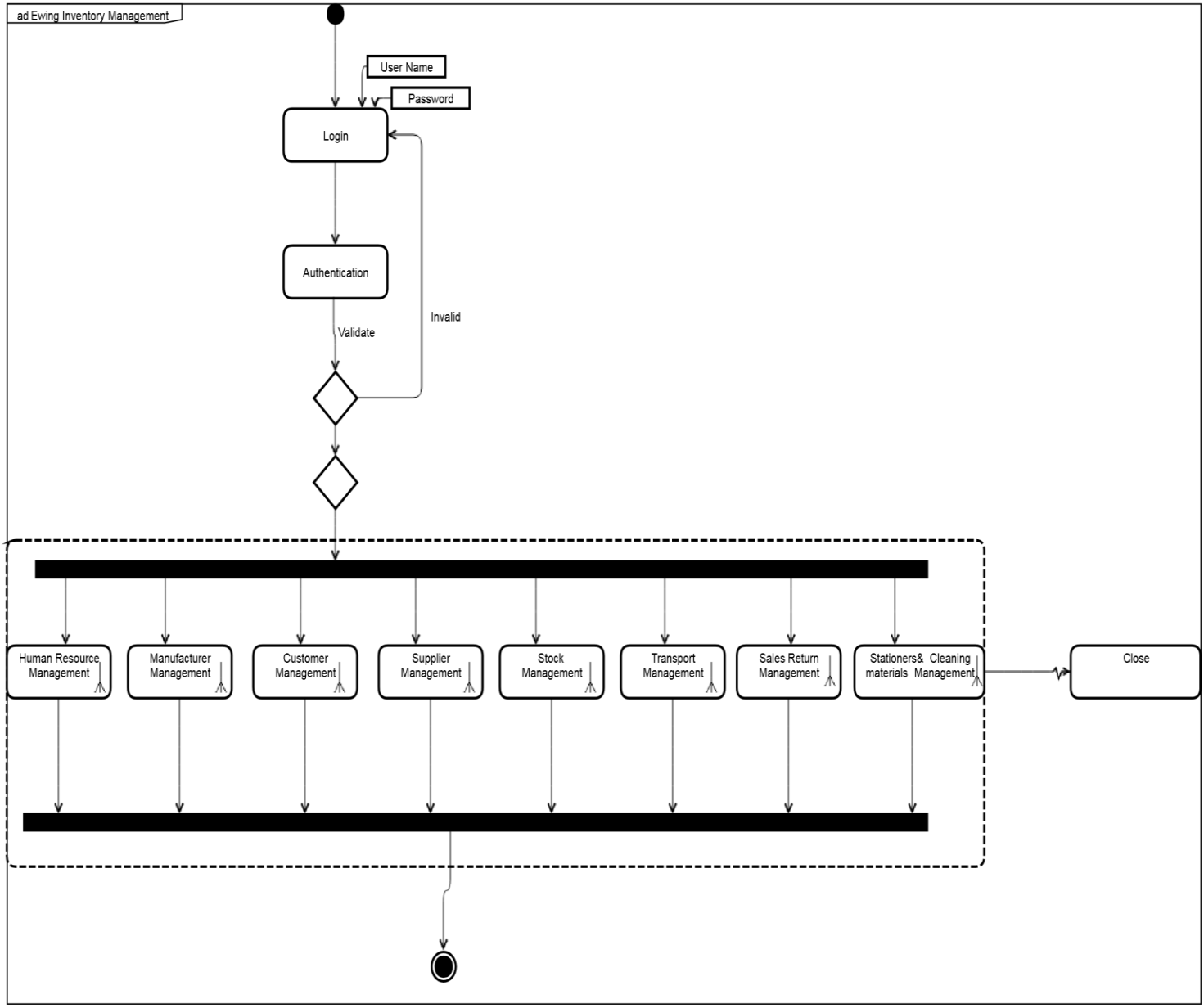


Figure 2.2.1 Activity Diagram for Ewing Inventory Management - 1

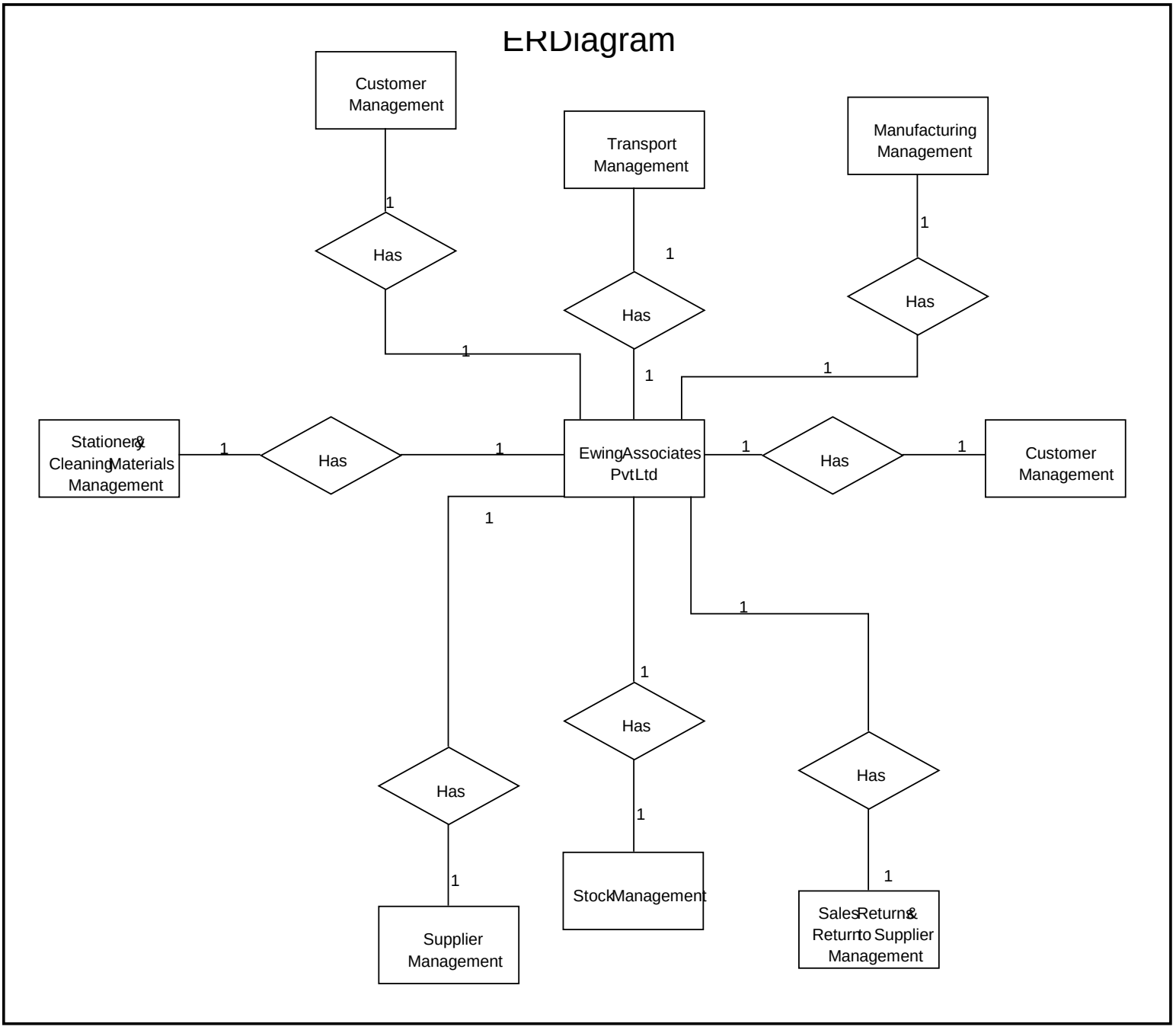


Figure 2.2.2 ER Diagram for Ewing Inventory Management - 1

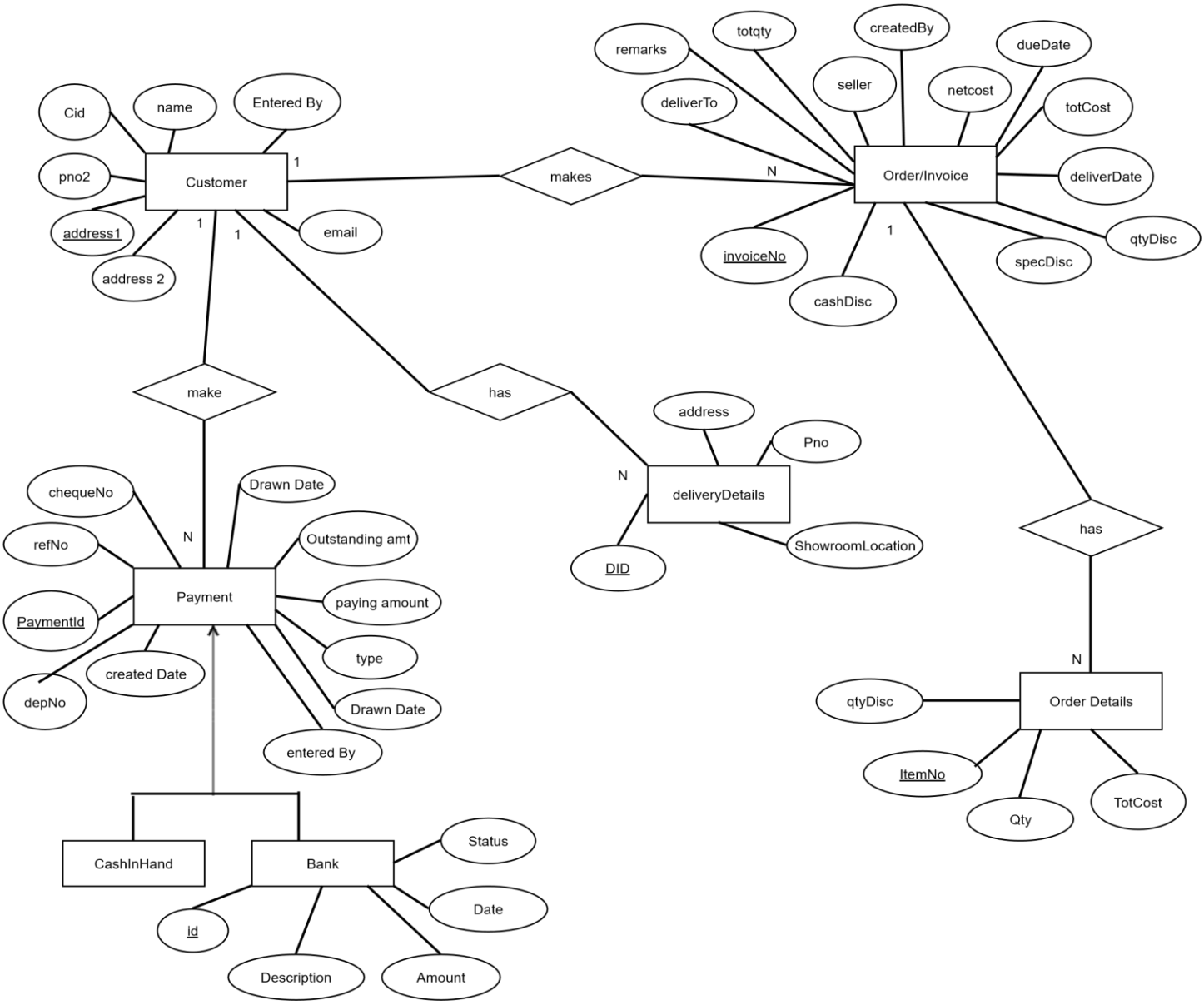


Figure 2.2.3 ER Diagram for Customer Management - 1

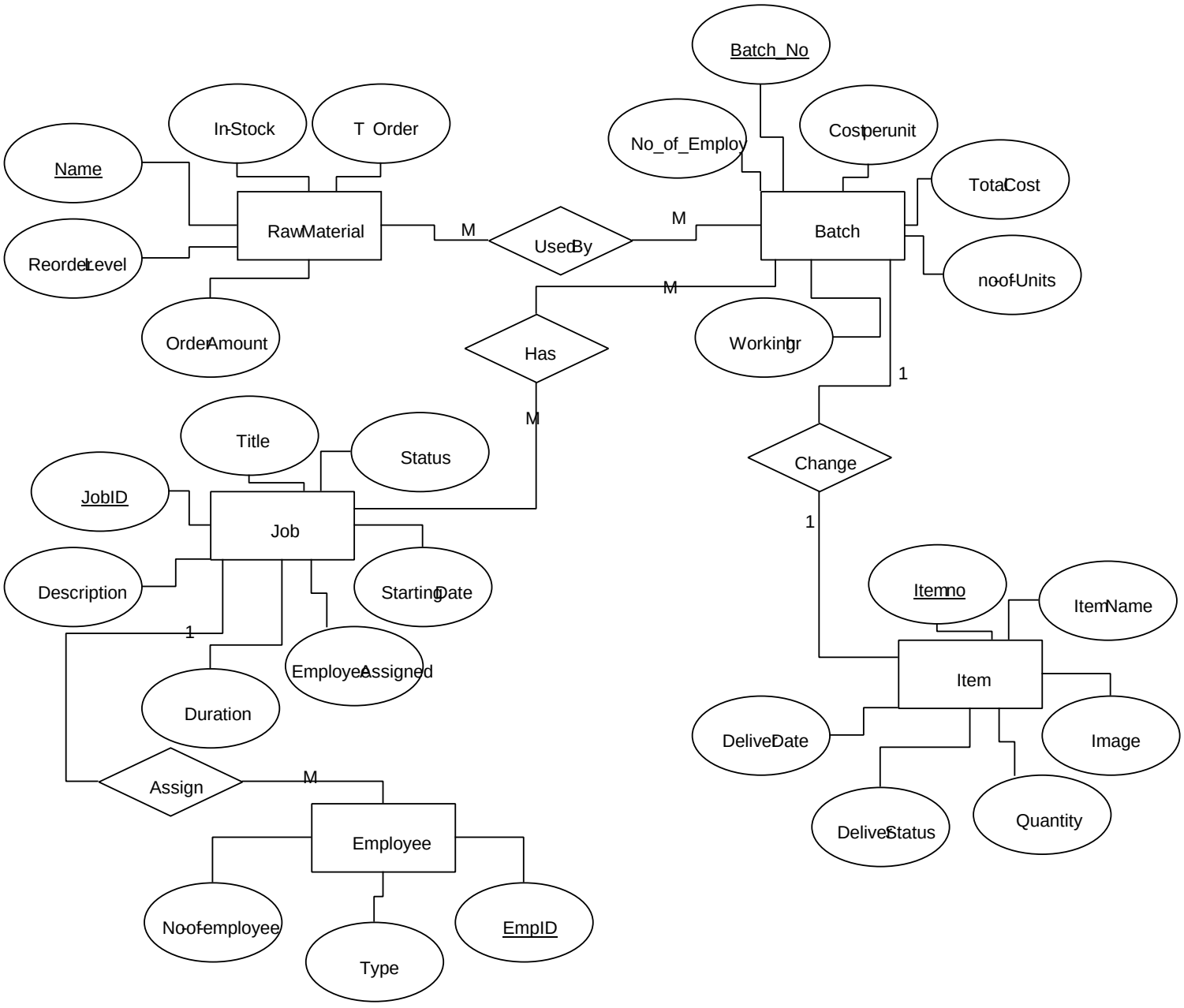


Figure 2.2.4 ER Diagram for Manufacture Management - 1

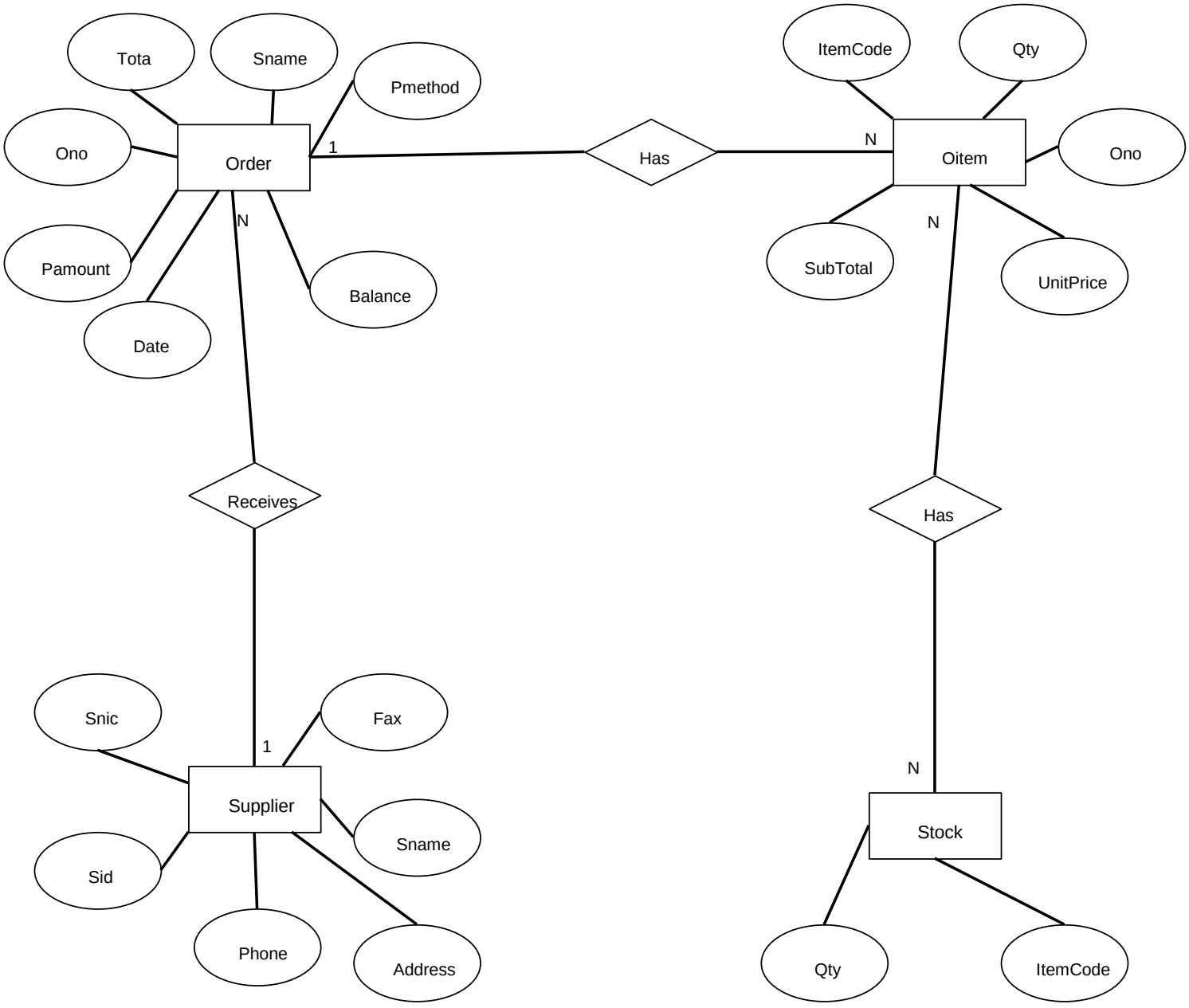
Tota
Sname
Pmethod
Ono
Order
1
Has
N
Oitem
Ono
ItemCode
Qty
N
Pamount
Balance
Date
SubTotal
UnitPrice
N
Receives
Has
Snic
Fax
1
Supplier
Sname
Sid
Phone
Address
N
Stock
Qty
ItemCode

Figure 2.2.5 ER Diagram for Supplier Management - 1

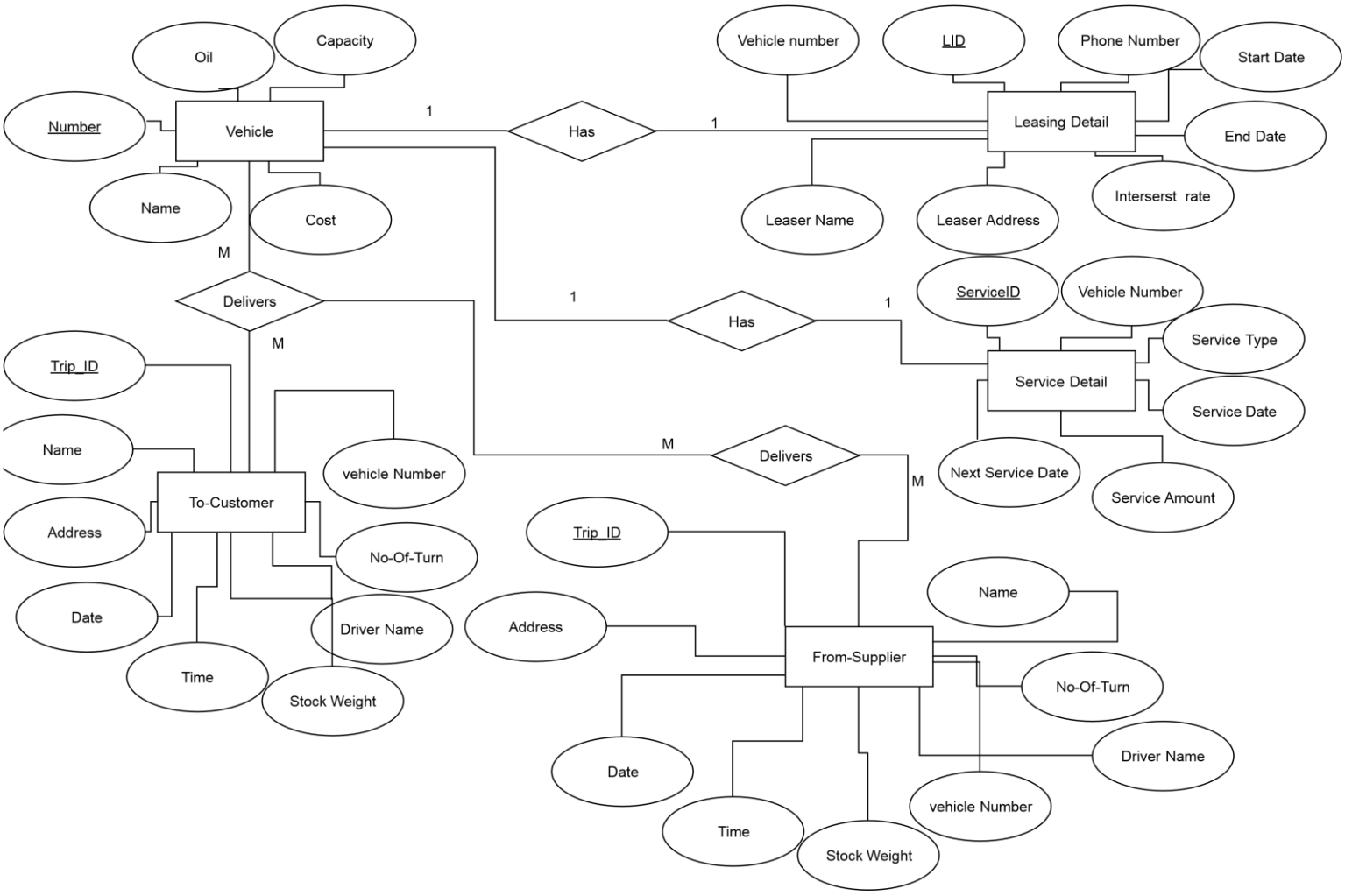


Figure 2.2.6 ER Diagram for Transport Management - 1

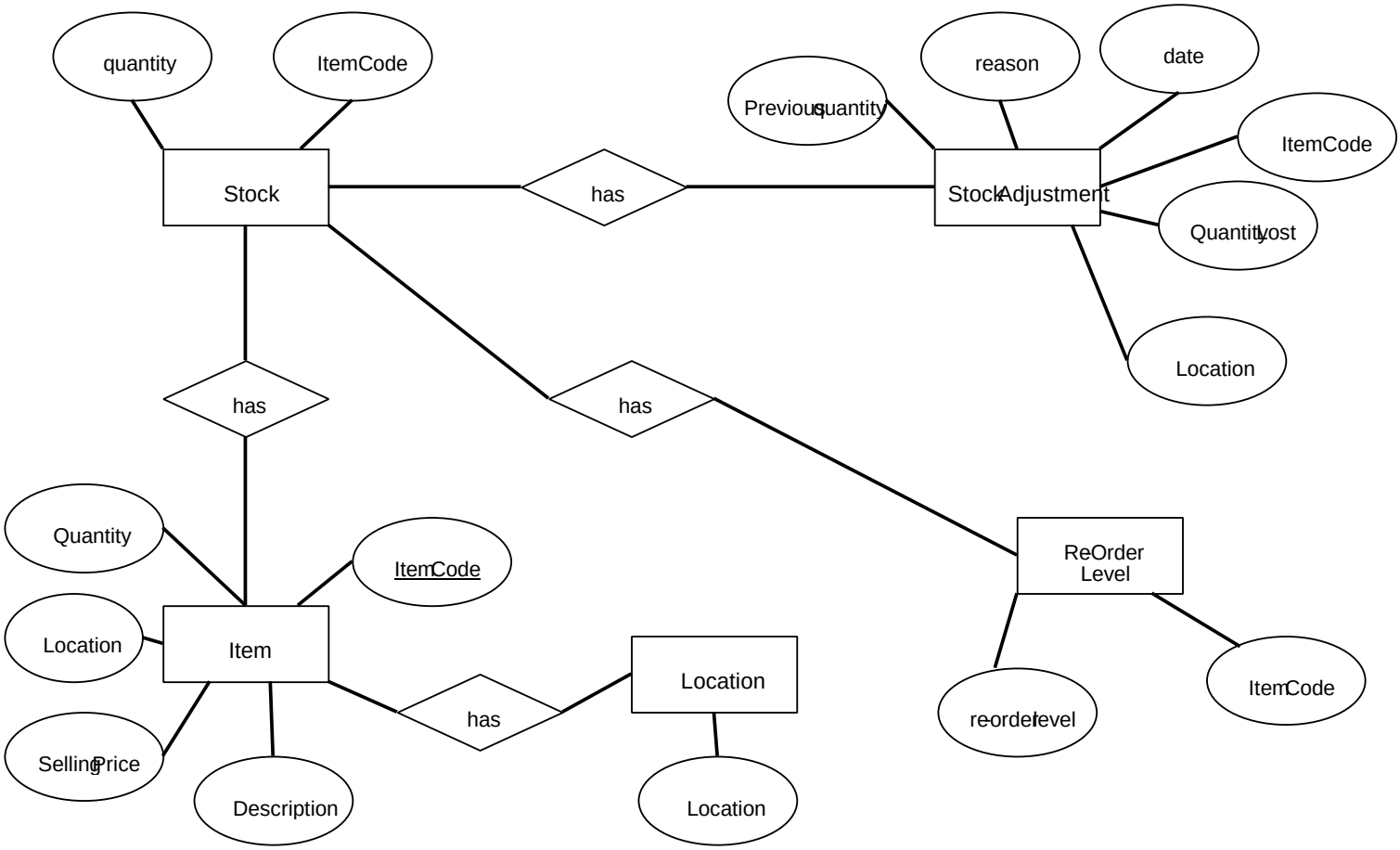


Figure 2.2.7 ER Diagram for SManagement - 1

## 2.3 Implementation

**8 major module structures**

- Human Resource Management: this function supports the system to implement functions related to the employees work under the organization.
- Add new staff, change their access permission, and change designation when they get promotions and also removing staff members when they are no longer working under the organization.
- Attendance and leave Management, that is record time in and out, number of leaves allocated per staff member based on their designation and years of service, leaves taken and leaves remaining, leave requests, yearend performance review.
- Staff Loans and salary advances, which is to process loans/salary advance request, deduct loans/advances in monthly basis.
- Handling payroll that is deducting staff purchases from salary, EPF/ETF calculations, no pay deductions, calculating commissions for sales, yearly salary increments, generating and printing pay sheets
- Manufacturing Management: this function supports the system to handle and implement all the manufacturing related activities of the organization since it is an essential component for a manufacturing process and better handling of information to increase overall efficiency.
- This contains of 4 core entities:
- Managing raw materials: that to handle information with regard to the Manufacturing materials
- Production: that is to handle information regarding daily, weekly and monthly production plan and packaging.
- Job scheduling: to handle information with regard to organizing workers for the production and packaging according to the production plan.
- Monitoring: this processes the details of finished goods. At the same time whenever the production transferred to sales it will keep track of the transaction and maintain the stock information according to that.
- The system is able to add, delete, update each entity and also will provide the search functionality on each of the entity for fast retrieval of records apart from that it will facilitate to keep track of manufacturing material stock inventory.
- Also the system will generate reports on production details and reports of annual production details which gives outright information on the current stock level and also will generate reports of historical data.

- Stock Management: this function will support the system to implement and handle all the stock related activities and functions of the organization.
- Adding new stock to the system, Update remaining items whenever there I a change in a specific item and deleting items when there is no supply or when the item is outdated
- Deciding the maximum and minimum level of stocks that is needed to be kept in the warehouse and also setting optimized re-order levels, safety stock levels (below which the stock level should not go down)
- Safety stock management that is maintaining a buffer stock level in case of an unexpected delay in replenishing inventory or excess sales.
- Stock adjustments when physical stock and the system stock amount is not equal in some situations and also sometimes amount of inventory has to be reduced without making a sale due to breakage(damaged inventory), wastage(out dated inventory), written offs(inventory losses due to other reasons such as thefts and fire)
- Inventory valuations when the same item is bought several times at different prices then those price are being tracked and also calculating average prices so it helps to set selling prices and to calculate profit margins.Valuing real time worth of the assets
- Supplier Management: this module supports the system to implement and manage all the functions related to the suppliers of the organization and that is by
- Creating new suppliers that is by adding new suppliers to the system and updating the supplier details due to changes of their current details and also deleting suppliers when they no longer interact with the organization and to search the supplier by his name to be more convenient.
- Also the system allows to find the cheapest supplier for each and every item which is existing in the organization and to generate the report of cheapest suppliers for each and every item
- Also a purchase order can be made through the system and select multiple amount of items from the same supplier at the same time and then to decide whether goods are bought in cash, credit or through a cheque and then to get the subtotal and to calculate the surplus or deficit which resulted due to the amount we decided to pay.
- Payment history can be viewed anytime and it has two ways to view it. If the button more is pressed a detailed version of the payment history is displayed.
- Generating reports such as purchase order receipt and supplier detail report and also payment history report are generated through the system
- Customer Management: helps to achieve the goal of maintaining and implementing records of customers and to determine how to improve the business and meet the needs of the customers by applying discounts.
- Applying discounts: discounts encourage buyers to buy products in bulk after-season days and it induces the customer to pay in cash rather than thinking of credit. There are three main types of discounts
- Quantity Discount - If a seller can sell more of a product to a given buyer various cost savings may occur. Distribution and marketing expenses are reduced

- Seasonal Discount- The more demand for a product gets heavier price discounts. As our client company's business is cloths related in April and December it has higher
- Cash Discount- It is for payment of an invoice with a specific time period. Because if the payment is immediately done by the customer it can be an investment for the period.

- Generating Invoices: The total cost for the purchase of customer is calculated according to the discounts and quantity. It helps to make process of sales to become well organized and efficient.
- The system will generate reports such as Customer wise outstanding report, Ageing report to list each customers outstanding balance and will then sort the total amount including current, 1-30, 30-60 and above 60 days past due and also List of customers, email sent to customers and customer invoices.
- Product Returns Management: this function allows the system to deal and implement the returns that can be either sales returns or purchase returns.
- Returns to supplier: returning damaged items to supplier and getting refund.
- Returns from the Customer:
- Checking returns from customers and replace the product to customer.
- Calculating re-selling price by giving discounts to damaged cloths.
- Giving credit notes to customers who returned non-moving goods.
- Transport Management: this function helps the system to handle and implement all the activities related with transport.
- There is a separate transport department so details of Drivers and Vehicles are maintained separately vehicles can be added to the system, deleted from the system and also details can be updated.
- There are two scheduling categories which is scheduled by the system when the necessary information is provided such as Time scheduling to bring cloths from customers and tie scheduling to deliver cloths to customers and this happens according to the availability of drivers, vehicles and priority loading.
- Leasing activities can also be handled through the system by adding, updating and deleting leasing details.
- Service activities of the vehicles are also managed through the system that is by selecting what vehicle to be serviced and selecting the service type and adding the new details to the system and those details can be updated or deleted later if necessary.
- Maps can be loaded when the location and city is given and it makes convenient to know the exact place where the goods should be delivered or the goods should get delivered.
- Also the system will generate reports of leasing details and service details.
- Finance Management: this module will deal with all the incomes and expenses the organization has and the assets liabilities and organizations equity.
- Adding, Updating, deleting incomes, expenses, assets, liabilities and equity whenever it is necessary
- Also the system will calculate profits and losses as per the requirement that is either quarterly or annually by generating profit and loss statement and balance sheet.
- Also the system is calculating depreciation of assets.
- System will then generate reports of the balance sheet and profit/loss statement.

## Choice of DBMS and Implementation Language

The DBMS selected is MySQL since it is easy and convenient to use and the implemented language is C#

## 2.4 Testing

Testing an application is the most important phase of the software life cycle. Testing phase involves many steps. We believed that this will gain more efficiency to the test process and provide accurate results. It starts from unit testing mentioned above. Testing was done by the developers before the presentation. Then the following tests are undertaken

- Integration Testing

  Integration testing is testing in which a group of components are combined one by one to produce output as it is easy to identify any errors. Also, the interaction between software and hardware is tested in integration testing if software and hardware components have any relation.

- Functional Testing

  Functional testing is the testing to ensure that our specified functionality required in the system requirements works.

- System Testing

  We are going to put the software in different environments (e.g., Operating Systems) and verify it still works. System testing is done with full system implementation and environment.

- Performance Testing

  In this testing we are mainly assessing the speed and effectiveness of the system and to make sure it is generating results within a specified time as in performance requirements.

- Beta Testing

  Beta testing is the testing which is done by end users, a team outside development, or publicly releasing full pre-version of the product which is known as beta version. The aim of beta testing is to cover unexpected errors.

- Acceptance testing – This is done before the system is accepted for operational use. Here the system is planned to be tested using the data supplied by our client.

  Also there are various strategies to undertake the testing. We are planning to test our system using

  - Stress testing
  - Back to back testing

**Test Cases**

Test cases are designed in a way that we could directly test the modules in the existing system. In the latest stage of development process testers can easily observe the expected results with the actual test results.

| **Test Case ID** | **Stock MGT-1** |
|---|---|
| **Test Case Summary** | Add Items |
| **Test Plan** | 1. Go to the Items tab.<br>2. Enter the details in the relevant text boxes.<br>3. Press Save Button |
| **Expected Output** | The added item is displayed in the window |
| **Test Data** | Item Code : 11110<br>Description : Red T-shirt XL (male)<br>Selling Price : 800<br>MRP : 1250<br>Location : Moratuwa |
| **Outcome** | The added Item is displayed in the window |
| **Test Status** | Passed |

Table 2.4.1 Test Case for Stock Management - 1

| | |
|---|---|
| **Test Case ID** | **Stock MGT-2** |
| **Test Case Summary** | Stock Adjustment |
| **Test Plan** | 1. Go to the Stock Adjustment tab.<br>2. Enter the details in the relevant text boxes.<br>3. Press Adjust Button |
| **Expected Output** | The adjusted Stock is displayed in the window |
| **Test Data** | Item : Blue T-shirt XL male<br>New Quantity : 250<br>Reason : Stolen |
| **Outcome** | The adjusted Stock is displayed in the window |
| **Test Status** | Passed |

Table 2.4.2 Test Case for Stock Management - 2

| | |
|---|---|
| **Test Case ID** | **Supplier MGT-1** |
| **Test Case Summary** | Add Supplier |
| **Test Plan** | 1. Go to the Supplier Manipulation tab.<br>2. Enter the details in the relevant text boxes.<br>3. Press Save Button |
| **Expected Output** | The added Supplier is displayed in the window |
| **Test Data** | Supplier Name : Trevor Philips<br>Supplier NIC: 852787887V<br>Phone: 0771234567<br>Fax 0112765432<br>Email: trevor@gmail.com<br>Address: No 20/4,templers rd, Mt Lavinia. |
| **Outcome** | The added Supplier is displayed in the window |
| **Test Status** | Passed |

Table 2.4.3 Test Case for Supplier Management - 1

| | |
|---|---|
| **Test Case ID** | **Supplier MGT-2** |
| **Test Case Summary** | Purchase Order |
| **Test Plan** | 1. Go to the Purchase Order tab.<br>2. Enter the details in the relevant text boxes.<br>3. Press Submit Button.<br>4. then again fill relevant text boxes<br>5. Press Pay Button. |
| **Expected Output** | Transaction should be displayed in Payment History |
| **Test Data** | Item Description: Red T-shirt XL (male)<br>Quantity: 50<br>Unit Price: 1500<br>Supplier Name: Anjelo Fernando<br>Payment amount: 10000<br>Payment method: Cash |
| **Outcome** | Transaction should be displayed in Payment History |
| **Test Status** | Passed |

Table 2.4.4 Test Case for Supplier Management - 2

| | |
|---|---|
| Test Case Id | **ManufactMGT-1** |
| Test Case Summary | Add Raw Material |
| Test Plan | Go to the Raw Material Tab.<br>Enter the details in the relevant text boxes.<br>Press “Add” button. |
| Expected Output | The added Raw Material’s details are visible in the window. |
| Test Data | ID – AB100<br>NAME – Cloth<br>IN STOCK – 500<br>ROL – 250<br>ORDER AMOUNT – 400<br>TO ORDER – No |
| Outcome | The added Raw Material’s details are visible in the window. |
| Test Status | Passed |

Table 2.4.5 Test Case for Manufacture Management - 1

| | |
|---|---|
| Test Case Id | **ManufactMGT-2** |
| Test Case Summary | Updating Batch |
| Test Plan | 1.Go To Production Form<br>2.Select Batch No<br>3.Input the values for Relevant field<br>4.Click Update Button |
| Expected Output | A message box with success message is visible in the window and can v<br>the Batch updated in the form |
| Test Data | BATCH NO – IT1500<br>JOB – Cutting<br>NO OF EMPLOYEES – 20<br>WORKING HRS – 50<br>COST PER UNIT – 150<br>NO OF UNITS – 500<br>TOTAL COST - 75000 |
| Outcome | A message box with success message is visible in the window and can v<br>the Batch updated in the form |
| Test Status | Passed |

Table 2.4.6 Test Case for Manufacture Management - 2

| | |
|---|---|
| Test Case Id | **ManufactMGT-3** |
| Test Case Summary | Re-Ordering Raw Material |
| Test Plan | Login as Manufacturing Manager<br>Click on Raw Material which has less stock than ROL.<br>Select a Raw Material and view<br>Click on Make Order |
| Expected Output | Message box popup and display amount to order. When "OK" button clicked; the IN STOCK amount should raise by ordered amount and the Material vanishes from RM To Order table. A Success Status displayed message. |
| Test Data | Raw Material ID : AB100<br>Status: 'completed' |
| Outcome | Message box popup and display amount to order. When "OK" button clicked; the IN STOCK amount should raise by ordered amount and the Material vanishes from RM To Order table. A Success Status displayed message. |
| Test Status | Passed |

Table 2.4.7 Test Case for Manufacture Management - 2

| | |
|---|---|
| Test Case Id | **TransportTGT-1** |
| Test Case Summary | Add Vehicle |
| Test Plan | Go to the Vehicle tab<br>Enter the details in relevant text boxes.<br>Press add button. |
| Expected Output | The added vehicle's details are visible in the Window. |
| Test Data | Vehicle Number –DAD-8149<br>Engine Number -08LTDICRAIL07ATYSO5162<br>Chassis Number -MAT445405G2R01544<br>Vehicle Name – DIMO BATTA<br>Capacity – 40KG<br>Cost –40LAK<br>Oil -DISEL |
| Outcome | The added Vehicle's details are visible in the window. |
| Test Status | Passed |

Table 2.4.8 Test Case for Transport Management – 1

| | |
|---|---|
| Test Case Id | **TransportTGT-2** |
| Test Case Summary | Updating Service Detail |
| Test Plan | 1.Go To Service Detail tab<br>2.Select The Relevant Vehicle<br>3. Input the values to relevant text Boxes.<br>4. Click the Update Button |
| Expected Output | A Message box with Success message is visible in the window and Can view the Service detail Updated form. |
| Test Data | Service ID – 1<br>Vehicle Number – DAD-8149<br>Service Type – Washing<br>Service Date -2017/11/14<br>Next Service Date – 2017/12/14<br>Service Amount – 1800.00 |
| Outcome | A Message box with Success message is visible in the window and Can view the Service detail Updated form. |
| Test Status | Passed |

Table 2.4.9 Test Case for Transport Management - 2

| | |
|---|---|
| Test Case Id | **Customer Mgt-1** |
| Test Case Summary | Add invoice |
| Test Plan | 1.Go to the sales order tab<br>2. Enter the details in relevant text boxes.<br>3. Add item to table.<br>4.Select the payment method<br>5. Discounts and Net Cost is calculated<br>6. Select the delivery details.<br>7. Press save button. |
| Expected Output | When Selecting the payment method discounts and net cost are calculated. The added invoice is visible in the invoice table and clear the relevant table and textboxes. |
| Test Data | InvoiceNo- INV00000001<br>CID – 001<br>Date – 2017-11-18<br>Remark-<br>Payment – Cash<br>SalesRep – Chanuka .S<br>DeliveryTo- Wellawatte<br>Expected Delivery Date- 2017-11-22 |
| Outcome | When Selecting the payment method discounts and net cost are calculated. The added invoice is visible in the invoice table and clear the relevant table and textboxes. |
| Test Status | Passed |

Table 2.4.10 Test Case for Customer Management - 1

| | |
|---|---|
| Test Case Id | **CustomerMgt-2** |
| Test Case Summary | Updating Customer |
| Test Plan | 1.Go To Service customer tab<br>2.Select The Relevant customer<br>3. Input the values to relevant text Boxes.<br>4. Click the Update Button |
| Expected Output | A Message box with Success message is visible in the window and Can view the customer detail Updated in the table. |
| Test Data | CID –001<br>Name -Saman.R<br>PhoneNo1-0112154211<br>PhoneNo2-0775454121<br>Company Name- Nolimit<br>Address- No 15,Galleroad,Wellawatte<br>Email- Saman@gmail.com<br>EnteredBy-Gowshi |
| Outcome | A Message box with Success message is visible in the window and Can view the customer detail Updated in the table. |
| Test Status | Passed |

Table 2.4.11 Test Case for Customer Management - 2

| | |
|---|---|
| Test Case Id | **Account-1** |
| Test Case Summary | Add Expenditures |
| Test Plan | 1)Press the expenditure tab<br>2)Enter the inputs in the relevant text boxes<br>3)Click Add Button |
| Expected Output | The added expenditures details are display in the table , store in database and display the successfully added message. |
| Test Data | ID-101<br>Expenditure Name-Advertisement<br>Amount-1000<br>Description-Bill for November<br>Account type-cash<br>Cheque No-12233324<br>Drawn Date-2017-11-23 |
| Outcome | The added expenditures details are display in the table , store in database and display the successfully added message. |
| Test Status | Passed |

Table 2.4.12 Test Case for Account Management - 1

| | |
|---|---|
| Test Case Id | **Account-2** |
| Test Case Summary | Update Expenditures |
| Test Plan | 1)Click the Particular Row in the table<br>2)Inputs the value for relevant fields<br>3)Click Update Button |
| Expected Output | The updated expenditures details are display in the table, store in database and display the successfully Updated message. |
| Test Data | ID-102<br>Expenditure Name-Advertisement<br>Amount-2000<br>Description-Bill for December<br>Account type-cash<br>Cheque No-12233324<br>Drawn Date-2017-11-23 |
| Outcome | The updated expenditures details are display in the table, store in database and display the successfully updated message. |
| Test Status | Passed |

Table 2.4.13 Test Case for Account Management - 2

| | |
|---|---|
| Test Case Id | **Account-3** |
| Test Case Summary | Delete Expenditures |
| Test Plan | 1)Click the Particular Row in the table<br>2)Click Delete Button |
| Expected Output | The Deleted expenditures details are Remove from the table and database,<br>Display the successfully Deleted message. |
| Test Data | ID-101<br>Expenditure Name-Advertisement<br>Amount-1000<br>Description-Bill for November<br>Account type-cash<br>Cheque No-12233324<br>Drawn Date-2017-11-23 |
| Outcome | The Deleted expenditures details are Remove from the table and database,<br>Display the successfully Deleted message. |
| Test Status | Passed |

Table 2.4.14 Test Case for Account Management - 3

| | |
|---|---|
| Test Case Id | **Account-4** |
| Test Case Summary | Calculate Profit and Loss |
| Test Plan | 1)Click the profit and loss tab<br>2)Select the dates From to To |
| Expected Output | Profit or Loss Amount display in the Table And print the report. |
| Test Data | Gross profit and other income-20000<br>Administration and selling and the finance total-30000<br>Profit/Loss Amount-50000 |
| Outcome | Profit or Loss Amount display in the Table And print the report |
| Test Status | Passed |

Table 2.4.15 Test Case for Account Management - 4

| | |
|---|---|
| Test Case Id | **Account-5** |
| Test Case Summary | Calculate Balance sheet |
| Test Plan | 1)Click the Balance sheet tab<br>2)Select the dates From to To |
| Expected Output | Liabilities and Equity Amount display in the Table<br>And print the report. |
| Test Data | Total Current liabilities-20000<br>Total Current Assets-30000<br>Total Equity and Liabilities-50000 |
| Outcome | Liabilities and Equity Amount display in the Table<br>And print the report. |
| Test Status | Passed |

Table 2.4.16 Test Case for Account Management - 5

# 3. Evaluation

## 3.1 Assessment of the Project results

The project was intended to provide the well-organized solutions to the outside users and improve the productivity of inside users. The first step of starting the project is formation of a group with eight members. The aspects and talents of the group members were identified after some regular discussions and reduced the differentiation. Several questionnaires were conducted with the client to identify the exact scope of the system. The user requirements are identified with several discussions with the group leader and team members with the consideration of client's needs. Our Supervisor Ms. Chathurangika Kahandawaarachchi provided us appropriate guidelines throughout the development process. The steps to measure the progress or to identify the development of the project were scheduled as several iterations such as 'Proposal Presentation', 'Interface Presentation' ,'Prototype Presentation' and 'Final Presentation'. The functions of each modules were explained in proposal presentation. The interfaces and the database connectivity were explained in interface presentation. The 75% of the project is explain in prototype presentation and finally the fully integrated system was tested in final presentation. In each and every iterations valuable advices were given by the supervisor to modify and improve the system. Most of the steps were recorded in the document format and those reports were evaluated by our Supervisor. The presentations mentioned above gave us the chance to present the development of the project time to time and those works were resulted us to follow the standards of the project as much as we could.

## 3.2 Lessons Learned

Also we faced lot of inconveniences while engaging with the project development and those incidents gave the experiences of facing the problems and finding the appropriate solutions as necessary.

It is very hard to develop a top rated software without the given time period, because the developers were not well experienced. But at the end of this project they have learn many things about the industry and how to face problems and how to overcome those problems easily. Developer faced many difficulties during coding phase and project delivery. Since they had grouped together, they were able to overcome those difficulties. Working as group was aided to learn sharing knowledge, thoughts and ideas, each individual possessed a positive attitude by working together.
Developers gained experience in applying their knowledge to achieve goals in practical situations. This will help them immensely in developing software solution in their professional work in the future.

- There were lots of lessons learned from throughout the time spent for developing this project. Most importantly programmers learned how to work according to a time schedule and how to manage the time to take the maximum benefit of the time the developers had.
- The requirement has to be analyzed well before starting the project as it is the important stage of the SDLC.
- Before finalizing each and every module we have first see how our own module is interacting other modules in the system.
- When deciding the software development tool such as the IDE and the data base server all should agree to use one particular version so it would not cause any problems when it comes to integration.
- Even though the GUI were designed smoothly, when it comes to the coding part we found it difficult to actually implement because then only we realized there were some missing attributes that we should add and there were irrelevant attributes that we should remove.
- Working as a team helped us in sharing knowledge, thoughts and ideas, each individual possessed also the team spirit has been developed.

- We learned how to bridge the gap between the theories we learned and found and the actual implementation of it.
- We learned a good lesson how punctual we should be and to work responsibly.

## 3.3 Future Work

If there is any need to add any features or modules the current system can be modified. Processing or performance failures can be repaired. Changes in the organizational procedures, organizational objective, goals, forms, system controls and security needs can be made. Adding new programs or modifying the existing program to enhance the performance of the system can be made. If they wanted the developers to improve the system in such situations the requirements will be considered and the relevant changes will be made to full fill their expectations.

# 4. Conclusion

*< This section sums up the whole project. Discuss the realization of the original objectives/goals and how work can be taken further. Highlight the weaknesses/limitations of your proposed*

*technique but you must always suggest a solution to all these (especially in future work). Also highlight the benefits of developing this project to the client organization>*

# 5. References

The main resource where most of the references were done is internet you tube videos and websites like stack over flow, Fox Learn etc.


[WWW3] http:// www.gliffy .com [15-11-2017]

[WWW3] https://www.youtube.com/results?search_query=browse+file+and+get+the+path+in+c%3 [15-11-2017]

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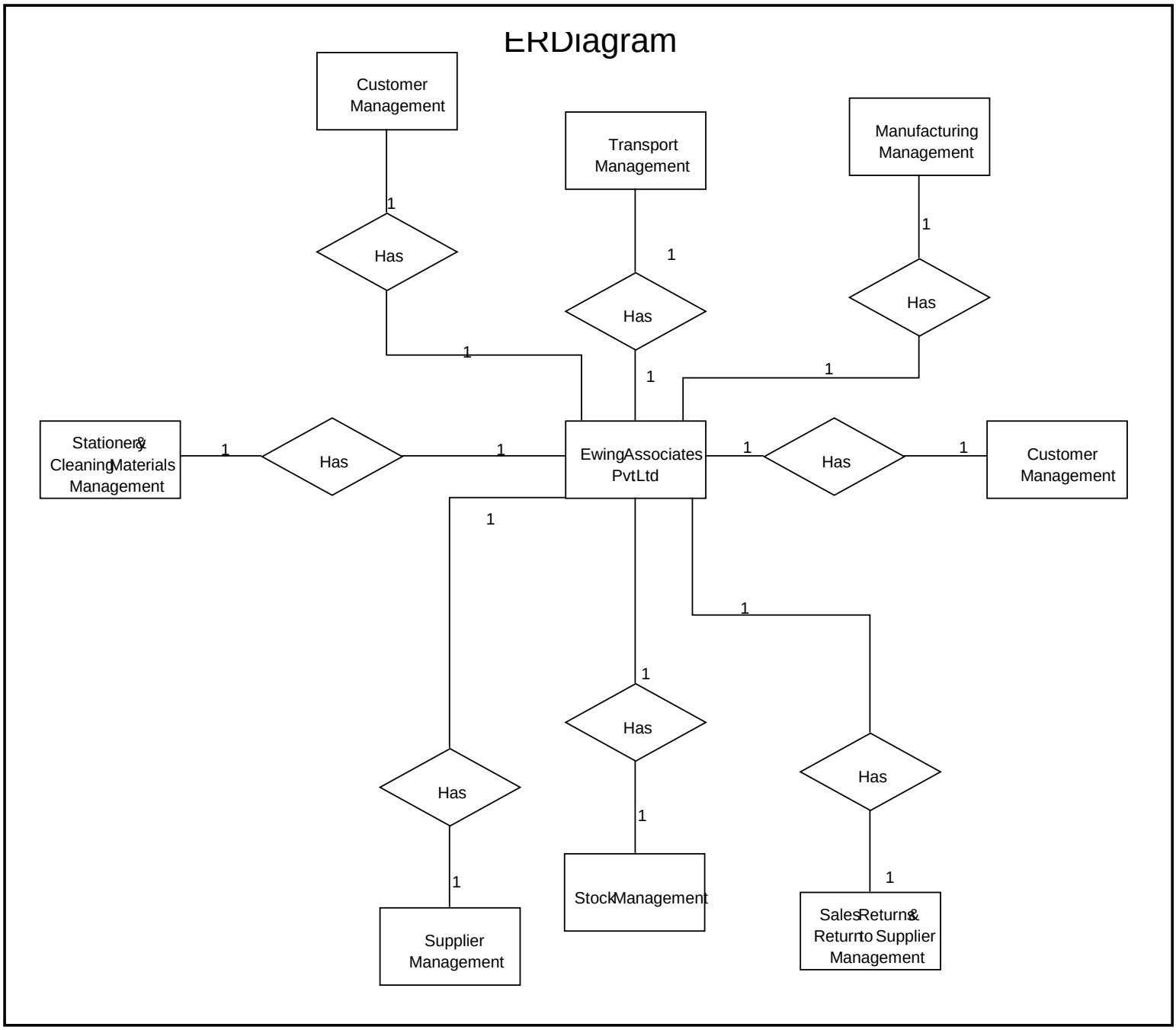
# Appendix A: Design Diagrams



# Appendix C: Selected Code Listings

**//NIC validation**

```
bool isValidNIC(string nic)
        {
            bool r = true;
            if (nic != "")
            {
                if (nic.Length == 2)
                {
                    int year = Convert.ToInt32(nic);
                    if (year < 62 && year != 19)
                        r = false;
                }
                else if (nic.Length == 4)2
                {
                    int year = Convert.ToInt32(nic);
                    if (year < 1962)
                        r = false;
                }
                else if (nic.Length == 10)
                {
                    if (!System.Text.RegularExpressions.Regex.IsMatch(nic, "^[0-9]{9}[xXvV]$")
&& !System.Text.RegularExpressions.Regex.IsMatch(nic, "^[0-9]{10}$"))
                        r = false;
                }
                else if (nic.Length == 12)
                {
                    if (!System.Text.RegularExpressions.Regex.IsMatch(nic, "^[0-9]{12}$"))
                        r = false;
                }
            }
            return r;
        }
```

```
      //validate e-mail

                        if (!(Regex.IsMatch(email.Text,
     @"^[a-z,A-Z]{1,10}((-|.)\w+)*@\w+.\w{3}$") && email.Text.EndsWith(".com")))
                        {
     }

     else
     {}
```

*//Phone Number Validation*

```
private void sphone_TextChanged(object sender, EventArgs e)
        {
            int s;

            if (!(sphone.Text.Length == 10 && (int.TryParse(sphone.Text, out s))))
            { label14.Show(); }
            else
            { label14.Visible = false; }
        }
```

```
  //Email Validation
          public bool isValidEmail(string email)
          {
              return new EmailAddressAttribute().IsValid(email);
          }
```