Point of Sale and Stock Management System for Wathumal Traders (PVT), Ltd.

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2018

Point of Sale and Stock Management System for Wathumal Traders (PVT), Ltd.

A dissertation submitted for the Degree of Master of Information Technology

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University of Colombo School of Computing

2018

Declaration

The thesis is my original work and has not been submitted previously for a degree at this or any other university/institute.

To the best of my knowledge it does not contain any material published or written by another person, except as acknowledged in the text.

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This is to certify that this thesis is based on the work of

Mr. W A S C NANDASENA,

under my supervision. The thesis has been prepared in accordance to the format stipulated and is of acceptable standard.

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Abstract

Any shop or a market place needs a proper Point of Sale (POS) and Stock Management System, since manual managing of stocks is considered to be a very difficult task. Mishandling of stock could lead to dire consequences like stock expiration, storage issues, and loss of sale.

Point of sales and stock management system provide facilities such as tracking availability of stock for uninterrupted sales, providing a scientific basis for planning an inventory, aiding the decision making of the management to ensure the stock allocation are done appropriately, and reducing wastage whilst saving time.

The client for the project, Wathumal Traders (PVT) Ltd, is vending grocery items and kitchen related products. Currently the processes related to selling items are done manually. Hence it is very difficult to generate data to make future sales predictions, and to efficiently summarize transactions to fulfil the regulatory requirements. So Wathumal Traders (PVT), Ltd plans to terminate the traditional methods which are inefficient and go for an automated system.

When the manual system is automated, the company will be able to calculate revenue due for every order entered, record the method of the payments, price adjustments and initiate promotion campaigns.

The automated system is tested using various testing methods such as unit test, Integration test, System test and finally Acceptance test. First the units of codes are tested and which is called a code level testing. To test the modules of the system an integration testing is performed. The whole system gets tested after the unit testing and integration testing to guarantee the standard of the system using an environment similar to the environment where the system is going to practically used. A customer confirmation is obtained by a user acceptance testing after the completion of the system. It ensures the requirements are fulfilled by the developed system.

This Stock and POS portal has the scope of all the main function required for a stock process, such as: .Build point of sales module for the Wathumal Traders, Enable add item to the stock, Get details about Business, Get details about due customers, Upload new stock by using SQL, Download current stock database, Generate reports that include in total revenue, no of items in stock, Custom Bar code generation and return items.

Acknowledgment

I would like to express my deepest appreciation to all those who provided me the possibility to complete this project. I am especially grateful to my supervisor and coordinator, Dr. Enosha Hettiarachchi who has supported and guided me to carry out the project and provided suggestions and encouragement during the development of system.

Furthermore I would like to acknowledge with much appreciation the crucial role of the staff of Wathumal Traders (PVT), Ltd, who gave the permission to use all required documents to complete the project.

I would also like to take this opportunity to thank my friends and colleagues, who gave endless support and advices during the development of this project.

I am also indebted to my parents and my beloved wife. Without the continued support and encouragement provided by them, especially during those difficult times, I may have not reached the end of this strenuous journey.

W.A.S.C NANDASENA

Table of Contents

List of Tables

List of Figures

List of Abbreviations

ER Diagram	…….	Entity Relationship Diagram
UAT	…….	User Acceptance Test
POS	…….	Point Of Sale
UML	…….	Unified Modeling Language
CUITs	…….	Coded User Interface Tests
UI	…….	User Interface

Chapter 1 Introduction

1.1 Introduction

Any shop or a market place needs a proper Point of Sale (POS) and Stock Management System, since manual managing of stocks is considered to be a very difficult task. Mishandling of stock could lead to dire consequences like stock expiration, storage issues, and loss of sale. Manual processing of stock management, sales handling and reporting is a time consuming process. It also generates a lot of paper work in day to day activities. All these procedures are inefficient and expensive. To overcome these problems, proper Point of Sale (POS) and Stock Management System need to be implemented. The client for the project, Wathumal Traders (PVT), Ltd, vends grocery and kitchen items. Currently recordings related to stock and sales items are done manually. It is cumbersome to generate reports to analyse the past data to identify trends, and to fulfil regulatory requirements. In order to be more efficient and cost effective they planned to terminate the traditional methods and move towards an automated system.

This system will assist the company to calculate cash due for every order entered, record the method of payment, keeps track of the items sold and record information on debtors .The system will display the debtor due period by separate colours indicating their due period. This will enable the user to identify the debtors who will likely to become bad debtors and could stop further business with them.

1.2 Problem Statement

Wathumal Traders (PVT), Ltd carries their recordings manually and enters all the data to a paper based system. Due to manual handling of work, they have to face several drawbacks. All these procedure are time consuming. They could not get reports of the daily revenue, daily sales, item of the stock, and items that need to be reordered for the stock. Also, traditional methods are inefficient and generates substantial amount of paper records. For an example extracting relevant information about previous revenue from the ledger book for investment decision-making is a complicated and a time consuming task. Deterioration of records, unreadable hand writing leads to confusion and many documents were found with incomplete information. This leads to incorrect resources allocation which mainly affect the profit margins.

Lack of up to date and real time information on stocks due to not connection between all the modules of systems creates significant issues in the business. Mishandling of stocks is untraceable and it has become a serious problem at most of the companies at present.
The company also faces a problem of bad debts. The Manual recordings hardly help to identify the debtor periods and untrustworthy trade partners.
The unnecessary gathering of the inventory creates problems such as excessive wear housing costs and inventory management costs. Unable to identify the goods which are nearing to the expiry date also creates wastage of goods.
The company also faces a challenge in identifying the goods which are in frequent high demand and seasonal trends.

1.3 Motivation of the project

Point of sale and stock management system mainly involves maintaining the record of stock and cash registry of the shop, which could include a system to analyse data and find new trends in sales items.
When the Point of sale and stock management system is implemented, the company will be able to calculate revenue due for every order entered, record the method of the payments, price adjustments and initiate promotion campaigns.
It also provide facilities to keep records on customer details, generate reports and get historical data about products, customers and suppliers. This aids the decision making process of the management.
This system combines all those facilities together to achieve better control and management.

1.4 Objectives of proposed system

Main objective of this system is to automate the manual stock management system. Then the company will be able to calculate revenue due for every order entered, record the method of the payments, and price adjusting and promotion campaign. Sub objectives in this system can be listed as follows,

1. Providing user friendly environment to the user though the system

2. Develop a strong point of sales and stock management system to handle stock management.
3. Enforce security by adding user account with different privilege and regular data backup.
4. Provide point of sales of stock management system with detailed report for sorted according to the needs of the management, such as report by best- selling, report by purchase date, report by current stock data, daily sales, identify items which near to expire date. Also record by payment due date, report by payment methods.
5. Create the point of sales module for the Wathumal Traders using barcode searching and item searching.
6. Obtain the details about Business behaviour based on total profit per month, no of items in the stock, investment for current stock.
7. Obtain the details about due customers and amount due from those customers.
8. Generate the custom bar code for items such as vegetables.
9. Support various types of POS printers to print bill

1.5 Scope of the project

This point of sales section of this system mainly consists of modules for product customer and reporting. For the customer module, system gives the detail about payments. After the payment (cash/credit) receipt will be printed through the system. Customer can pay any amount of the due payment for bill and remaining amount of the payment will be recorded. Managers will be provided with authority to adjust prices and conduct promotion campaign when necessity arise. They can also edit the receipt details when any product is incorrectly entered by cashier. Also, System can provide reports that the management needs for the analysing purposes. There will be three type of reports. One such report is time based report. It provides details above the sales of stock, expire date of stock, available quantity of stock on daily, weekly , monthly, quarterly, and annual basis. Another one is product base report. This describe availability of the stock as future demands of the items. This open a clear path to manager to take decisions about introducing new products to the market. As well as it will remove existing products which has come to its declining stage. Next report is payments report. This provide details of payments methods, due payments, with respective customers. User should be able to logging the system and perform their duties. They will be authorized to perform their task according to the

difference user levels and privileges. Managers can used their privileges to user management and logging module. Stock part is handle by manager of the branch. Various types of items selling by the shop. Suppliers are included in the suppliers' category. Items supplied by the suppliers are included in the items category. System can allocate space for different item which comes under difference suppliers. Also, it provide space for single item which supplied by difference suppliers.

All the items are issued by the cashier of the shop. All the details regarding issuing items will be maintained by this issue section. Manger can check the issued items. Discount prices are given for some items. All the discount related decisions are taken by the Manager.

All the return items will be handle by manager. Coordinating with suppliers to return their rejected items is also another task comes under the return section. At the same time, when some items got expired, destroying or removing of such items from the existing stock will also be handle by this section.

1.6 Dissertation Outline

Chapter 1-Introduction

Describes the problems being faced currently and how to address all those problems with the proposed system. Project scope, goals and dissertation structure is also provided.

Chapter 2-Background

This chapter targets a crucial review of matching systems and technologies and related applications. Additionally, it is aimed for the evaluation of stock management process and justification of tool and technology selections with quotation.

Chapter 3-Analysis and Design

Provide description of ER diagram, UML diagrams and the methodological approach that are applied in the program designing. Also, consists of the requirement analysis, functional and non-functional requirements of the system design.

Chapter 4-Implementation

Appropriate coding and implementation tools and techniques which are used to developing the system are included.

Chapter 5-Evaluation

Developed system is tested against the user requirements, which are gathered at the beginning. Actual data from the client's environment is used. The chapter also includes aspects such as test plan, test cases, use of test automation tools and testing frameworks.

Chapter 6-Conclusion and Future work

This chapter summarizes the work; discusses its findings and contributions; points out limitations of the current work and outlines directions for future research

Chapter 2 Background

2.1 Introduction

Computerization makes it easy for a company do to their internal and external work. There are many studies found in terms of implementing point of sales and stock management software. The idea is that they are very common and people may find it difficult to customize according to their business needs because of their busy life cycle. Businessmen are now interested in customized software module for their business to reduce their busy work load. Because they believe that customized solution always become user friendly as it is required very less technical knowledge to operate. These reasons shows a path to develop simple user friendly system.

2.2 Review of present well-known Point of Sale and Stock Management Systems

There are plenty of Point of Sales and Stock Management systems which are using around the world to make it easy to sell items and Stock Management. Developing POS and Stock management industry is enhancing daily and can forecast well way beyond the borders. Few of them are,

- myPOS

myPOS is a point of sales solution, used in Cool planet fashion chain in Sri Lanka. It gives you a convenient way of checking out customers and of recording sales whilst keeping record of the order processing, printing out receipts, carrying out promotions, tracking customers, managing sales assistants performances, etc. The system eases the flow at checkout terminals, while recording all the information that can help you make better business decisions.

When checking out a customer Sales person can input the sales item, use a bar code scanner. myPOS also provides reports on inventory, sales, customers, etc. Since it is already recording each sale, it can easily tell you the sales and revenue of the day.

myPOS provides an easy to use interface for all activities of the sales person and It can make the job of the cashier a lot easier by automating the routine tasks of the day. myPOS comes

with a wide variety of modules and Sales person can choose one that fits your budget and meets the needs of his particular business. [1]

- WallacePOS

WallacePOS is an open-source, intuitive & modern web based POS & business management system. It uses the power of the modern web to provide an easy to use & extensible solution suitable from small to medium businesses. It's also compatible with standard POS hardware including receipt printers, cash draws and barcode scanners. With a rich administration dashboard and reporting features, WallacePOS is accessible to managers and staff levels. All the records are kept digitally. Their databases are accessible via internet. All data is made available for export & external analysis. Configuration and item updates are delivered to POS terminals in real time Supports POS hardware across a large number of devices and operating systems. It Compatible with receipt printers, cash draws and standard USB barcode scanners and also it Produces Professional receipts complete with your logo, custom text & QR code[2]

- INVcool

This Provides complete physical inventory capabilities and makes inventory tracking easy with worksheets and variance reports. It helps to Record detailed information (purchase date, purchase cost, warranty expiration date, etc.) against inventory and stock items.

This will allow you to post charges to the Job Cost module for more complete tracking of materials used on a project.it gives customer to easily access a complete audit trail with history, actions and events performed by all users .It provides facility to tracks minimum, maximum, and order point stocking levels by part to help keep stock quantities at optimum levels. Also it provides instant inquiry of part information, including receipts, issues, returns, and adjustments.

Its Leverages four costing methods: Standard, Average, FIFO, and LIFO.It gives easily copies an existing part to a new part, making the setup of like items faster and easier.

It Performs transfers and disposals for individual items or groups of items. And it stores a full history and future maintenance plans for each item.

It has facility to link inventory items with fixed assets system register INVcool produce a full range of standard and customized reports. [3]

2.3 Critical Analysis of Similar Systems

Table 2-1 shows the a summary of critical analysis of similar systems

FEATURES	myPOS	Wallace POS	INVcool	POS and Stock management for wathumal traders
01.Getting reports of slow selling products	NO	YES	NO	YES
02.Order Processing	YES	NO	YES	YES
03.Getting reports of slow overstocking products	NO	YES	NO	YES
04..Printing out receipt with company logo	Yes	NO	Yes	Yes
05.Products Reorder	NO	Yes	NO	Yes
06.Input records damage or lost products	Yes	NO	Yes	Yes
07. carrying out promotions	Yes	Yes	Yes	Yes
09.Using Barcode reader	Yes	Yes	Yes	Yes
10.Warehouse Management	Yes	Yes	NO	Yes
11.Custom Pricing	NO	NO	Yes	Yes
12.Stock Management	Yes	Yes	Yes	Yes

Table 2-1: Critical Analysis

2.4 Summary

This chapter gives a review of matching systems and technologies and related applications. Additionally, it is aimed at the evaluation of stock management process and justification of tool and technology selections with quotation.

This project has been compared with the stock management software such as myPOS, WallacePOS and INVcool. The critical analysis of this has been shown in the above table 2.1.

Chapter 3 Analysis and Design

3.1 Introduction

Analysis phase mainly focused on requirement gathering, fact finding and identifying the functional and non-functional requirements in the system. In addition, rapid analysis of existing Point of sale and stock management systems are discussed. At the end of the analysis phase, the system can proceed in to the design phase, that consider the software architecture design and primary diagram designs.

3.2 Requirements Gathering

Requirements gathering is an important task in any sort of system development. It is very important to take workable conclusions to make the analysis phase a successful one. Most of the time, discovering the problem precisely, is what a potential client required. It will not be much clear in the beginning. However, while moving forward it can be clearer with much sense.

If we fail to catch up the requirements carefully, the entire project will end up in failure. In theory it will be a challenge to identify the real requirements. Therefore, understanding the actual requirement is vital. Following strategies has been used to gather the requirements.

3.2.1 Fact Finding Techniques

- **Observation and follow similar systems**

  There are plenty of POS systems in the market. For this project, it has cross reviewed many functionalities and behaviours of exiting systems and actively participated and observed as user behaviours in few commercial systems on demonstration modes.

- **Interviews**

  Interview is one of the best source to find out the flow of a requirement gathering process. Each professional prefers customize flow where they can adapt. Choosing the best flow for the process is a challenge based on different interests. However associating with few in a list can come to a stage where we can decide an optimal flow.

- **Unstructured Interviews**

  A general objective or business domain in mind. Questions can differ from one individual to another.
- **Structured Interviews**

  Pre-defined certain list of questions maintained to inquire from the interviewee.

- **Review of available documents and manuals**

  Review the available company documentations and charts, of the pos and stock management systems.

3.3 Requirement analysis and Management

Collected requirements need to be analysed and validated. Requirements needs to be clear unless it can create chaos later. Receiving new requirements from the client unconditionally will impact the project quality or it can result in over budget of initial estimation for the project. Hence requirement management is a critical task in any project.

3.4 Analysis of the ongoing systems

Current work process need to be evaluated prior to any system design drafting. It can be the best place to start with requirement analysis. When the ongoing steps and process are clear it very easy to extract the change requirement and then new addition that needs to be implemented.

3.5 Requirements for the new system

3.5.1 Functional Requirements

1. Build point of sales module for the Wathumal Traders.

- Add new item to the shopping card by using item name.
- Add new item to shopping card by using bar code.
- Can check available quantity.
- Can adjust price of the item

- Can generate new invoice
- Remove item from the cart
- Available for various payment method(cash/credit)
- Print preview of invoice
- Print option of two sizes of bill type

2. Enable add item to the stock

- add category of the stock –add sub category of the stock
- Update inventory
- Remove inventory
- create custom bar code generator for item
- Search by invoice
- search by supplier Name
- Able to view best selling
- Search by selling date.
- View all item of the stock
- View total value of stock item
- View total numbers of item type
- View total numbers of units

3. Get details about Business

- Search by sales date
- Search by expire date
- Show all sales
- Show all card payment separately on time duration
- Display all the cash sales
- Display all the credit sales and their due periods.
- Search due amount using time period, Invoice No, Customer ID
- Show total turn over
- Show total profit
- Show total orders
- Show total.

4. Obtain the details about due customers

5. Download current stock database as backup.

6. Generate reports that include total revenue, no of items in stock

7. Build point of sales module for the Wathumal Traders.

- Add new item to the shopping card by using item name.
- Add new item to shopping card by using bar code.
- Can check available quantity.
- Can adjust price of the item
- Can generate new invoice
- Remove item from the cart
- Available for various payment method(cash/credit)
- Print preview of invoice
- Print option of using various pepper size)

8. Enable add item to the stock

- add category of the stock –add sub category of the stock
- Update inventory levels (multiple cells on one click)
- Remove items from Stock
- create custom bar code generator for item
- Search by invoice number
- search by supplier Name
- Able to view current bestselling item of the shop
- Search items by selling date
- View all item of the stock
- View total value of stock item
- View total numbers of item type
- View total numbers of units

9. Get details about Business

- Search by sales date
- Search by expire date
- Show all sales
- Show all card payment separately on time duration
- Generate all payments which are done by cash

- Show due customers and their due period dates using a colour code. Red colour shows the debtors over ninety days. Yellow colour shows the debtors' days between thirty to sixty days. Green colour shows the debtor days less than the 30 days.
- Show all payments which are done by credits card (currently shop does not support credit card payment due to 3% of charge from bank)
- Search(customer) due amount using time period, Invoice No, Customer ID
- Show total turnover (total invest for the stuff)
- Show total profit(daily , monthly, yearly)

3.5.2 Non-Functional Requirements

Performance

Loading time is obviously an important part of any user experience. And many times, we'll let it slide to accommodate better aesthetic design, new attractive functionality or to add more content to one pages. For example cashier sales part includes barcode reader and item issuing and able to verify stuff for the cashier

Reliability

Information that contains within the system needs to be accurate and consistence. Most of the shop work depends on the system. So it needs be accurate if not the business will fall.

User Friendliness

Users should quickly need to get the hang of the system flow. In addition, cashier should be issue items speedily without wasting time of the customer. Therefore POS Interface should be more user friendly than others. The main intention is that this system is being used by less educated individuals and they should be understood it easily.

Availability

System Bar code reader and POS should be available all the time in the Shop without any interrupt.

Security and safety

System should be secure enough to handled stock information. As well as have to provide secure access to the admin users because they have the take decision about the Sales of the shop, Total revenue, Current Stock, Best-selling Items, Least selling items

Privacy

Maintain security measurements for company reports is a must. Alone with that assign user privileges and Separate Logging for Reports which consist of information such as total revenue ,stock level and other business data are an important part in the software. The cashier do not have the authorization to view the stock levels, add items to the system or view reports. Thus the system has a sound security.

3.5.3 Hardware and Software requirements

Hardware Module	Requirement
Processor	Intel 2Ghz or higher
RAM	512 MB/1 GB or higher
Hard Disk	20 GB or More Disk space
Internet Connection	Broadband Connection
Resolution	Minimum 1024 x 768

Table 3-1: Hardware requirements

Software Module	Requirement
Operating System	Windows XP or Later
Database	My SQL 5.x version

Table 3-2: Software requirements

3.5.4 System Architecture

- **Three Tier Architecture**

A three-tier architecture is a client-server architecture in which the functional process logic, data access, computer data storage and user interface are developed and maintained as independent modules on separate platforms. Three-tier architecture is a software design pattern and a well-established software architecture.

The Client (also called the Presentation layer) typically could be a client application written in Atomic. This is the Wathumal Traders exe is the app which mainly interact with client.

The logic tier (also called Business logic layer) is typically .net framework which is used to implement this system. This is the brains of a 3-tier app and is responsible for receiving and transmitting requests and responses from and to the presentation client. It also acts as the intermediary to the back-end database.

The database tier is typically a database server such as MySQL, or Oracle, It could also be a database server, that itself handles stock data. In this system Wathumal Traders data base represents the data base tier. [4].

3.6 Design of system

3.6.1 Introduction

The design and implementation phase on this system development will concern about the design of suggested program using Unified Modelling Language (UML) plus the interpretation of the design to the desired design specifications and source code. The main objective of the implementation is to generate the source code and that adheres to the specifications.

3.6.2 ER Diagram

An entity–relationship model is usually the result of systematic analysis to define and describe what is important to processes in an area of a business. It does not define the business processes; it only presents a business data schema in graphical form. It is usually drawn in a graphical

form as boxes (entities) that are connected by lines (relationships) which express the associations and dependencies between entities. [5]

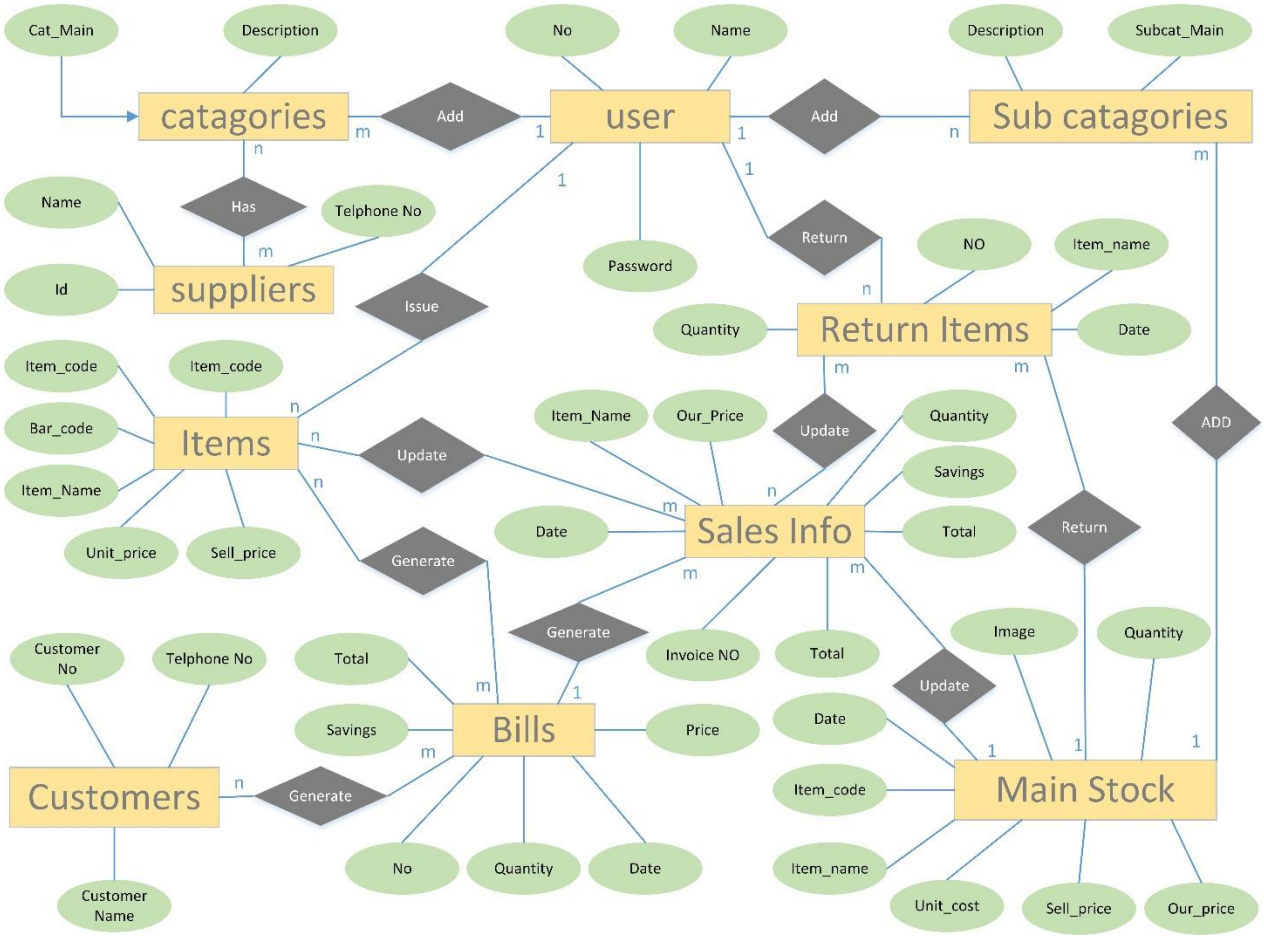

Figure 3-1: ER diagram

3.6.3 Use case descriptions

A use case is a methodology used in system analysis to identify, clarify, and organize system requirements. Use case diagrams are employed in UML (Unified Modelling Language), a standard notation for the modelling of real-world objects and systems. UML shows the various activities users can perform in the system and represent the dynamic aspects of system also

provides user's perspective of the system. In user case diagram an actor are users of the system and playing a role. [6]

Use-Case	Issue item
Actor	Cashier, Manager
Overview	
Issue items from Stock	
Pre-conditions	
Cashier must login to the system	
Flow of events	
1. Cashier must logging in to the system 2. Generate new invoice 3. Enter customer name if required 4. Enter customer 5. Enter item name or expose to the barcode reader 6. Enter quantity 7. Selecting best price 8. Enter total payment 9. Selecting payment type 10. Print bill	
Post conditions	
Issue item to customer	

Table 3-3: Use case description of Issue item

Use-Case	Add item to stock
Actor	Manager
Overview	
Manager add items to stock	
Pre-conditions	
Manager mast log in to the system	
Flow of events	
1. Logging in to the system 2. Add main category 3. Add sub category 4. Add item code of item 5. Add barcode of item 6. Add item name 7. Add rack 8. Add Sinhala name 9. Add unit cost item 10. Add selling price 11. Add best price of item 12. Add Quantity of Item 13. Add Reorder Quantity 14. Add supplier name 15. Add Expire date 16. Add Purchase date 17. Add Image of product	
Post conditions	
Item has added to stock	

Table 3-4: Use case description of Add item to stock

Use-Case	Generate barcode of item
Actor	Manager
Overview	
Generate barcode of item	
Pre-conditions	
Manager must logging in to the system	
Flow of events	
1. Logging to the system 2. Add main category 3. Add description of main category 4. Add sub category 5. Add item code 6. Add bar code of item 7. Add item name 8. Add rack 9. Add Sinhala name 10. Add unit cost of item 11. Add selling price of item 12. Add best price of item 13. Add quantity of stock 14. Add re order quantity amount 15. Add supplier Name 16. Add Expire date 17. Add purchase dare 18. Add image of product	
Post conditions	
Bar code has generated	

Table 3-5: Use case description of Generate barcode of item

Please refer appendix A for more use case description.

3.6.4 High-level use case diagram for the system

High level use case diagram provides the brief description of three actors such as, cashier, manager and customers.

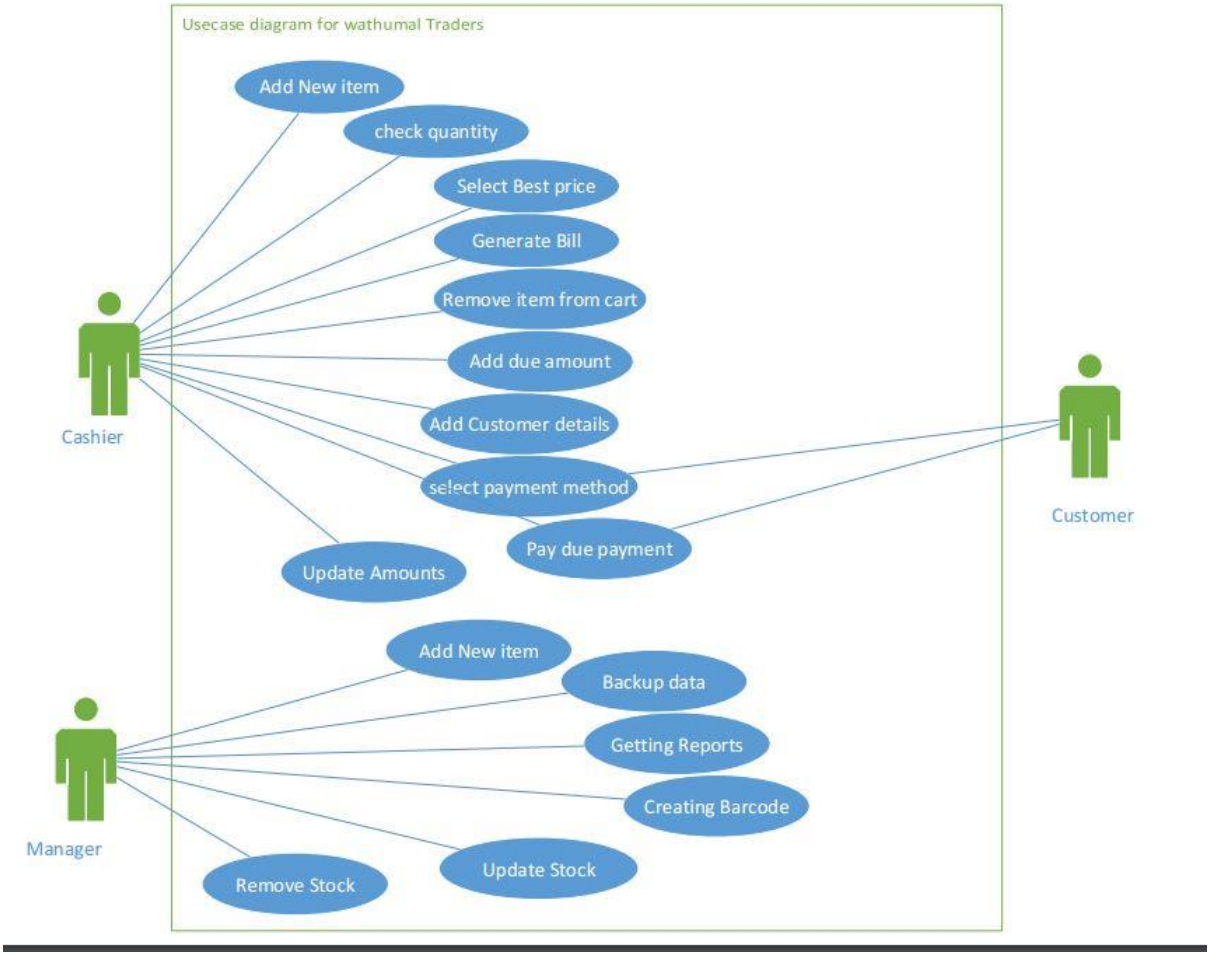

Figure 3-2 :High-level use case diagram

3.6.5 Sequence diagrams for entire process

The Sequence diagrams mainly use to identify the process in easily understandable way. Without high level software architecture or design knowledge can identify each event and its logic with the main key objects. In the below sequence diagram it has four characters such as Cashier, manager, customer and the system. [7]

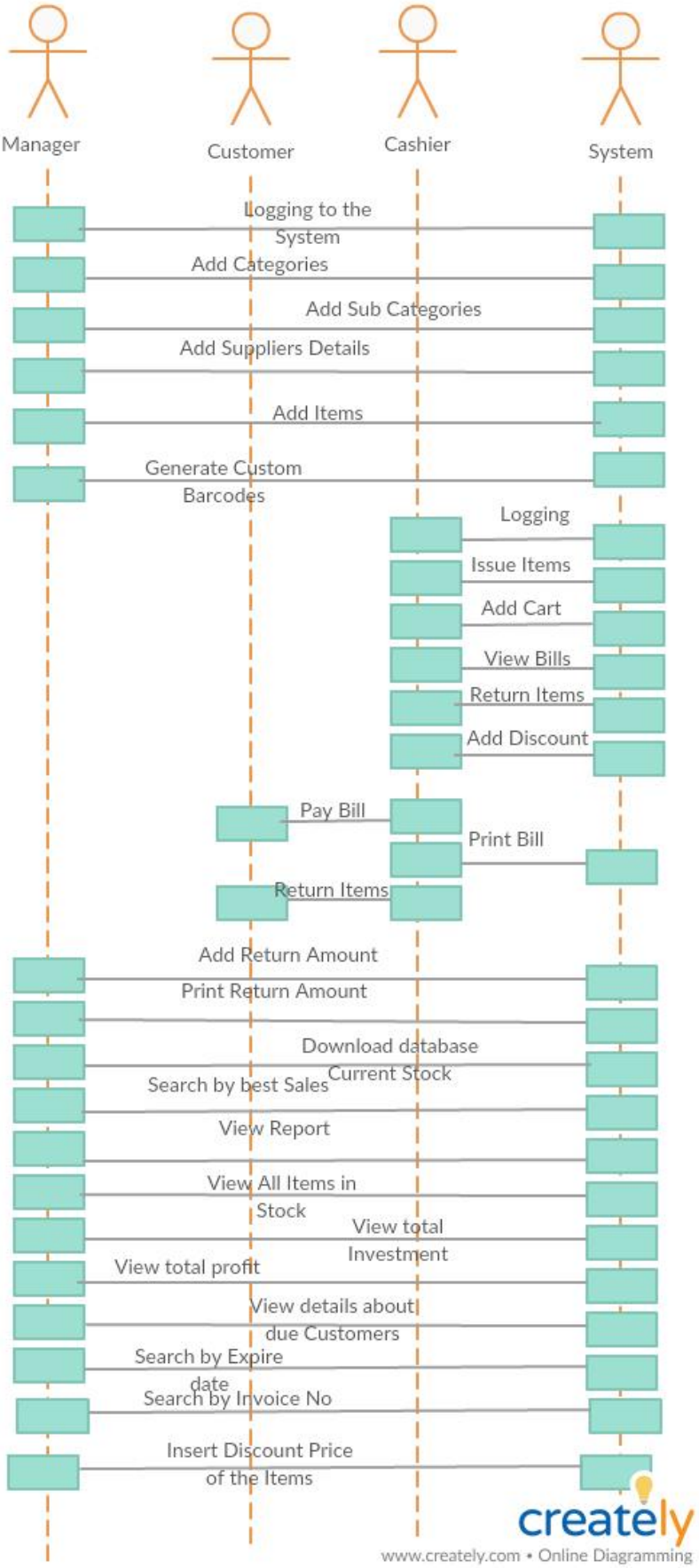

Figure 3-3 : Sequence Diagram

3.6.6 Class diagram for the system

The class diagram describes the attributes and operations of a class and the constraints imposed on the system. The class diagrams are widely used in the modelling of object oriented systems because they are the only UML diagrams which can be mapped directly with object oriented languages.[8]

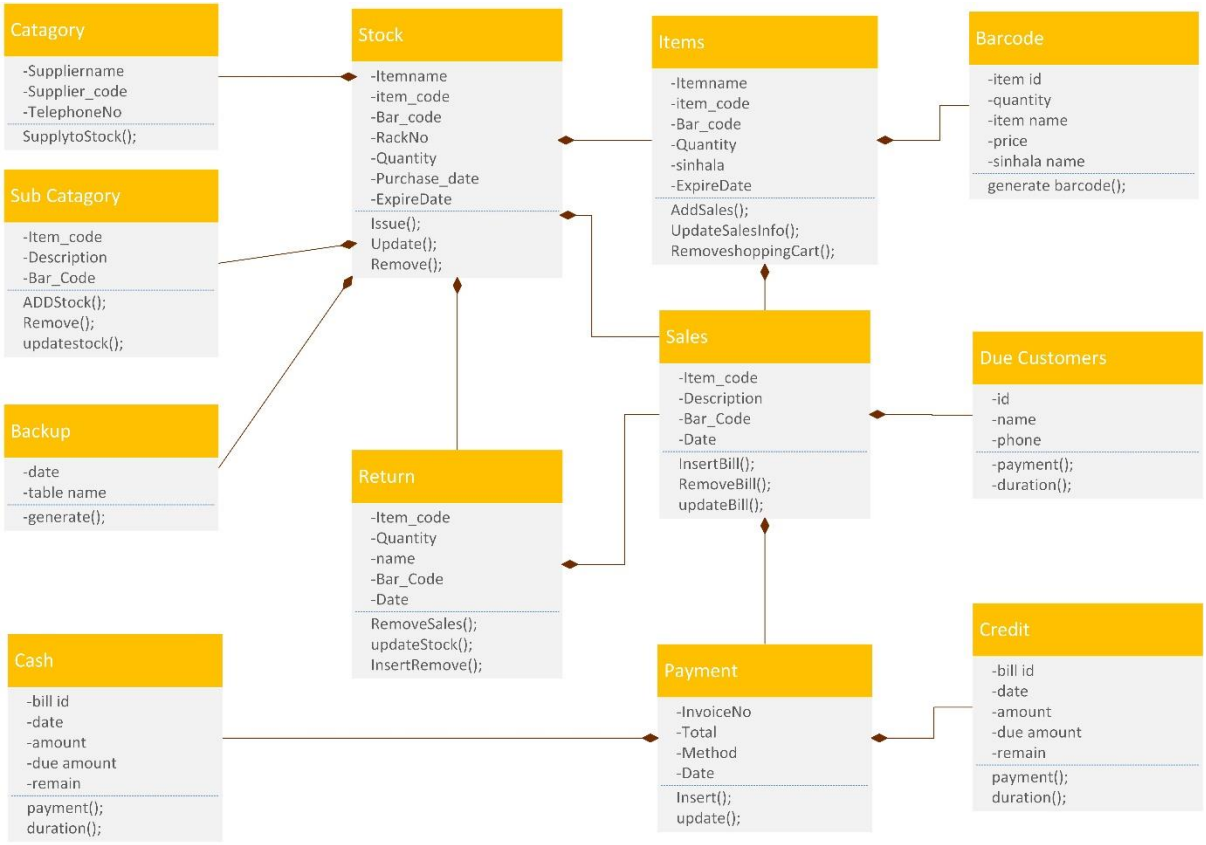

Figure 3-4: Class Diagram

3.7 Summary

This section mainly focused on system analysis and design of the POS and stock management portal. It contains requirement gathering, fact finding and find the functional and non-functional requirements of the system at the same time brief analysis of planned system. Once analysis completed successfully can move to the design phase. It may focus on initial diagram designs such as ER diagram and UML diagrams. ER diagram, Class diagram, sequence diagram and use case diagrams which are discovered in the design section.

Chapter 4 Implementation

4.1 Introduction

Point of sale and stock management system is implemented on windows platform. It utilizes the MySQL Database platform. Currently database server is used to store stock database .All the users are able to connect data base using WIFI connection or LAN connection and update the database table every time using the system. In Current situation the database server has been established on the shop. So there is no need to bother Internet connection availability. To generate barcode instantly for the goods that are not having barcode, customer and Crystal Report with Net libraries have been used in the system. With the windows platform utility, any windows operating system can be used to run and deploy the system. All user interaction methods are performed directly through the windows OS. Users are categorized into two main domains; Cashier and Manager.

Practical version of the Point of sale and stock management system consist only with one manager but can expand into multiple cashiers. Manager has responsibilities such as add suppliers, add categories, generate bar codes for items, add item to the system, update details of items, remove items from database, adding cashiers to the system. Apart from that system also provides some details to take decision for managers such as search by the best-selling, search sales by date and search by Expiry- date.

Point of sale and stock management system has a separate login for the reporting. It can be viewed by all the transactions per day and per month, by pre-defined time duration, by the transaction type, cash or credit and also by customer due amounts.

Point of sale and stock management system also enrich with POS part. It also enables with auto loading features when searching item for purpose of minimizing errors.

Stock details and transaction details (database) can be downloaded using this system.

4.2 System Overview

Point of sale and stock management system allows the users to login as the manager and cashier. Loading page requires master password which will be given to the system owner by the system developer. By using the master password the manager to create logins for manager and cashiers. If cashier or manager forget the password it can be reset using master password which is stored at email or cloud.

Home page of the system gives the functionalities such as sale orders, add items to stock, Database backup, find details of stock, and report section which can be used to calculate total revenue of the shop.

Sales orders let the cashiers to access the POS part of the system and it also include some auto loading functions and bar code features to get details of the selling item.

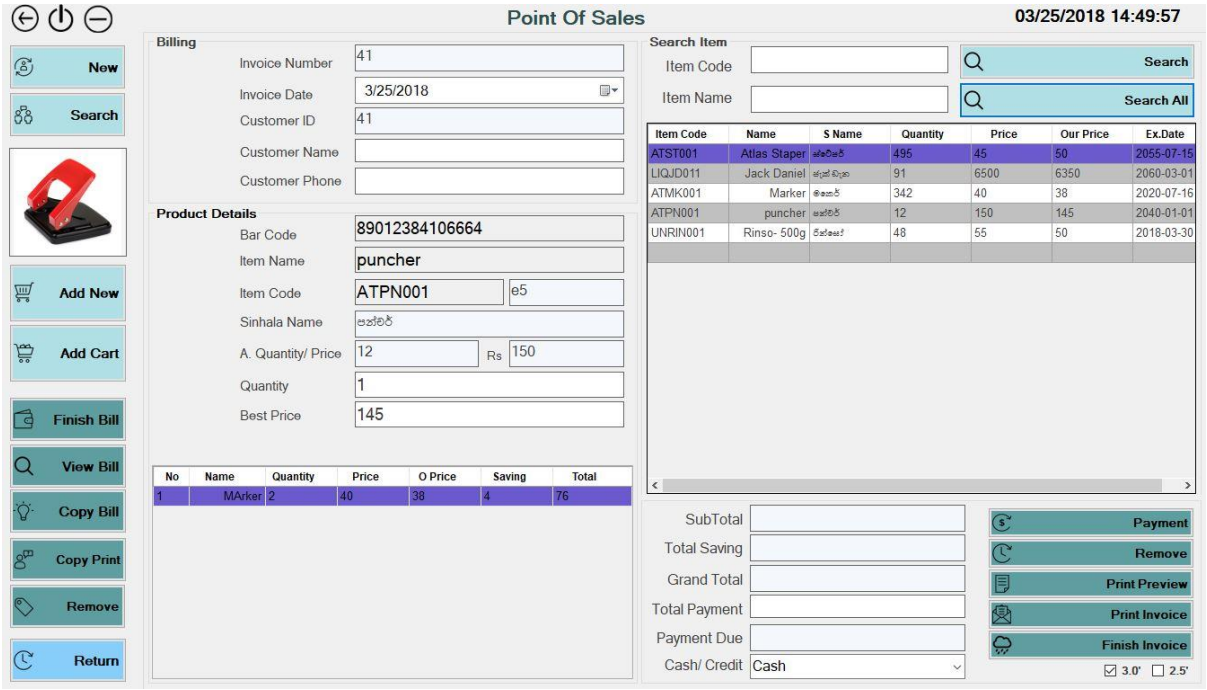

Figure 4-1: POS Section

Sales orders is the most visited page by users and it should provide detailed idea about the items of stock. Some of data table sections to view stock for cashier which help to get some verification about items sold are given below.

4.3 Add Section

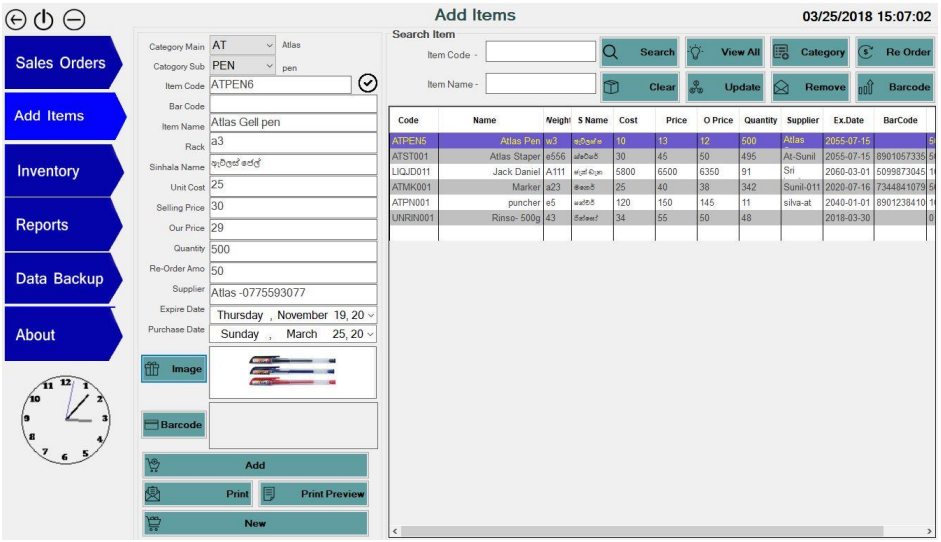

Figure 4-2: Add Section

It is mandatory to include all the important information about of the items accurately to the system. This system provides the facility to grab most important content from item as given above in the figure 4.1.

Also system enrich with “search” function which enables the user to search items by item name and code. There is a function called “view all” to verify the items added to the database.

Manager can update (edit or remove) the stock details when it requires.

There is a separate tab to generate bar codes for the items as shown in the figure.

Report page provide the facility to view the details of the items by all the transactions per day and per month, by pre-defined time duration, by the transaction type, cash or credit and also by customer due amounts.

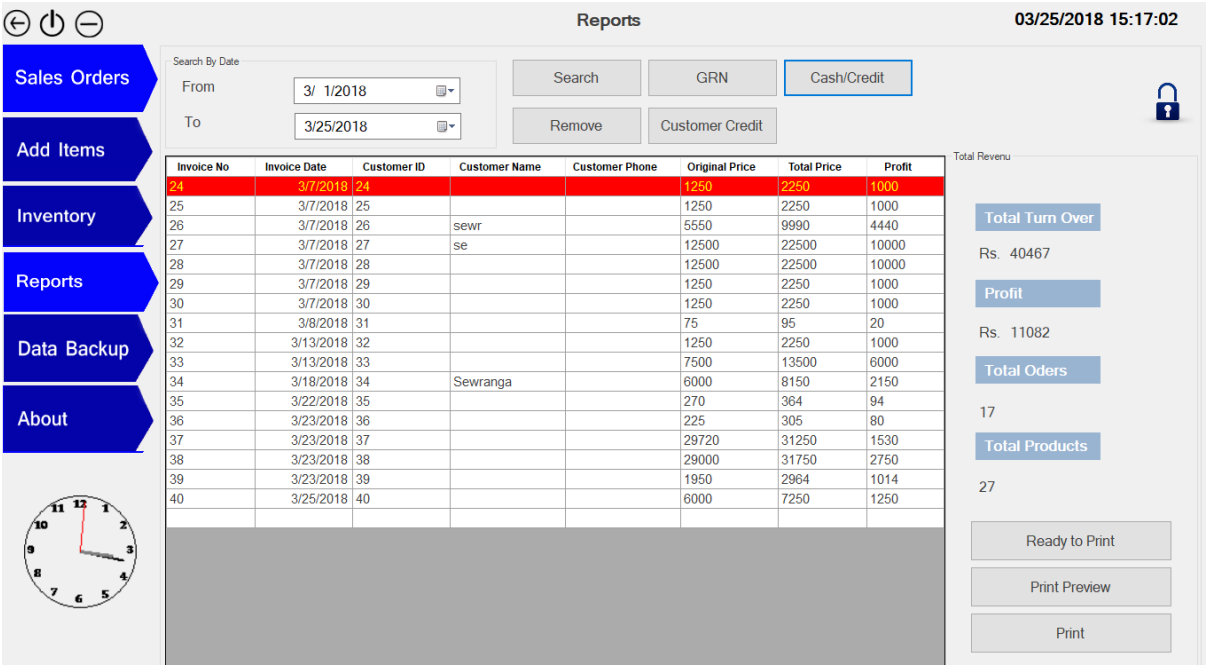

Figure 4-3: Reports

Stock page provide the current stock details.

It is facilitated to search by invoice No., best- selling item, suppliers name, latest purchasing item, and daily sales and sales quantity by date.

Also the users can view Stock details and update (edit and remove) the items of the Stock.

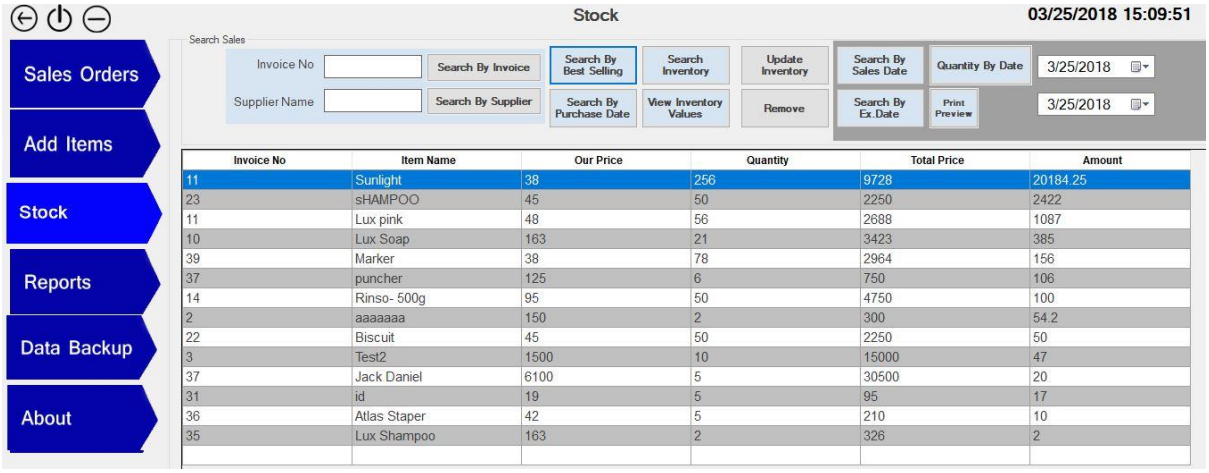

Figure 4-4: Stocks

Back up page provides the facility to back up the stock details and helps to prevent the extra load to the system.

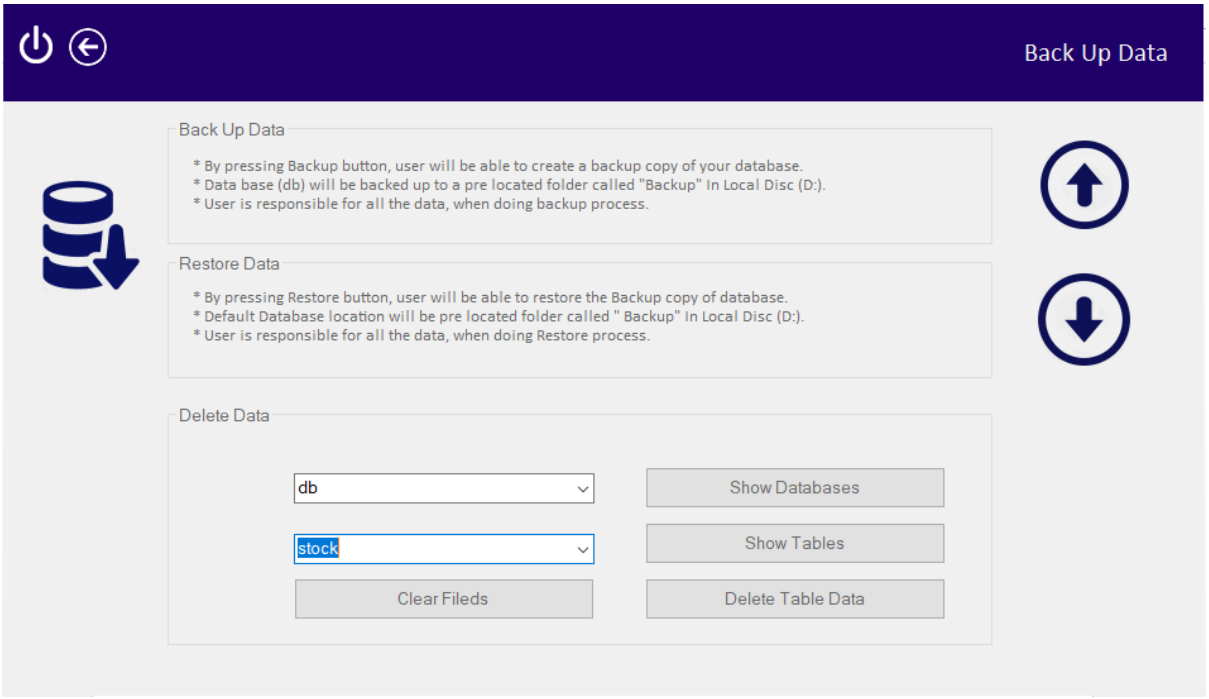

Figure 4-5: Backup

4.4 Printing Section

There are two types of printing pages are supplied by the system.

Bill width – 2”

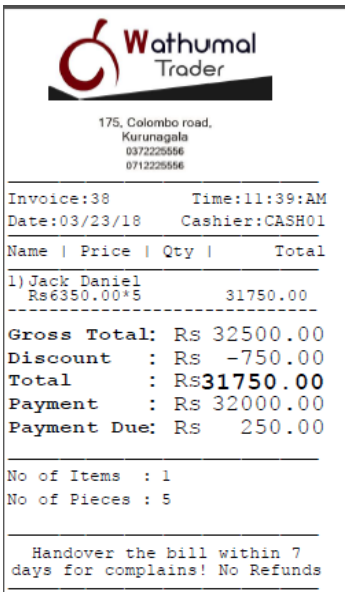

Figure 4-6: Bill Width-2”

Bill width – 3”

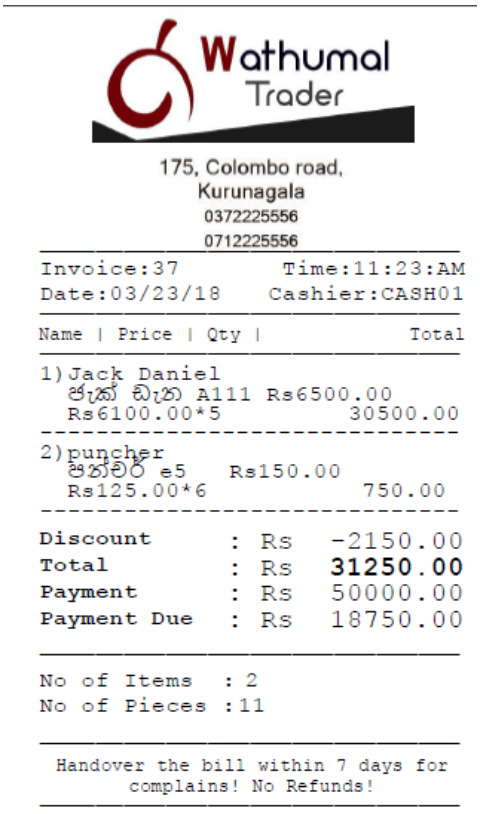

Figure 4-7: Bill Width-3”

4.5 Technology and Tools

Visual Studio 2008

Development Process Development started by first defining classes related to each of the layer in the layered architecture described in Chapter 4. It was decided to use some of the relationships with Visual Studios 2008 and free reusable components in the implementation stage of the program. The first step of the development process was to identify the conventions that should be used when coding. It was decided to use namespaces to logically group similar classes. [9] To create the exe set up file the visual studio 2008 software was used as newer versions do not have that ability.

My SQL Server

MySQL Community Edition is a freely downloadable version of the world's most popular open source database that is supported by an active community of open source developers and enthusiasts. It’s the most widely used open source RDBMS. It is the most popular choice of

database management system for use in web applications. Many third-party GUI tools are available. MySQL work bench is one example for GUI tool.[10]

Adobe Photoshop,

Adobe Photoshop CS6 tool use for user interface designing. Adobe flash and Adobe premiere used to create the multimedia contents of the system. To create buttons, logo and the fill format the Photoshop software have been used. [11]

Crystal Report

Crystal Reports is a business intelligence application, currently marketed to small businesses by SAP SE. It is used to design and generate reports from a wide range of data sources. [12]

To generate the custom barcodes, crystal report software have been used.

4.6 Hardware and Software /Application Requirements

4.6.1 Hardware configuration for user PC

- Intel Core i5 Processor
- 8 GB RAM
- 64-Bit Operating System
- 250 GB Hard Disk Drive
- HD Monitors 1366 X 768
- LAN network card or Wireless card
- Software configuration for user PC
- Windows 7 or above version

4.7 Server Environment

4.7.1 Hardware Configuration

- 3.0GHz Intel Processor
- 4GB RAM
- 150 Free Hard Disk Drive
- LAN network card or Wireless card

4.7.2 Software/Application Configuration

My SQL server 5.0.45 has been installed in the Ubuntu Latest stable version. Then the System database will be installed into My SQL server 5.0.45.By using wireless card or network card, the manager or the cashier could build the access to the data base. [13]

4.8 Client side requirement

4.8.1 Hardware Configuration

Any Internet connected PC (at least of 512 KB/s speed internet) and having processor power more than 2.0 GHz.

4.8.2 Major code segments

Cording of the proposed system was done using Visual Studio 2008. Some major code segments of the system are given below.

Barcode is important part of the Point of sales system. Below shows major code of Barcode .cs file.

```
try
{
if (textBox17.Text != "")
{
        for (int i = 0; i < int.Parse(textBox17.Text); i++)
        {
            dt.Rows.Add(textBox11.Text, textBox12.Text, textBox13.Text, textBox14.Text, t
        }

        cry.Load(@"D:\Project\CrystalReport1.rpt");
        cry.SetDataSource(dt);
        crystalReportViewer1.ReportSource = cry;
    }
    else MessageBox.Show("Enter the Barcode Quantity.", "Error", MessageBoxButtons.OK, Me
    textBox17.Focus();
}
```

Figure 4-8: Barcode

Data backup is main part of any system. Below shows main part of Backup code.

```
DialogResult dialogResult = MessageBox.Show("Are you sure You want to Backup the Database",
    if (dialogResult == DialogResult.Yes)
    {

        try
        {
            string constring = "server=localhost;user=root;pwd=;database=db;";
            string file = "D:\\Backup\\db.sql";
            using (MySqlConnection conn = new MySqlConnection(constring))
            {
                using (MySqlCommand cmd = new MySqlCommand())
                {
                    using (MySqlBackup mb = new MySqlBackup(cmd))
                    {
                        cmd.Connection = conn;
                        conn.Open();
                        mb.ExportToFile(file);

                        MessageBox.Show("DataBase Backup Has Been Completed Successfully!");
                        conn.Close();
                    }
                }
            }
```

Figure 4-9: Coding of Backup

Printing Bill

```
layout = new RectangleF(new PointF(startX, 70 + offset), layoutSize);
Bitmap bmp2 = new Bitmap(Properties.Resources.Address);
Image Image = bmp2;
e.Graphics.DrawImage(Image, startX + 35, 85, Image.Width / 2, Image.Height / 2);
offset = offset + fontHeight;


layout = new RectangleF(new PointF(startX, 120 + offset), layoutSize);
graphic.DrawString("".PadRight(30, '_'), font10, brush, layout, formatLeft);
offset = offset + lineheight12;


layout = new RectangleF(new PointF(startX, 115 + offset), layoutSize);
graphic.DrawString("Invoice:" + textBox11.Text, font10, brush, layout, formatLeft
graphic.DrawString("Time:" + DateTime.Now.ToString("hh:mm:tt"), font10, brush, la
offset = offset + lineheight14;
layout = new RectangleF(new PointF(startX, 105 + offset), layoutSize);
graphic.DrawString("Date:" + DateTime.Now.ToString("MM/dd/yy"), font10, brush, la
graphic.DrawString("Cashier:CASH01", font10, brush, layout, formatRight);
offset = offset + lineheight14;
```

Figure 4-10: Coding of Print Bill

4.8.3 Validation

Code segments used to validate the system is given below.

Validation of Best price text field

```
Double bPrice = double.Parse(textBox19.Text);
Double suPrice = double.Parse(textBox3.Text);

if (bPrice >= suPrice)
{
    MessageBox.Show("Best price must lower than price.", "Error", MessageBoxButtons.OK, Me
    textBox19.Focus();
    return false;
}
```

Figure 4-11: Validation of Best price

Validation of date field

```
var value = dateTimePicker1.Value;


if (value.Date != DateTime.Now.Date)
{
    MessageBox.Show("Invoice date should current date ", "Error", MessageBoxButtons.OK
    dateTimePicker1.Focus();
    return false;
}
```

Figure 4-12: Validation of Date

Validation of not empty required id filed

```
if (textBox13.Text.Trim() == string.Empty)
{
    MessageBox.Show("Client ID is required.", "Error", MessageBoxButtons.OK, MessageBoxIcc
    textBox13.Focus();
    return false;
}
```

Figure 4-2: Validation of required id

Validation of Item Code

```
if (textBox6.Text.Trim() == string.Empty)
{
    MessageBox.Show("Item Code is required.", "Error", MessageBoxButtons.OK, MessageBoxIcc
    textBox6.Focus();
    return false;
}
```

Figure 4-14: Validation of Item Code

Validation of Invoice Number

```
if (textBox11.Text.Trim() == string.Empty)
{
    MessageBox.Show("Invoice Number is required.", "Error", MessageBoxButtons.OK, MessageI

    textBox4.ReadOnly = true;
    textBox3.ReadOnly = true;
```

Figure 4-15: Validation of Invoice Number

Validation of Quantity text field

```
decimal n;
bool isDecimal = decimal.TryParse(textBox2.Text.Trim(), out n);

if (!isDecimal)
{
    MessageBox.Show("Quantity should be a number.", "Error", MessageBoxButtons.OK, Me
    textBox2.Clear();
    textBox2.Focus();
    return false;
}
```

Figure 4-163: Validation of Quantity

4.9 Summary

Implementation chapter focus on the POS and Stock Management portal user interfaces as well as justification of technology, tools used in the system. Configuration of server, configuration of development PC, client hardware and software also mentioned briefly.

Chapter 5 Evaluation and Testing

5.1 Introduction

Evaluation phase is used to test the implemented system for its uses and accuracy by using various test strategies. In this phase system components are tested and re-arranged if they do not meet the requirements.

This chapter represents the work carried out during the evaluation phase of this project.

5.2 Main objective of the Test process

Given below are the test objectives that has been set at the beginning of testing.

1. To meet the client / user requirements
2. To arrange the system in order to free from bugs and finalize in stable condition.
3. To ensure that the system is ready for the real time use.

5.3 Front End Testing

Standalone application is mostly based on the user interfaces (UI) because of the lack of computer or IT knowledge of the stake holders. UI functions of the application are tested according to the test plan using Black box testing methodology. The system has tested on each module and the results of the each test cases were generated and given below.

5.4 Test Cases

Test case is an outline which tests a feature or set of features. It provides developer a systematic approach for testing. Therefore it will ensure the completeness of test and provide the highest likelihood for uncovering errors in the software. Test case consist of:

- Test data
- Expected results
- Purpose of having the particular test data.

For the functions and procedures a unit testing is carried out first when coding the system. The behavior is intended by the unit test. The units of codes are tested and it is called a code level testing. To test the modules of the system an integration testing is processed. When using different kinds of implementation technologies this is a must to ensure the proper working of all the integrated components for the relevant outcome. The whole system has been tested after the unit testing and integration testing to guarantee the standard of the system using an environment similar to the environment where the system is going to practically used. A customer confirmation is obtained by a user acceptance testing after the completion of the system. It ensures the requirements are fulfilled by the developed system.

5.4.1 Unit Testing

Unit testing was done while implementing the project. This is done for individual units.

5.4.2 Integration Testing

Integration Testing is carried out after the separate software modules have been unit testing. Integration testing is based on the functional specification of the software. E.g. when cashier provided the correct credentials to the login module, it logged to the POS interface and issue item to customer.

5.4.3 System Testing

System testing is carried out at the completion of the integration testing. The purpose of system testing is to prove that the software meets the agreed user requirements and works in the target environment. System testing covers both functional and non-functional requirements.

E.g.: By logging into the system and routing through different processes the whole system was tested.

5.4.4 Black-box testing

This type of testing is done without testing its internal structure. Testing is done only to see whether it meets desired outputs.

5.4.5 White-box testing

This is done to test the systems internal structure. This is also called Glass box testing.

For example debugging the bar code generation

5.4.6 Regression Testing

This is done after changes are made to a system application. This test is to prove that the change has been made correctly and that change has not introduced any new errors.

Return

Test	Test Case	Expected out comes	Success
1	Modify Auto generated Invoice Number.	Don't allow to modify Auto generated Invoice No	Yes
2	Modify Auto generated Item Number.	Don't allow to modify Auto generated Item Number.	Yes
3	Modify Auto generated Purchasing Quantity.	Don't allow to modify Auto generated Purchasing Quantity.	Yes
4	Modify Auto generated Sold Price.	Don't allow to modify Auto generated Sold Price.	Yes
5	Search Invalid or Null Return Quantity	Display error message on Same Page "Invalid Quantity"	Yes

Table 5-1 Test case for Return

Stock

Test	Test Case	Expected out comes	Success
1	Search Invalid or Null Item Code	Error notifications in relevant fields. System rejects to proceed	Yes
2	Search Invalid or Null Item Name	Error notifications in relevant fields. System rejects to proceed	Yes
3	Purchase date greater than issue date in Quantity	Error notifications in relevant fields. System rejects to proceed	Yes
4	Remove item accidentally	Confirm box will pop up	Yes
5	Update Item accidentally	Confirm box will pop up	Yes

Table 5-2 Test case for Stock

Database

Test	Test Case	Expected out comes	Success
1	Backup Empty database	Error notifications in relevant fields. System rejects to proceed	Yes
2	Backup Empty database table	Error notifications in relevant fields. System rejects to proceed	Yes

Table 5-3 Test case for Database

Reports

Test	Test Case	Expected out comes	Success
1	Purchase date greater than issue date in Quantity	Error notifications in relevant fields. System rejects to proceed	Yes
2	Remove item accidentally	Confirm box will pop up	Yes

Table 5-4 Test case for Reports

Customer due Amount

Test	Test Case	Expected out comes	Success
1	Modify Auto generated Invoice Number.	Don't allow to modify Auto generated Invoice No	Yes
2	Modify Auto generated Invoice Date.	Don't allow to modify Auto generated Item Number.	Yes
3	Modify Auto generated Customer ID.	Don't allow to modify Auto generated Customer ID.	Yes
4	Modify Auto generated Customer Name	Don't allow to modify Auto generated Customer Name.	Yes
5	Modify Auto generated Customer Phone	Don't allow to modify Auto generated Customer Phone.	Yes
6	Modify Auto generated Invoice Number.	Don't allow to modify Auto generated Invoice Number	Yes
2	Modify Auto generated Total Amount	Don't allow to modify Auto generated Total Amount	Yes
3	Modify Auto generated Payment.	Don't allow to modify Auto generated Payment	Yes
4	Modify Auto generated Due Amount	Don't allow to modify Auto generated Due Amount..	Yes
5	Modify Auto generated Due Age	Don't allow to modify Auto generated Due Age	Yes

Table 5-5 Test case for Customer Due Amount

System

Test	Test Case	Expected out comes	Success
1	Shutdown System Accidently.	Error notifications in relevant fields. System rejects to proceed	Yes
2	Back to the Previous Menu accidently	Error notifications in relevant fields. System rejects to proceed	Yes
3	Incorrect Login for Cashier.	Error notifications in relevant fields. System rejects to proceed	Yes
4	Incorrect Login for Manager	Error notifications in relevant fields. System rejects to proceed	Yes

Table 5-6 Test case for System

POS

Test	Test Case	Expected out comes	Success
1	Modify Auto generated Invoice Number.	Don't allow to modify Auto generated Invoice Number	Yes
2	Modify Auto generated Invoice Date.	Don't allow to modify Auto generated Invoice Date	Yes
3	Modify Auto generated Customer Telephone No.	Don't allow to modify Auto generated Telephone No	Yes
4	Modify Auto generated Item Name.	Don't allow to modify Auto generated Item Name.	Yes
5	Modify Auto generated Item Code.	Don't allow to modify Auto generated Item Code.	Yes
6	Modify Auto generated Item Picture.	Don't allow to modify Auto generated Item Picture.	Yes
7	Modify Auto generated Sinhala Name	Don't allow to modify Auto generated Sinhala Name	Yes
8	Modify Auto generated Discount Price.	Don't allow to modify Auto generated Discount Price.	Yes
9	Search Invalid or Null Item Code	Error notifications in relevant fields. System rejects to proceed	Yes
10	Search Invalid or Null Item Name	Error notifications in relevant fields. System rejects to proceed	Yes
11	Modify Auto generated Subtotal.	Don't allow to modify Auto generated Subtotal.	Yes
13	Modify Auto generated Total Savings	Don't allow to modify Auto generated Total Savings	Yes
14	Modify Auto generated Grand total	Don't allow to modify Auto generated Grand total	Yes
15	Assign Custom Invoice No after ending previous Invoice	Don't allow to modify Auto generated Invoice Date	Yes

Table 5-7 Test case for Point of sales

Add Items

Test	Test Case	Expected out comes	Success
1	Assign Invalid Main Category in Add item	Error notifications in relevant fields. System rejects to proceed	Yes
2	Assign Invalid Sub Category in Add item	Error notifications in relevant fields. System rejects to proceed	Yes
3	Assign Duplicate Item Code	Error notifications in relevant fields. System rejects to proceed	Yes
4	Assign Duplicate Bar Code	Error notifications in relevant fields. System rejects to proceed	Yes
5	Assign Invalid (negative number, letters) values in Unit Cost	Error notifications in relevant fields. System rejects to proceed	Yes
6	Assign Invalid (negative number, letters) values in Selling Price	Error notifications in relevant fields. System rejects to proceed	Yes
7	Assign Invalid (negative number, letters) values in Our Price	Error notifications in relevant fields. System rejects to proceed	Yes
8	Assign Invalid (negative number, letters) values in Stock Quantity	Error notifications in relevant fields. System rejects to proceed	Yes
9	Assign older date as purchasing date	Error notifications in relevant fields. System rejects to proceed	Yes
10	Assign older date as Expire date	Error notifications in relevant fields. System rejects to proceed	Yes
11	Assign older Expire date than Purchasing date	Error notifications in relevant fields. System rejects to proceed	Yes
12	Search Invalid Item Code	Error notifications in relevant fields. System rejects to proceed	Yes
13	Search Invalid Item Name	Error notifications in relevant fields. System rejects to proceed	Yes
14	Assign Duplicate entry for Category	Error notifications in relevant fields. System rejects to proceed	Yes
15	Assign Duplicate entry for Sub Category	Error notifications in relevant fields. System rejects to proceed	Yes
16	Assign Invalid values(Digits) for Category description	Error notifications in relevant fields. System rejects to proceed	Yes
17	Edit and update button click	When update button press, it displays in editable mode with existing data	Yes
18	Remove Button click	Before remove a confirmation message	Yes

Table 5-8 Test case for Add Items

Please refer appendix E for analysis of test results.

5.5 Automated testing for Wathumal traders

Automated tests that drive an application through its user interface (UI) are known as coded UI tests (CUITs). The Code First approach is a relatively new workflow introduced by Microsoft. It is utilized to generate UI Map elements by using Search (or) Filter properties of a control, instead of using UI Map objects generated by the Coded UI Test Builder.These tests include functional testing of the UI controls. It let user verify that the whole application, including its user interface, is functioning correctly. Coded UI Tests are particularly useful where there is validation or other logic in the user interface, for example CUITs can be used to verify all the database connectivity between UI functionalities such as WinButton, WinCalender, WinCell, WinColumnHeader, WinComboBox, WinControl, WinCustom, WinEdit, WinGroup, WinHyperLink, WinList, WinMenuItem, WinListItem, WinMenuBar, WinPane, WinRadioButton, WinScrollBar etc of Wathumal Traders Software.[14]

5.6 User Acceptance form

User acceptance test (UAT) is one of the main evaluation method before the software go on live. UAT generate instance feedbacks form the end users and it is most healthy way of collecting feedback on the new system with real people interaction. . Please refer Appendix E for user feedback.

5.7 Summary

This section mainly focused on Evaluation of the system. It contains tested against the user requirements, which are gathered at the beginning. In testing actual data from the client's environment is used. The units of codes are tested and it is called a code level testing. Secondly the modules of the system an integration testing is processed. The whole system has been tested after the unit testing and integration testing to guarantee the standard of the system using an In environment similar to the environment where the system is going to practically used. A customer confirmation is obtained by a user acceptance testing after the completion of the system. It ensures the requirements are fulfilled by the developed system.

The chapter also includes aspects such as test plan, test cases, use of test automation tools and testing frameworks.

Chapter 6 Conclusion and Future work

6.1 Introduction

This chapter focused on conclusions of the dissertation with a critical evaluation of the system, lesson learned and suggestions for any future work.

6.2 Lesson learned

In the process of implementing this system it was required to gain knowledge in several aspects. Such as requirement gathering, requirement analyze, planning, frontend and backend development, software testing, infrastructure setup and documentation. It's like an A to Z process which has roles of a System Analysis, Developer, Tester, Network Administrator, Content Write and Project Manager. The self-confidence to complete the project successfully on time has been a great challenge for individual and it has been self-satisfactory goal for myself. It was mandate to learn the programming Visual Studio 2008, MySQL and many other important new technologies to lead the way and it was a very dynamic learning curve.

6.3 Conclusion

The stock and POS portal could be used to build a point of sales module for Wathumal traders. The Manager can add new stocks to the system. Another important characteristic of the system is to create information such as bestselling items, items close to expire and reorder levels using the system and generate reports that can be used to improve the future business.

6.3.1 Future Works

When the business expands and more stores are opening up in the country, the existing data base will not be enough .By hosting a cloud Database or giving remote access from other site to the data base should be created in the future to solve this problem.

To further develop the system, QR cord payment method will be develop in the future. This will allow customers to scan and purchase items using its QR cords through a smart phone or tablet.

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APPENDIX A – Use Cases

Use-Case	Search by best selling
Actor	Manager
Overview	
Search by best selling	
Pre-conditions	
Manager must logging in to the system	
Flow of events	
1. Logging to the system 2. Select the inventory tab 3. Click search by best selling	
Post conditions	
Gather bestselling item	

Table A 1 Search by best selling

Use-Case	Add main category system
Actor	Manager
Overview	
Main category to system	
Pre-conditions	
Manager must log in to the system	
Flow of events	
1. Manager must logging in to the system 2. Add to unit code 3. Add description	
Post conditions	
Main category is added	

Table A 2 Add main category system

Use-Case	Add sub category system
Actor	Manager
Overview	
Sub category to system	
Pre-conditions	
Manager must log in to the system	
Flow of events	
1. Manager must logging in to the system 2. Add to sub code 3. Add description	
Post conditions	
Sub category is added	

Table A 3 Add sub category system

Use-Case	Show sales time duration
Actor	Manager
Overview	
Show sales time duration	
Pre-conditions	
Manager must logging in to the system	
Flow of events	
1. Logging to the system 2. Select the date range 3. Click sales	
Post conditions	
Gather sales from time duration	

Table A 4 Show sales time duration

Use-Case	Issue item
Actor	Cashier, Manager
Overview	
Issue items from Stock	
Pre-conditions	
Cashier must login to the system	
Flow of events	
1. Cashier must logging in to the system 2. Generate new invoice 3. Enter customer name if required 4. Enter customer 5. Enter item name or expose to the barcode reader 6. Enter quantity 7. Selecting best price 8. Enter full payment 9. Selecting payment type 10. Print bill	
Post conditions	
Issue item to customer	

Table A 5 Issue item

APPENDIX B – Activity Diagrams

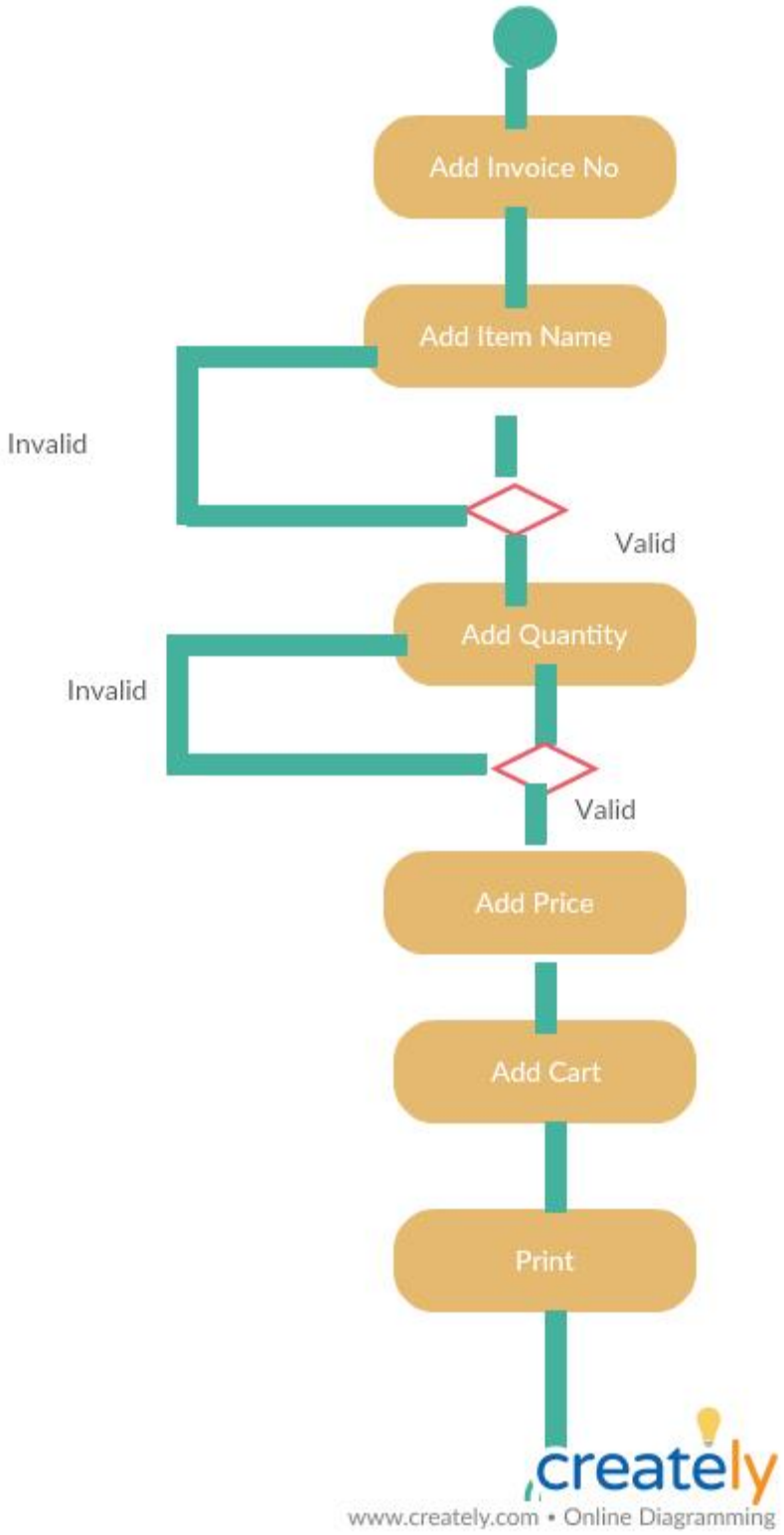


Figure B 1: Activity diagram of Add items

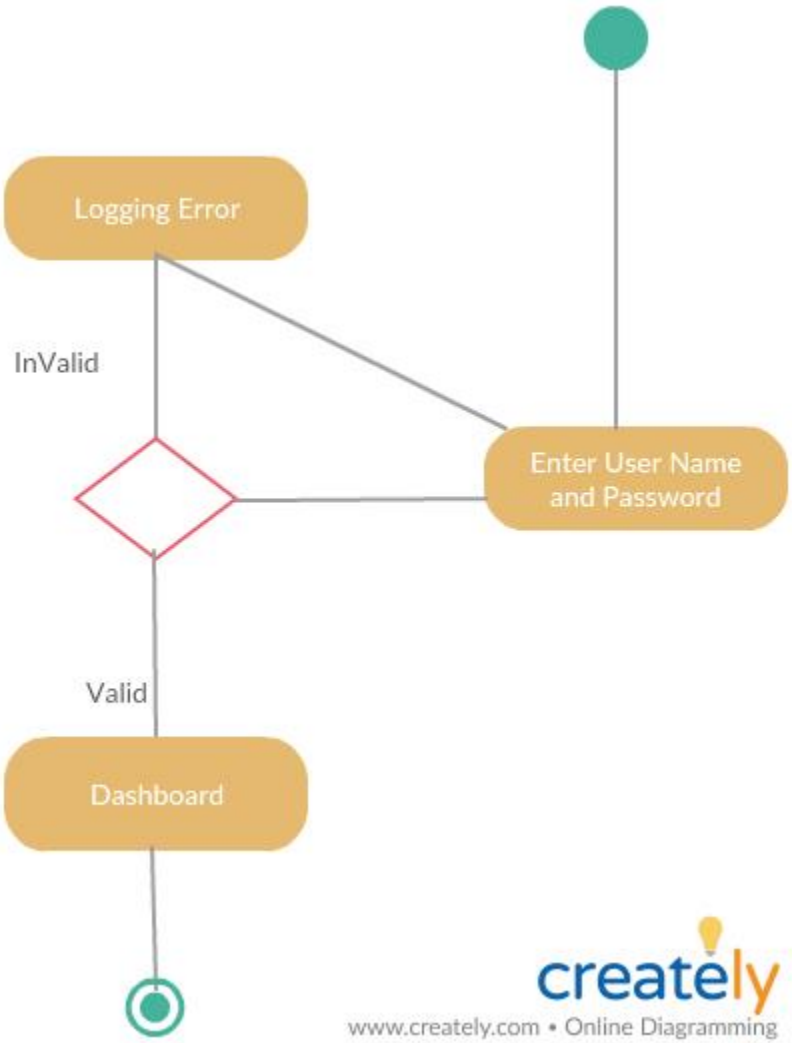


Figure B 2: Activity diagram of Logging

APPENDIX C – User Manual

Point of sale and stock management system allows the users to login as manager and cashier. Loading page requires master password (most probably developers) to create logins for managers and cashiers.

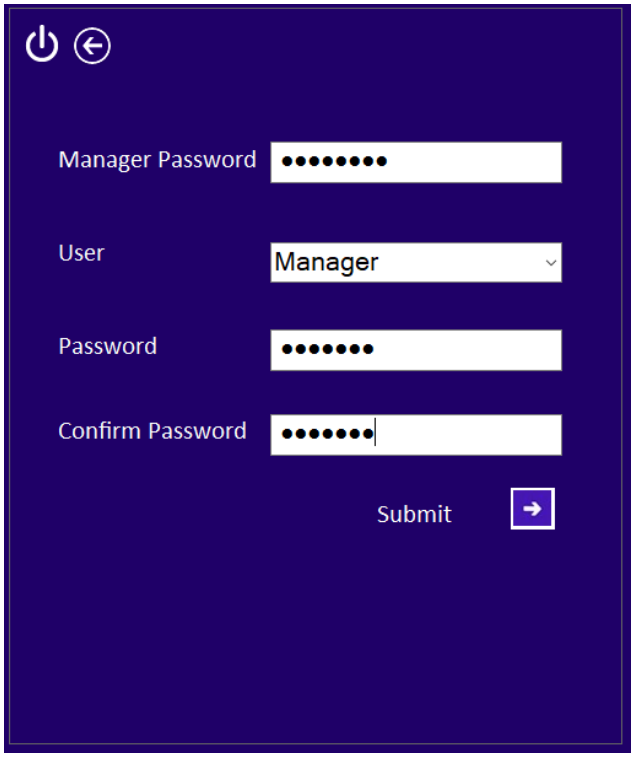


Figure C 1 logging

After finalizing the payment for developers, manager can get the master password and create logins for cashiers.

Sales orders let the cashiers to access the POS part of the system and it also include some auto loading functions and bar code features to get details of the selling item.

Sales orders is the most visited page by users and it should provide detailed idea about the items of stock. Some of data table sections to view stock for cashier which help to get some verification about items sold are given below.

- Add new item to the shopping card by using item name.
- Add new item to shopping card by using bar code.
- Can check available quantity.
- Can adjust price of the item
- Can generate new invoice
- Remove item from the cart

- Available for various payment method(cash/credit)
- Print preview of invoice
- Print option of various types (3.0,2.0)

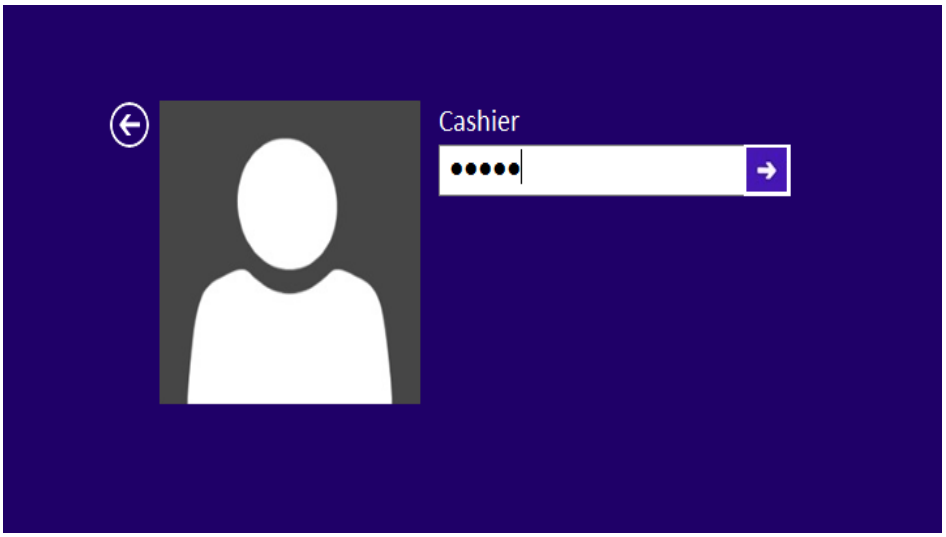


Figure C 2: cashier logging

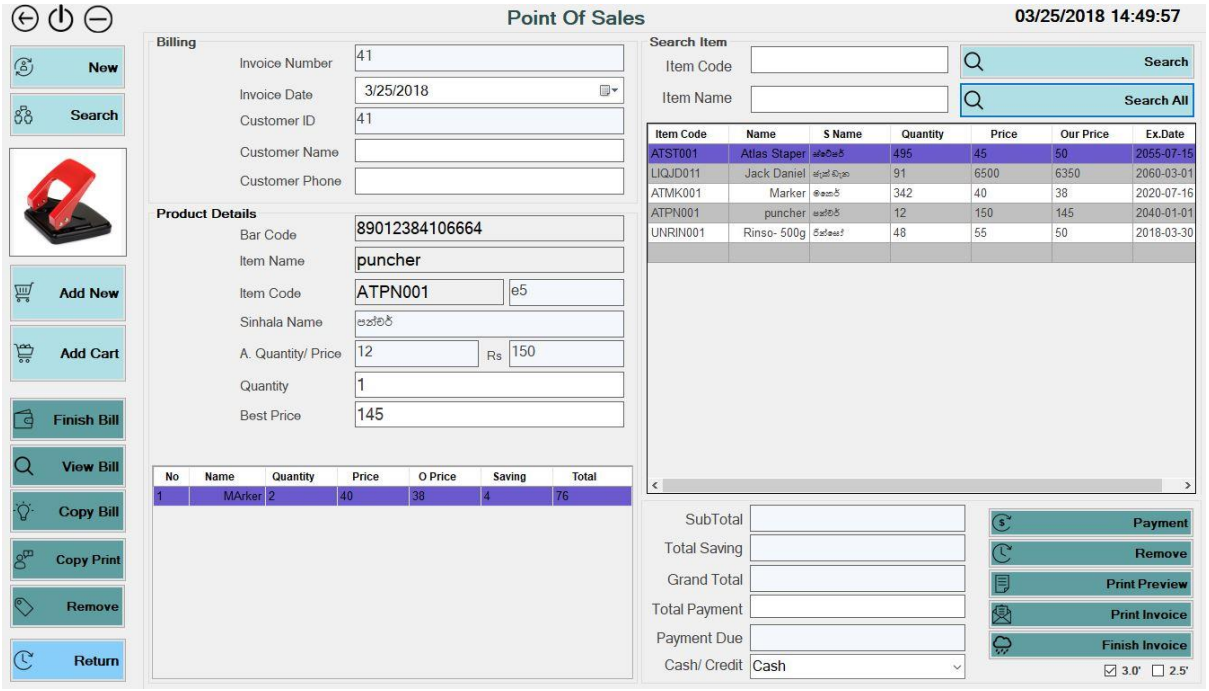


Figure C 3: Cashier sales orders

Item Return section

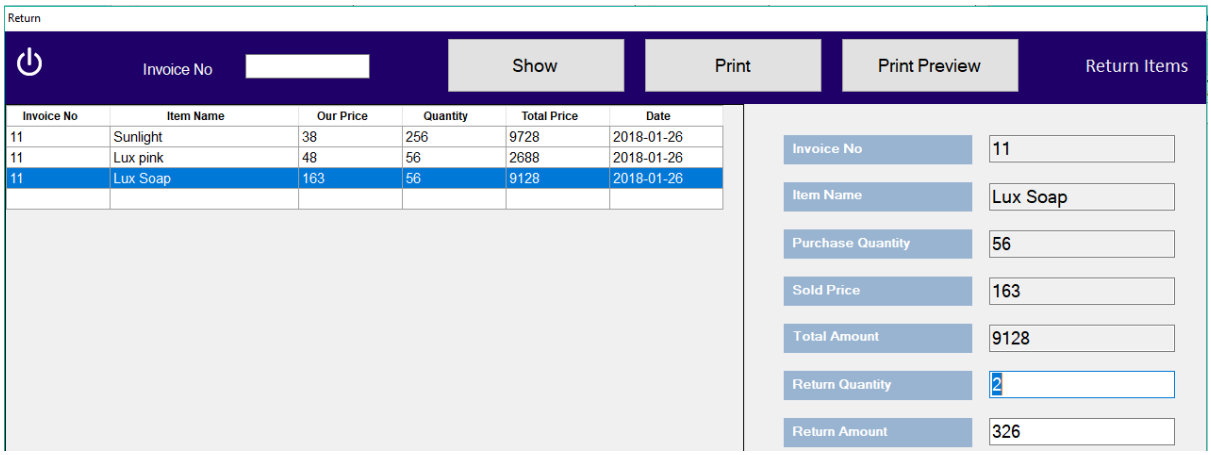


Figure C 4: Return Item

"Return Item" let the cashiers to access the returning part of the system and it also includes auto loading functions to validate the invoice and customer can either get the amount returned or buy new products using the amount.

Item Add section

It is mandatory to include all the important information about of the items accurately to the system. This system provides the facility to grab most important content from item as given below in the figure….

1. Logging using Manager login
2. add category of the stock –add sub category of the stock
3. Update inventory
4. Remove inventory
5. create custom bar code generator for item
6. Search by invoice
7. search by supplier Name
8. Able to view best selling
9. Search by selling date.
10. View all item of the stock
11. View total value of stock item

12. View total numbers of item type
13. View total numbers of units

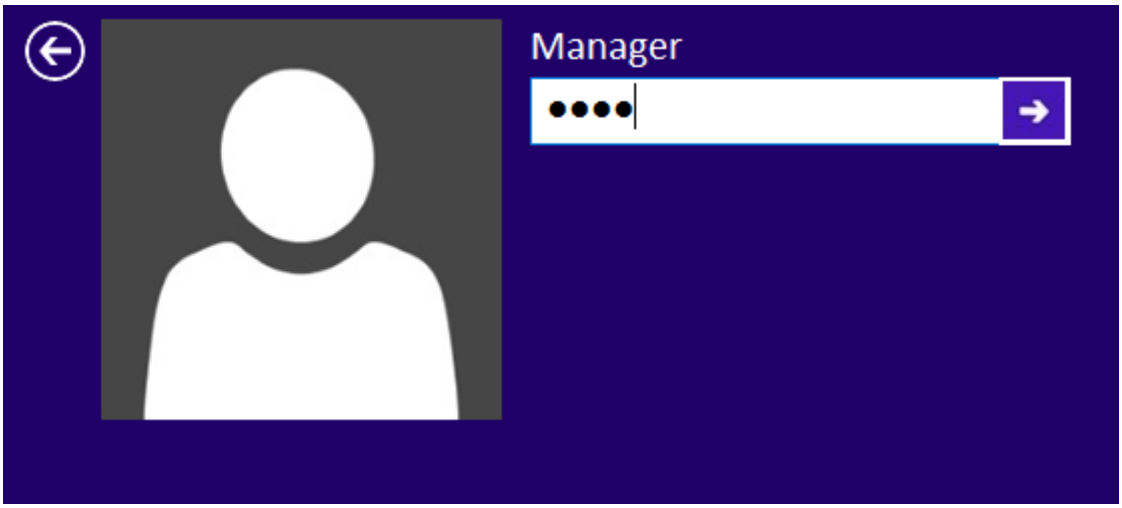


Figure C 5: Manager Logging

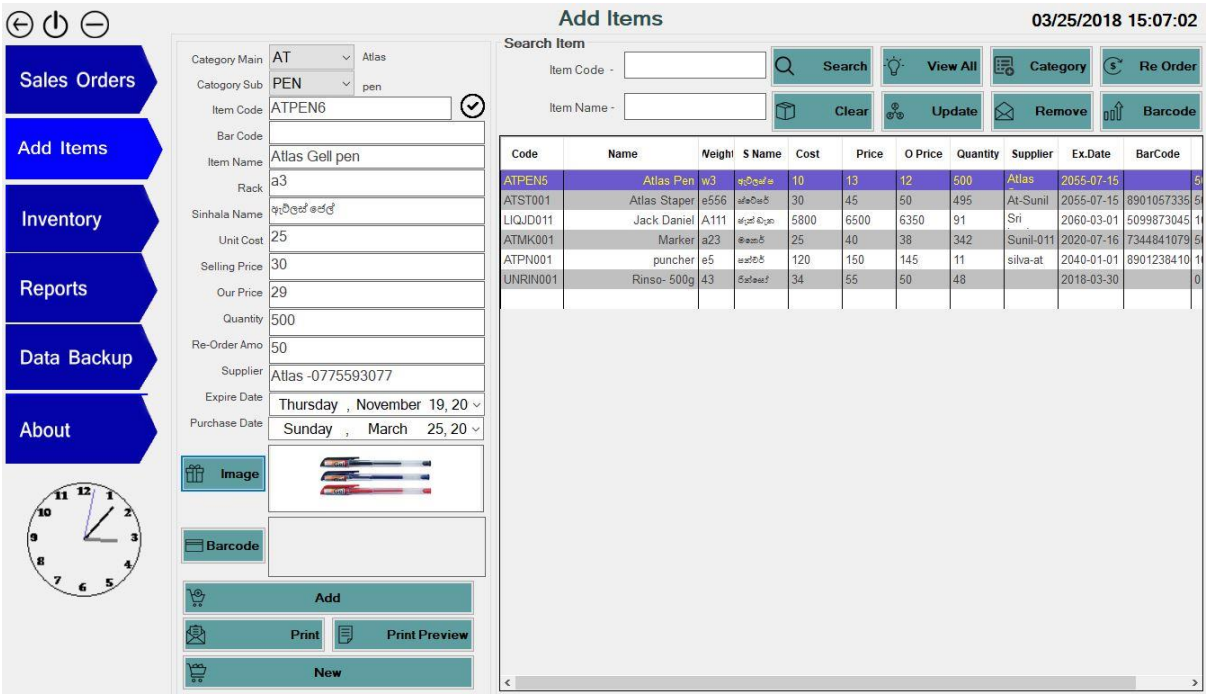


Figure C 6: Add Items

There is a separate tab to generate bar codes for the items as shown in the figure.

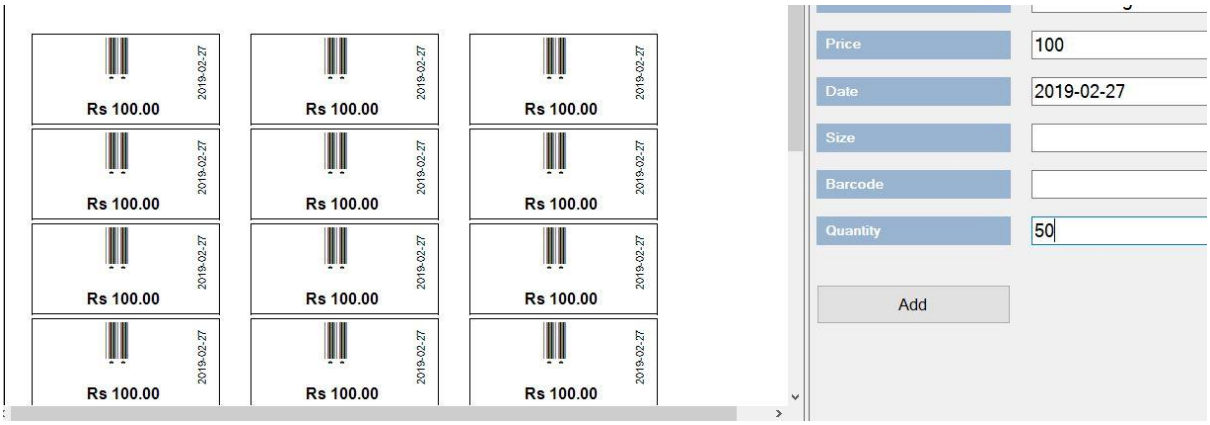


Figure C 7: Bar code generator

Inventory page provide the current stock details.

It is facilitated to search by invoice No., best- selling item, suppliers name, latest purchasing item, daily sales and sales quantity by date.

Also the users can view inventory details and update (edit and remove) the items of the inventory

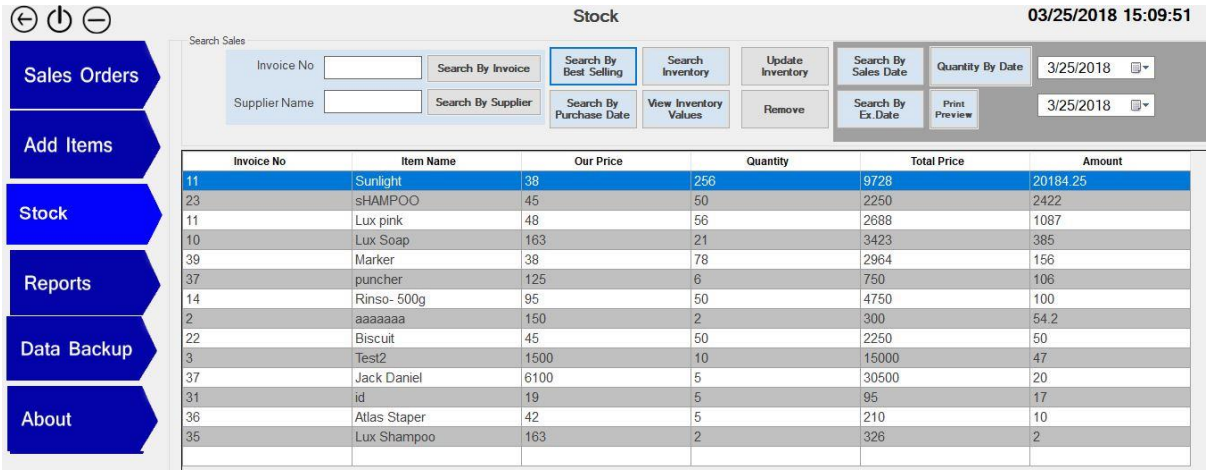


Figure C 8: Stock

Report page provide the facility to view the details of the items by all the transactions per day and per month, by pre-defined time duration, by the transaction type, cash or credit and also by customer due amounts.

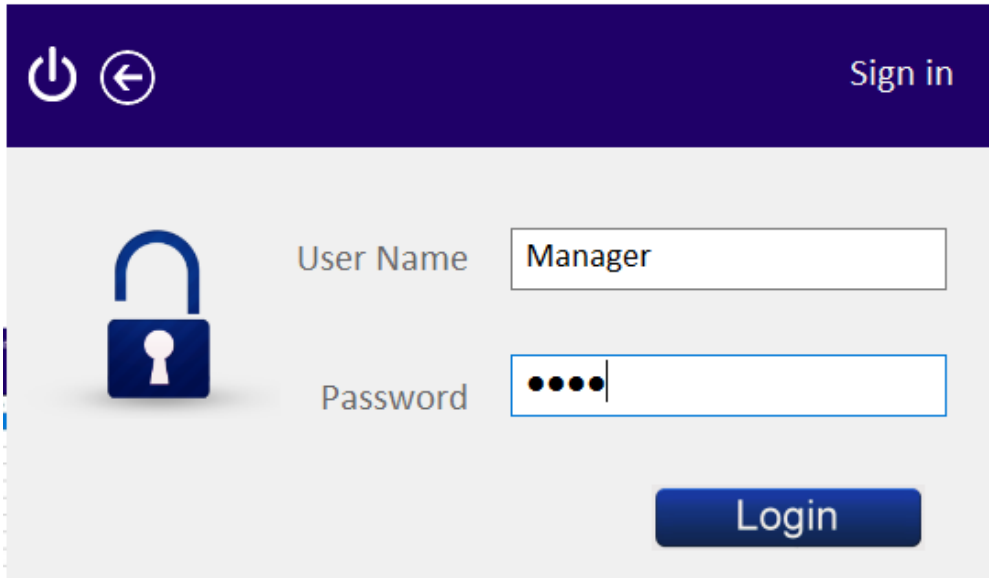
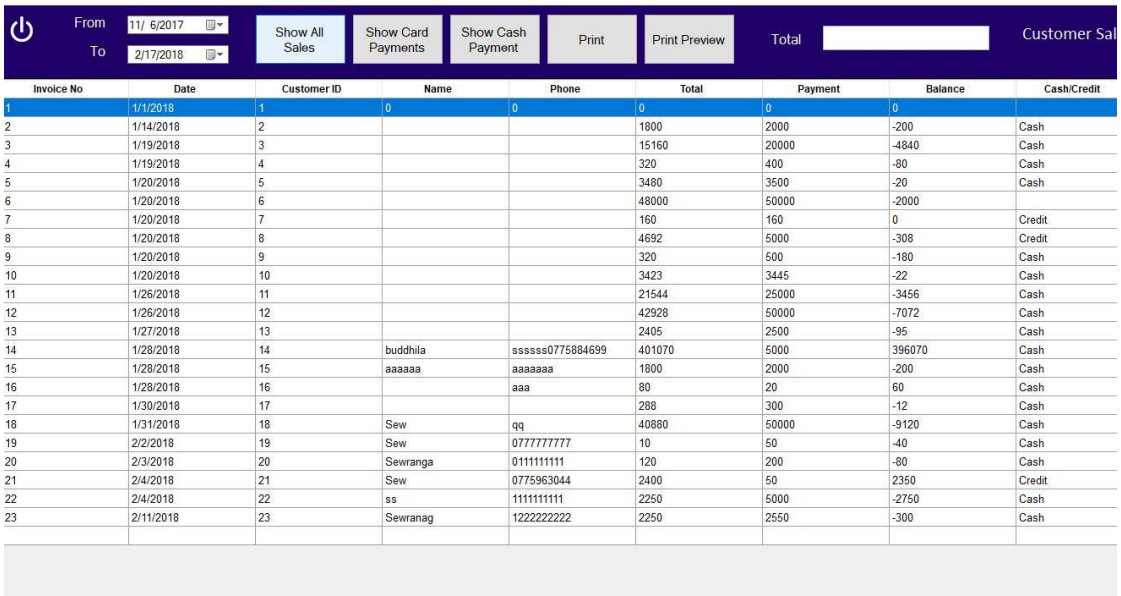


Figure C 9: Manager Report Logging

1. Show All sales- view all transaction
2. Show card payments- view all transaction which were done by credit card
3. Show cash payments-view all transaction which were done by cash



Invoice No	Date	Customer ID	Name	Phone	Total	Payment	Balance	Cash/Credit
1	1/1/2018	1	0	0	0	0	0	
2	1/14/2018	2			1800	2000	-200	Cash
3	1/19/2018	3			15160	20000	-4840	Cash
4	1/19/2018	4			320	400	-80	Cash
5	1/20/2018	5			3480	3500	-20	Cash
6	1/20/2018	6			48000	50000	-2000	
7	1/20/2018	7			160	160	0	Credit
8	1/20/2018	8			4692	5000	-308	Credit
9	1/20/2018	9			320	500	-180	Cash
10	1/20/2018	10			3423	3445	-22	Cash
11	1/26/2018	11			21544	25000	-3456	Cash
12	1/26/2018	12			42928	50000	-7072	Cash
13	1/27/2018	13			2405	2500	-95	Cash
14	1/28/2018	14	buddhila	ssssss0775884699	401070	5000	396070	Cash
15	1/28/2018	15	aaaaaa	aaaaaaa	1800	2000	-200	Cash
16	1/28/2018	16		aaa	80	20	60	Cash
17	1/30/2018	17			288	300	-12	Cash
18	1/31/2018	18	Sew	qq	40880	50000	-9120	Cash
19	2/2/2018	19	Sew	0777777777	10	50	-40	Cash
20	2/3/2018	20	Sewranga	0111111111	120	200	-80	Cash
21	2/4/2018	21	Sew	0775963044	2400	50	2350	Credit
22	2/4/2018	22	ss	1111111111	2250	5000	-2750	Cash
23	2/11/2018	23	Sewranag	1222222222	2250	2550	-300	Cash

Figure C 10: Sales

1. Show due by date-show due amount and customer name and phone

2. Show all sales- view all sales

3. Show all credit- show all payment which was payment by credit cards

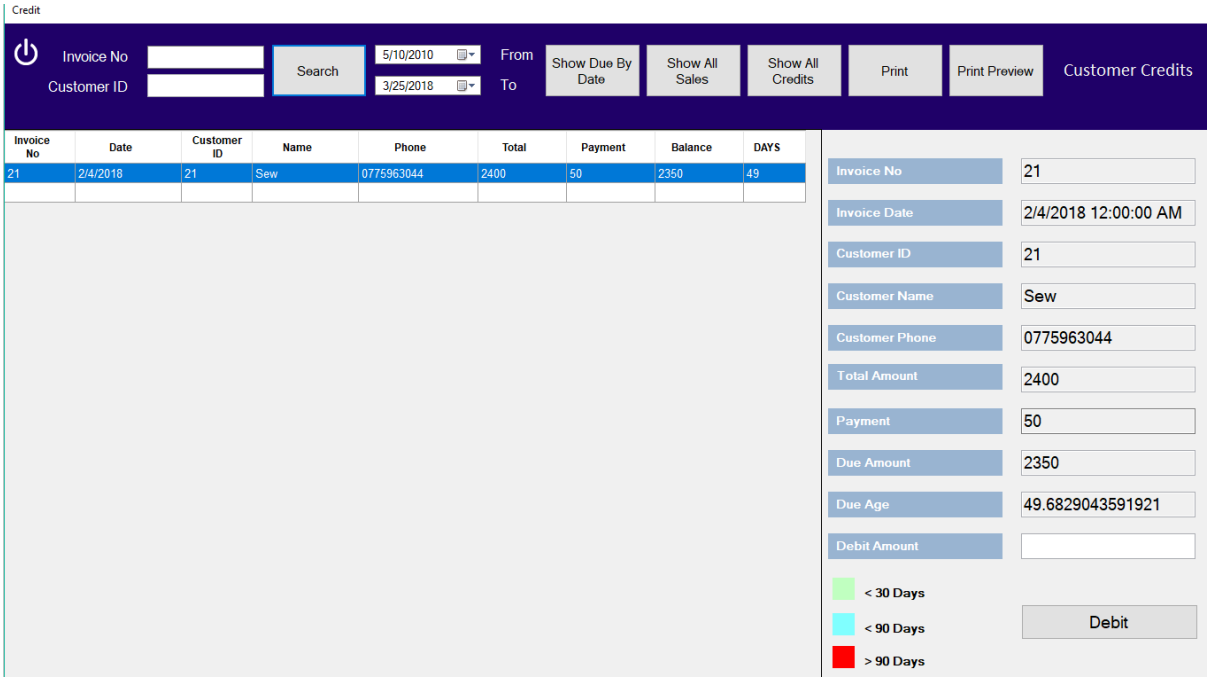


Figure C 4: Payments

Back up page provides the facility to back up the stock details and helps to prevent the extra load to the system.

1. Select database
2. Click Download button

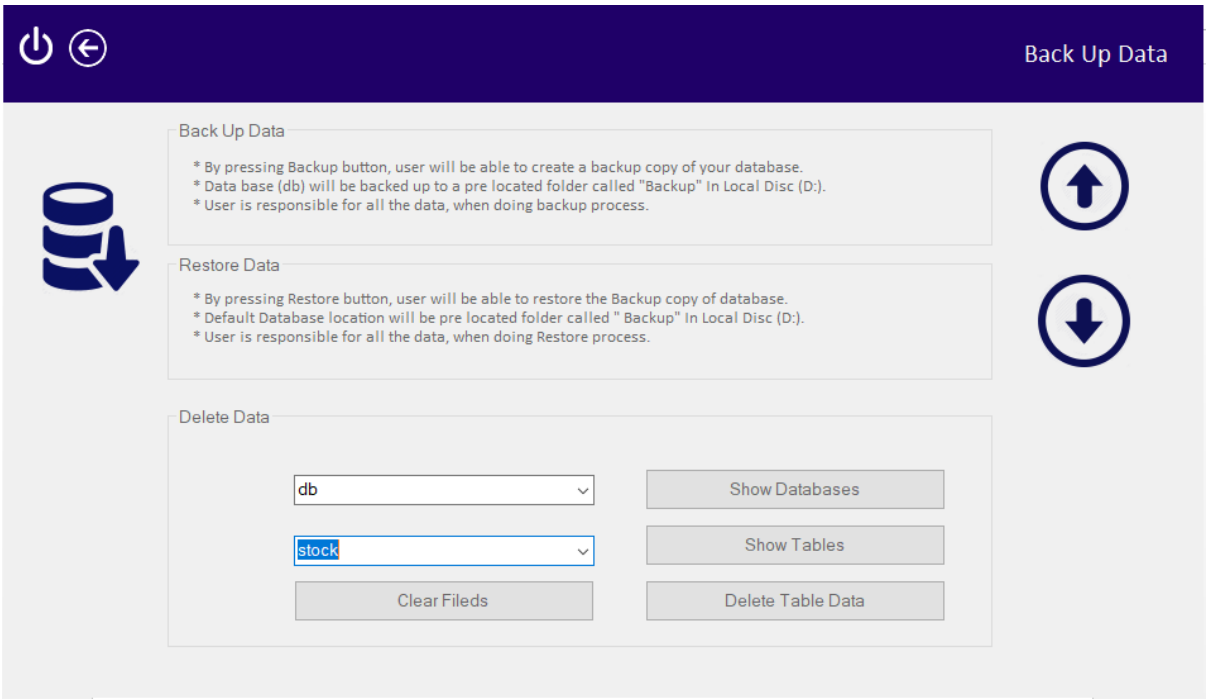


Figure C 5: Back up

APPENDIX D - Questionnaires

Name of Employee	
Designation	
Working Experience -	□ 1 – 3 Years □ 3 – 5 Years □ 5 – 10 Years□ Over 10 Years
1. Is the Initial interface is attractive? Do you like it?	o Extremely Satisfied o Very Satisfied o Somewhat Satisfied o Not so Satisfied
2. Always, different interfaces are not complicated, I feel comfortable	o Extremely Satisfied o Very Satisfied o Somewhat Satisfied o Not so Satisfied
3. Processes involved in the software, are not found complex. I feel comfortable.	o Extremely Satisfied o Very Satisfied o Somewhat Satisfied o Not so Satisfied
4. How would you rate the speed of Application Software?	o Extremely Satisfied o Very Satisfied o Somewhat Satisfied o Not so Satisfied
5. Message and instructions receiving from software are available where ever we need	o Extremely Satisfied o Very Satisfied o Somewhat Satisfied o Not so Satisfied
6. I am satisfied with the response and attendance to enquiries made	o Extremely Satisfied o Very Satisfied o Somewhat Satisfied o Not so Satisfied
7. I am satisfied totally with the whole software provided	o Extremely Satisfied o Very Satisfied o Somewhat Satisfied

	o Not so Satisfied
8. I am fully satisfied with the service provided with the software	o Extremely Satisfied o Very Satisfied o Somewhat Satisfied o Not so Satisfied
9. All, in process needs within the systems of the institution are fulfilled by this software	o Extremely Satisfied o Very Satisfied o Somewhat Satisfied o Not so Satisfied
10. Titles used in the general process are similar and find no issues within the used titles of the software.	o Extremely Satisfied o Very Satisfied o Somewhat Satisfied o Not so Satisfied
11. No misleading guides were found within the software and Manual.	o Extremely Satisfied o Very Satisfied o Somewhat Satisfied o Not so Satisfied
12. Compatibility with other application software's?	o Extremely Satisfied o Very Satisfied o Somewhat Satisfied o Not so Satisfied
13. How often does our software freeze or crash?	o Extremely Satisfied o Very Satisfied o Somewhat Satisfied o Not so Satisfied
14. Would you recommend our software to others?	o Extremely Satisfied o Very Satisfied o Somewhat Satisfied o Not so Satisfied

Table D 1: Questionnaire

1. Is the Initial interface is attractive? Do you like it?

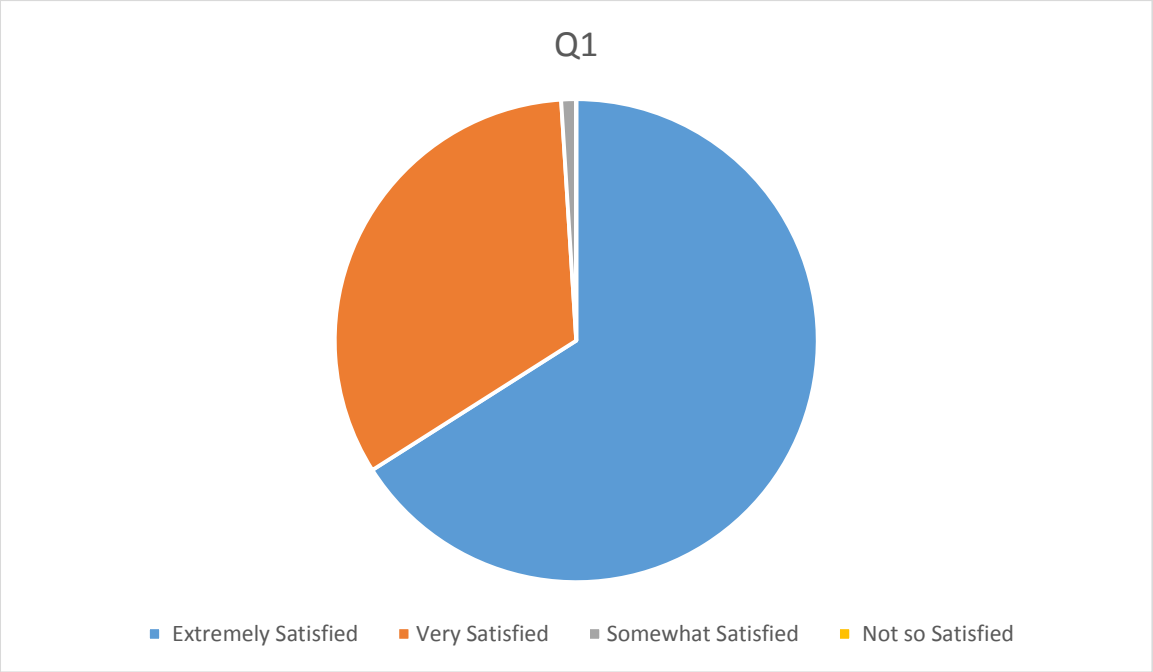


Figure D 1: Evaluation of attractiveness of the interface

2. Always, different interfaces are not complicated, I feel comfortable

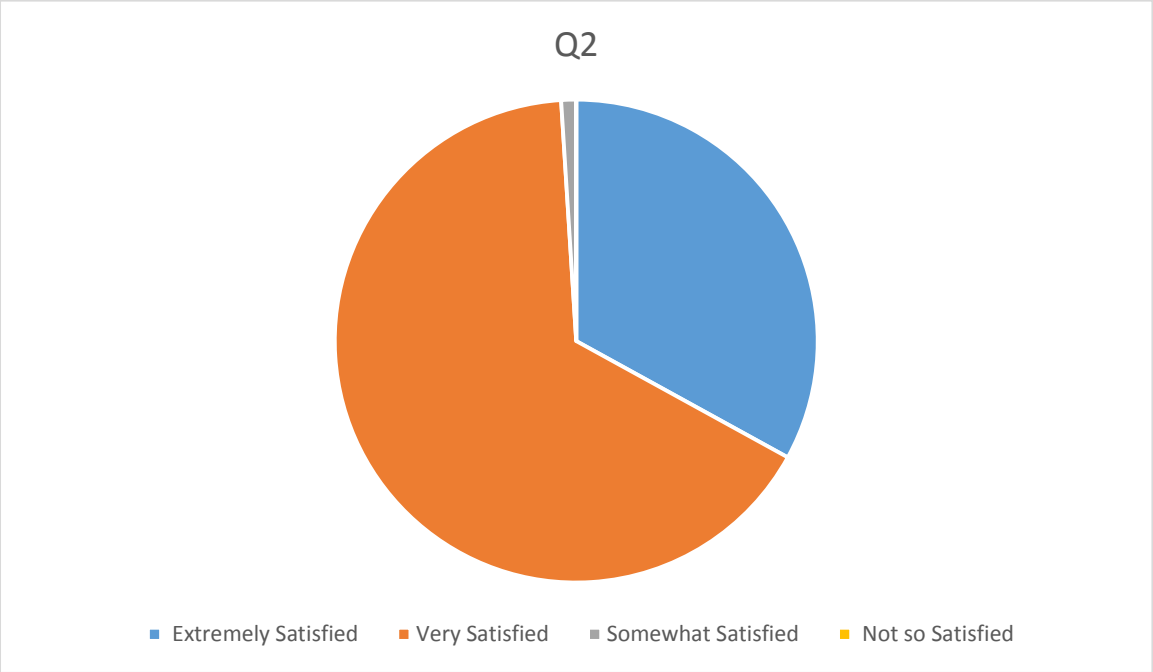


Figure D 2: Evaluation of the complicated aspect

3. Processes involved in the software, are not found complex. I feel comfortable.

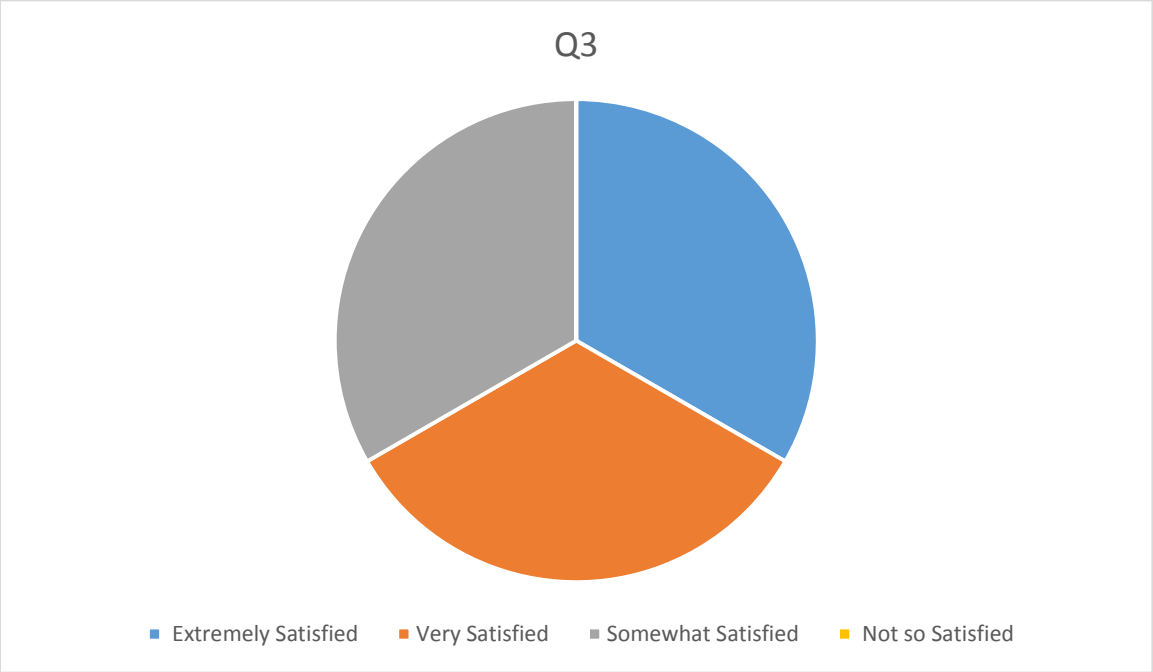


Figure D 3: Evaluation of the process in the software

4. How would you rate the speed of Application Software?

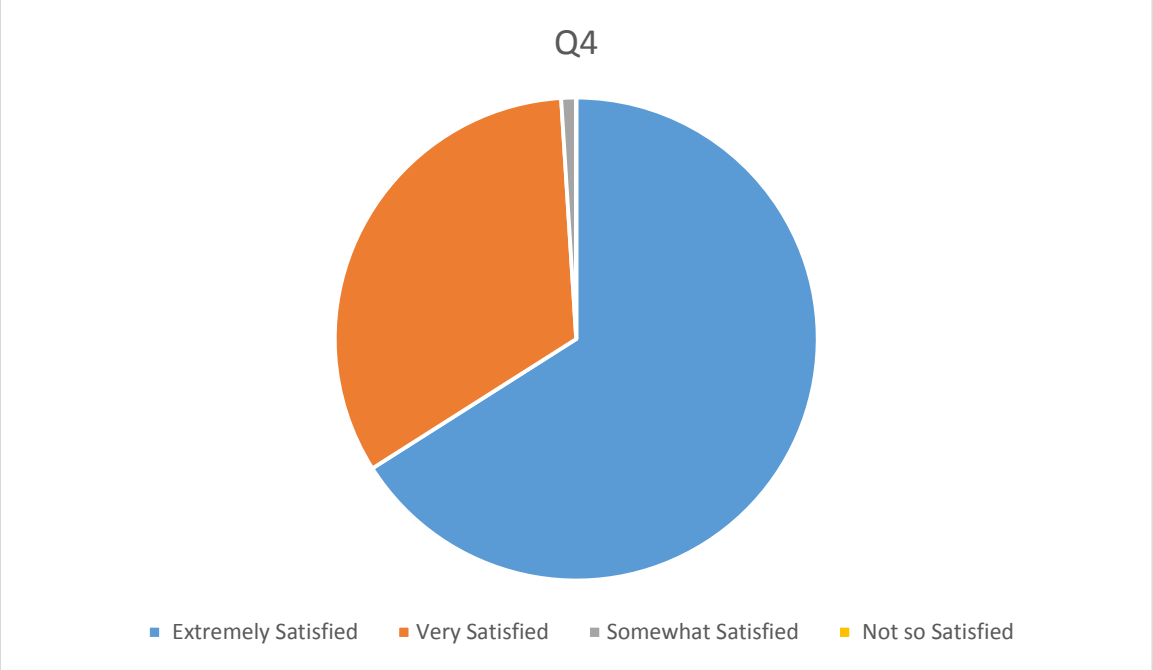


Figure D 4: Evaluation of the speed of the software

5. Message and instructions receiving from software are available where ever we need

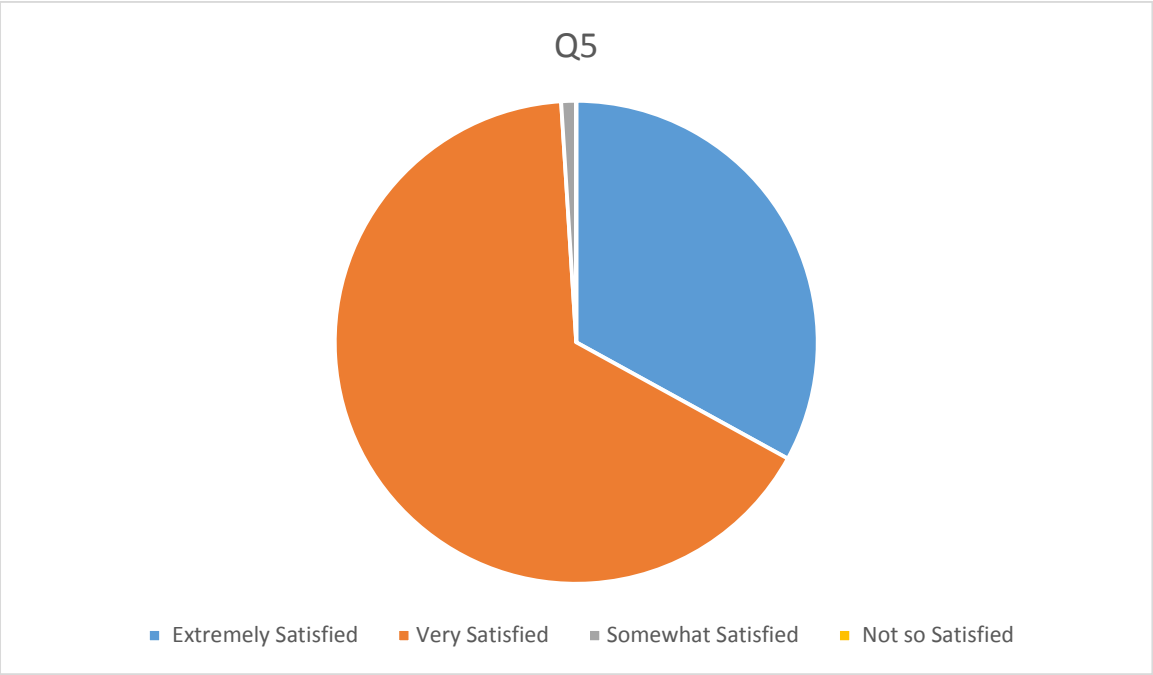


Figure D 5: Evaluation of the user communication

6. I am satisfied with the response and attendance to enquiries made

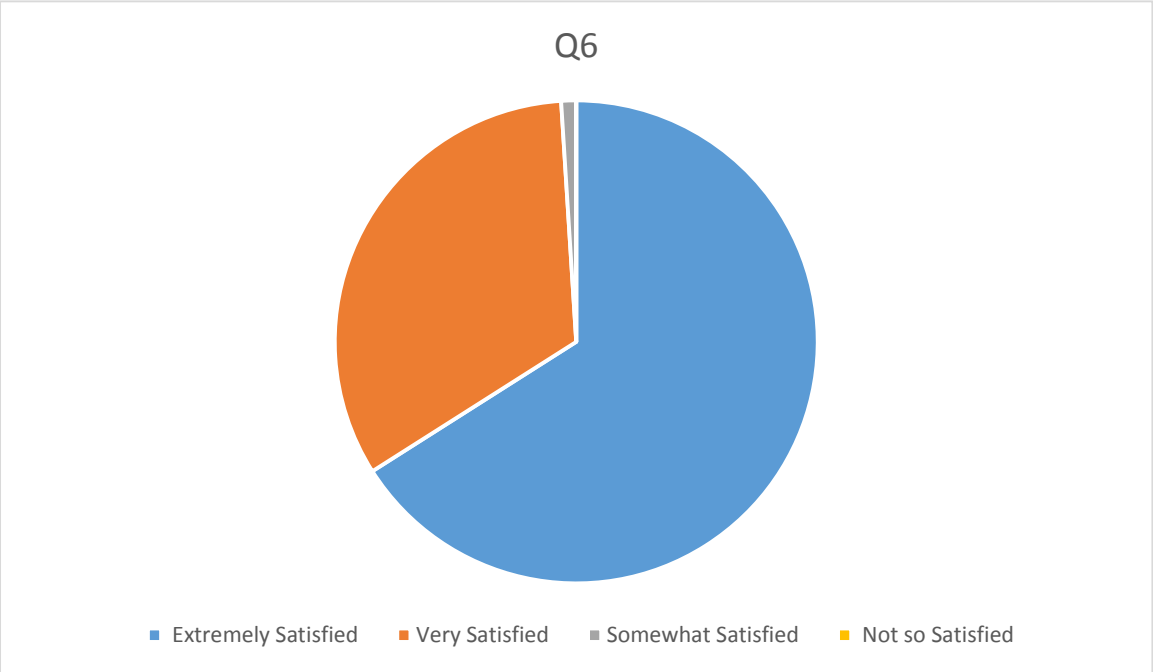


Figure D 6: Evaluation of response rate

7. I am satisfied totally with the whole software provided

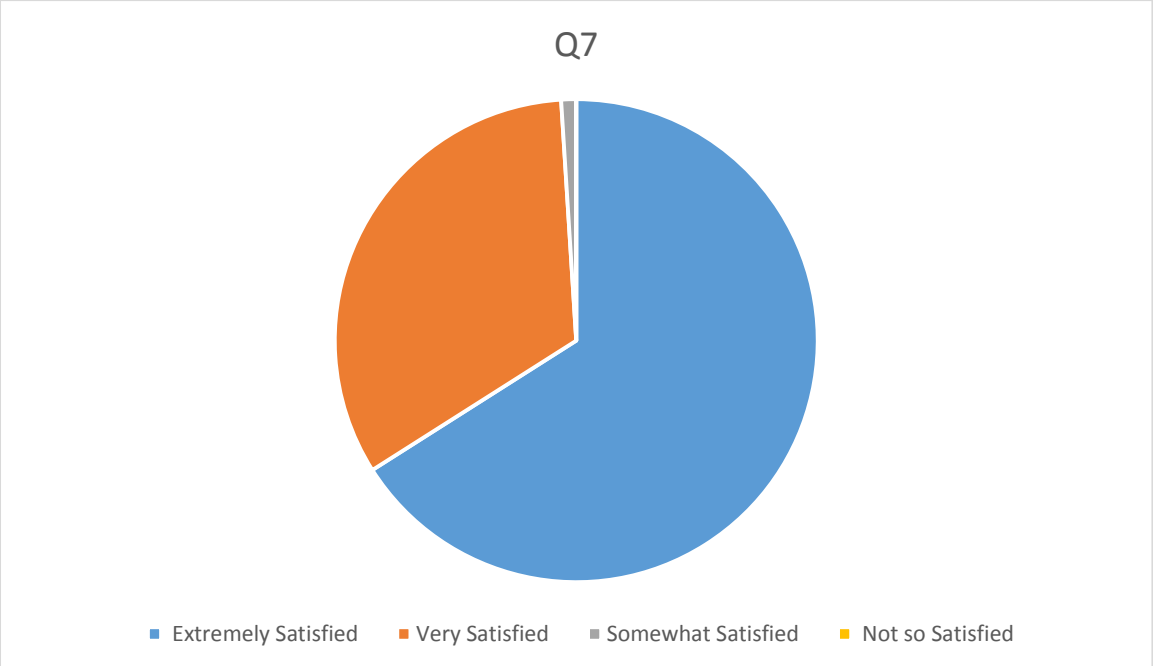


Figure D 7: Evaluation of satisfaction with the software solution

8. I am fully satisfied with the service provided with the software

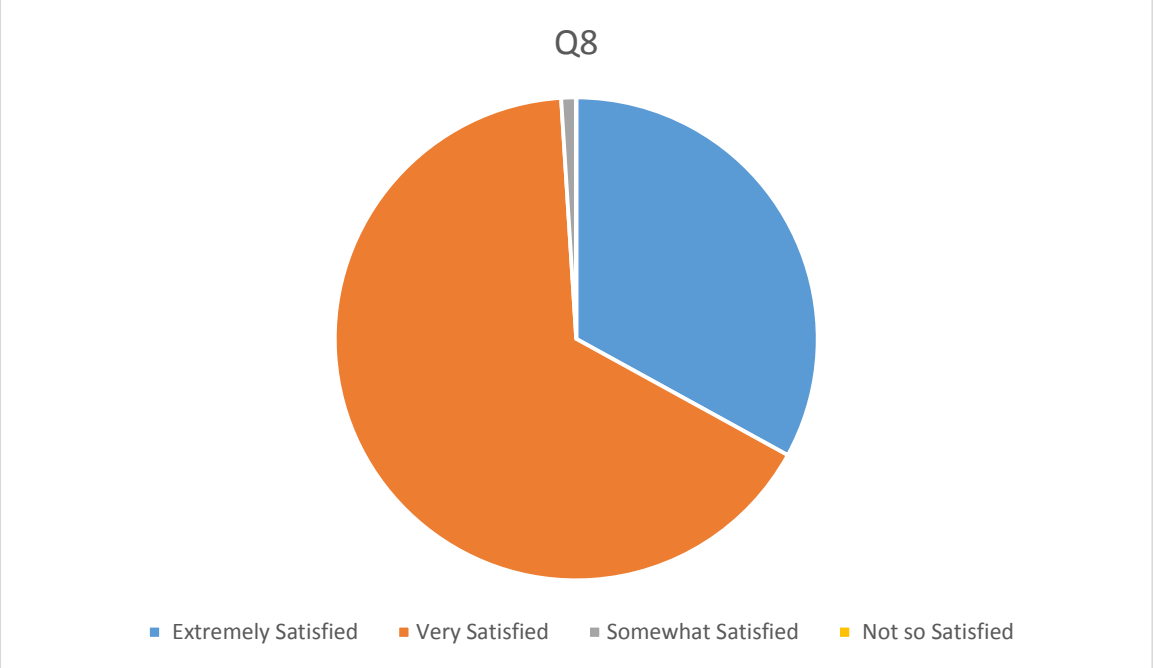


Figure D 8: Evaluation of service provide by the software

9. All, in process needs within the systems of the institution are fulfilled by this software

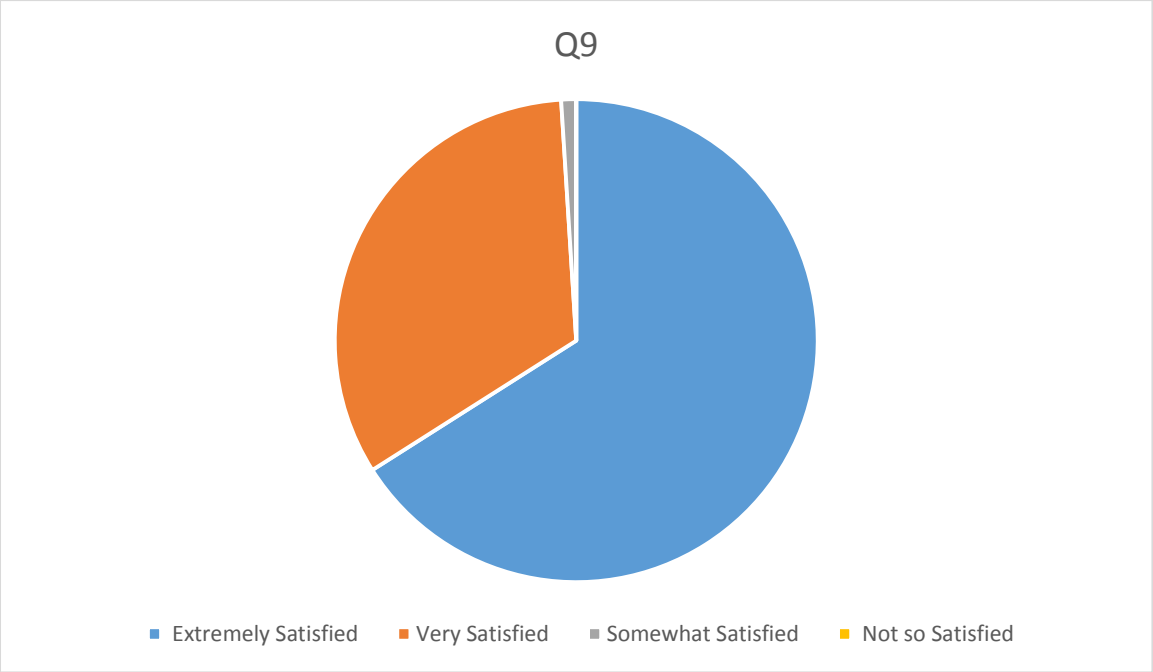


Figure D 9: Evaluation of fulfilment of user requirements

10. Titles used in the general process are similar and find no issues within the used titles of the software.

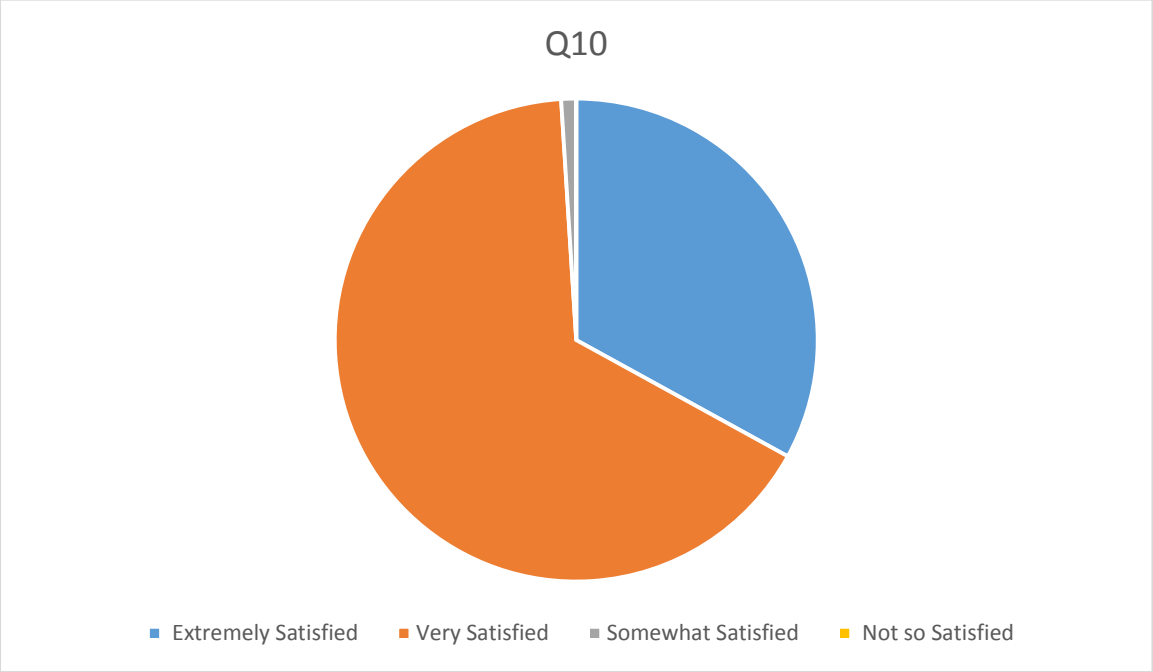


Figure D 10: Evaluation of title used

11. No misleading guides were found within the software and Manual.

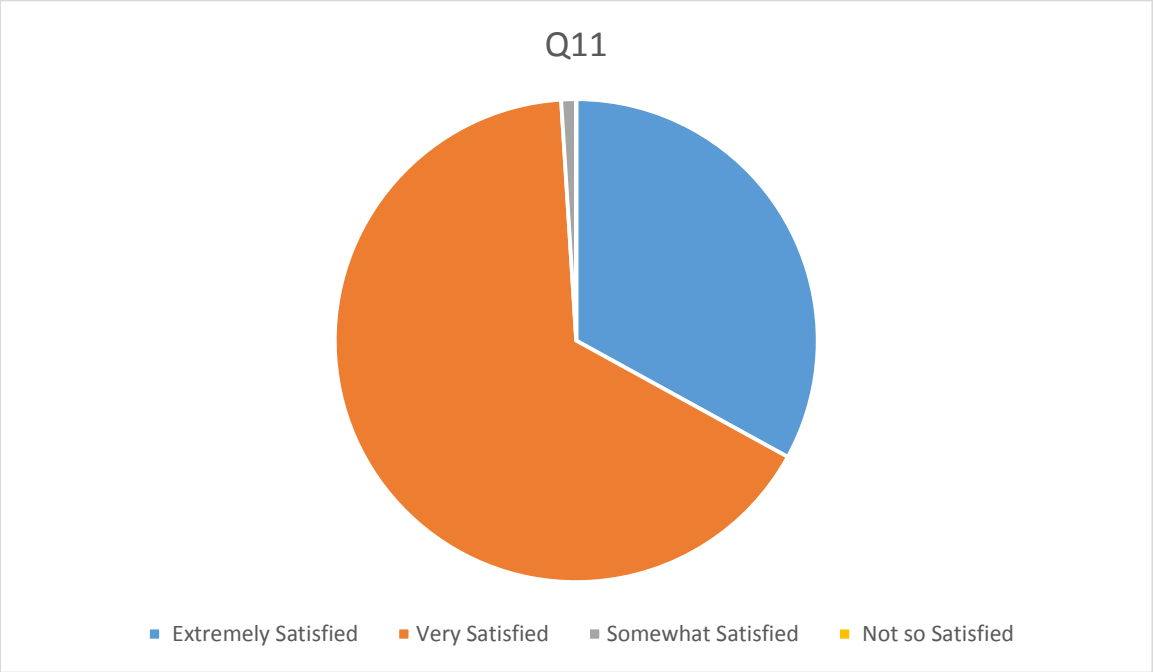


Figure D 11: Evaluation of the software guide and the manual

12. Compatibility with other application software's?

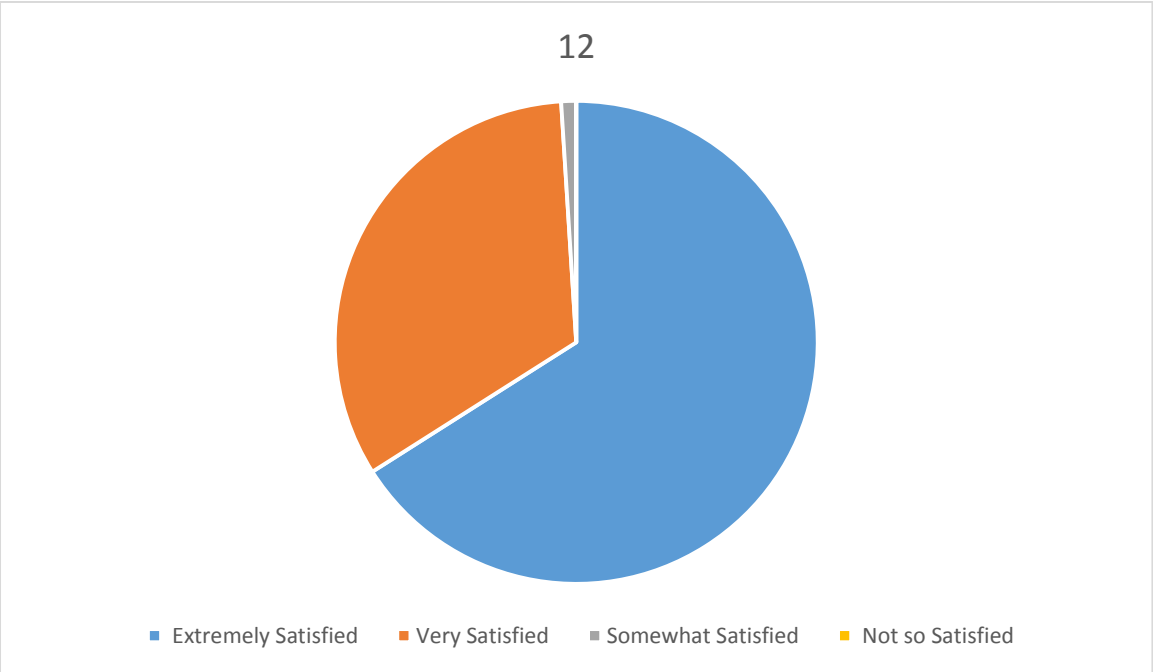


Figure D 12: Evaluation of compatibility with other application software

13. How often does our software freeze or crash?

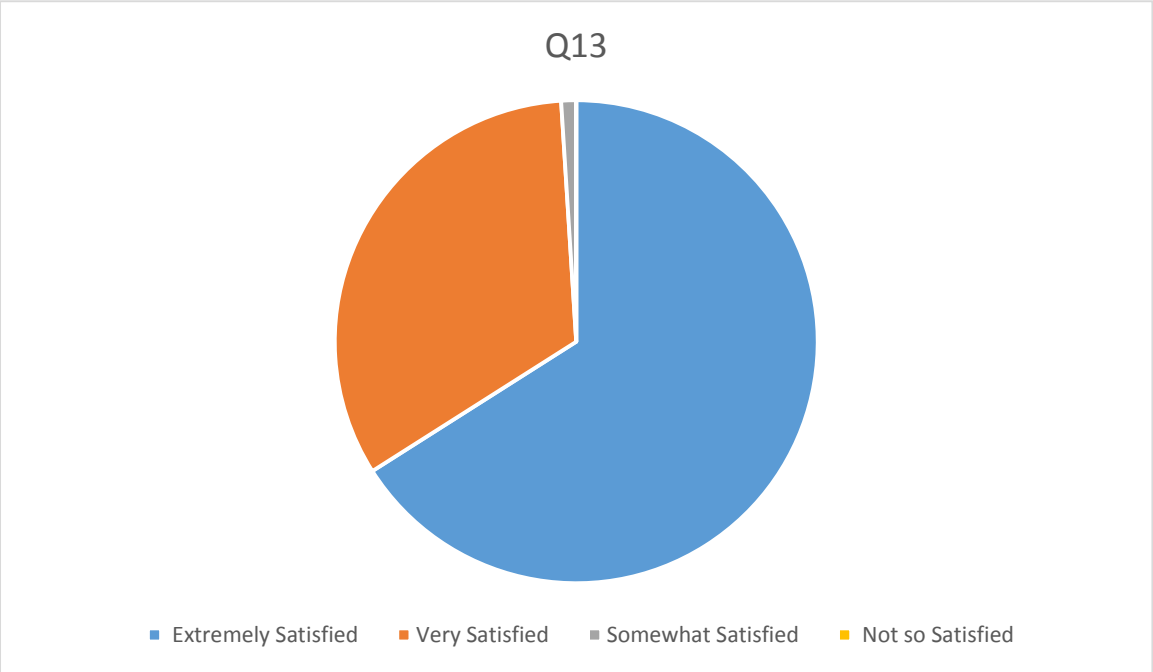


Figure D 13: Evaluation of software robustness

14. Would you recommend our software to others?

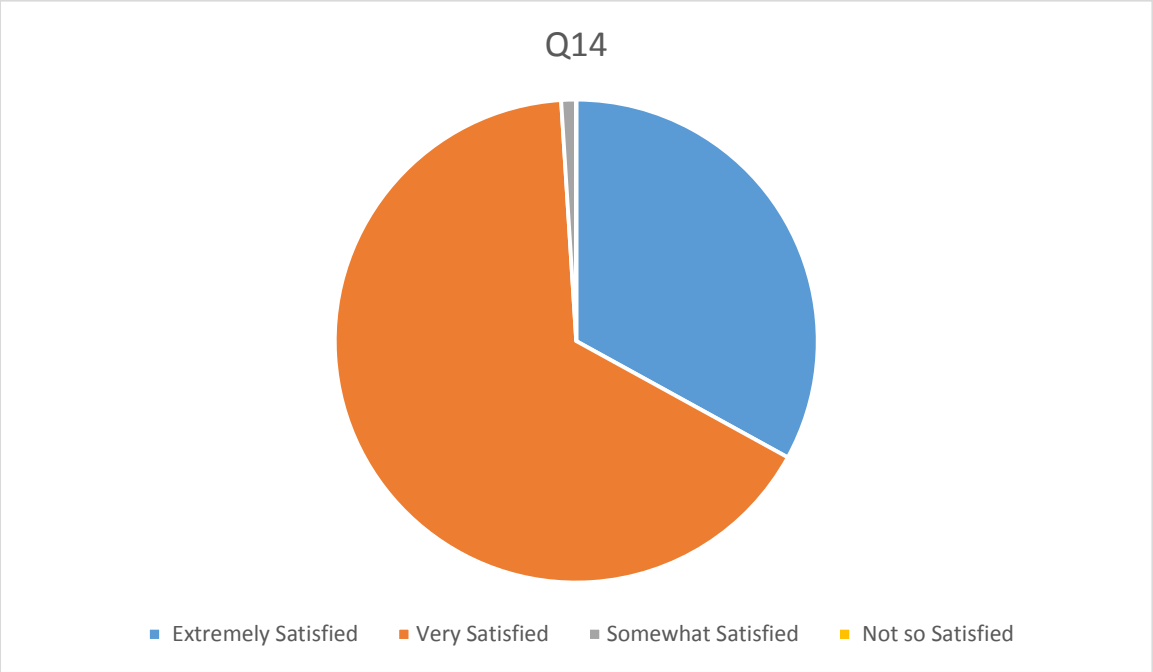


Figure D 14: Evaluation of users' likeliness of recommending the software to others

APPENDIX E – Test Cases

Return

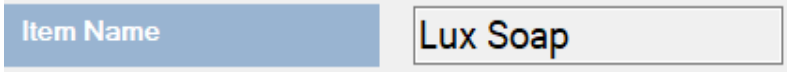
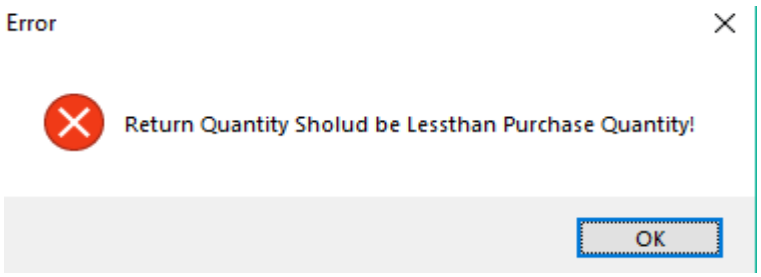
Test	Test Case	Expected out comes	Success
1	Modify Auto generated Invoice Number.	Don't allow to modify Auto generated Invoice No(Read Only field) 	Yes
2	Modify Auto generated Item Number.	Don't allow to modify Auto generated Item Number.(Read Only field) 	Yes
3	Modify Auto generated Purchasing Quantity.	Don't allow to modify Auto generated Purchasing Quantity.(Read Only field) 	Yes
4	Modify Auto generated Sold Price.	Don't allow to modify Auto generated Sold Price.(Read only field)  .	Yes
5	Search Invalid or Null Return Quantity	Display error message on Same Page "Invalid Quantity" (Read Only Field) 	Yes
6	Return Quantity greater than Purchase Quantity	Error will Pop Up 	Yes
7	Invalid Number type for Return Quantity	Do not allow type letters 	Yes

Table E 1Test case for Return

Stock

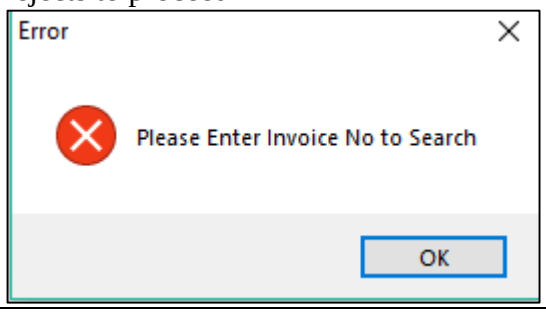
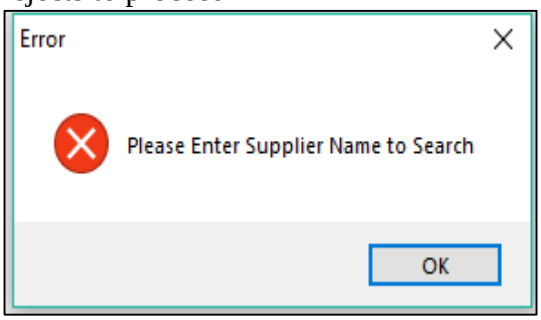
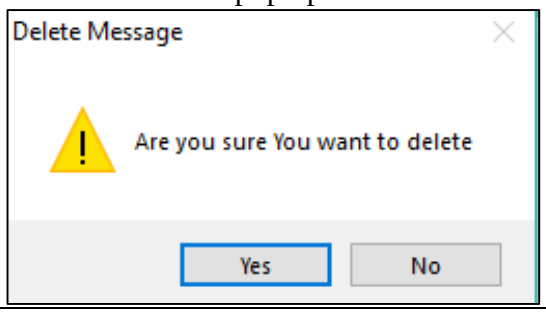
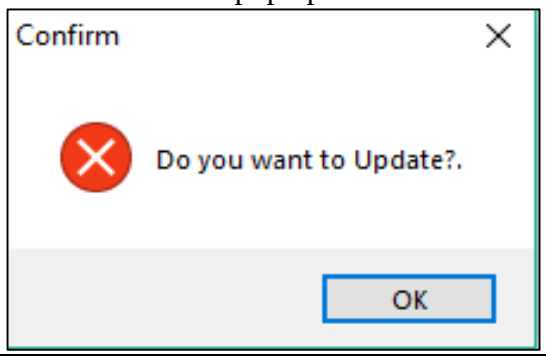
Test	Test Case	Expected out comes	Success
1	Search Invalid or Null Item Code	Error notifications in relevant fields. System rejects to proceed 	Yes
2	Search Invalid or Null Supplier Name	Error notifications in relevant fields. System rejects to proceed 	Yes
3	Remove item accidentally	Confirm box will pop up. 	Yes
4	Update Item accidentally	Confirm box will pop up 	Yes

Table E 2: Test case for Stock

Backup

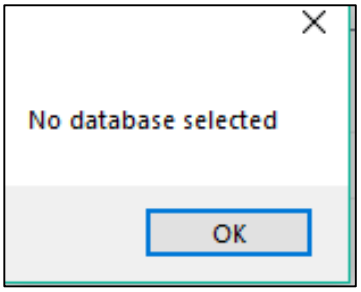
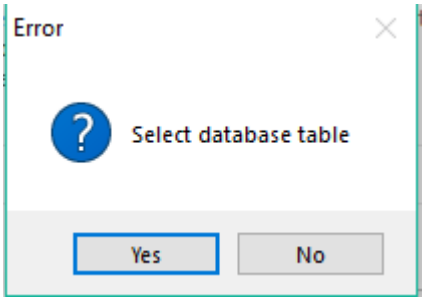
Test	Test Case	Expected out comes	Success
1	Backup Empty database	Error notifications in relevant fields. System rejects to proceed 	Yes
2	Backup Empty database table	Error notifications in relevant fields. System rejects to proceed 	Yes

Table E 3: Test case for Backup

Reports

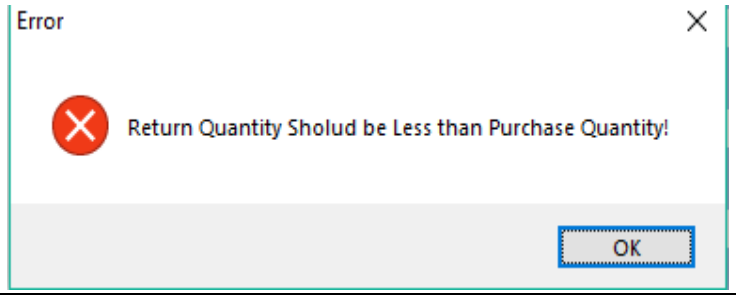
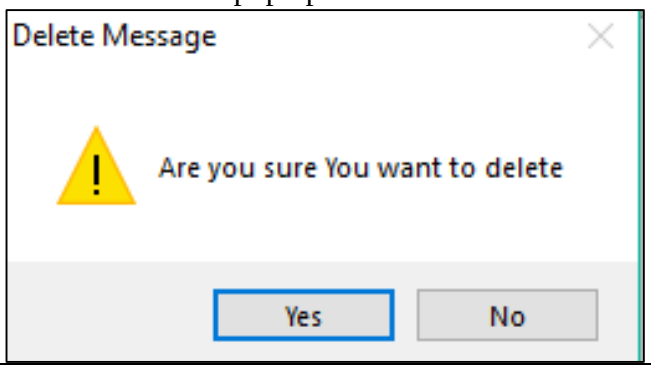
Test	Test Case	Expected out comes	Success
1	Purchase date greater than issue date in Quantity	Error notifications in relevant fields. System rejects to proceed 	Yes
2	Remove item accidentally	Confirm box will pop up 	Yes

Table E 4: Test case for Reports

Customer due Amount

Test	Test Case	Expected out comes	Success
1	Modify Auto generated Invoice Number.	Don't allow to modify Auto generated Invoice No (Read Only field) 	Yes
2	Modify Auto generated Invoice Date.	Don't allow to modify Auto generated Item Number (Read Only field) 	Yes
3	Modify Auto generated Customer ID.	Don't allow to modify Auto generated Customer ID (Read Only field) 	Yes

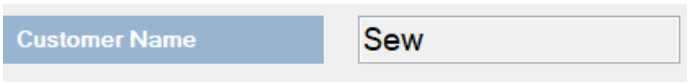
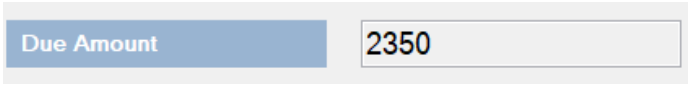
4	Modify Auto generated Customer Name	Don't allow to modify Auto generated Customer Name (Read Only field) 	Yes
5	Modify Auto generated Customer Phone	Don't allow to modify Auto generated Customer Phone (Read Only field) 	Yes
6	Modify Auto generated Invoice Number.	Don't allow to modify Auto generated Invoice Number (Read Only field) 	Yes
7	Modify Auto generated Total Amount	Don't allow to modify Auto generated Total Amount (Read Only field) 	Yes
8	Modify Auto generated Payment.	Don't allow to modify Auto generated Payment (Read Only field) 	Yes
9	Modify Auto generated Due Amount	Don't allow to modify Auto generated Due Amount (Read Only field) 	Yes
10	Modify Auto generated Due Age	Don't allow to modify Auto generated Due Age (Read Only field) 	Yes

Table E 5: Test case for Customer due Amount

System

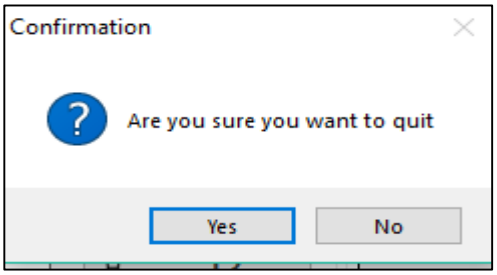
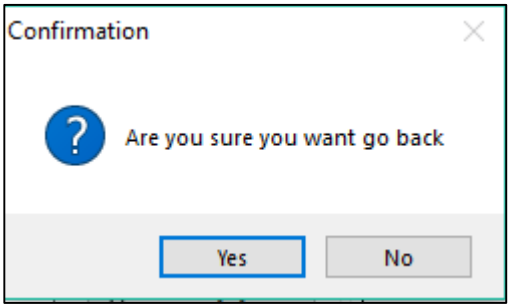
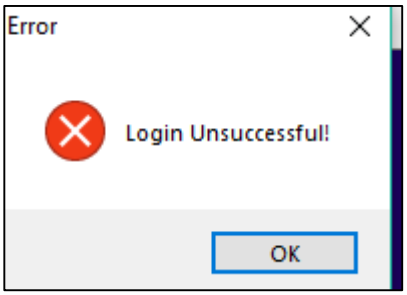
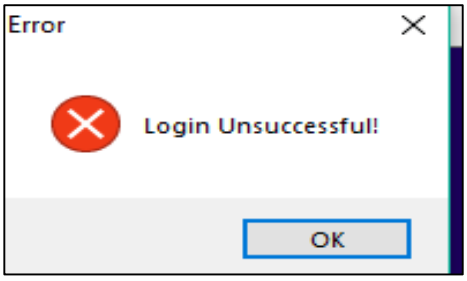
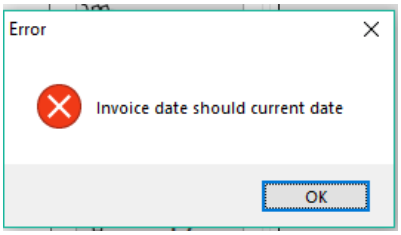
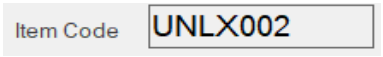
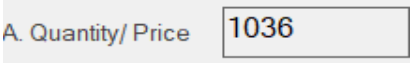
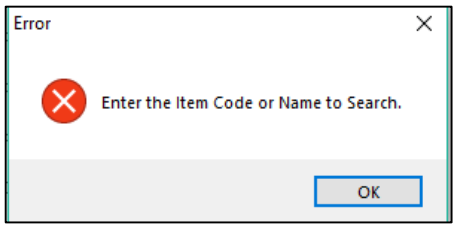
Test	Test Case	Expected out comes	Success
1	Shutdown System Accidently.	Error notifications in relevant fields. System rejects to proceed 	Yes
2	Back to previous Menu accidently	Error notifications in relevant fields. System rejects to proceed 	Yes
3	Incorrect Login for Cashier.	Error notifications in relevant fields. System rejects to proceed 	Yes
4	Incorrect Login for Manager	Error notifications in relevant fields. System rejects to proceed 	Yes

Table E 6: Test case for System

POS

Test	Test Case	Expected out comes	Success
1	Modify Auto generated Invoice Number.	Don't allow to modify Auto generated Invoice Number 	Yes
2	Modify Auto generated Invoice Date.	Don't allow to modify Auto generated Invoice Date 	Yes
3	Modify Auto generated Customer Telephone No.	Don't allow to modify Auto generated Telephone No 	Yes
4	Modify Auto generated Item Name.	Don't allow to modify Auto generated Item Name. 	Yes
5	Modify Auto generated Item Code.	Don't allow to modify Auto generated Item Code. 	Yes
6	Modify Auto generated Item Picture.	Don't allow to modify Auto generated Item Picture. 	Yes
7	Modify Auto generated Sinhala Name	Don't allow to modify Auto generated Sinhala Name 	Yes
8	Modify Auto generated Quantity.	Don't allow to modify Auto generated Quantity. 	Yes
9	Search Invalid or Null Item Code	Error notifications in relevant fields. System rejects to proceed 	Yes

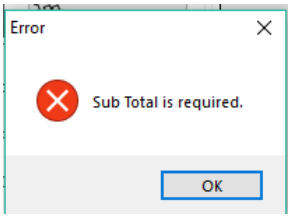
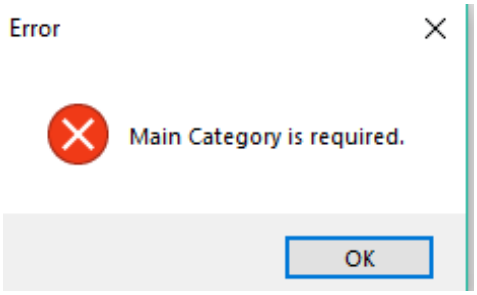
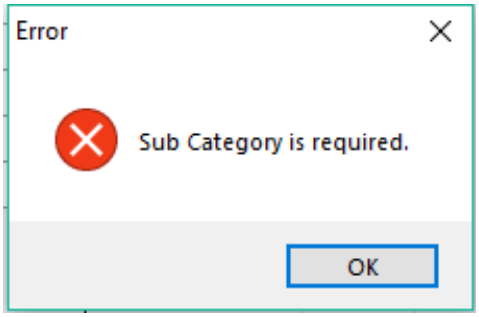
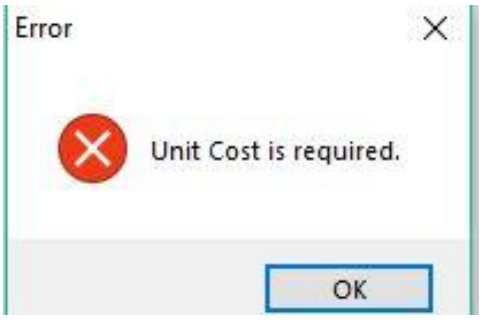
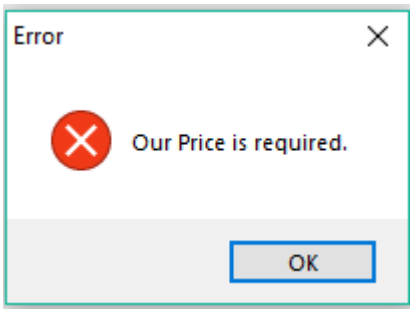
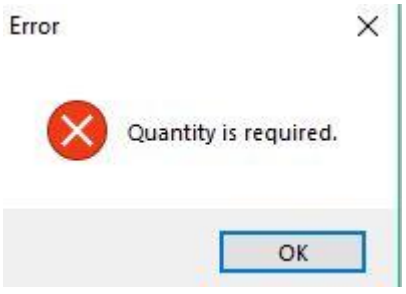
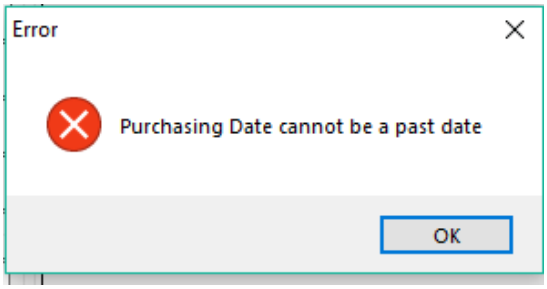
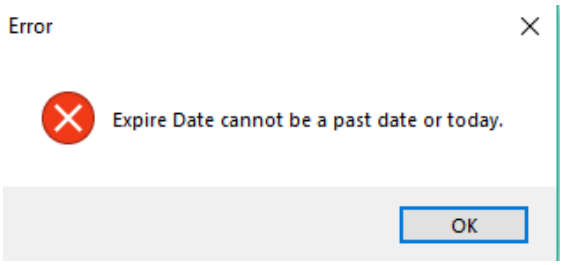
10	Modify Auto generated Subtotal	Don’t allow to modify Auto generated Sub total. 	Yes
11	Modify Auto generated Total Savings	Don’t allow to modify Auto generated Total Savings 	Yes

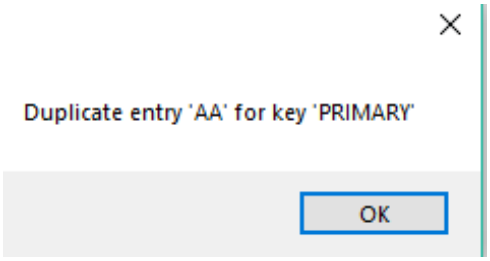
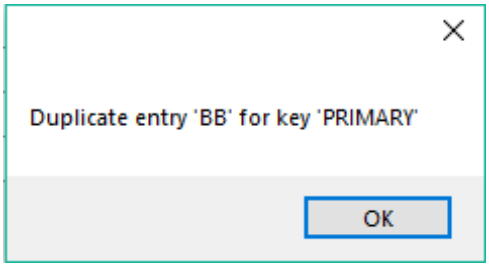
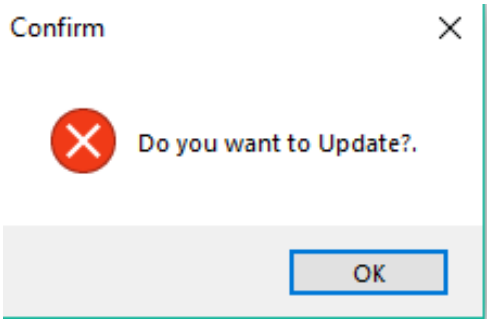
Table E 7: Test case for POS

Add Items

Test	Test Case	Expected out comes	Success
1	Empty Main Category in Add item	Error notifications in relevant fields. System rejects to proceed 	Yes
2	Assign Invalid Sub Category in Add item	Error notifications in relevant fields. System rejects to proceed 	Yes
3	Assign Duplicate Item Code	Error notifications in relevant fields. System rejects to proceed 	Yes

4	Assign Invalid (negative number, letters) values in Unit Cost	Error notifications in relevant fields. System rejects to proceed 	Yes
5	Assign Invalid (negative number, letters) values in Selling Price	Error notifications in relevant fields. System rejects to proceed 	Yes
6	Assign Invalid (negative number, letters) values in Our Price	Error notifications in relevant fields. System rejects to proceed 	Yes
7	Assign Invalid (negative number, letters) values in Stock Quantity	Error notifications in relevant fields. System rejects to proceed 	Yes

8	Assign older date as purchasing date	Error notifications in relevant fields. System rejects to proceed 	Yes
9	Assign older date as Expire date	Error notifications in relevant fields. System rejects to proceed 	Yes
10	Assign older Expire date than Purchasing date	Error notifications in relevant fields. System rejects to proceed 	Yes
11	Search Invalid Item Code	Error notifications in relevant fields. System rejects to proceed 	Yes

12	Search Invalid Item Name	Error notifications in relevant fields. System rejects to proceed 	Yes
13	Assign Duplicate entry for Category	Error notifications in relevant fields. System rejects to proceed 	Yes
14	Assign Duplicate entry for Sub Category	Error notifications in relevant fields. System rejects to proceed 	Yes
15	Edit and update button click	When update button press, it displays in editable mode with existing data 	Yes

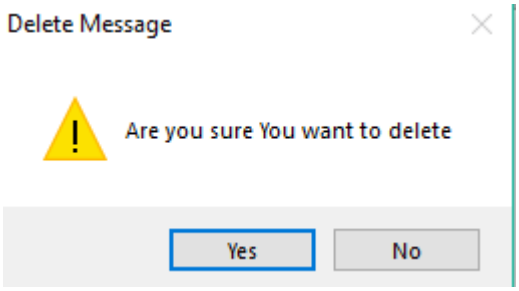
16	Remove Button click	Before remove a confirmation message 	Yes

Table E 8: Test case for Add Items