



Masters Project Final Report

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MOBILE INTEGRATED STOCK
AND RESTAURANT
MANAGEMENT SYSTEM

M.D.C.E.S Jayarathna (13550351)
2017



MOBILE INTEGRATED STOCK AND RESTAURANT MANAGEMENT SYSTEM

**A dissertation submitted for the Degree of Master of
Information Technology**

M.D.C.E.S Jayarathna

University of Colombo School of Computing

2017



Declaration

The thesis is an original work and it 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.

Student Name : M.D.C.E.S Jayarathna

Registration Number : 2013/MIT/035

Index Number : 13550351

15/06/2017

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Signature:

.....
Date

This is to certify that this thesis is based on the work of Mr. M.D.C.E.S Jayarathna under my supervision. The thesis has been prepared according to the format stipulated and is of acceptable standard.

Certified by :

Supervisor Name : Mr. Malik de Silva

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Signature:

.....
Date

Abstract

Asiri hotel and restaurant located on Thudella of Ja-Ela. It was established on 2002 under registration of Sri Lanka Hotel cooperation. It is one of the well reputed, and leading hotel and restaurant in Sri Lanka.

The Asiri hotel and restaurant is providing better service for customer with catering different kind of foods and beverages with maximizing satisfaction of the customer. The management of the hotel is managing Restaurant and bar using manual procedures.

At the moment more than thousands of customers had served by the Asiri hotel. Every day hundreds of customers are visiting to this restaurant and bar because of the different kind of menus and loyalty service.

The management of the hotel cannot handle day to day transactions using the manual system. Because of manual system is not supporting to track requirement of the restaurant such as groceries, food portions, and beverage. Also the management has to face a lot of difficulties to ready the restaurant for the business of the days ahead, serve many no of customers at same time without delay, preparing different kind of reports. Apart from that, customers' demand, waiters encounter a lot of difficulties, especially when catering meals from kitchen to tables and beverages from bar to tables. There is no proper system to manage transaction details of each customer. Those problems cause the customer to wait for a long period of time for served ordering menus or beverages.

Before deploying this solution, they did not have a methodology for the tracking or follow up of day to day transactions such as orders, payments, incentive calculations, tax calculations etc...

There are 35 employees working in the hotel and some of them are working as the waiters. In the existing process management cannot monitor how much of customers are handled by the waiters separately. Therefore they couldn't calculate incentive against customer service for the waiters.

As a solution for above matters restaurant management system is proposed. This system facilitate to manage stock with handling Good received note, Good return notes, damage management, stock adjustment, recipe management, place orders by using computers or mobile phones, generate different kind of reports and many more feature.

After analyzing all problems by following software engineering methodology, mobile application technology and windows application technology are used to develop a solution. This system required wireless network facilities, computers, android smart phones, Barcode scanners, printers.

After that database of the system, Windows Communication Foundation service are installed in main server and windows application installed on client computers. Mobile application installed on android based smart phone based on users requirements. User training and instructions were given to the users to work with the system.

After installing this system, management got valuable achievements from the business and employee management. The management able to monitor stock and sales of the restaurant properly by referring reports which generated by the system. Order serving time, rate of wastage are minimized and accuracy of the transactions, customer satisfaction, employee satisfactions are maximized by this solution.

This system uses C# as main programming language for windows application and Windows Communication Foundation service, and Java as main programming language of android application, MS SQL server for database, RDLC and crystal report as reporting tool.

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List of Abbreviations

WPF	Windows Presentation Foundation
WCF	Windows Communication Foundation
CSS	Cascading Style Sheet
CPU	Central Processing Unit
ER	Entity Relationship
GUI	Graphical User Interface
XML	Extension Markup Language
XAML	Extensible Application Markup Language
JPEG	Format for compressing image files.
SQL	Sequel Query Language
PNG	Portable Network Graphics
RUP	Rational Unified Process
RAM	Random Access Memory

UCSC	University of Colombo School of Computing
GRN	Good Received Note
BOT	Bar Order Transaction
KOT	Kitchen Order Transaction
NIC	National Identity Card

1. CHAPTER ONE

Introduction

1.1. Company background

Asiri hotel & restaurant is a well formed hotel which established on 2002 and registered under Sri Lanka Hotel cooperation. It is one of the well reputed, and leading hotel and restaurant in Sri Lanka. Which is located on Thudella, Ja-Ela.

The Asiri hotel & restaurant has provide better service for customer with catering different kind of foods and beverages with maximizing satisfy of the customer. There are restaurant and bar which are managed by management. Also approximately fifty employees are working on the hotel who assigned to different kind of job roles.

1.2. Problem domain and the motivation

There are many restaurants in Sri Lanka and most of them do not use automated restaurant management systems. As a result of that they cannot track how many groceries are required, how many food portions are required, the cost and profits of the business. Therefore management has to face a lot of difficulties to ready the restaurant for the business of the days ahead, serve many no of customers at same time without delay etc...

In the restaurant, there are two kinds of orders that are handled such as kitchen order and bar order. Normally those processes are handled by waiter manually. Once customer requests something, waiter has to walk many times to kitchen or bar to bring the requested order to the table. As a result of that waiter have difficulties to give better service to many no of customers at the same time. Sometime receptionist may place 'take away' orders. At that situation, receptionist has to check availability of requested meal from kitchen.

Management has to forecast about the business analyzing previous business details. But if restaurant is using manual processes, that is difficult. Because of that they have to refer many sales bills, purchasing bills and many more documents.

Therefore 'Mobile Integrated Stock and Restaurant Management System' proposes to handle all of the manual processes of a restaurant with integrated mobile technology.

1.3. Goals and objectives to be addressed

The objective of this project is to accomplish the following:

- Facilitate to manage stock of restaurant including raw materials, foods, soft drinks and liquors.
- Facilitate to track stock details, selling details, in various formats such as time-wise, day-wise, month-wise etc...
- Facilitate to define recipes, define price for foods and beverages.
- Facilitate to place kitchen or bar orders via mobile application or computers by waiter or receptionist.
- Facilitate to send response message from kitchen or bar to waiter or receptionist when order is not available or ready.
- Facilitate to generate stock related and sales related comprehensive reports analyzing existing data.
- Build better communication between kitchen, bar, receptionist and waiter.
- Increase productivity and efficiency of the business with improving service.

1.4. Project scope

Basically there are two modules of this project. Those are stock module and restaurant module. Functionality of each module is described below:

Stock Module

Under this module, manage raw materials, food materials and liquors of the restaurant will be done. Especially Good Received Note, Recipe management, Re-Order management, Stock Adjustment are would be implemented under this module.

Restaurant Module

Under this module kitchen order, bar order and payment management will be done. Kitchen and bar orders are handled by receptionist and waiters. There are two methods to handle those transactions.

Waiter can access the system via android application which is installed on a smart phone. That application facilitates to view available meals and liquors, place orders based on tables, check payment due for placed orders etc.

Receptionist can place orders and handle the payment via a computer aided applications.

Once waiter or receptionist places the kitchen order, order details and barcode would be printed in kitchen. Once requested meal is ready, user who is in kitchen should scan barcode by using barcode scanner which is installed in kitchen. Then 'meal ready' notification would be passed to waiter or receptionist. Then they can collect it from kitchen. Above scenario is used to handle bar orders also. Finally when payment is ready, receptionist can handle it via application. At that time commission of transaction would be calculated based on waiter.

Apart from that management can generate various reports based on stock and restaurant modules. For example stock age analysis report, material consumption report, sales reports will be generated. Those reports can be customized based on user's requirement.

1.5 Dissertation structure organization

Chapter 2 – Background

In this chapter explains the background of the foreign recruitment handling systems. Also discussed about similar systems.

Chapter 3 - Analysis and Design

Requirement Gathering, Analyzing and Management techniques are explained in this chapter. Functional and non-functional requirements of the proposed system will also be included.

Initial design diagrams and the methodological approach used in the system designing, alternative approaches and their justification for not using in the system are discussed.

Chapter 4 – Testing and Evaluation

This chapter will explain the way this software is tested and evaluated.

Chapter 5 - Progress to Date and Project Plan

This chapter will explain the changes in flow of the project, milestones of the project as well as difficulties faced up to now.

Chapter 6 - Conclusion & Future Work

This chapter will explain the conclusion of this project and future works.

2. CHAPTER TWO

Background

In this chapter explained the background of the Mobile based restaurant management system. When searching for similar systems have found few. But the owner of those systems not allowed to study about their systems. Because they are trying to keep secrete about products which are developed. But gathered basic ideas of their systems.

2.1. Similar projects

2.1.1. KCS Restaurant Management System [1]

This system provided by KCS Software Pvt Ltd. Which is windows based application. There are several modules, such as stock management, recipe management, billing management, bar management etc... That application designed to install in PCs and database would be hosted on centralized server. Users will communicate with server via VPN. But this system will not cover commission calculation module of waiters and also which is not supported to mobile platform.

2.1.2 Restaurant Manger [2]

‘Restaurant Manger Table Service’ provided by ASI. Countless features designed specifically for the table service environment make communication and order management much more efficient. Beyond improved service and reduced labor costs at the point of sale, Restaurant Manager’s powerful back office tracking and analysis allow staff to make fast, informed management decisions. But this system will not cover commission calculation module of waiters, manage bar ordering module, stock and recipe management module.

2.1.3 True Restaurant [3]

‘True Restaurant’ provided by Truelogics Infotech Pvt Ltd which is windows based application. There are several module Stock Management, Recipe Management, KOT (Kitchen Order Transaction) Management etc... But which is not supported to BOT (Bar Order Transaction) Management and mobile platform.

2.1.4 Common problems in those applications

- **May not have stock and Recipe Management**

Stock management and recipie management module is very useful for restaurant management system. Because of which is main part of this kind of system and it would support to management to make decision. If someone use that kind of applications they may have to install separate stock system or have to manage stock and recipe module manually.

- **May not support to calculate waiters commission**

In restaurants, service charge will be calculated based on sales. If meals are delivered to table commission would be calculated for relevant waiter. That is important requirement of Asiri Hotel and Restaurant. But above mentioned applications does not have that facility.

- **May not support BOT (Bar Order Transaction) Management**

BOT management is very important requirement of Asiri Hotel and Restaurant. That facility may not available above mentioned application.

- **Do not support Mobile Platform**

This is major requirement of Asiri Hotel and Restaurant. With this facility, management is wishing to improve efficiency and effectiveness of the service staff. But above mentioned application do not support to mobile platform.

- **Cost of solution**

Above mentioned solutions are very costly. Those companies charging that kind of cost because of all of them are overseas companies. The management of the hotel difficult to pay for those solutions.

2.1.5 Alternative design strategies

This solution can be developed based on different kind of technologies such as web based solution, windows based solution and mobile based solution.

When considering requirement and resources of the hotel, management of hotel refused web based solution because of they do not like to pay for the cost of hosting, domain and maintain cost of web based solution.

But the management agreed to develop the solution using windows and mobile technologies because of those technologies are very familiar for the staff of the hotel. Also staff are trained well for the new solution which was developed based on mobile and windows technologies.

3. CHAPTER THREE

Analysis and Design

3.1 Analysis and Design

Analysis is the major part of the software development life cycle. It will support to developers to get a clear idea about the problem domain and what are the user's requirements and expectations about the new system before start developing.

In this chapter explains the way of requirement gathering, analyzing and management techniques of the system. Apart from that Functional and nonfunctional requirements of the proposed system will be discussed. Also discussed difficulties in completing requirements and how to overcome them in the best possible way. And what are the best method to develop the system, what technologies have to be used and what tools are required to develop the system.

3.2 Requirement gathering and fact finding

Gathering requirement can be done by following various fact finding techniques. Below mentioned techniques have been used.

3.2.1 Background reading

Have good understanding of the organization's business objectives will leads to get a good understanding about requirements.

For that by looking at manual system process, accounting documents, Policy Manuals, Job Descriptions, Reports and Documentation of existing manual system can have a good understanding in background of the business.

3.2.2 Observation

By watching user's and their normal work flow carrying out their operations to learn about system. And also with participating for activities such as Stock management, recipe management, KOT (Kitchen order Transaction) Management, BOT (Bar Order Management), Billing and commission calculation etc... have helped to gather much needed information's for the development.

Observation is useful to validate collected data.

3.2.3 Questionnaire

Providing questionnaires from users that helps to identify the requirement of the system. For that, collections of questions have to define carefully because of that questions should be help to identify issues of existing process and users' expectations.

3.2.4 Interviewing

With this technique analyst can collect the information from groups or individuals. In this technique, by siting face to face with the Manager, Receptionists, chefs, barman, waiter and selected group of users who will work with the system provide, information of manual process flow, valuable ideas about the usability of the system and issues of processes in manual system.

Had few problems with this technique because some users are don't like being observed and some are behave differently while observing.

3.2.5 PACT analysis

Proposed system must implemented as a user-centered implementation. Because for this system user involvement is very high. PACT (People, Activity, Context, and Technology) framework is the best way to think regarding user centered implementation. It leads to have a good analysis and design for current situations and understand future situations.

3.2.6 Prototyping

By showing prototype of the system, could be identify functional and non-functional requirements of the system. Also management could be proposed new functionalities of the system.

3.3 Analysis of the existing system

The company doesn't have computerized system to fulfill their requirement. The management of Asiri hotel has been managed stock and billing by using books and documents. Apart from that Microsoft office package have been used. Especially they are manage restaurant process by using traditional concepts. As result of that management have to face different kind of issues in managing stock, preparing menus, KOT BOT management and commission calculation etc...

3.4. Requirement analysis and management

Requirement management is a major task of the project and it is a critical task. After gathering requirements of the project which should analyzed and check for ambiguities to be solved. Then project flow should be identified. After that in this the process of maintaining document of system, analyzing, tracing, prioritizing tasks and agreeing on requirement changes.

Accepting new requirements unconditionally, will affect the project quality and it will lead to project delays.

3.5. Requirement gathered from analysis

3.5.1 Functional requirements

- **Stock Module**

Under this module, manage raw materials, food materials and liquors of the restaurant will be done using below mentioned functionalities:

- **Good Received Note**

This functionality can be used to add stock to the system.

- **Stock Adjustment**

This enables to manage wastage and damage quantities of row materials, food materials, drinks etc...

- **Re-Order management**

This enables to establish reorder quantity for each item. Based on re-order level, management can decide to update stock.

- **Recipe management**
This functionality can be used to prepare recipe in the system assigning no of food materials and raw materials with quantities. Once a meal is prepared based on selected recipe via restaurant module, quantities would be updated based on row materials and items which were assigned to recipe.
- **Bill of Quantity Management**
This functionality enable to users to defined sub items with based on selected row material. Especially this functionality would be useful for the bar. Because of, barman has to issue liquors for customers by glass without issuing bottle.
- **KOT (Kitchen Order Transaction) Module**
Under this module would be manage Kitchen order transactions. This module designed to support computers and mobile platforms. When place a kitchen order, barcode receipt printed on kitchen. After preparing order and scanning barcode via barcode reader system would be notified the order is ready.
- **BOT (Bar Order Transaction) Module**
Under this module would be manage bar order transactions. This module also designed to support computers and mobile platforms. When place a bar order, barcode receipt printed on bar. After preparing order and scanning barcode via barcode reader system would be notified the order is ready.
- **Billing Module**
Billing module is designed to manage billing of the restaurant. Once place an orders from the different kind of users by different kind of devices, billing Clark or receptionist can bill based on the orders.
- **Employee module**
This module designed to keep employees' basic information. Which is help to calculated employees' incentive based on their services.
- **Notification module**
This module helps to identify,
 - Expired or going to be expired items
 - Available menus
 - Available foods, beverages and liquors
 - Pending Orders
 - Prepared orders
 - Pending bills
- **Mobile integrated application**
This application communicated main system via WCF (Windows Communication Foundation) service which is hosted on main server. Especially this application designed for the waters to place the KOT or BOT based on tables. That application facilitate to,
 - Place KOT order
 - Place BOT order
 - View placed and unbilled KOT based on table

- View placed and unbilled BOT based on table
- Alert facility
- View Daily commission of the sales regarding the placed orders

- **User management and configuration module**

In this application there are three user types who access the system

- System administrator
- Top management
- Staff members
- Mobile User

Each user type may have different privileges. Normally privileges of different interfaces have been assigned to the user type. But when create a user who is assigned or remove privileges of interfaces which are assigned to the user type which belong with the user.

Privileges assigning part would be handled separately. This module enable to;

- Define User
- Change Password
- Assigning/ Changing User type
- Activate/ Deactivate user profile
- Grant/ Deny privilege of different interfaces
- Inherit privileges of user to another user

3.5.2 Non-functional requirements

- **User friendliness**

This system design to increase job satisfaction of the employees. For that use colors which are suitable for eyes and attractive, readable font size, meaningful content and messages and meaningful icons. Also user enable to find functionality of the system easily.

- **Reliability**

The system has the ability to work without failure other than power failure or network failure. Business rules are implemented based on customers given requirement after cross checking all the exceptions.

- **Efficiency**

After installing this application efficiency of the employee would be increased. That enable to users to working with different tasks simultaneously. Especially waiters workload would be reduce and who could be serve many customers in short time period.

- **Security**

In the application level System data are highly protected. System authorization and authentication part would be handle in user management and configuration module. All users have to login to system by using them User name and password. Regarding privileges of the user who can access functionalities of the system.

Android application would be installed on waiters' smart phone. They have to access system via that application only. If waiter resign from the hotel, system

administrator would be deactivate waiter profile. After that waiter cannot use that application.

- **Availability**

System should not crash due to the high work load. Android application would be working only hotel premises because of the management requirement.

- **Capacity**

Capacity of the server should be high because of the when growing the database, server should have necessary space. But on mobile devices, should not worry about memory of the device. Because of data are not keeping on the mobile devices.

- **Performance**

System should have high performance because of at the peak time there are many no of customers and all transactions should be handled quickly. Therefore system users should response quickly. In the system, users facilitate to use short keys to control events. To increase the performance high speed printers and barcode readers would be used.

Hardware and software Implementation for the windows application

Hardware:

Decide to buy Dell PowerEdge T110 II Server

Intel(R) Xeon(R) 3.10GHz

16GB RAM

2000GB Hard disk

Wi-Fi router

Barcode printer

Barcode scanner

Software's:

Microsoft Windows Server 2012

SQL Server 2012

RDLC report viewer

Crystal report viewer

Hardware and software Implementation for the windows application

Android smart phones which operating system higher than Jelly bean

3.6. Introduction to design

System design phase is most important part of the project development. It is make easy and help to represent exact image of the system to the developers. Also which may be used to give clear idea of project to client at the development stage.

As the example use case diagram help to understand users' involvement to the different functionalities by client or developer.

For this project Rational Unified Process (RUP) methodology was used. Because of that which is mostly compatible with iterative development and that could be handle higher risk of requirement changing through the project duration.

3.7. Development approach

The Rational Unified Process (RUP) is an iterative software development process framework developed by Rational Software Cooperation which can be described as iterative, architecture-centric, and use-case driven. There are six best practices

1. Develop iteratively, with risk as the primary iteration driver
2. Manage requirements
3. Employ a component-based architecture
4. Model software visually
5. Continuously verify quality
6. Control changes

That all the functionality of the system is derived from use cases, simple descriptions of the interactions between the system and its users. This ensures that only features of value to users are developed. RUP provides a well-defined structure for the lifecycle of a project and includes essential milestones where major decisions can be made about the project.

There are four phases. Figure 1 RUP [4], [5]

- **Inception**

The business case for the project is built by developing a good understanding of the requirements and scope of the system and getting buy-in from the project stakeholders. At the end of this phase the project team will know whether or not to proceed with the project.

- **Elaboration**

In this phase is concerned with addressing the major technical risks of the project. The focus of the work is to create a bare bones system which answers all of the major technical questions.

- **Construction**

The Construction Phase is concerned with moving from the executable architecture created in the Elaboration Phase to an operational system. End of this phase project team will have beta version of the system which can be used to evaluation.

- **Transition**

In this phase is concerned with ensuring that the software meets the needs of its users. The system is evaluated and refined based on user feedback. At the end of this Phase the system is released and the project evaluated.

Rational Unified Process (RUP)

Iterative Development

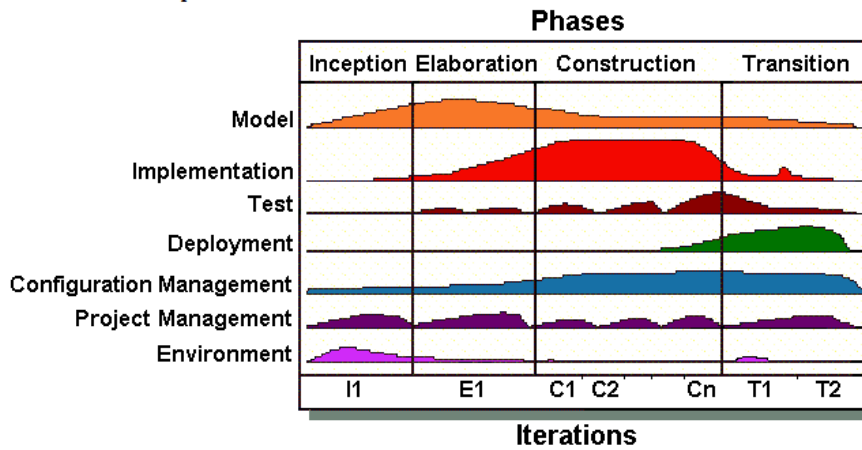


Figure 1 RUP

3.8. System structure

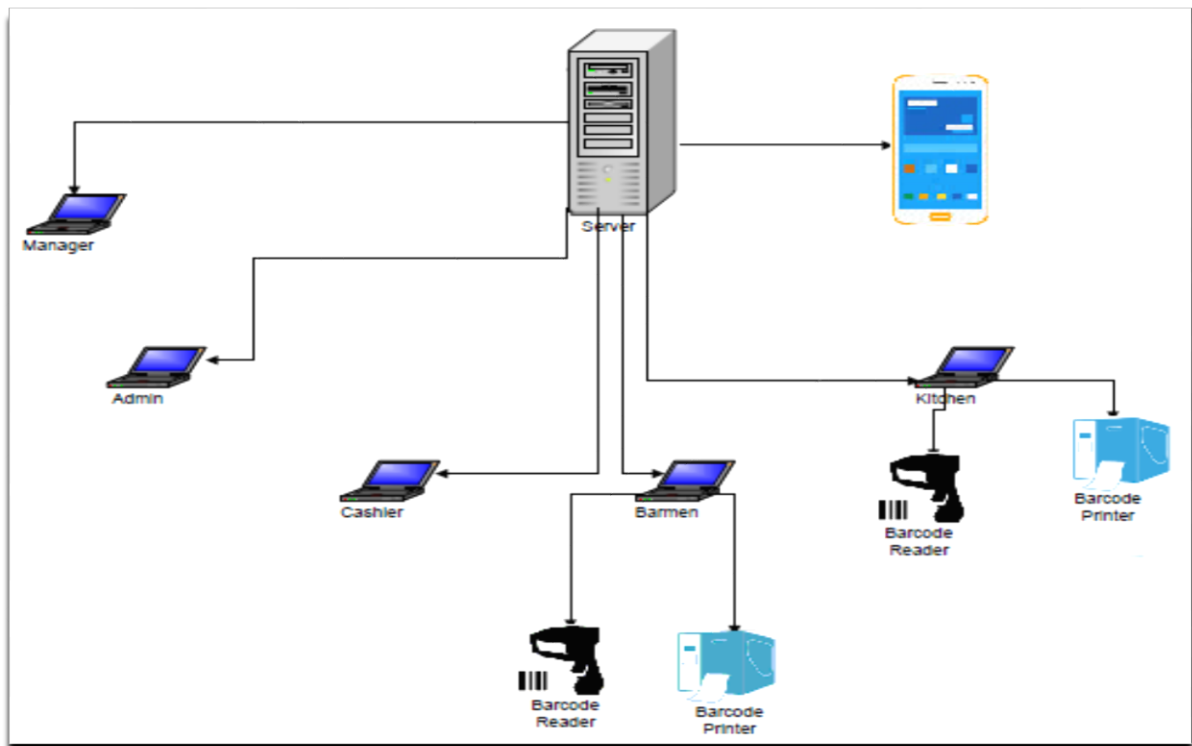


Figure 2 : System Structure

Mobile Integrated Restaurant Management system is a windows and mobile based application on client server architecture. Top management & system administrator and system users able to access system via computers Waiters can access system via smart phone within the hotel premises.

3.9. High-level use case diagram for the system

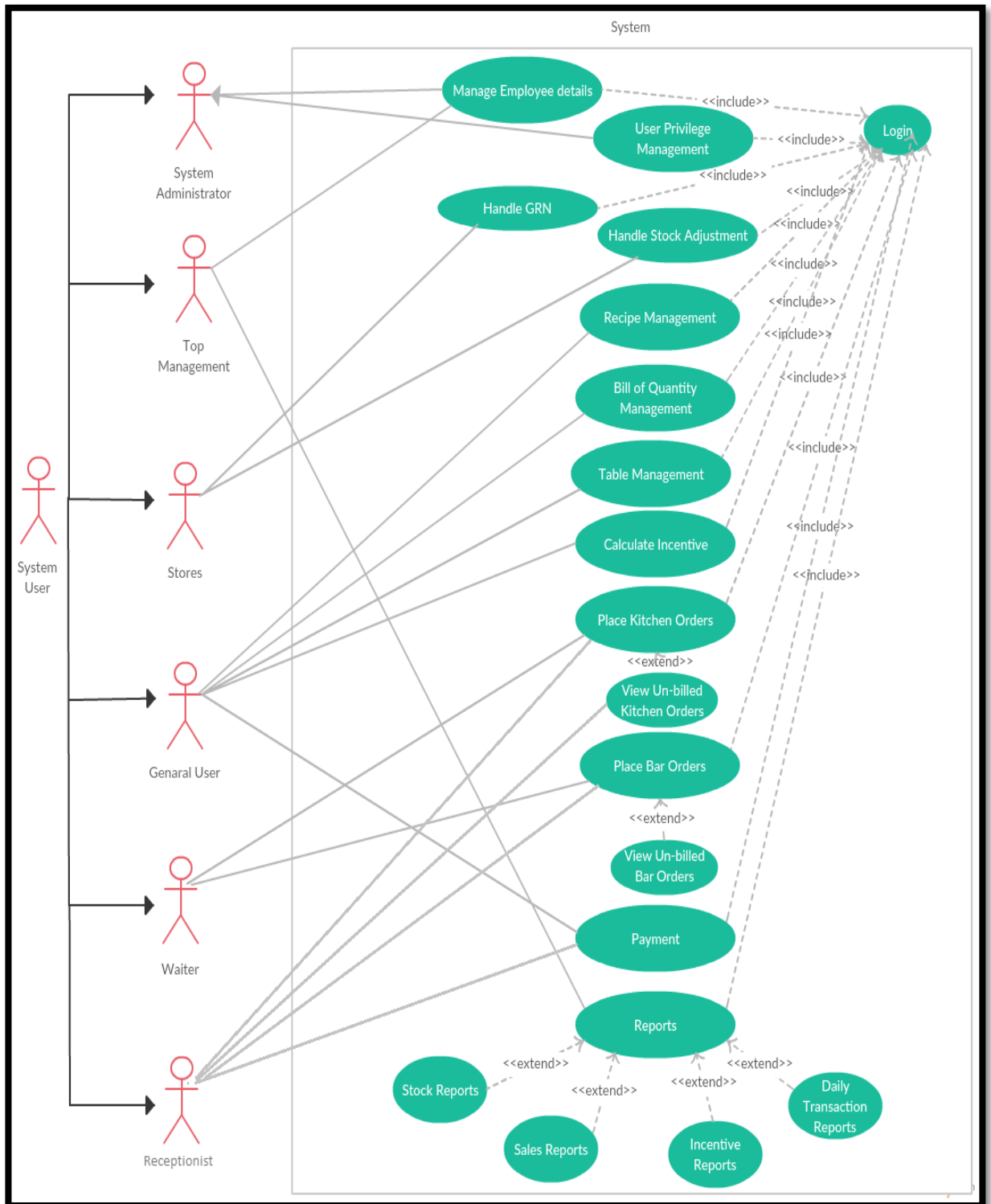


Figure 3 : High level use case diagram

3.10. Use case narratives for implemented modules

Use case narratives are used for the all the modules of this system. Because of which are help to identify users who are involving the module, preconditions, post conditions, main scenario and alternative scenario. Sample of them is given here.

3.10.1 Use case narrative for login

Use Case ID	01		
Use Case Name	Login		
Created By	M.D.C.E.S Jayarathna	Last Updated By	M.D.C.E.S Jayarathna
Created Date	10-09-2016	Last Revision Date	10-09-2016
Actors	System Administrator, Top Management, Stores, General User, Waiter		
Description	Login to the system		
Precondition	Local network should be available. System Should be working without crashes.		
Post conditions	Successfully login to the system		
Main Scenario	<ol style="list-style-type: none"> 1. Login to the restaurant management system. 2. Validate user login 3. Regarding user's privileges selected menu item would be enable. 		
Alternative Scenario	<ol style="list-style-type: none"> 1. Validation fail. <ol style="list-style-type: none"> a. If user failed to login to the system, error message would be provided. b. If user trying to more than three times with invalid login details, application would be closed. 		

Table 01: use case narrative for login

For more Use case narratives Appendix A

3.11. Sequence diagrams

3.11.1 Sequence diagram for system configurations

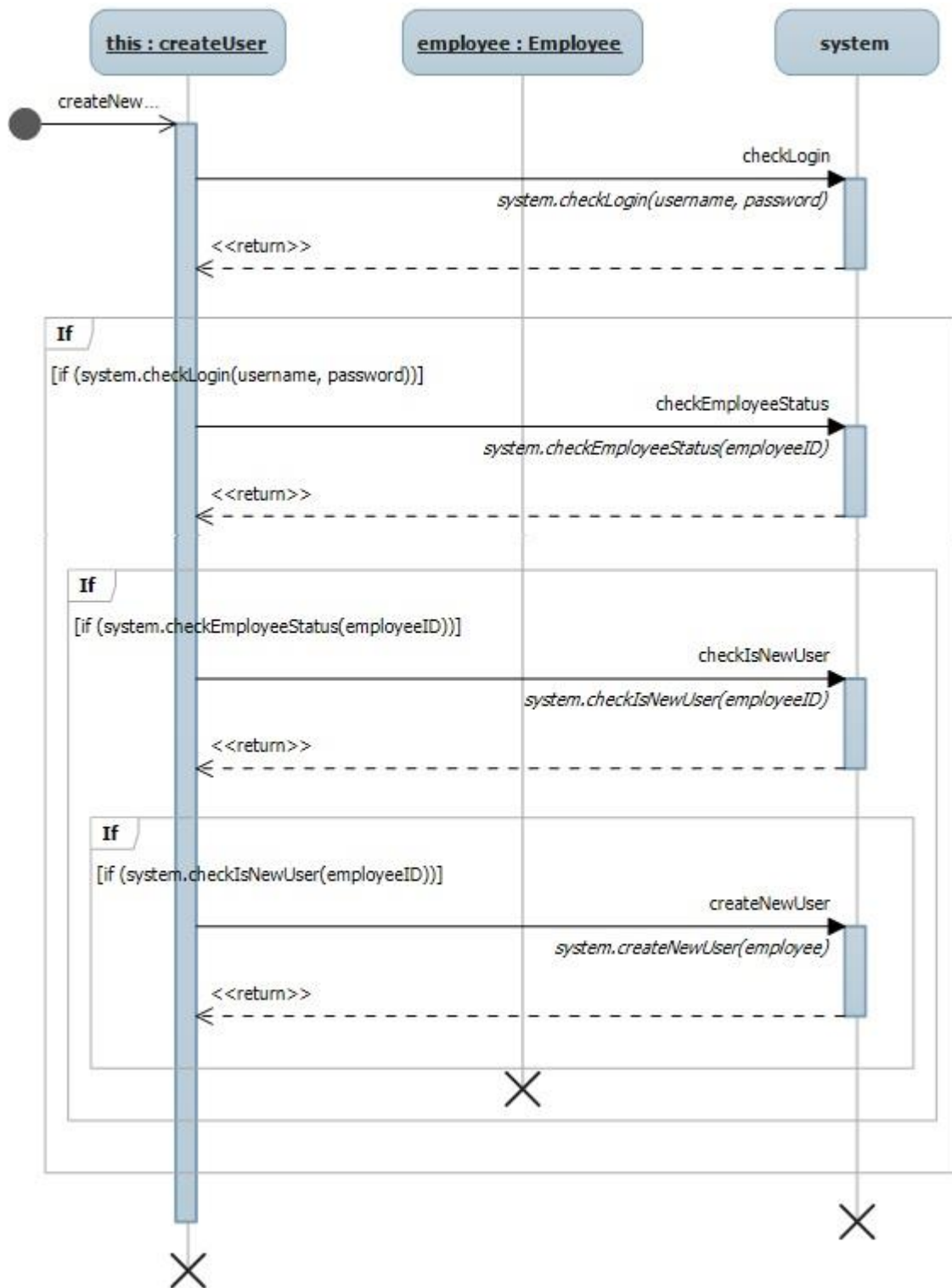


Figure 4 : Sequence diagram for User Management

For more sequence diagram Appendix B

3.12 ER Diagram

3.12.1 ER diagram of User Management module

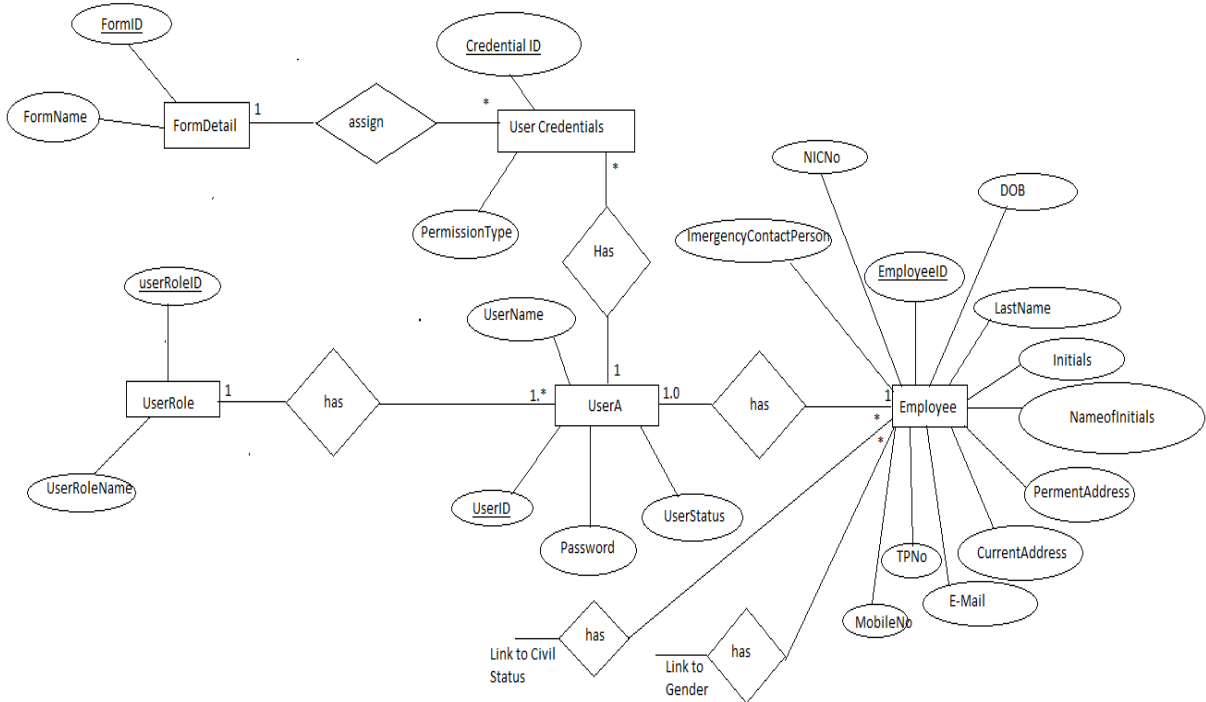


Figure 5 : ER diagram of User management Module

ER diagram is used to design the database based on standard methodologies. Tables and references of the user management module was designed based on this ER diagram. It is showing, what are the entities, attributes, relationships, Cardinalities of user management module. Also this diagram helpful to identify primary keys, foreign keys, strong entities, weak entities of the user management module.

Further it is describe how employee become a user of the system, which kind of user role is assigned for him and which forms can access of the application.

For more ER diagram Appendix C

3.13 Database diagram

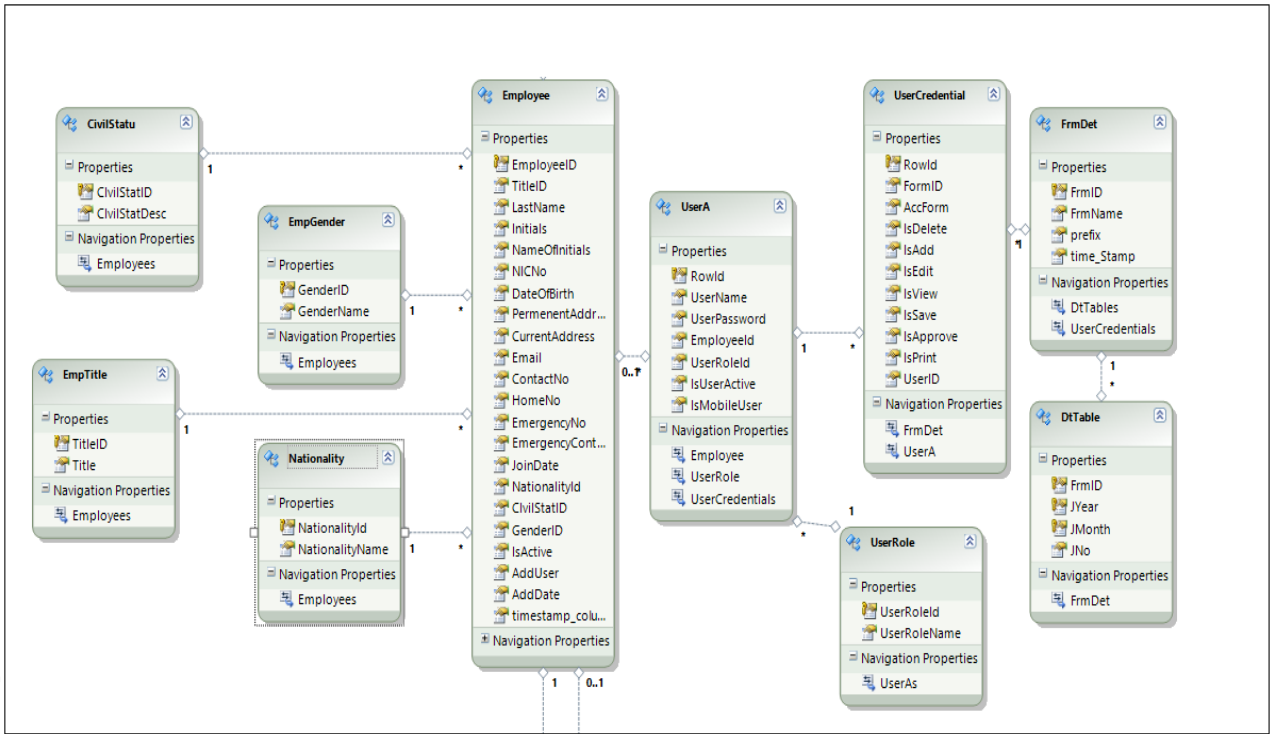


Figure 6 : Database diagram of user management

Figure 6 is showing table structure of user management module. These tables are designed based on ER diagram which is shown at Figure 5. Attributes of entities, primary keys, foreign keys are defined based on that ER diagram. Each table are representing entity of ER diagram. Properties of the table are similar to the attributes of entity of ER diagram. Navigation properties of table representing reference table.

Full database structure in Appendix D

3.14 Summery

In this chapter all design techniques have been discussed with explaining user requirements and development approaches of the new system.

For describe that, use case narrations, sequence diagrams and ER diagram have been used. Those diagram would be represent few major processes and functionalities of the system. Especially use case narration would be useful when represent clear picture of the new system to the customer. Apart from that nonfunctional requirements and hardware requirements have been mentioned on this chapter.

In Next chapter software tools, techniques, methods would be described which are using in the new system development.

4. CHAPTER FOUR

Implementation

In this stage finalized requirements at the previous phase would be turn into a solution. Also in this chapter would be described tool, techniques and methods which are used to implement the system including development platform, programming languages, reporting tools, database management system etc...

4.1. Tools and techniques used for implementation

4.1.1 Main Technologies, languages and services used for implementation

Development Platform	Microsoft Visual Studio 2010 Android Studio	[1], [2]
Technologies	WPF, WCF, Entity Framework 4, Android	[3], [4], [5], [6]
Programming Languages	C#.NET, Java	[7], [8]
Reporting	RDLC Reports	[9]
Scripting Languages	XAML, XML	[10], [11]
Database	Microsoft SQL Server 2008 R2 Express	[12]
Server	Microsoft Server 2008	[13]

Table 2: Main Technologies, languages and services used for implementation

4.1.2 Third party tools

Reporting	Crystal Report	[14]
Report viewer	Crystal Report viewer, RDLC Report Viewer	[15] [16]

Table 3: Third party tools

4.2. Database Implementation

Database is the main part of the system development. It is used to keep all information about the application in separate tables but which may have relationships with other tables. In the database, Data Definition Languages (DDL), Data Manipulate Language (DML) would be used as usually.

MS SQL Server 2008 R2 Express edition is used to keep database of the system. The reason of selection of that database server, which is most compatible with development platform and which is user friendly rather than other database servers. Apart from which would be reliable, high speed of accessing data when growing database and compatible with relational database management principles.

4.2.1. MySQL Query examples

4.2.1.1 Create Database

Following query has executed in MS SQL server to create 'RMS' database. Sample code shown in Figure 7: SQL code of RMS database creation

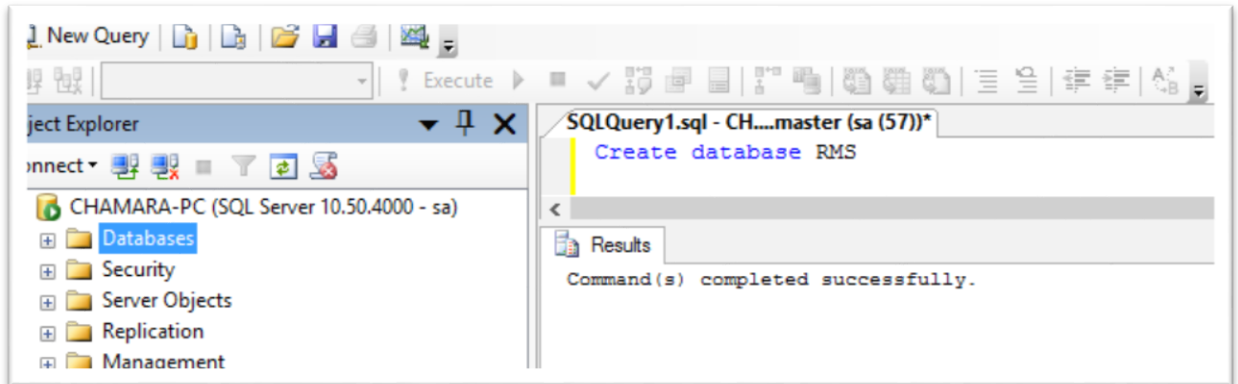


Figure 7 : SQL code of RMS database creation

4.2.1.2 Create table in database

Tables are required to create in database to keep data of the application. Sample code is shown in Figure 8 : SQL code of Supplier Table creation

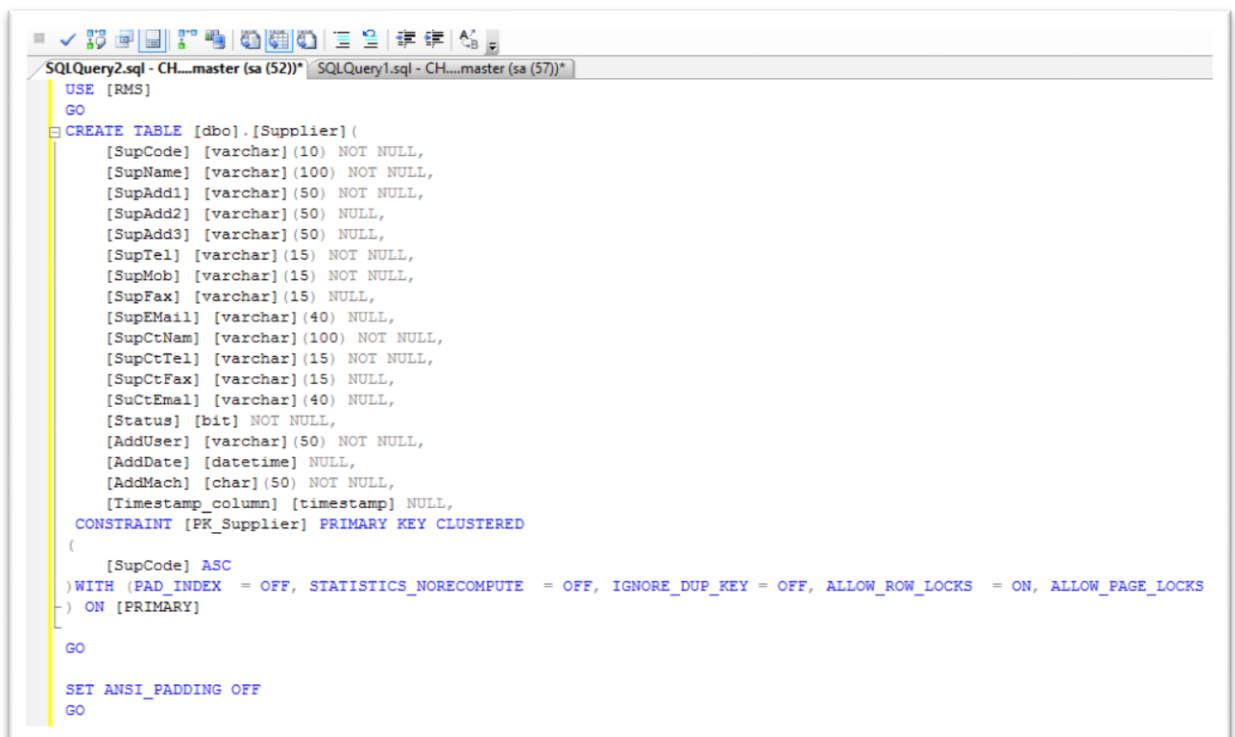
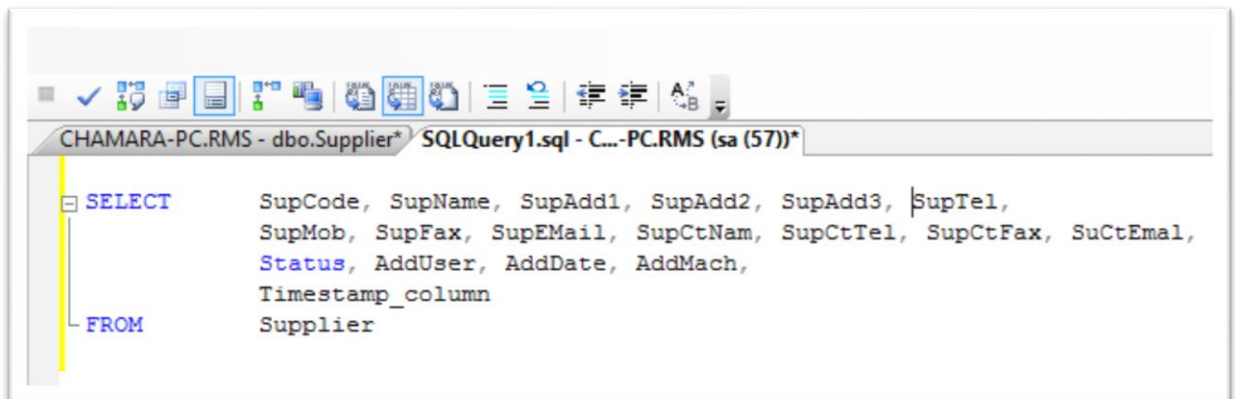


Figure 8 : SQL code of Supplier Table creation

4.2.1.3 Select data from Table

Select queries are used to manipulate data from the database. Sample code is shown in Figure 9: SQL code sample for view data

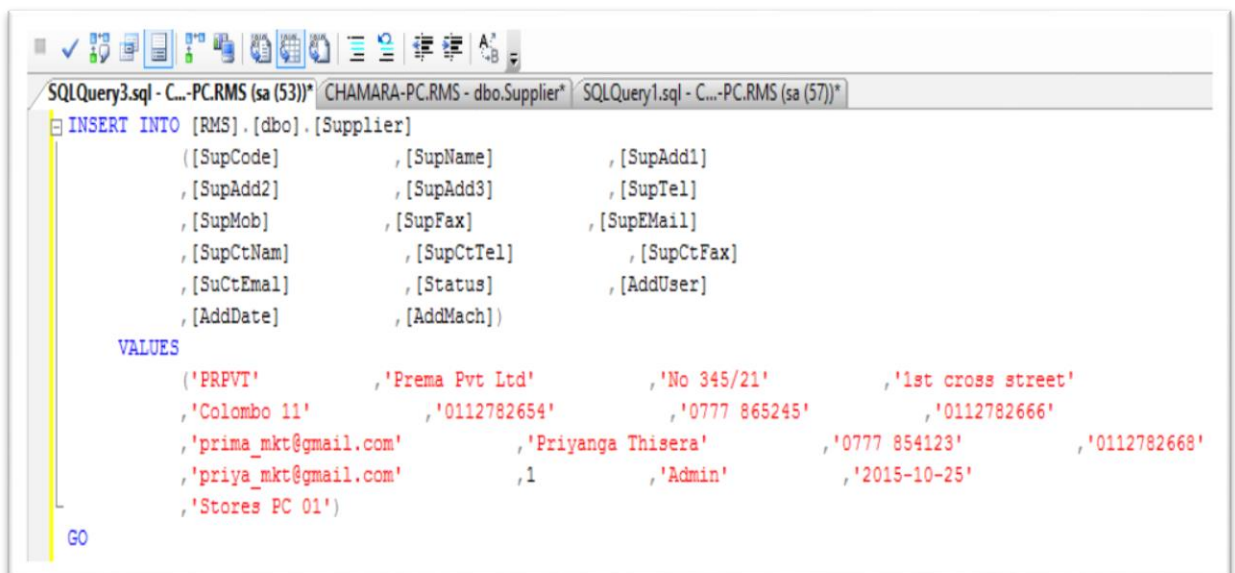


```
CHAMARA-PC.RMS - dbo.Supplier* SQLQuery1.sql - C...-PC.RMS (sa (57))*  
  
SELECT      SupCode, SupName, SupAdd1, SupAdd2, SupAdd3, SupTel,  
            SupMob, SupFax, SupEMail, SupCtNam, SupCtTel, SupCtFax, SuCtEmal,  
            Status, AddUser, AddDate, AddMach,  
            Timestamp_column  
FROM        Supplier
```

Figure 9 : SQL code sample for view data

4.2.1.4 Insert data to the table

Insert queries are used to insert data to the tables through the application. Sample code is shown in Figure 10: SQL code sample for insert data into table

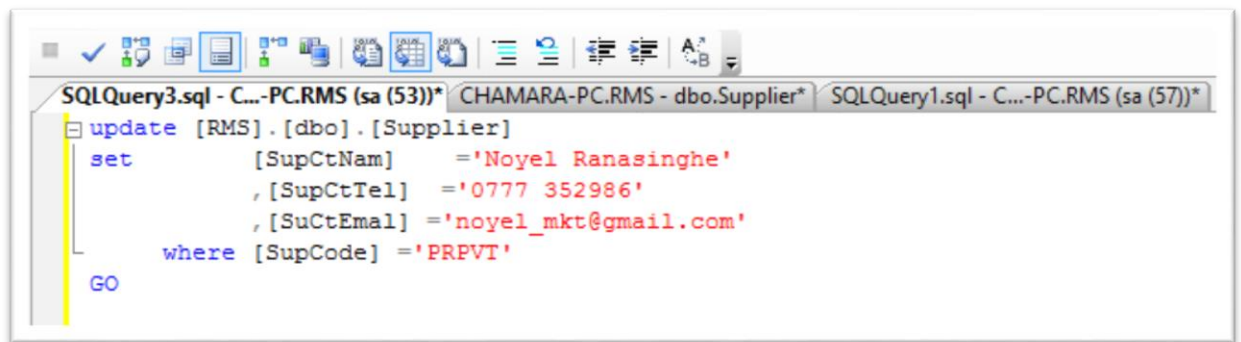


```
SQLQuery3.sql - C...-PC.RMS (sa (53))* CHAMARA-PC.RMS - dbo.Supplier* SQLQuery1.sql - C...-PC.RMS (sa (57))*  
  
INSERT INTO [RMS].[dbo].[Supplier]  
            ([SupCode]      , [SupName]      , [SupAdd1]  
            , [SupAdd2]      , [SupAdd3]      , [SupTel]  
            , [SupMob]      , [SupFax]      , [SupEMail]  
            , [SupCtNam]    , [SupCtTel]    , [SupCtFax]  
            , [SuCtEmal]    , [Status]      , [AddUser]  
            , [AddDate]    , [AddMach])  
VALUES  
            ('PRPVT'      , 'Prema Pvt Ltd'      , 'No 345/21'      , '1st cross street'  
            , 'Colombo 11'      , '0112782654'      , '0777 865245'      , '0112782666'  
            , 'prima_mkt@gmail.com'      , 'Priyanga Thisera'      , '0777 854123'      , '0112782668'  
            , 'priya_mkt@gmail.com'      , 1      , 'Admin'      , '2015-10-25'  
            , 'Stores PC 01')  
  
GO
```

Figure 90 : SQL code sample for insert data into table

4.2.1.5 Update data in table

Update queries are used to modify data inside the table. Sample code is shown in Figure 11: SQL code sample for update existing data in table

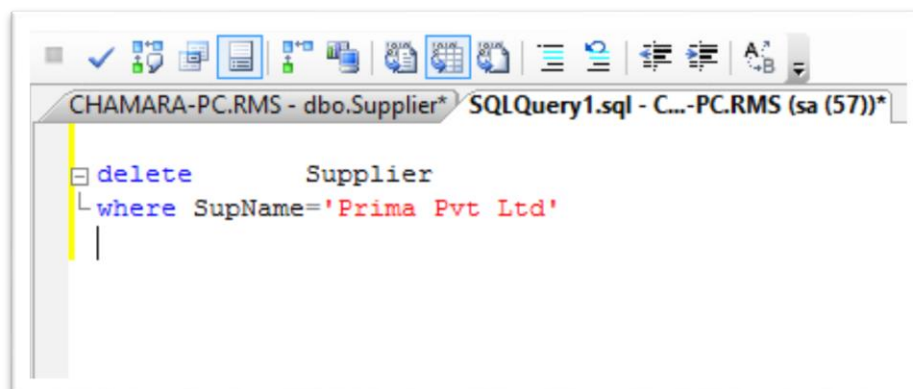


```
SQLQuery3.sql - C...-PC.RMS (sa (53))* CHAMARA-PC.RMS - dbo.Supplier* SQLQuery1.sql - C...-PC.RMS (sa (57))*
update [RMS] . [dbo] . [Supplier]
set      [SupCtNam]      ='Noyel Ranasinghe'
        , [SupCtTel]    ='0777 352986'
        , [SuCtEmal]   ='noyel_mkt@gmail.com'
where [SupCode] ='PRPVT'
GO
```

Figure 101 : SQL code sample for update existing data in table

4.2.1.6 Delete record from table

Delete queries are used to remove data from the table. Sample code is shown in Figure 12: SQL code sample for delete selected record from table

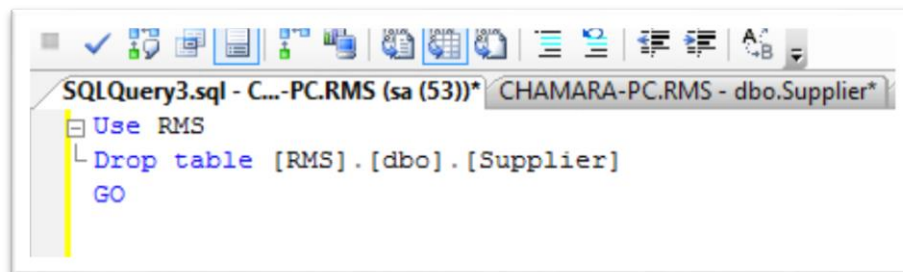


```
CHAMARA-PC.RMS - dbo.Supplier* SQLQuery1.sql - C...-PC.RMS (sa (57))*
delete      Supplier
where SupName='Prima Pvt Ltd'
```

Figure 112 : SQL code sample for delete selected record from table

4.2.1.7 Delete table from database

Drop queries are used to remove table from the database. Sample code is shown in Figure 13: SQL code sample for delete table from Database

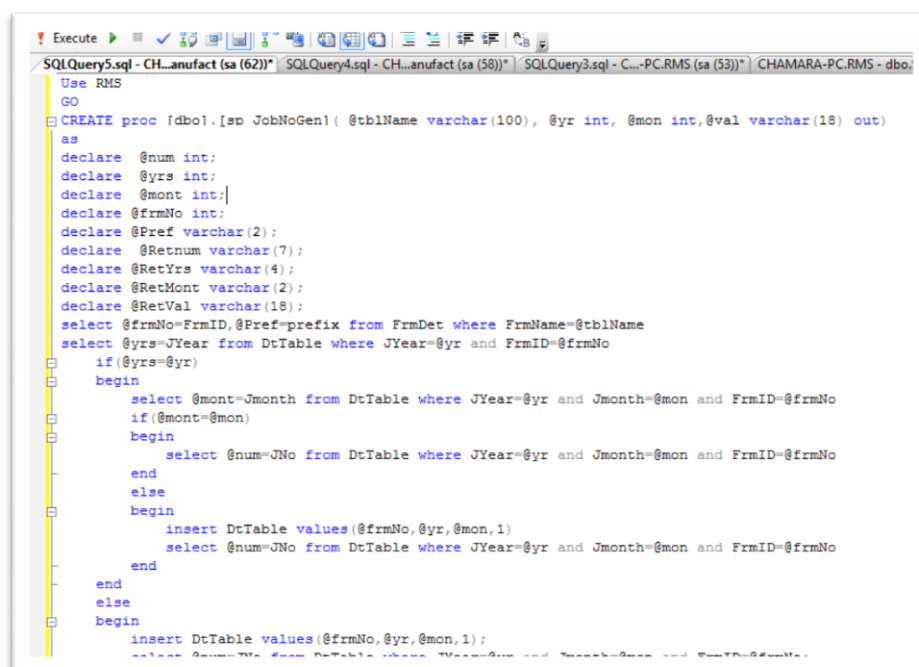


```
SQLQuery3.sql - C...-PC.RMS (sa (53))* CHAMARA-PC.RMS - dbo.Supplier*
Use RMS
Drop table [RMS].[dbo].[Supplier]
GO
```

Figure 123 : SQL code sample for delete table from Database

4.2.1.8 Stored procedure

Stored procedures are used to execute collection of queries with collection of data. Sample code is shown in Figure 14: SQL code sample for stored procedure creation



```
SQLQuery5.sql - CH...anufact (sa (62))* SQLQuery4.sql - CH...anufact (sa (58))* SQLQuery3.sql - C...-PC.RMS (sa (53))* CHAMARA-PC.RMS - dbo
Use RMS
GO
CREATE proc [dbo].[sp JobNoGen] ( @tblName varchar(100), @yr int, @mon int,@val varchar(18) out)
as
declare @num int;
declare @yrs int;
declare @mont int;
declare @frmNo int;
declare @Pref varchar(2);
declare @Retnum varchar(7);
declare @RetYrs varchar(4);
declare @RetMont varchar(2);
declare @RetVal varchar(18);
select @frmNo=FrmID,@Pref=prefix from FrmDet where FrmName=@tblName
select @yrs=JYear from DtTable where JYear=@yr and FrmID=@frmNo
if (@yrs=@yr)
begin
select @mont=Jmonth from DtTable where JYear=@yr and Jmonth=@mon and FrmID=@frmNo
if (@mont=@mon)
begin
select @num=JNo from DtTable where JYear=@yr and Jmonth=@mon and FrmID=@frmNo
end
else
begin
insert DtTable values (@frmNo,@yr,@mon,1)
select @num=JNo from DtTable where JYear=@yr and Jmonth=@mon and FrmID=@frmNo
end
end
else
begin
insert DtTable values (@frmNo,@yr,@mon,1);

```

Figure 134 : SQL code sample for stored procedure creation

4.3 WCF (Windows Communication Foundation) Service Implementation

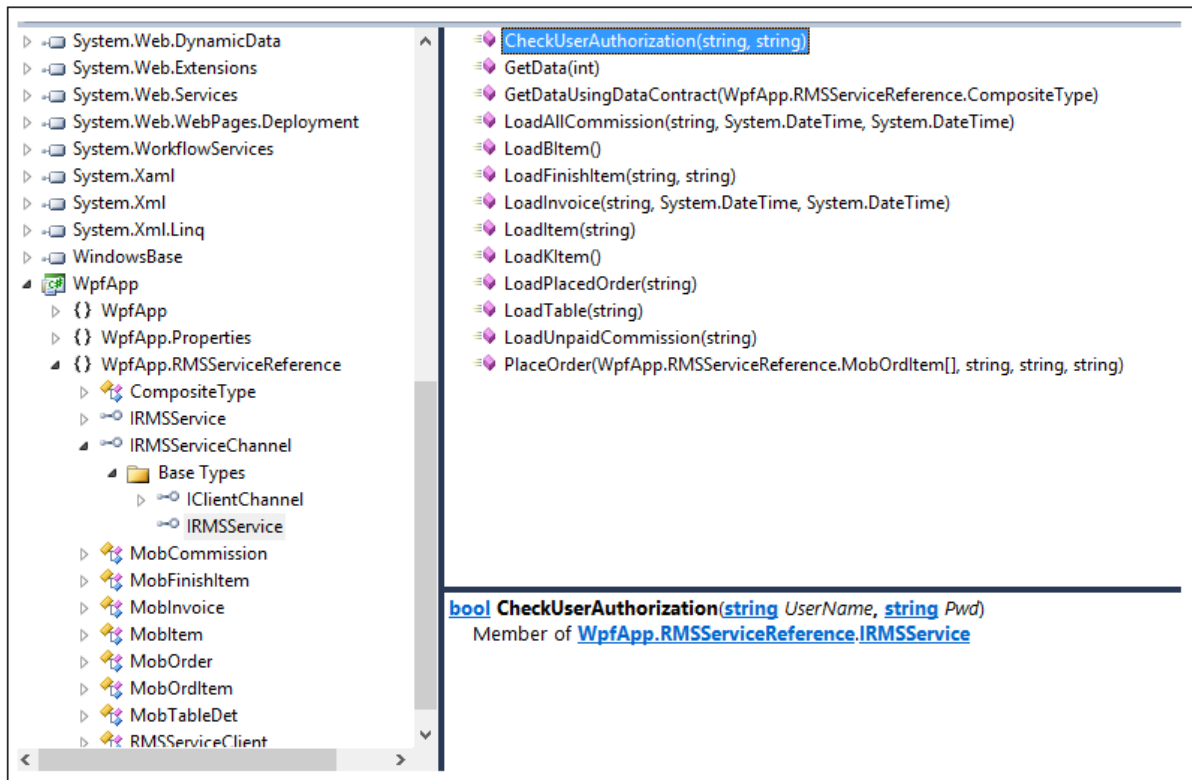


Figure 145: Calling methods of WCF Service

Figure 16 is showing calling methods of WCF (Windows Communication Foundation) service of this solution. WCF service is using to communicate with database and mobile application. This service is hosting in IIS (Internet Information Server) of main server and which can consume by using mobile application. There are no of methods which are implemented for their own purpose such as view available menu, place an order, check prepared item etc...

4.4. User Interface designs in Windows application

In this application, XAML and C#.NET technologies are used to design interface for windows application at visual studio 2010. Color themes are selected based on user requirement. Additionally different colours are using to alert user at the different situation such as identify mandatory field, data validations, alert notifications etc...

4.4.1. User login (Windows Application)

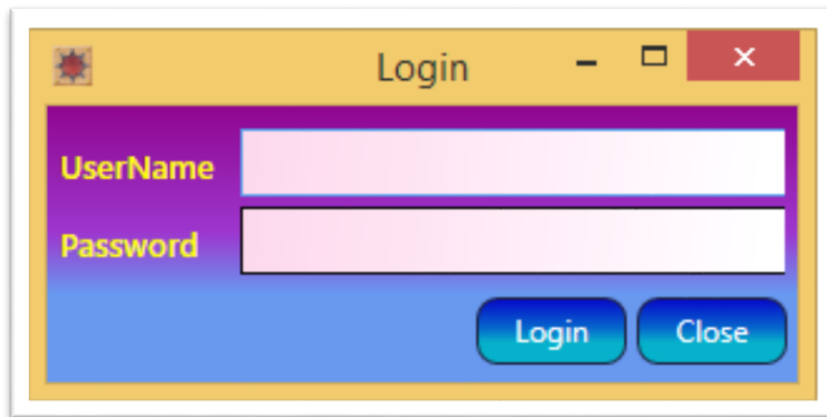


Figure 156: Login Form

For more User Interfaces Appendix E

4.5. Code segments

4.5.1. Login Form's XAML code

```
File Edit View Project Build Debug Team Data Tools Architecture Test Analyze Window Help
Debug PlanInsDet
Login.xaml* x:Class="UnilakManuFact.Login"
xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
Title="Login" Height="149" Width="315" WindowStartupLocation="CenterScreen" Icon="/UnilakManuFact;component/Resources/uni.ico" Loaded="Window_Loaded"
<Grid Background="{StaticResource UsCBackground}">
  <Grid.ColumnDefinitions...>
  <Grid.RowDefinitions...>
  <StackPanel Orientation="Vertical" Grid.Column="0" Grid.Row="0" Grid.RowSpan="1" >
    <Label Style="{StaticResource ComLabel}" Content="UserName" Height="27" Margin="0,10,0,0"/>
    <Label Style="{StaticResource ComLabel}" Content="Password" Height="27" Margin="0,4,0,0"/>
  </StackPanel>
  <Border BorderBrush="{StaticResource SubBorderBrush}" Grid.Column="1" Grid.ColumnSpan="2" Grid.Row="0" Grid.RowSpan="1" Margin="5,5,5,5">
    <StackPanel Orientation="Vertical" >
      <TextBox Style="{StaticResource MandTxt}" x:Name="txt_UName" Width="219" Height="27" Margin="0,4,0,0" CharacterCasing="Upper" />
      <PasswordBox BorderBrush="Black" x:Name="txt_Pwd" Width="219" Height="27" Margin="0,4,0,4">
        <PasswordBox.Background>
          <LinearGradientBrush>
            <GradientStop Color="#FFF8D5E8" Offset="0"/>
            <GradientStop Color="White" Offset="1"/>
          </LinearGradientBrush>
        </PasswordBox.Background>
      </PasswordBox>
    </StackPanel>
  </Border>
  <StackPanel Grid.Column="0" Grid.ColumnSpan="3" Grid.Row="1" Grid.RowSpan="2" Orientation="Horizontal" HorizontalAlignment="Right" VerticalAlignment="Top">
    <Button Style="{StaticResource ButtonStyle}" x:Name="Btn_Login" Content="Login" Width="60" Click="Btn_Login_Click" Margin="0,0,4,4" />
    <Button Style="{StaticResource ButtonStyle}" Width="60" x:Name="Btn_Close" Content="Close" Margin="0,0,4,4" Click="Btn_Close_Click" />
  </StackPanel>
</Grid>
</Window>
```

Figure 167: Login Forms XAML code

4.5.2 Login process

```
private void login()
{
    try
    {
        if (dbSet != null)
        {
            dbSet.Close();
        }
        if (txt_UserName.Text.Length > 0 && txt_Password.Length > 0)
        {
            UnilakManufactEntities db = ClsDbConnection.GetDbConnection();
            UserHed usr = (UserHed)(from us in db.UserHeds
                                   where us.UserName == txt_UserName.Text.Trim() && us.Password == txt_Password.Text.Trim()
                                   select us).FirstOrDefault();

            if (usr != null)
            {
                Main _mi = new Main(usr.UserName.ToString());
                _mi.Show();
                this.Close();
                if (dbSet != null)
                {
                    dbSet.Close();
                }
            }
            else
            {
                MessageBox.Show("Invalid User Name or Password", "Login Fail.", MessageBoxButtons.OK, MessageBoxIcon.Error);
            }
        }
        else
        {
            MessageBox.Show("Enter login details", "Message", MessageBoxButtons.OK, MessageBoxIcon.Question);
        }
    }
}
```

Figure 178: Login process

Figure 19 show c# code segment of the login process.

More code of this system can find on Appendix F.

4.6. Mobile Application Development

Mobile application is major part of this solution. These days most favorite mobile operating system is Android operating system. Therefore management of the hotel requested to developed mobile application of this solution to compatible with Android operating system. Android studio is used for development tool. XML is using to design user interface and Java is using for as the programming language.

Mobile application development has not implemented because of at the last movement, management change his mobile requirement. Therefore mobile application development couldn't to implement before the viva.

4.7. File formats in system (extensions)

4.7.1 Windows application

.CS	C# file
.XAML	XAML file
.RDLC	RDLC report template file
.rpt	Crystal report template file
.png	PNG image file
.jpg	JPEG image file
.ico	Icon file
.XML	XML file

4.7.2 Android application

.XML	XML file
.java	Java file
.png	PNG image file
.jpg	JPEG image file
.ico	Icon file

As previously mentioned in this chapter all project related development platform, Database Management system, tools have been described.

Apart from that programming languages, scripting and designing technologies have been explained.

In next chapter will contain the details system testing and validation

5. CHAPTER FIVE
System Testing and Evaluation

Testing and evaluation is one of major part of the software development life cycle. Which is ensure that provide best solution to customer. In this chapter would be explained testing techniques which are used to test this application.

Apart from that this chapter would be explained process and methods which can used to verification, validation of the system.

5.1 Testing – Introduction

For succeed the project which should be bugs/errors free. If it is not project might be rejected by customer. Also additional resource would be allocated to re-develop the system. Software testing methodologies are used to identify error/bug of the system and which help to fixed.

Testing processes includes verification & validation.

5.1.1 Verification

This process make sure that, development team develop the product correctly. That would realized product achieved the conditions which are identified beginning of the implementing phase.

5.1.2 Validation

This process ensure that, development team develop right product with capturing customer’s needs. Final solution should be satisfy the customer’s given requirements.

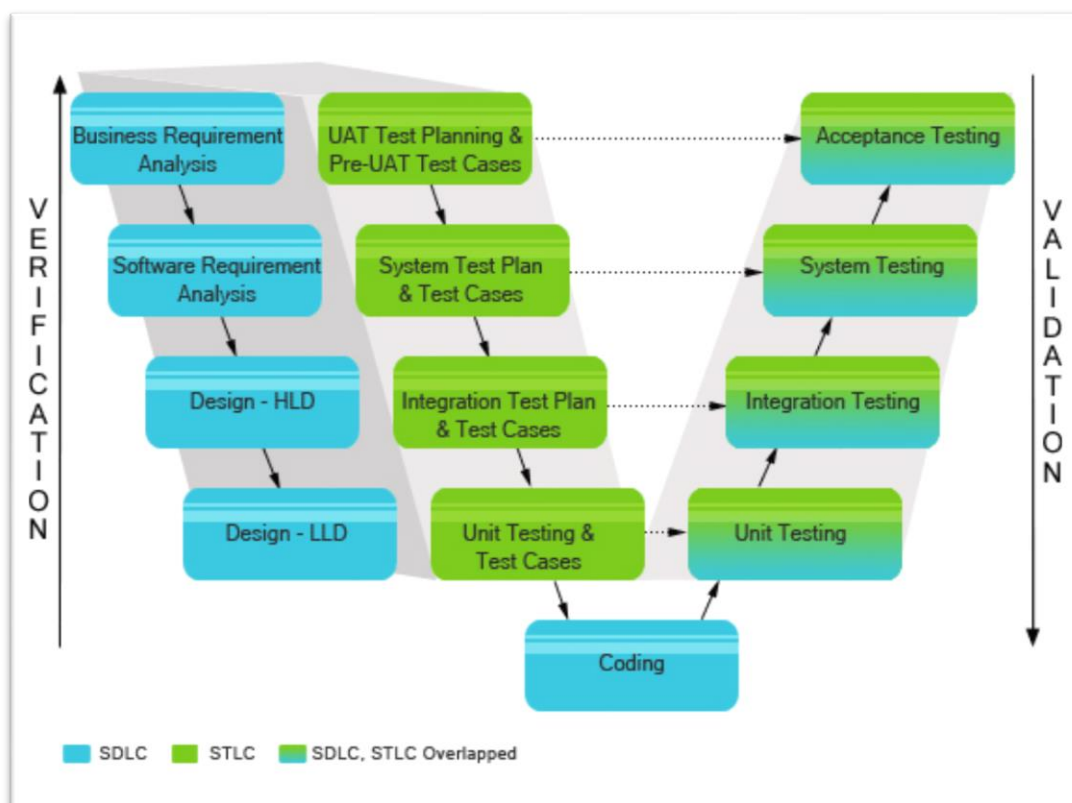


Figure 19: Verification vs. Validation

5.2.3 Testing Methods in detail

Software testing can be grouped into two categories STATIC TESTING (verification) & DYNAMIC TESTING (validation)

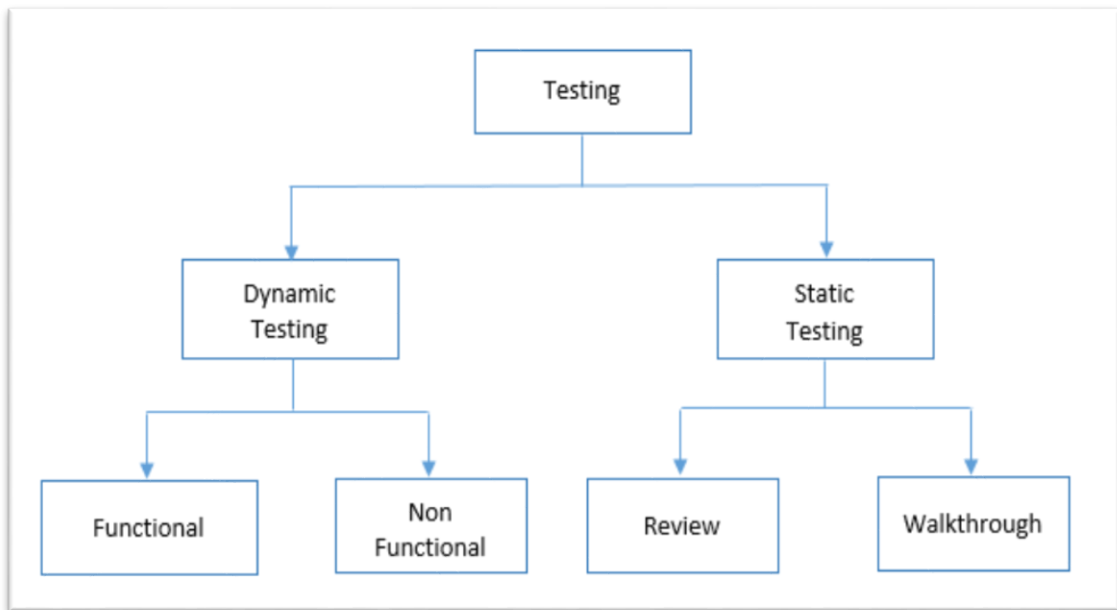


Figure 180 : Testing Method

5.2.4. Static testing (verification testing)

Static testing use to check code manually without executing testing codes. Also static testing used to find errors in requirement documents, design documents. By using those documents make reviews and which are used to find defects and bugs. Static testing is used to improve quality of the solution with identifying bugs and errors at the analyzing and designing phase. Therefore which is called as non-executing testing or verification testing.

5.2.4.1. Techniques used in static testing

- **Walkthrough**

Team Leader of the project would be explain the product to the development team. At that time participant can ask question to clear out them. Scribe makes note of review comments.

- **Informal Reviews**

This is one of the type of review which doesn't follow any process to find errors in the document. Under this technique, developer can review the document and give informal comments on it.

- **Technical Reviews**

Team member would be review the technical specification of the software product and checks whether it is suitable for the project with finding any discrepancies in the specifications and standards followed. This review concentrates mainly on the technical document related to the software such as Test Strategy, Test Plan and requirement specification documents.

- **Inspection**

This review use to follow strict process to find the defects and that was mentioned as formal type of review. Reviewers are maintaining checklist to review the work products and who are recording defects to inform the participating to rectify that bugs.

- **Static code Review**

Static code Review would be check syntax of the code, code optimization and coding standards without executing source code. That could be known as white box testing. This review can be done at any point during development.

5.2.5. Dynamic testing (validation testing)

Dynamic Testing done by executing the program at the validation process. This testing used to find the bugs/bottlenecks of the system and fix the defects. When use dynamic testing developer has to prepare test cases which are used to test codes.

This methods can be performed at all levels of the implementation and which can be white box testing or black box testing.

White Box Testing

White box testing is commonly used for validation. The testers who are testing application using white box testing, who should able to understanding programming language. Because of test cases define by using code. White box testing would be called as glass box testing.

Black Box Testing

In this technique, test cases would be define based on system specification program. This testing can be done by non-technical person such as system users, top management, and administrator. Because of tester do not need about knowledge of programming language. Tester can check the output against input. If the output not achieve the expected result, that would be a bug.

5.2.6 Testing Techniques

5.2.6.1 Unit Testing

Under this testing method, developer has to prepare test cases for individual units or module. After that by using those test cases developer would be test units or modules. That would be happen in coding phase.

5.2.6.2 Integration Testing

The purpose of the integration testing is to determine modules of the solution are working as expected once the developers are integrated.

5.2.6.3 System Testing

System testing is used to check whether whole system meets the requirement specification document which was prepared based on customer expectation.

5.2.6.4 Stress Testing

This testing method used to determine the stability of a system. Also that would be confirmed system does not crash. Apart from that which is confirmed hardware components are compatible to run the solution.

5.2.6.5 Security Testing

This process can be used to test the security mechanism and of an application that protect data and functionality. The security testing would be check confidentiality, integrity, authentication and authorization.

5.2.6.6 Regression testing

This testing method ensure that changes do not have such as uncover bugs or regressions, patches or configurations etc...

5.2.6.7 Acceptance testing

The purpose of the acceptance test is to show to the customer that the software does working with achieving customer's expected requirement.

5.2.6.8 Alpha Testing

Alpha testing would be done by small number of selected customer who are wishing to do that. Once the errors or defects found by those customer who would be reported to the development team and development team will fix those issues. That would be first real use of the solution.

5.2.6.9 Beta Testing

After completing alpha testing and fixing bugs and make changes of the solution, new version will be released to large audience. If any bugs of application are reported by the customers, those are fixed by the development team. After that, general solution would be released.

5.2.7. Testing Plan and Test Cases

A test plan contains testing strategies, testing objectives, test cases and test schedules. Test plan documentation formats can be varied product to product or organization to organization which it apply.

A test plan contains the functionalities which need to test, testing procedures, test data and expected result.

5.2.8. Test cases

Common Functionality for all Users				
Test Case ID	Functionality	Procedure	Expected Output	Priority
1.	Invalid login	Enter user name & password	Display error message	High
2.	Valid login	Enter user name & password	Login Form will closed and Main form will loaded	High
3.	Change Password Incorrectly	Enter Password & Re-type password	Display error message	High
4.	Change password Correctly	Enter Password & Re-type password	Display confirmation message	High
5.	View Menu available	Enable for all users without checking user credentials	Display Menu form	High

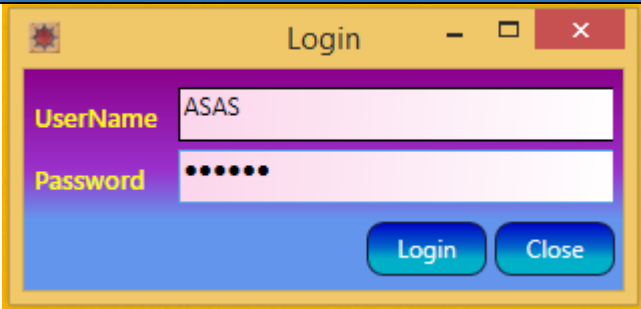
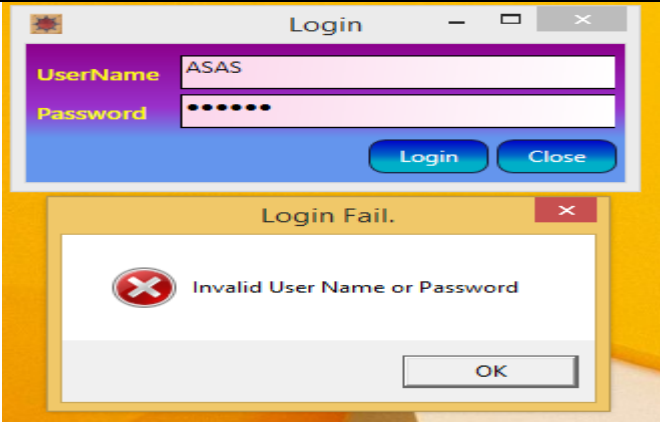
More test cases of this system can find on Appendix G.

5.2.9. Test data and test results

Considering the data captured from sample documents which were grabbed during the analysis stage, can create needed test data to run tests.

For every test case, have to choose test data based on specific requirements for check the accuracy/correctness of the software and to check whether the software is able to validate and produce error messages when validate goes wrong.

Following table shows the set of collected data, expected out come and actual outcome from the software components.

Test Case ID	01		
Tested Component	Login Form		
Module Name	Login Module		
Test Case	Invalid Login		
Expected Output	Display Error message		
Test Case Description			
No	Test Data	Actual Output	Status
1	User Name And Password field		pass
2.	Required field empty message		Pass

More test data and test result of this system can find on Appendix H.

5.3. User Evaluation – Introduction

Acceptance testing of the software will be done in the evaluation process. Mainly in the evaluation process concentrate on usability, sustainability and maintainability of the software.

Evaluation takes a huge part in learning software, and it can provide a well meaningful, useful information on the outcome of the software. And also it helps to determine the working abilities of people who undertook the analysis and development processes.

Usability

Good technical writing, like good interaction design, focuses on user's goals. The first step in creating a usable product is understanding those goals in the context of the user's environment, task or work flow, and letting these needs inform the design. [51]

User Centered Design helps to develop software's which are rich in usability. Because of this developers should and can runs acceptance tests on early stages. It will guide to accomplish interaction design and user satisfaction.

5.3.1. Evaluating Methods

- **User-base**
Testing software with sample of the intended users performing a set of tasks. Goal of this is to examine software supports the intended users in their work.
- **Expert-base**
Usability expert makes an assessment of software
- **Model-base**
Expert uses formal methods to predict one or more criteria of user performance

5.3.3. Evaluating Software

Evaluating software with sample of users performing tasks is considered to yield the most reliable and valid estimate of a software usability. Questionnaire used to evaluate the software is attached in Appendix K.

Purpose of questionnaire is to collect information from users regarding their understanding with the developed software. In the questionnaire there are 10 properties of system were evaluated. Evaluators were people who were going to use Mobile Integrated stock and Restaurant Management System. That group included Managing Director, 2 top management, one associate software engineer, 2 quality assurance engineer, one account clerk's, 5 staff members and 10 waiters.

5.3.4. Results of user evaluation

Regarding the evaluation results of the application, following factors are satisfied by users. Those factors are interface and graphical view expectation, color scheme, notifications facility of the system, minimum errors and improved trouble shooting capabilities, information about the system. Also users appreciated Security of the system because of there are separate module to manage user privileges of the system.

But users are not satisfy about response time of the application. This system has developed WPF technology and entity framework. Those technologies are consumed large memory space on random access memory of the computers. Therefore some processes will be modified in future.

Final result of this evaluation, users are like to recommend this software to other companies.

Full questionnaire analysis on Appendix L

6. CHAPTER SIX
Conclusion & Future Work

6.1. Conclusion

6.1.1. Purpose of Project

There were four major aims of implementing Mobile Integrated Restaurant Management System,

- Automate manual business process with undertaking requirement.
- Avoid issues in manual system.
- Increase the efficiency of the waiters and provide better and fast service to the customer.
- Provide different kind of reports which are necessary for the management.

At this movement solution have been implemented without any changes. But go through the system, there will be some new changes. If that kind of changes happened those would be classified by using Rational Unified Process.

6.1.2. Challenges

At the beginning of this implementation, different kind of difficulties have been faced. When gathering requirements, had to spend more time because of difficulties of contact management of the hotel. Also when interviewing users of the hotel have to have to explain many things about automated system because some of them didn't have clear idea about the system.

When discussing system with high level prototype of the system, management and users had ask many kind of changes. Some of the changes were implemented and some of them are refused because of those changes are not possible to implement in the application. After that user interfaces were designed to satisfy users' requirements.

After implementing solution in the hotel so many issues were faced. Because of requirement changes and user training. Especially in the report module, management ask to change content of reports, design new report templates etc... After discussing with management decisions were made to make changes in the future.

When accessing application via smart phone there were some issues because of weakness of the Wi-Fi router. So strength of the Wi-Fi had to increase with installing suitable devices. Those changes were made by hotel management as per the requirement.

6.1.3. Lessons Learned

While developing this project, following factors are improved,

- Gain good experience in analyzing and design based on customer exact requirement.
- Gain good experience in how working with customer
- Gain knowledge about principles of stock management, billing management and restaurant management
- Gain new experienced about developing and hosting windows service for mobile application
- Gain knowledge about Java and XML
- Improve knowledge of mobile application development in Eclipse
- Learn about how Configuring windows service and mobile application

- Learn about features of different kind of devices such as barcode reader, barcode printers, and smart phones Wi-Fi routers etc...

6.2.4. Future Works

After implement this applications on the Asiri restaurant, some changes are identified. Because of users are requesting to improve system to minimize them day to day manual works. Basically the management of the restaurant are requested to re-design mobile application because initial requirement of the mobile application were changed while developing this application. Following features should implement on mobile application:

- Table merge facility while placing order
- Order closing facility via android application
- Raise invoice against KOT and BOT orders

Apart from that following changes also implemented on the system:

- Fine-tune the developed module of windows application and android application with improving speed of the application.
- Update the windows service to improve functionality of mobile application.
- Improve report module.
- Implement new reports which are requested by management as modifications.
- Improve notification module and implement new notifications.
- Improve validation methods to increase user friendliness of the application.

REFERENCES

- [1] KCS Restaurant Management System, EffiaSoft Pvt Ltd, Madinaguda, Hyderabad, Telangana, India. [Online]. Available: <https://justbilling.in/>
- [2] Restaurant manager, ASI Technology, Washington, D.C. [Online]. Available: <http://www.rmpos.com/company/>
- [3] True Restaurant, Truelogics Infotech Pvt. Ltd, Jaipur, India. [Online]. Available: <http://www.truelogics.net/>
- [4] "Requirements Management," December 2006. [Online]. Available: https://en.wikipedia.org/wiki/Requirements_management
- [5] "Rational Unified Process," Wikipedia, [Online]. Available: https://en.wikipedia.org/wiki/Rational_Unified_Process
- [6] "Visual Studio 2010" [Online]. Available: [https://msdn.microsoft.com/en-us/library/dd831853\(v=vs.100\).aspx](https://msdn.microsoft.com/en-us/library/dd831853(v=vs.100).aspx)
- [7] "Android Studio", [Online]. Available: <http://developer.android.com/sdk/index.html>
- [8] "Introduction to WPF", [Online]. Available: [https://msdn.microsoft.com/en-us/library/aa970268\(v=vs.100\).aspx](https://msdn.microsoft.com/en-us/library/aa970268(v=vs.100).aspx)
- [9] "What Is Windows Communication Foundation", [Online] Available: <https://msdn.microsoft.com/en-us/library/ms731082%28v=vs.110%29.aspx>
- [10] "Introduction to Entity Framework", Updated: October 23, 2016, [Online] Available: <https://msdn.microsoft.com/en-us/data/ef.aspx>
- [11] "Android", 2014, [Online] Available: <https://www.android.com/>
- [12] "Introduction to the C# Language and the .NET Framework", Updated: July 20, 2015, [Online] Available: <https://msdn.microsoft.com/en-us/library/z1zx9t92.aspx>
- [13] "Oracle and Java" [Online] Available: <https://www.oracle.com/java/index.html>
- [14] "Creating Client Report Definition (.rdlc) Files" [Online] Available: <https://msdn.microsoft.com/en-us/library/ms252067.aspx>
- [15] "What is XAML?" [Online] Available: <https://msdn.microsoft.com/en-us/library/cc295302.aspx>
- [16] "XML Tutorial" W3Schools.com, [Online] Available: <https://www.w3schools.com/xml/>
- [17] "Microsoft SQL Server 2008 R2 SP2 - Express Edition", Microsoft.com, [Online] Available: <https://www.microsoft.com/en-us/download/details.aspx?id=30438>
- [18] "Windows Server 2008", wikipedia.com, [Online] Available: https://en.wikipedia.org/wiki/Windows_Server_2008
- [19] "SAP Crystal Report", [Online] Available: <http://www.crystalreports.com/>
- [20] "SAP Crystal Report Viewer", [Online] Available: <https://www.sap.com/product/analytics/bi-platform/crystal-reports-viewer.html>
- [21] "Adding and Configuring the ReportViewer Controls", [Online] Available: <https://msdn.microsoft.com/library/ms252104%28v=vs.100%29.aspx>
- [22] "What is database? - Definition," WhatIs.com, [Online]. Available: <http://searchsqlserver.techtarget.com/definition/database>
- [23] "Software Testing," Wikipedia, [Online]. Available: https://en.wikipedia.org/wiki/Software_testing
- [24] "What is software testing," [Online]. Available: <http://istqbexamcertification.com/what-is-a-software-testing>

- [25]J. Pan, "Software testing is any activity aimed at evaluating an attribute or capability of a program or system and determining that it meets its required results.," [Online]. Available: http://users.ece.cmu.edu/~koopman/des_s99/sw_testing/
- [26]R. Zafar, "Software Testing is the process of evaluation," [Online]. Available: <http://www.codeproject.com/Tips/351122/What-is-software-testing-What-are-the-different-ty>
- [27]"Static Vs Dynamic Testing," [Online]. Available: <http://www.guru99.com/static-dynamic-testing.html>
- [28]"Alpha vs. Beta Testing," [Online]. Available: <http://www.centercode.com/blog/2011/01/alpha-vs-beta-testing/>
- [29]"Software Evaluation Guide," 11 November 2004. [Online]. Available: <http://www.software.ac.uk/software-evaluation-guide>
- [30]"Software Evaluation," [Online]. Available: <https://itaccessibility.illinois.edu/software-evaluation>
- [31]"Project Evaluation," [Online]. Available: http://www.planning.wa.gov.au/dop_pub_pdf/5_Project_Evaluation.pdf

APPENDIX

A. Appendix - Use case narratives

a. Use case narrative for manage employee details

Use Case ID	02		
Use Case Name	Manage employee details		
Created By	M.D.C.E.S Jayarathna	Last Updated By	M.D.C.E.S Jayarathna
Created Date	10-09-2016	Last Revision Date	10-09-2016
Actors	System Administrator, Top Management		
Description	manage employee details inside the system		
Precondition	Local network should be available. System Should be working without crashes.		
Post conditions	Create/ Modify/Delete employee profile successfully		
Main Scenario	<ol style="list-style-type: none"> 1. Login to the restaurant management system. 2. Add/ Modify/ Delete employee profile as usual. 3. If add or modify employee, system would be validate relevant fields before save the changes. 4. After clicking 'Save' button employee profile would be save in the system and confirmation message would be shown. 5. If user going to delete employee profile, check whether selected employee used in other forms inside the System. 6. If selected employee does not used in other transaction employee profile would be deleted. 		
Alternative Scenario	<ol style="list-style-type: none"> 1. Save fail. <ol style="list-style-type: none"> a. If user entered invalid data to the fields or ignore the mandatory fields validation error notifications would be shown on corresponding fields. 2. Delete Fail <ol style="list-style-type: none"> a. If user trying to delete employee who used in other transaction delete fail message would be shown. 		

b. Use case narrative for user privilege management

Use Case ID	03		
Use Case Name	User Privilege Management		
Created By	M.D.C.E.S Jayarathna	Last Updated By	M.D.C.E.S Jayarathna
Created Date	10-09-2016	Last Revision Date	10-09-2016
Actors	System Administrator		
Description	manage user privileges inside the system		
Precondition	Local network should be available. System Should be working without crashes. Employee profile should be already exist and active.		
Post conditions	Grant/ Deny privileges for users		
Main Scenario	<ol style="list-style-type: none"> 1. Login to the restaurant management system. 2. Searching selected employee has the user profile by using employee ID. 3. If not system would be facilitate to create new user profile to the selected employee and system would be validate relevant fields before save the changes. 4. If employee has user profile, system would be facilitate to modify/ delete user profile. 5. After creating/Modifying user profile successfully, administrator can assign accessible functionality for the user profile. 6. After clicking 'Save' button employee profile would be save in the system and confirmation message would be shown. 		
Alternative Scenario	<ol style="list-style-type: none"> 1. Save fail. <ol style="list-style-type: none"> a. If user entered invalid data to the fields or ignore the mandatory fields validation error notifications would be shown on corresponding fields. 		

c. Use case narrative for Add Good Received Note (GRN)

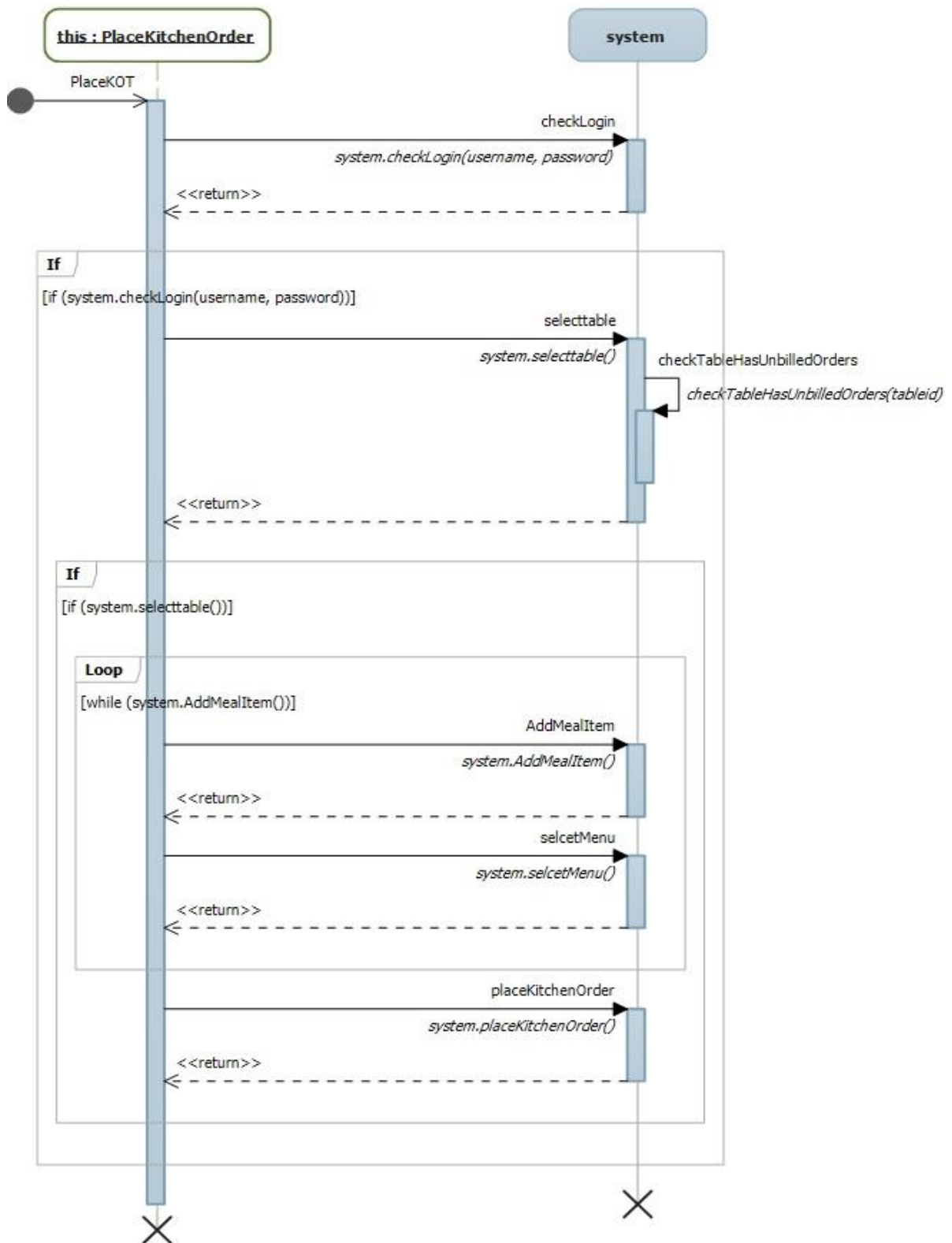
Use Case ID	04		
Use Case Name	Add Good Received Note		
Created By	M.D.C.E.S Jayarathna	Last Updated By	M.D.C.E.S Jayarathna
Created Date	10-09-2016	Last Revision Date	10-09-2016
Actors	Stores		
Description	Add GRN and update the stock regarding the GRN.		
Precondition	Local network should be available. System Should be working without crashes. Supplier profile should be defined on the system. Item profile should be defined on the system.		
Post conditions	Add item quantity to the stock		
Main Scenario	<ol style="list-style-type: none"> 1. Login to the restaurant management system. 2. Searching supplier profile exist in the system. 3. Searching item profile exist in the system. 4. Checking GRN quantity is greater than minimum supply quantity of the item. 5. Checking expiry date. 6. If those fields are valid user can be saved the GRN. 7. Also stock quantity would be updated simultaneously. 		
Alternative Scenario	<ol style="list-style-type: none"> 2. Save fail. b. If user entered invalid data to the fields or ignore the mandatory fields validation error notifications would be shown on corresponding fields. 		

d. Use case narrative for Place Kitchen Order Transaction

Use Case ID	05		
Use Case Name	Place Kitchen Order Transaction		
Created By	M.D.C.E.S Jayarathna	Last Updated By	M.D.C.E.S Jayarathna
Created Date	10-09-2016	Last Revision Date	10-09-2016
Actors	General user, waiter		
Description	Place Kitchen Order Transaction		
Precondition	Local network should be available. System Should be working without crashes.		
Post conditions	Update kitchen order queue		
Main Scenario	<ol style="list-style-type: none"> 1. Login to the restaurant management system. 2. Select menu 3. Check selected meal available 4. Select order type such as take away or set table. 5. If not 'take away' order. Select the table. 6. Place an order with no of quantity of selected menu. 7. When save the record, order receipt would be printed on kitchen. 		
Alternative Scenario	<ol style="list-style-type: none"> 1. Save fail. <ol style="list-style-type: none"> a. If user entered invalid data to the fields or ignore the mandatory fields validation error notifications would be shown on corresponding fields. 		

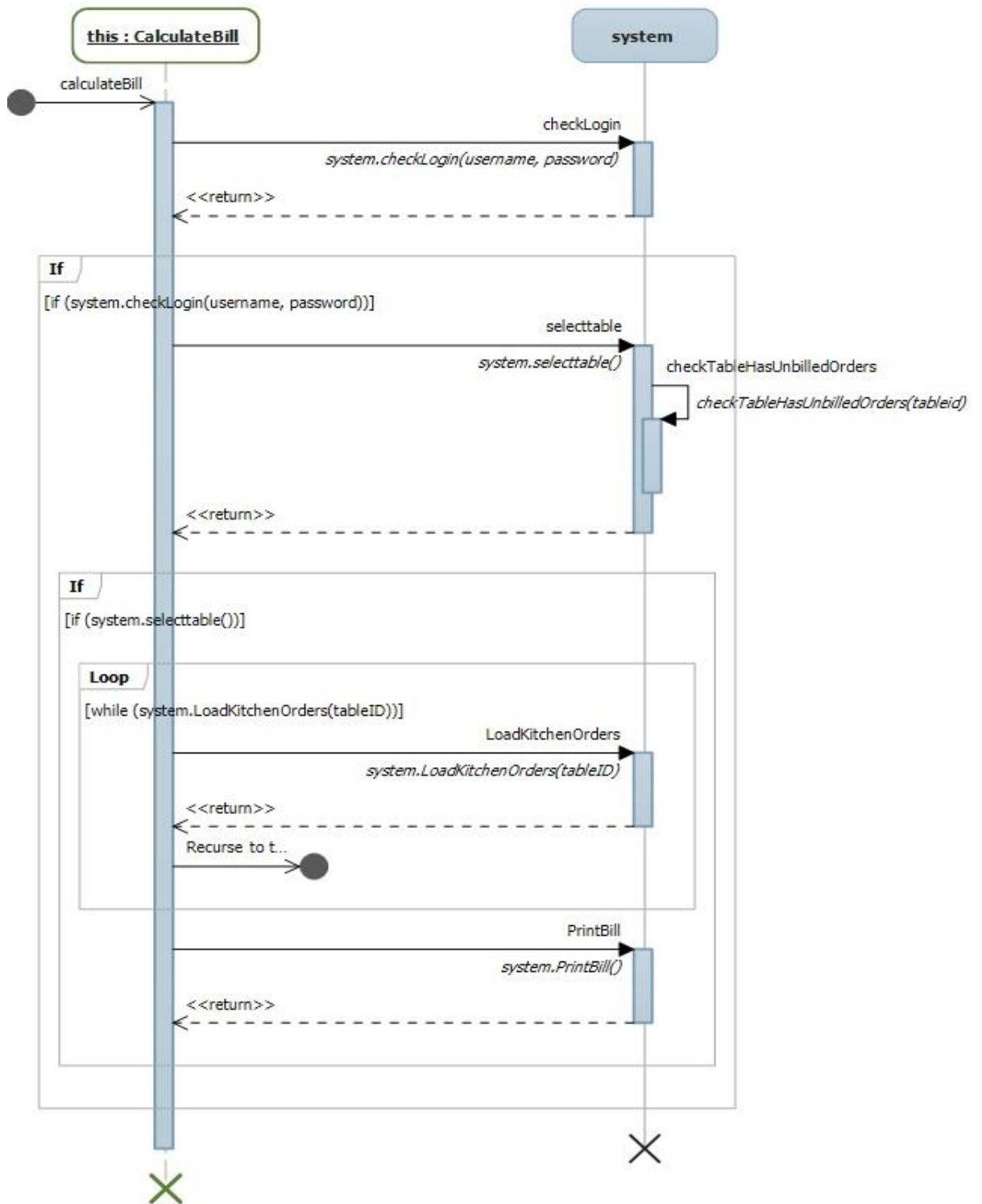
B. Appendix - Sequence Diagram

a. Sequence diagram for place an order



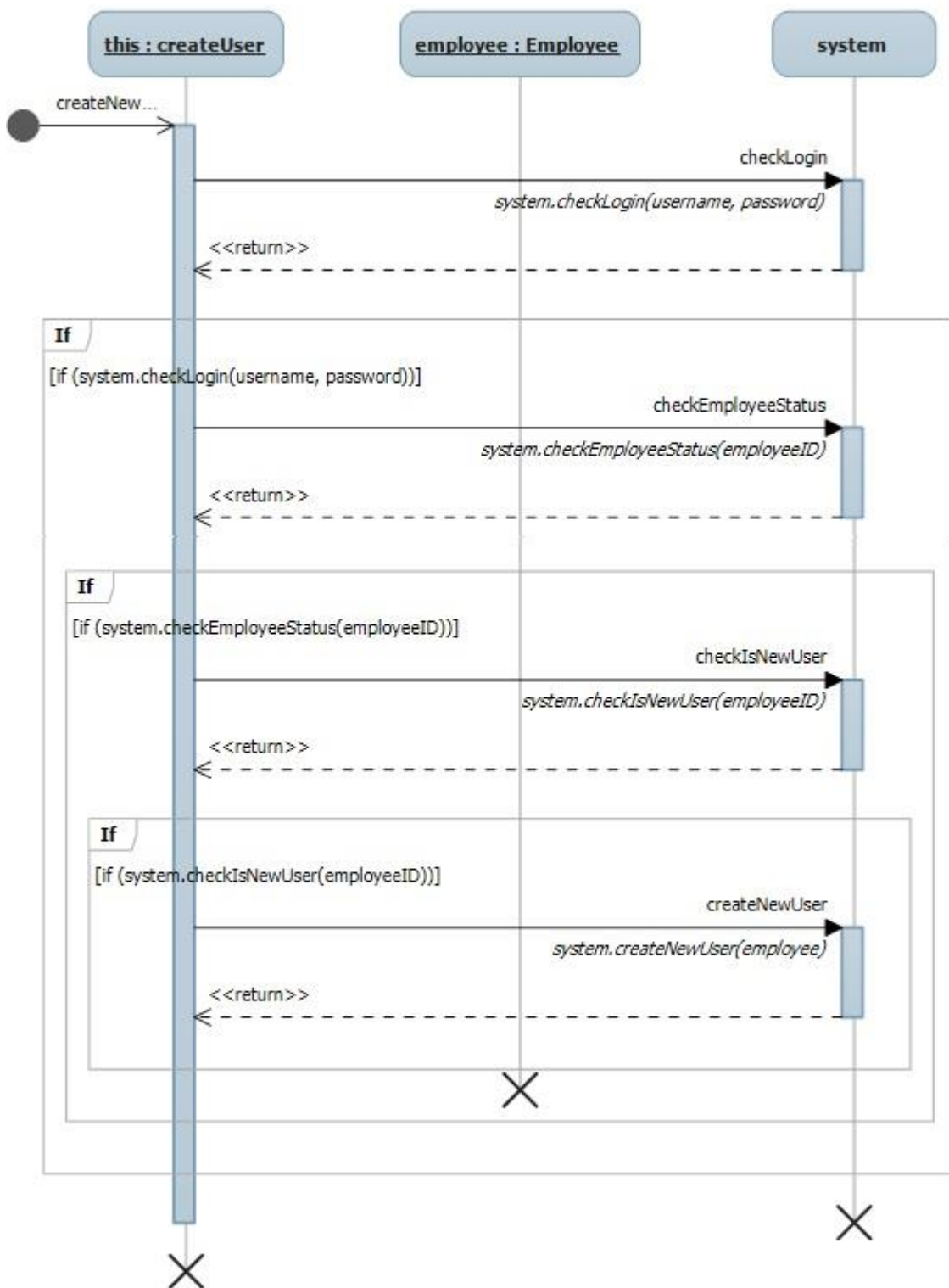
This diagram describe all methods and conditions which are used for place an order in the application. Login, table availability, selecting menu, add meal and place the kitchen order are the methods of this transaction.

b. Sequence diagram for calculate the bill



This diagram describe all methods and conditions which are used for calculate bill in the application. Login, select the table, load all kitchen orders, and calculate bill and print receipt are the methods of this transaction.

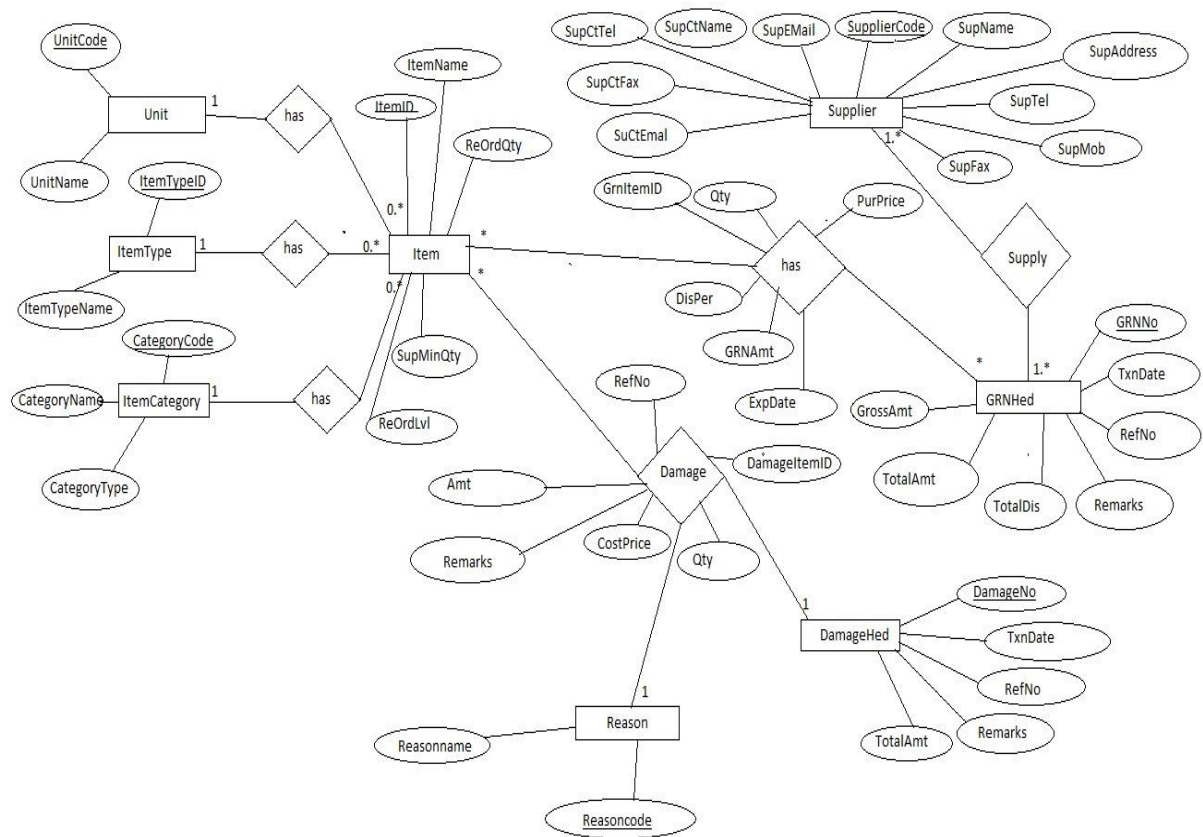
c. Sequence diagram for create new user



This diagram describe all methods and conditions which are used for create new user in the application. Login, check employee status, check considered employee is new user, and after satisfying all the conditions create the new user at the application.

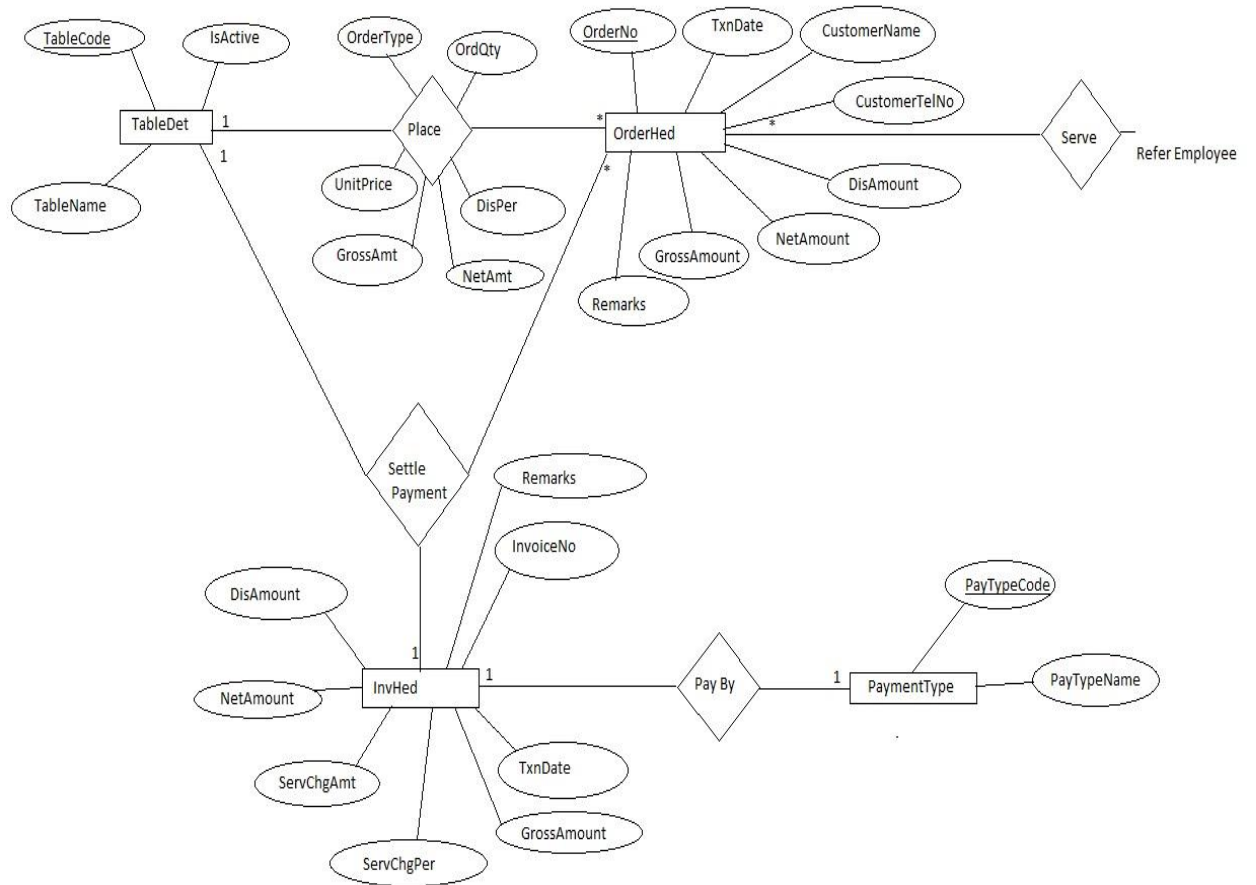
C. Appendix - ER Diagram

a. ER diagram for place an Good Received Note and Damage Entry



This ER diagram is used to design tables of Good Received Note and Damage Entry transaction. The entities of this diagram are implemented as a tables.

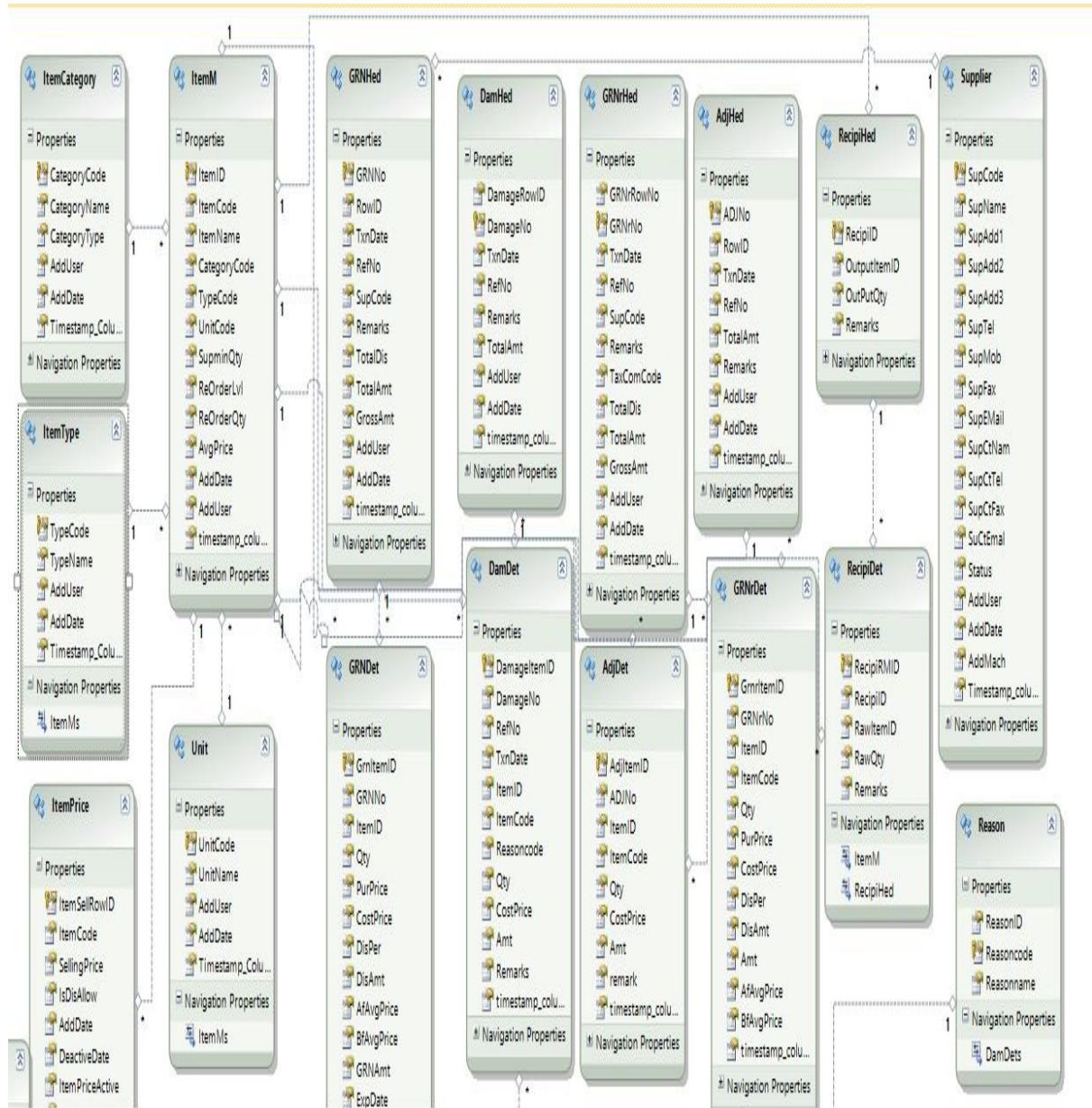
b. ER diagram for Place order and billing



This ER diagram is used to design tables of Place an orders of kitchen and bar and billing transaction. The entities of this diagram are implemented as a tables.

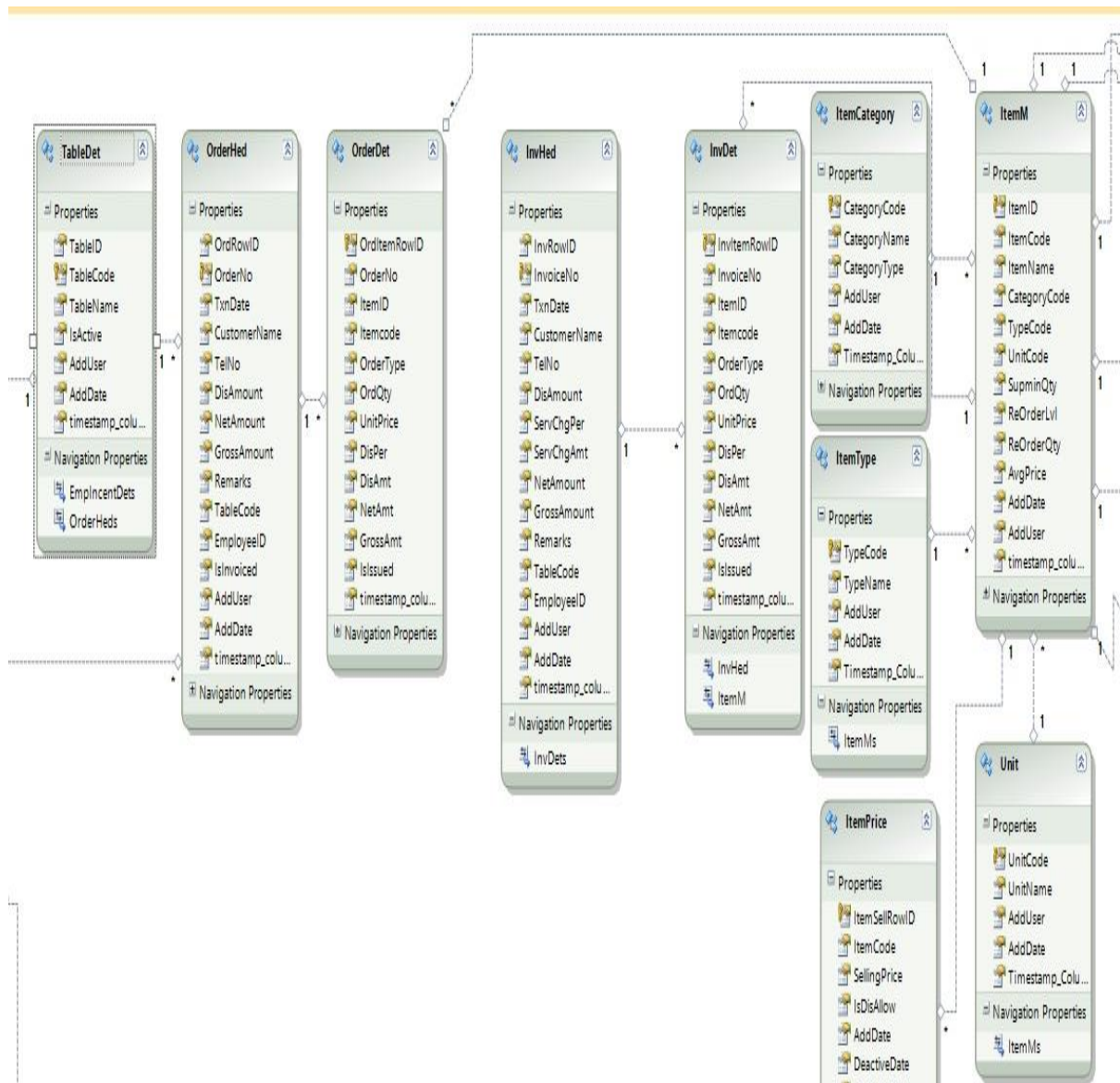
D. Appendix - Database Diagram

a. Database diagram for Stock Module



These tables are related with stock module. Which are used to keep data of Good Received Note, Damage Entry, Good Return Note, Price Management recipe management etc...

b. Database diagram for Sales Module



These tables are related with sales module. Which are used to keep data of Kitchen order, bar order, invoice and commission calculation of the sales module.

E. Appendix – User Interfaces

a. Supplier Profile

The screenshot shows a software window titled "Supplier" with a close button (X) in the top right corner. Below the title bar is a toolbar with buttons for "Add", "Edit", "Clear", "Delete", "Top", "Next", "Previous", "Bottom", and "Save". The main area contains a form with two columns of input fields. The left column includes: "Supplier Code", "Supplier Name", "Address Line1", "Address Line2", "Address Line3", "Tel No", and "Mobile". The right column includes: "Sup Address Fax", "Email", "Contact Person", "Contact Person's Tel No", "Contact Person's Fax", "Contact Person's Email", and "Active Status" with a checkbox labeled "Active".

b. Item Profile

The screenshot shows a software window titled "Item Master" with a close button (X) in the top right corner. Below the title bar is a toolbar with buttons for "Add", "Edit", "Clear", "Delete", "Top", "Next", "Previous", "Bottom", and "Save". The main area contains a form with a single column of input fields: "Item Code", "Item Name", "Category Code", "Type Code", "Unit Code", "Minimum Purchase Quantity", "Re-order Level", and "Re-order quantity". At the bottom of the form, there are three checkboxes: "Sales Item", "Kitchen Item", and "Bar Item".

c. Good Received Note

Good Receive Note X

GRN No	<input type="text"/>	Transaction Date	<input type="text" value="15"/>
Supplier Code	<input type="text"/>	Entry Date	<input type="text"/>
Remarks	<input type="text"/>	Ref No	<input type="text"/>
		Added User	<input type="text"/>
<input type="checkbox"/> Approved			

Total Discount Amount	<input type="text"/>	Total Amount	<input type="text"/>	Gross Amount	<input type="text"/>
-----------------------	----------------------	--------------	----------------------	--------------	----------------------

Item Code	Expire Date	Quantity	Unit Price	Discount (%)	Discount Amount	Cost Price	Net Amount	Gross Amount	Remarks

d. Good Return Note

Good Return Form X

GRN Return No	<input type="text"/>	Transaction Date	<input type="text" value="15"/>
GRN No	<input type="text"/>	Entry Date	<input type="text"/>
Supplier Code	<input type="text"/>	Ref No	<input type="text"/>
Remarks	<input type="text"/>	Added User	<input type="text"/>
<input type="checkbox"/> Approved			

Total Discount Amount	<input type="text"/>	Total Amount	<input type="text"/>	Gross Amount	<input type="text"/>
-----------------------	----------------------	--------------	----------------------	--------------	----------------------

Item Code	Quantity	Unit Price	Discount (%)	Discount Amount	Cost Price	Gross Amount	Net Amount	Reason	Remarks

e. Adjustment Addition

The screenshot shows a software window titled "Stock Adjustment Form" with a close button (X) in the top right corner. Below the title bar is a toolbar with buttons: Add, Edit, Clear, Delete, Top, Next, Previous, Bottom, Print, Save, and Approve. The main form area is divided into several sections:

- Form Fields:** Adjustment No, Ref No, Remarks, Transaction Date (with a calendar icon), Entry Date, and Added User.
- Approval:** A checkbox labeled "Approved".
- Total Amount:** A text input field.
- Item Management:** Buttons for "Add Item" and "Remove Item".
- Table:** A table with columns: Item Code, Quantity, Unit Price, Net Amount, and Remarks.

f. Damage Entry

The screenshot shows a software window titled "Damage Form" with a close button (X) in the top right corner. Below the title bar is a toolbar with buttons: Add, Edit, Clear, Delete, Top, Next, Previous, Bottom, Print, Save, and Approve. The main form area is divided into several sections:

- Form Fields:** Damage No, Ref No, Remarks, Transaction Date, and Add User.
- Approval:** A checkbox labeled "Is Approved".
- Total Amount:** A text input field.
- Item Management:** Buttons for "Add Item" and "Remove Item".
- Table:** A table with columns: Item Code, Reason, Quantity, Unit Price, Net Amount, and Remarks.

g. Recipe Management

Recipe Form [X]

Output Item
Output Quantity
Remarks
 Approved

Row	Item Cod	Item Name	Quantity	Remarks

h. Kitchen Order Form

Kitchen Order Form [X]

KOT No **Transaction Date**
Delivery Type Take Away On Table **Customer Name**
Table **Customer Tel No**
Waiter Issed
Remarks **Add User**
 Invoiced

Total Discount **Total Amount** **Gross Amount**

Item Code	Quantity	Unit Price	Discount (%)	Discount Amount	Net Amount	Gross Amount	Is Issued

i. Invoice Form

Kitchen Order Form X

Invoice No	<input type="text"/>	Transaction Date	<input type="text"/>
Delivery Type	<input type="radio"/> Take Away <input type="radio"/> On Table	Customer Name	<input type="text"/>
KOT No	<input type="text"/>	Customer Tel No	<input type="text"/>
Table	<input type="text"/>	Remarks	<input style="width: 100%; height: 100%;" type="text"/>
Waiter	<input type="text"/>		
Add User	<input type="text"/>		

Total Discount	<input type="text"/>	Service Charges (%)	<input type="text"/>	Service Charges Amount	<input type="text"/>
Total Amount	<input type="text" value="0.00"/>	Gross Amount	<input type="text"/>		
Payment Type	<input type="text"/>	Bank	<input type="text"/>	Card No	<input type="text"/>

Item Code	Quantity	Unit Price	Discount (%)	Discount Amount	Net Amount	Gross Amount

j. Incentive Monitoring Form

Incentive Monitoring Form X

Selected Employee Only

 From Date
 To Date

Paid
 Un-Paid

Last Name	Initials	Invoice No	Table Code	Incentive Amount	Invoice Date	Paid Status

F. Appendix – User Interfaces

a. Validation class of ItemType

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.ComponentModel;
using SRMS.Classes;

namespace SRMS.DataModel
{
    partial class ItemType:IDataErrorInfo
    {
        #region Variables
        Dictionary<string, string> ValidationErrors = new Dictionary<string, string>();
        string EntityStat = "";
        #endregion

        partial void OnTypeCodeChanging(string value)
        {
            EntityStat = this.EntityState.ToString();
            if (EntityStat == "Added" || EntityStat == "Modified")
            {
                this.ReportPropertyChanging("TypeCode");
                CheckTypeCode(value);
            }
        }

        private void CheckTypeCode(string value)
        {
            int lt = 20;
            if (string.IsNullOrEmpty(value))
            {
                this.AddErrors("TypeCode", "Please enter item type code");
            }
            else if (value.Length > lt)
            {
                this.AddErrors("TypeCode", "Length exceeded. Max length is 20.");
            }
            else if (ClsReferenceValidation.CheckItemTypeCode(value))
            {
                this.AddErrors("TypeCode", "Invalid item type code");
            }
            else
            {
                this.RemoveError("TypeCode");
            }
            this.ReportPropertyChanged("TypeCode");
        }

        partial void OnTypeNameChanging(string value)
        {
            EntityStat = this.EntityState.ToString();
            if (EntityStat == "Added" || EntityStat == "Modified")
            {
                this.ReportPropertyChanging("TypeName");
                CheckTypeName(value);
            }
        }
    }
}
```

```

private void CheckTypeName(string value)
{
    int lt = 100;
    if (string.IsNullOrEmpty(value))
    {
        this.AddErrors("TypeName", "Please enter type Name");
    }
    else if (value.Length > lt)
    {
        this.AddErrors("TypeName", "Length exceeded. Max length is 100.");
    }
    else
    {
        this.RemoveError("TypeName");
    }
    this.ReportPropertyChanged("TypeName");
}

public void validate()
{
    OnTypeCodeChanging(this.TypeCode);
    OnTypeNameChanging(this.TypeName);
}

#region Validation
private void AddErrors(string value, string message)
{
    if (!ValidationError.ContainsKey(value))
    {
        this.ValidationError.Add(value, message);
    }
}

private void RemoveError(string value)
{
    if (ValidationError.ContainsKey(value))
    {
        this.ValidationError.Remove(value);
    }
}

public string Error
{
    get
    {
        if (ValidationError.Count > 0)
        {
            return "Input data is invalid";
        }
        else
        {
            return null;
        }
    }
}

public virtual bool HasError
{
    get
    {
        if (ValidationError.Count > 0)
        {
            return true;
        }
    }
}

```

```

        }
        else
        {
            return false;
        }
    }
}

public string this[string columnName]
{
    //get { return null; }
    get
    {
        if (ValidationError.ContainsKey(columnName))
        {
            return ValidationError[columnName].ToString();
        }
        else
        {
            return null;
        }
    }
}

public override string ToString()
{
    StringBuilder Bulder = new StringBuilder(base.ToString());
    Bulder.Append("- ItemType: ");
    Bulder.Append(this.TypeCode);
    return base.ToString();
}
#endregion
}
}
}

```

b. XAML Code of Change Password Form

```
<UserControl x:Class="UnilakManuFact.Forms.AdminModule.ChangePwd"
    xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
    xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
    xmlns:mc="http://schemas.openxmlformats.org/markup-compatibility/2006"
    xmlns:d="http://schemas.microsoft.com/expression/blend/2008"
    xmlns:cls="clr-namespace:UnilakManuFact.Classes"
    xmlns:my="clr-namespace:UnilakManuFact.UserControls"
    mc:Ignorable="d"
    Background="{StaticResource UsCBackground}"
    d:DesignHeight="185" d:DesignWidth="300" Height="231" Width="396">

    <Border BorderBrush="{StaticResource MainBorderBrush}" Style="{StaticResource
FrmStyle}">
        <Grid >
            <Grid.RowDefinitions>
                <RowDefinition Height="Auto"/>
                <RowDefinition Height="Auto"/>
                <RowDefinition Height="Auto"/>
            </Grid.RowDefinitions>
            <Grid.ColumnDefinitions>
                <ColumnDefinition Width="Auto"/>
                <ColumnDefinition Width="Auto"/> <ColumnDefinition/>
            </Grid.ColumnDefinitions>
            <my:HeaderBar x:Name="headerbarcontrol" Grid.ColumnSpan="3"/>
            <Label Style="{StaticResource HeaderLable}" x:Name="tbChangePwd"
Content="Change Password"/>
            <Border Grid.Row="1" Grid.Column="0" Grid.ColumnSpan="3"
Style="{StaticResource GroupBorderStyle}" Margin="4">
                <StackPanel Orientation="Horizontal" Grid.ColumnSpan="3">
                    <Button Style="{StaticResource ButtonStyle}" x:Name="btn_Change"
Content="_Edit" Width="50" Click="btn_Change_Click" Margin="4"/>
                    <Button Style="{StaticResource ButtonStyle}" x:Name="btn_Save"
Content="_Save" Width="50" Click="btn_Save_Click"/>
                </StackPanel>
            </Border>
            <Border Grid.Row="2" Grid.RowSpan="4" Grid.Column="0"
Style="{StaticResource GroupBorderStyle}" Margin="4">
                <StackPanel Orientation="Vertical">
                    <Label Style="{StaticResource ComLable}" Margin="4,4,4,4"
Content="User Name " Height="27" HorizontalAlignment="Left"/>
                    <Label Style="{StaticResource ComLable}" Margin="0,4,4,4"
Content="Old Password " Height="27" HorizontalAlignment="Left"/>
                    <Label Style="{StaticResource ComLable}" Margin="0,4,4,4"
Content="New Password " Height="27" HorizontalAlignment="Left"/>
                    <Label Style="{StaticResource ComLable}" Margin="0,4,4,4"
Content="Confirm Password " Height="27" HorizontalAlignment="Left"/>
                </StackPanel>
            </Border>
            <Border Grid.Row="2" Grid.Column="1" Grid.ColumnSpan="3" Grid.RowSpan="4"
Style="{StaticResource GroupBorderStyle}" Margin="4">
                <StackPanel Orientation="Vertical" IsEnabled="False"
x:Name="stp_txtControls">
                    <TextBox x:Name="txt_userName" Margin="0,4,4,4" IsReadOnly="True"
Height="27"/>
                    <PasswordBox x:Name="txt_OldPwd" Margin="0,4,4,4" Height="27" />
                    <PasswordBox x:Name="txt_NewPwd" Margin="0,4,4,4" Height="27" />
                    <PasswordBox x:Name="txt_ConPwd" Margin="0,4,4,4" Height="27" />
                </StackPanel>
            </Border>
        </Grid>
    </Border>
</UserControl>
```

G. Appendix – Test Cases

a. Test case functionality for supplier registration

New Supplier Registration				
Test Case ID	Functionality	Procedure	Expected Output	Priority
1.	Register new Supplier	Click on Add Button	Fields of the form enable to enter the values	High
2.	Validate Supplier	Enter Supplier Details (Compulsory Details)	Error notifications would be shown.	High
3.	Valid Registration	Enter valid new supplier details and save	If Customer code exist display error message	High
4.	Update Existing Supplier profile	Validate entered supplier code	Display confirmation message	High
5.	Maintain valid contact details	Enter invalid contact details	Error notifications would be shown.	High
6.	Delete Existing Supplier	Check Supplier have been supply materials	Error message would be shown	High

b. Place a GRN

New GRN				
Test Case ID	Functionality	Procedure	Expected Output	Priority
7.	Place GRN	Click on Add Button	Fields of the form enable to enter the values	High
8.	Validate primary details of GRN such as Supplier, GRN No, and Ref No etc...	Enter invalid GRN primary details (Compulsory Details)	Error notifications would be shown.	High
9.	Validate GRN primary details such as Supplier, GRN No, and Ref No etc...	Enter valid GRN primary details (Compulsory Details)	Error notifications would be disappeared.	High
10.	Validate Purchased Item details	Enter invalid details about item, purchase quantity, purchase price, discount	Error notifications would be shown.	High
11.	Validate Purchased Item details	Enter valid details about item, purchase quantity, purchase price, discount	Error notifications would be disappeared.	High
12.	Save GRN	Validate all fields of the new entry.	Display confirmation message	High
13.	Find Existing GRN	Validate entered GRN code	Display details of GRN	High

c. Place an kitchen order

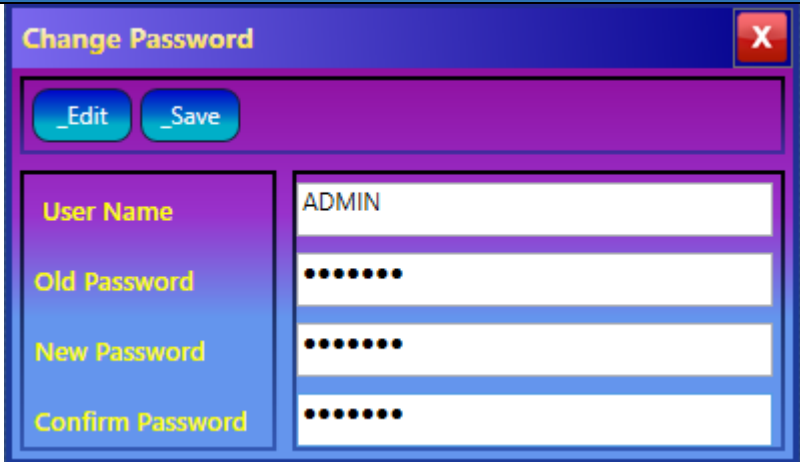
New Kitchen Order				
Test Case ID	Functionality	Procedure	Expected Output	Priority
14.	Place Kitchen Order	Click on Add Button	Fields of the form enable to enter the values	High
15.	Validate primary details of Kitchen Order such as table No, waiter no etc...	Enter invalid kitchen order Details (Compulsory Details)	Error notifications would be shown.	High
16.	Validate primary details of Kitchen Order such as table No, waiter no etc...	Enter valid kitchen order Details (Compulsory Details)	Error notifications would be disappeared.	High
17.	Select meal for the order	Enter meal code	If quantity is not available error notification would be disappeared.	High
18.	Validate order Item details.	Enter invalid details about menu, quantity	Error notifications would be shown.	High
19.	Validate order Item details.	Enter valid details about menu, quantity	Error notifications would be disappeared.	High
20.	Save kitchen Order	Validate all fields of the new entry.	Display confirmation message and print barcode in the kitchen.	High
21.	Find Existing kitchen Order	Validate entered kitchen Order code	Display details of kitchen Order	High

d. Place bar order

New Bar Order				
Test Case ID	Functionality	Procedure	Expected Output	Priority
22.	Place bar Order	Click on Add Button	Fields of the form enable to enter the values	High
23.	Validate primary details of bar Order such as table No, waiter no etc...	Enter invalid bar order Details (Compulsory Details)	Error notifications would be shown.	High
24.	Validate primary details of bar Order such as table No, waiter no etc...	Enter valid bar order Details (Compulsory Details)	Error notifications would be disappeared.	High
25.	Select beverages for the order	Enter beverages code	If quantity is not available error notification would be disappeared.	High
26.	Validate bar Item details.	Enter invalid details about menu, quantity	Error notifications would be shown.	High
27.	Validate bar Item details.	Enter valid details about menu, quantity	Error notifications would be disappeared.	High
28.	Save bar Order	Validate all fields of the new entry.	Display confirmation message and barcode would be printed on kitchen	High
29.	Find Existing bar Order	Validate entered bar Order code	Display details of bar Order	High

H. Appendix – Test Data and test results

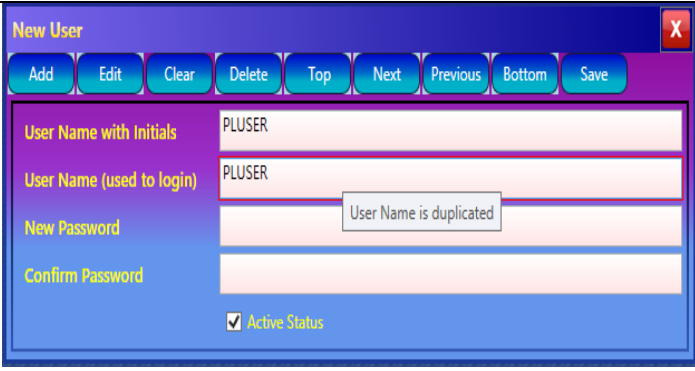

a. Change password

Test Case ID	02		
Tested Component	Change Password Form		
Module Name	User Management Module		
Test Case	Change password incorrectly		
Expected Output	Display confirmation message		
Test Case Description			
No	Test Data	Actual Output	Status
1	Old Password, new Password, Re-confirmed Password field		pass

2.	Save confirmation Message	 <p>The screenshot shows a 'Change Password' dialog box with fields for 'User Name' (ADMIN), 'Old Password', 'New Password', and 'Confirm Password'. Below it is a smaller dialog box with the message 'Password has changed successfully.' and an 'OK' button.</p>	Pass
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b. Create New User Profile

Test Case ID	03		
Tested Component	Create New User Profile		
Module Name	User Management Module		
Test Case	Check user profile is duplicated		
Expected Output	Display Error message		
Test Case Description			
No	Test Data	Actual Output	Status

1	Add employee name and user name		pass
2.	Record duplicate error message		Pass

b. Create New Employee Profile

Test Case ID	04		
Tested Component	Create New Employee Profile		
Module Name	User Management Module		
Test Case	Check all fields of employee form are validated		
Expected Output	Display Error message		
Test Case Description			
No	Test Data	Actual Output	Status

1	Add employee name and user name	 <p>The screenshot shows a web-based form titled "Employee" with a blue header and a purple sidebar. The form contains the following fields and controls:</p> <ul style="list-style-type: none">Employee ID: Text input with value "0".Title: Radio buttons for "Mr.", "Ms.", and "Mrs.". "Mr." is selected.Last Name: Text input. A tooltip message "Last Name cannot be empty." is visible over the field.Initials: Text input.Gender: Radio buttons for "Male" and "Female". "Male" is selected.Join Date: Date picker showing "12/29/2015".NIC No: Text input.Payment Type: Radio buttons for "Cash" and "Bank". "Cash" is selected.Permanent Address: Text input.Current Address: Text input.E-Mail: Text input.Contact No: Text input.Home No: Text input.Active Status: Check box labeled "Active", which is currently unchecked. <p>Navigation buttons at the top include "Add", "Edit", "Clear", "Delete", "Top", "Next", "Previous", "Bottom", and "Save".</p>	pass
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K. Appendix – Questionnaires

<u>Personal Details</u>	
Employee Name –	
Designation –	
Age (Year) –	<input type="checkbox"/> 18-25 <input type="checkbox"/> 26-30 <input type="checkbox"/> 31-40 <input type="checkbox"/> Above 40
Working Experience –	<input type="checkbox"/> 0 -1 Years <input type="checkbox"/> 1-3 Years <input type="checkbox"/> Over 5 years
Education Level –	<input type="checkbox"/> Pass Grade 10 <input type="checkbox"/> G.C.E O/L <input type="checkbox"/> G.C.E A/L <input type="checkbox"/> B.Sc. <input type="checkbox"/> M.Sc. <input type="checkbox"/> Other
1. Do you satisfied with the interface and graphical view of the system?	Yes No Partially
2. Do you satisfied with the color scheme of the system?	Yes No Partially
3. As user do u feel you have enough permission to access to the database?	Enough Not enough Should be more restricted
4. Do u satisfied with the responding speed of the system?	Satisfied Not satisfied Should be more speed
5. Do you feel trust about this application?	Yes No Some sort of
6. Do you satisfied the error and troubleshooting methods of the system?	Yes No Some sort of
7. How easy to understand the contents of the application?	

Very Good
Good
Bad
Very bad

8. What is your mobile os?

Android
IOS
Blackberry
Windows

9. Do you satisfied and informed about the application notifications in our product?

Yes
No

10. Would you recommend our software to others?

Yes
No

11. Any suggestions to improve this product?

.....

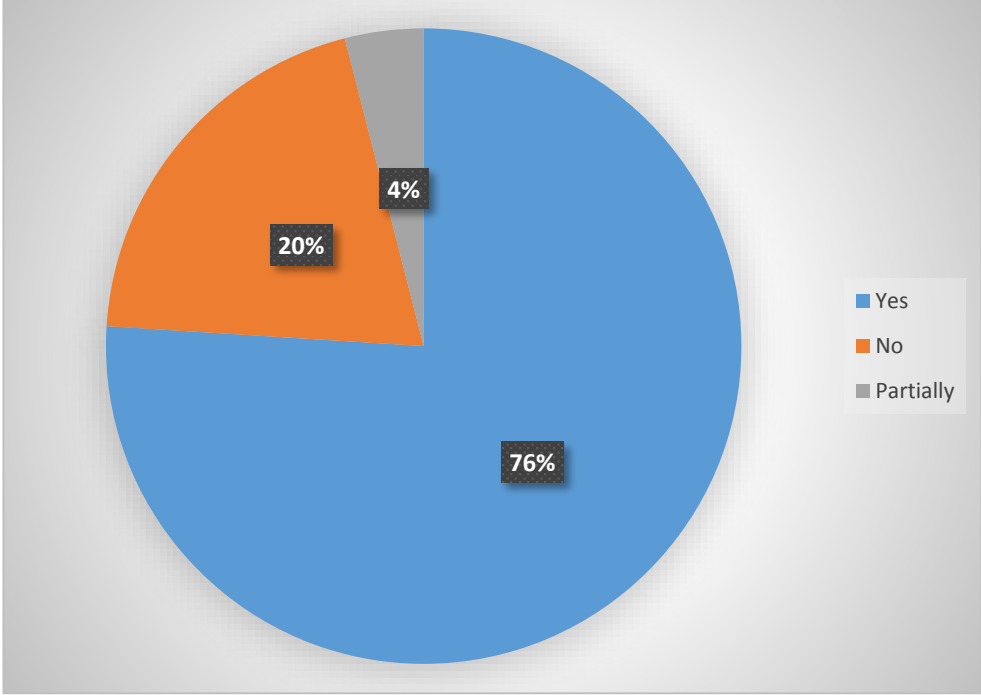
Date

.....

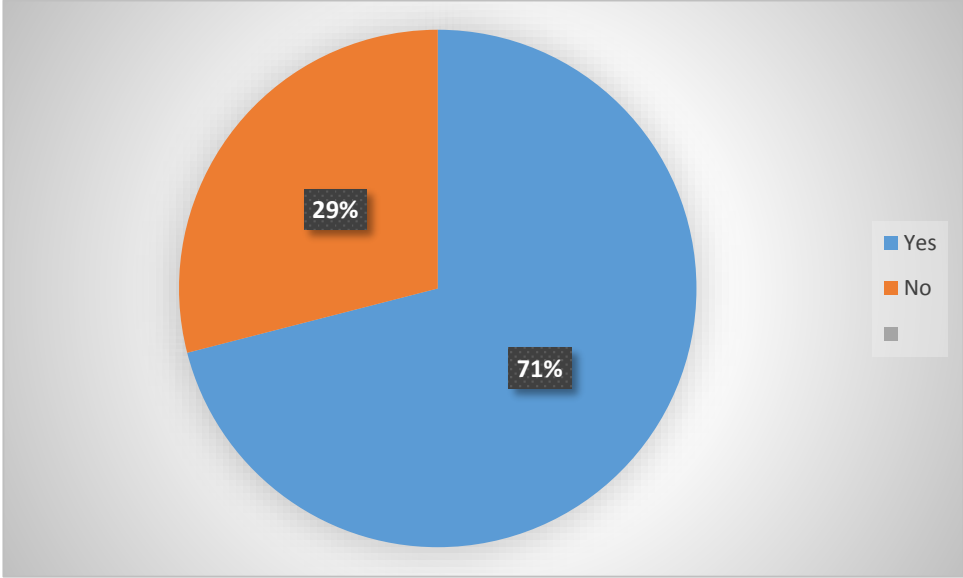
Signature

L. Questionnaire Analysis

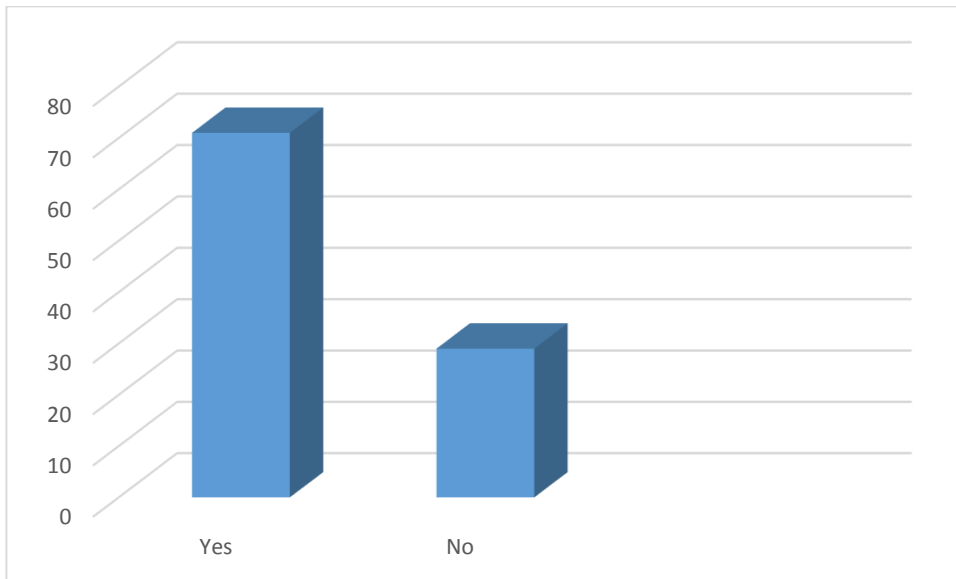
1. Do you satisfied with the interface and graphical view of the system?



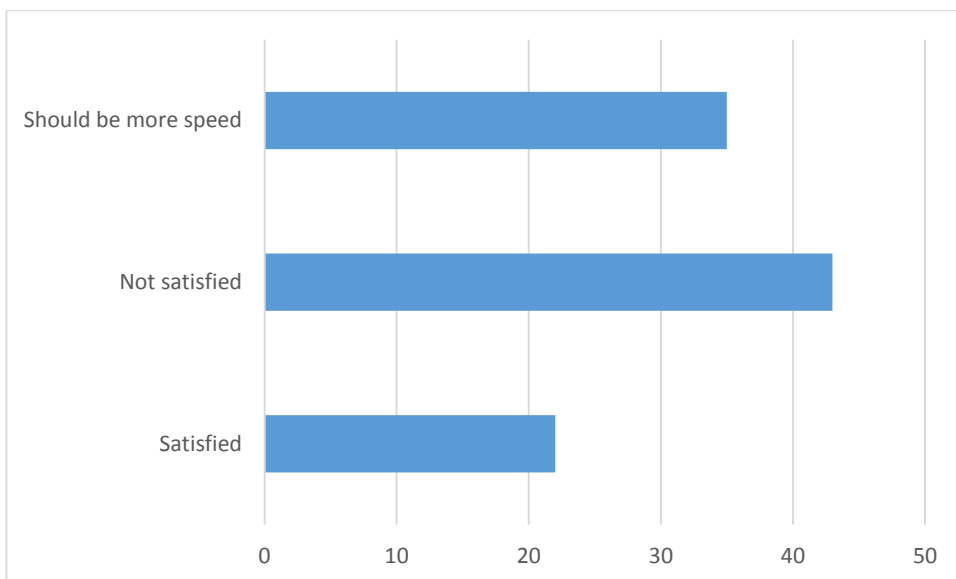
2. Do you satisfied with the color scheme of the system?



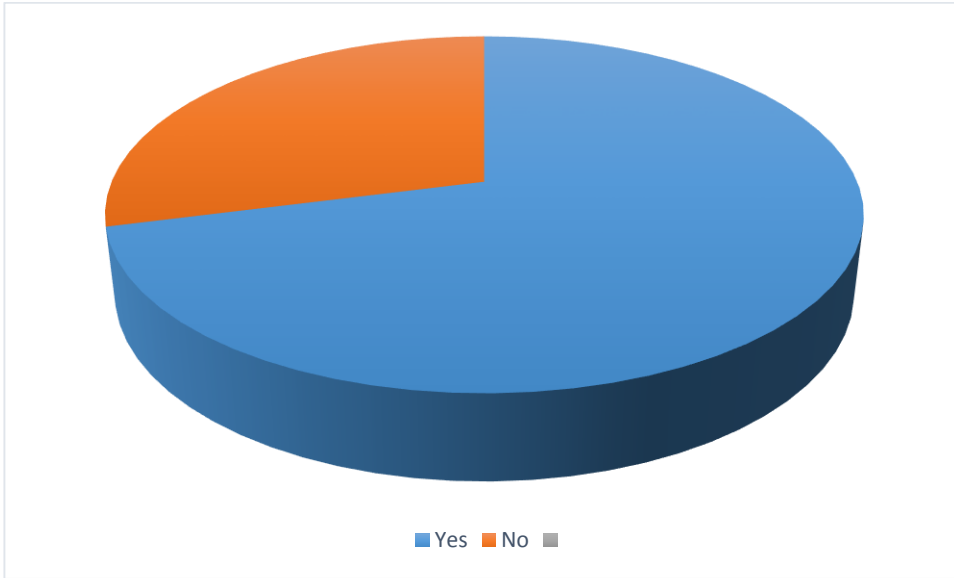
3. As user do u feel you have enough permission to access to the database?



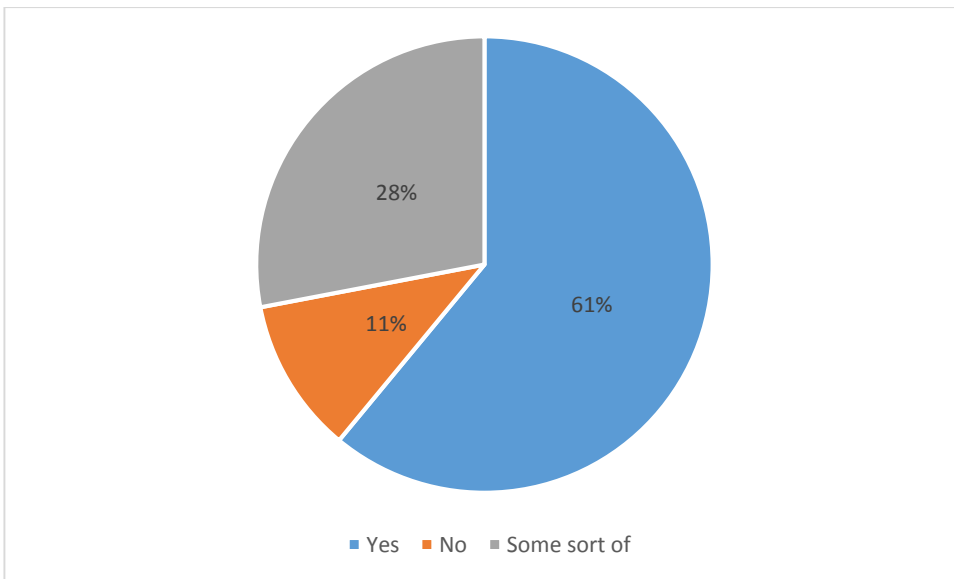
4. Do you satisfied with the responding speed of the system?



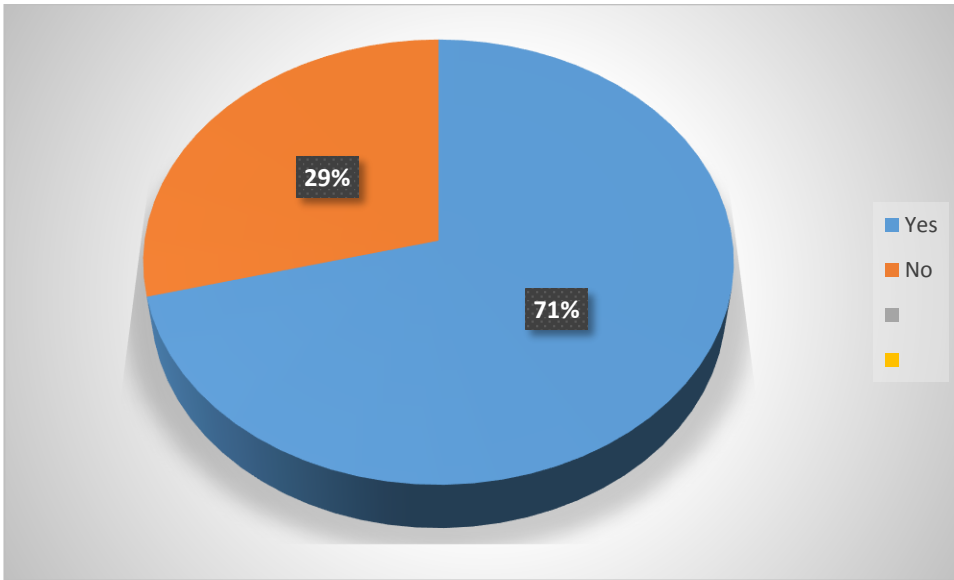
5. Do you feel trust about this application?



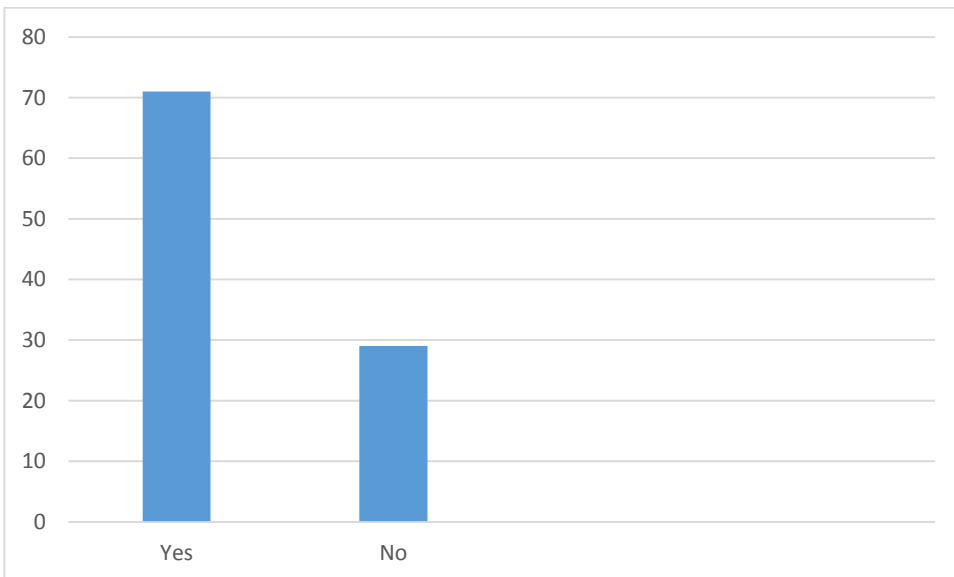
6. Do you satisfied the error and troubleshooting methods of the system?



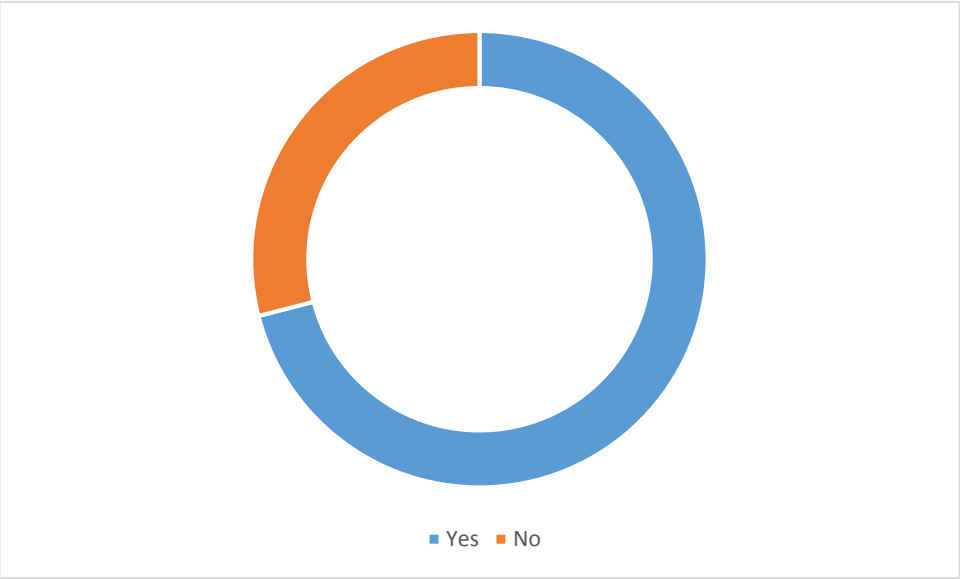
7. How easy to understand the contents of the application?



8. What is your mobile os?



9. Do you satisfied and informed about the application notifications in our product?



10. Would you recommend our software to others?

