Stock control and Vehicle Tracking System for Osurapharma Ltd

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Stock Control and Vehicle Tracking System for Osurapharma Ltd

A dissertation submitted for the Degree of Master of Information Technology

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UCSC

Declaration

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

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

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

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Under my supervision. The thesis has been prepared according to the format stipulated and is of acceptable standard.

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Abstract

Due to rapid evolutionary of Information communication technology and sake of the improved human thinking, manual processes are being converted to automotive computerised systems. Orienting to Warehouse and Stock Management system, resources exchanging speed is becoming faster than ever. Hence Stock management and warehousing is converting to run on web based platforms for fast access.

This Stock management and Vehicle tracking system was developed to fulfil the essential system requirements of OsuraPharma Ltd. Before this implementation employee maintained a manual system with various documents. It was harder to find out a systematic way in stock controlling, administration of the vehicle management, day to day operations including transactions, operational and non-operational activities, in, out stock levels, agent return items, suppliers' item issues, confirmation of deliveries, missing receipts, damage items and generating monthly and annual reports. In addition to that, huge racks with documents, agent return items which are not recorded in the files could be found. No Good received notes were maintained. It was highly noticed requirement of a database. By establishing a Stock control and inventory management it was expected to manage Stock, decide pricing data, integrating with vehicle tracking system, sales order processing, Purchase order processing, stock balance, monitoring the stock and batch control, monitor the delivery issues, update the GRN in the inventory and giving promotions.

In addition to that, driver issues, company vehicle issues, communication issues with customers regarding the items on time deliveries, fuel consumption issues, how to track the vehicle and drivers online are also there since there was no proper way to track the vehicles. Main objectives of developing a vehicle tracking system, are, monitor the live deliveries, get the vehicle details automatically, save the fuel consumption, save the vehicle maintain cost and optimize driver working time to full fill the company requirements. Building a proper database for all items, will eliminate the redundancy, remove manual work and build a user friendly environment to optimize the users' efficiency effectiveness heading towards to achieve company goals. In addition to that, other objectives were to manage proper vehicle tracking system and implement a report management system in the company.

Stock management system was developed based on PHP codeignitor framework. Software architecture was MVC (Model, View and controller) architecture. Programming language was PHP and java script. To create the database architecture, I used the MySQL and MySQL web launch. The other part of this development, vehicle tracking system was basically designed based on Google Map, GPS, WhatsApp application and Microsoft outlook. The main issue was to get the communication service (GSM) from third party to establish the link with Google map.

This system implementation facilitates to manage the company supply chain process with updated monthly, annual reports in efficient manner. By delegating the system access authorities to each level and check the day today operation online it made very easy to forecast the business survival in the market, make decisions and give the immediate solution at the same time. Data security, integrity of user work was established in the company. Agents and suppliers became happier and buildup a good partnership with the company since this system make their tasks easily and fast. In addition, using this versatile solution company can save money, time effort and make the route to achieve company goals easily.

Acknowledgements

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List of Abbreviations

COM – Communication

CSS – Cascading Style Sheet

DFD – Data Flow Diagrams

EER – Extended Entry relationship

ER – Entity relationship

GPS – Global Positioning System

GRN – Good received Note

GSM – Global System Mobile

GUI – Graphical User Interface

IaaS – Infrastructure as a Service

KPI – Key performance Indicator

MVC – Model View Controller

O365 – Office 365

OM – Object Model

PaaS – Platform as a Service

PHP – Hypertext Preprocessor

SaaS – Software as a Service

SLT – Sri Lanka Telecom

SQL – Structured Query language

SRS – System requirement specification

WAMP - Windows Apache MySql PHP

UML -- Unified Model Language

UCSC - University of Colombo School of computing

Chapter 1: Introduction

1.1 Motivation

When I met the client with the operation activities in the company, I saw many of manual works and nothing a computer system in the company. And users are fed-up doing the same thing again and again. In addition to that lot of wastage could be seen in many ways. I realized by having such kind of a computerized system they can eliminate all manual works and create a user friendly working environment. In addition to that it was eager to me establish a vehicle tracking system and integrate with the stock control system. It was bit of challenge to work with new technologies and motivated to build a complete computerized system in the company. In addition to that since the number of transaction are going up day by day, I understood there should be a computerized system to make easier such fast track processes. In the other hand, I realized it is essential to manage the customers' demand and streamline the on-time customer deliveries without effecting to company goodwill among the Industry. Those are the main facts which were motivated me to go for this system implementation.

1.2 Aims and Objectives

Main Objective of this project is to streamline the whole operation in order to full fill the company requirements, remove redundancy, remove manual work and build a user-friendly environment to optimize the users' efficiency and effectiveness heading towards to achieve company goals. In addition to that other main objectives were, to maintain a report management system and established a vehicle tracking system in the company. This will directly affect to forecast the future of the company and creating innovative decision to uplift the company business. Main objectives are as below,

1. Supply the drugs and medicines (items) to the customers on time.

2. Make payments on time and do the invoicing part without any penalties.

3. Make a user-friendly environment for the organization and staff.

4. Establish a fast reporting facility.

5. Make proper database to maintain current and predictable large customer agencies and supplier list

6. Build up a user-friendly interface which user attractive to work.

7. Monitor the vehicles and its deliveries by using glance overview and make understand how far those vehicles are travelling,

8. Reduce the Company vehicle maintain cost, control fuel consumption, Optimized the drivers working time when they are engaging the with company day to day operations.

9. Build competitive business Model for the company and make best competitor among same industry leaders.

10. Forecast the company future and make decision in time to time for better company growth.

1.3 Scope of the Project

This project implementation is consisted with two main sub systems, as stock control system and vehicle tracking system. This whole project implementation is consisted with below main functions,

1. User Login function (Manager, Admin, Super Admin, DEO)

2. User function, User type, User permission, system features and assign user responsibilities Function.

3. Dashboard Function alerts for Orders, GRN, Reorder Items and Zero quantities

4. Menu bar Notification for reorder and zero quantities.

5. Data filtering facility for each function.

6. Adding to do function in to the dashboard.

7. Customer Function with Suspend the Customer if it required.

8. Item Function and display Re order items

9. Supplier Function.

10. GRN Function.

11. Order function with email notifications to Driver and Dialog SMS gateway (Offline SMS name is Osura Order).

12. Item Re-Order Function with SMS receiving to Manager and Driver (Offline SMS name is Osura Stock).

13. Drivers' location details according to the Date; Vehicles details are maintaining as a function.

14. Print Function.

15. Reports Function (Income, GRN, Gross Profit, Highest Customers' sale, Highest item sale, Customers, Item and Suppliers information report,).

16. Vehicle tracking Integration by sending exact longitude and latitude using WhatsApp, as a location using Google Map via email). Voice communication is also possible.

17. Manager can view the drivers' and vehicles' location from anywhere.

1.3.1 The Domain

This proposed project aims at stock control and vehicle tracking in the Osurapharma Pvt Ltd in pharmaceutical Industry. Such a large domain would result in an equally as large scope of development. The software will be developed keeping in mind the requirements of Osurapharma Pvt Ltd. Our target domain is full of software to manage the company day today all transactions with items. This requirements focuses our product to our domain and makes it more appealing to those looking for a solution to this specific problem.

1.3.2 The Client

Client is Osuraphama Pvt Ltd which is leading company in pharmaceutical industry and performs delivering medicines and other pharmaceutical items (drugs) island wide. For their deliveries company is using company own vehicles and drivers.

1.3.3 The User

The main users of the system are Manager, Admin and the data entry operators. These 3 user types have different permission levels depending on their requirements. Administrator is the user who will assign permission levels to each user types. System users such as data entry operators have basic level permission levels.

1.4 Structure of Dissertation.

This dissertation contains six chapters.

- Chapter 1 was basically included some introduction of the project, before the implementation what was did, after the implantation what was achieved, overview of the whole project including project objectives, aims and how the scope is flowing for proposed sub-systems.

- Chapter 2 explores some background information, new technologies in advanced platforms, world trend for these alternative and powerful technologies, drawbacks of the technologies and brief comparison including references.

- Chapter 3 represent the analysis and design, requirement gathering, ER, UML, process flow of the project such as from start to end how the basic system functions are moved on step by step, system limitation, constraints, Software architecture and design pattern.

- Chapter 4 describe the Implementation steps and used tools according to the analysis and design. This will describe what kind of languages used, database language, how the database integration established, what kind of platform and framework used.

- Chapter 5 will be aligned to explained testing and evaluation part, what kind of testing method used. Testing phase is a very critical and important part of the development phase. How reports data validated and show comparisons with manual processed data. User permissions and their logins are also included in this section.

- Chapter 6 will show the conclusion and future work for maintain purposes, major findings, difficulties faced, how far proposed aims and objective have been captured, learning outcomes, what will be new trend for this design, future works and finally the conclusion.

Chapter 2. Background/Literature review

2.1 Introduction

This chapter basically explained what the background and requirement analysis of the project is. In addition to that, this chapter will describe about the existing similar systems, what are the latest technologies used in the world and alterative technology options which can be used in projects.

2.2 Background of the system requirement

Osuraphama is leading company in pharmaceutical industry and performs delivering medicines and other pharmaceutical items (drugs) island wide. After successfully growth of the company, management would decide they cannot stick with the manual process to handle their day to day operations and very difficult to manage the external operations as well. And when increase in sales volume and diversification of product assortments current process become more complex and complicated. In addition, when comparing to the other market competitors, company management understood they need to implement a digitized computer system as soon as possible to survive in the industry. As a result of these burning issues, this system came in the picture.

When the number of transactions and related operations for these transactions are going up, users wanted to update these data in a system and recorded these data instead of using manual files. Base on the main entities such as Agents, Suppliers, Items which are mainly categorized as medicines and pharmaceutical drugs, Pricing, invoicing, Ordering the items, vehicles and reports, this system was developed to support core functions in the company.

2.2.1 System Requirement Specification for Stock control and vehicle tracking system

2.2.1.1 Overview

Our proposed project is a real-time implementation of stock control and vehicle tracking system for Osuraphrama ltd which is a leading logistics pharmaceutical company. There are 3 main suppliers and over 300 pharmacies are connected with OSuraphamar supply chain. By implementing this software, we are ring to cover main operations such as purchasing, delivering, receiving, tracking, pricing, Invoicing, warehousing and storage, reordering and vehicle tracking. There are about 100 transactions are placing per day in the company.

Currently Osurapharma is using a manual process for all these activities and due lot of incapability to cover all agent requirements and whole operation, company forced to go this implementation. This means that they must count what they have sold, purchase, and returns, damage counting and what have left at the end of each day. All recordings have to be done in manually. This will waste valuable main hours which would be able to use for another work.

We propose a solution to this issues by developing software that keeps track of inventory in the company and update all records in a database accordingly. Also, we proposed to keep track of each and every item (medicine and drug) by dynamically linking it to the product name and as a result create a dependent relationship to the product category.

2.2.1.2 Purpose

Implement a well-established Stock control system for OsuraPharma Ltd to manage and encompasses all aspects of activities and operations including company inventories; purchasing, delivering, receiving, tracking, warehousing and storage, turnover, and reordering. In addition, Vehicle tracking system will intend to track the company vehicles.

2.2.2 Current System.

There wasn't such a digitized system in this company. Staff has maintained a manual system with various documents. It was harder to find out a systematic way in stock controlling, administration of the vehicle management, day to day operations including transactions, operational and none operational activities, in, out stock levels, agent return items, suppliers invoicing issues, confirmation of deliveries, missing receipts, damage items and generating monthly and annual reports. In addition to that, huge racks with documents, agent return items which are not recorded in the files, communication issues with suppliers could be found. No Good received notes were maintained. It was highly noticed requirement of a database. Driver issues and company vehicle issues are also there since there was no proper way to track the vehicles.

2.2.3 Proposed system

We propose to develop this software that keeps track of inventory in the Osurapharma and updates it according to daily sales and items supply to the company. Each item is linked to respective resources and when each item is sold and the supplier supply the items, changes in inventory are kept track of through utilizing a database. We propose to keep track of each and every item by dynamically linking it to the database item name and as a result create a dependent relationship to that item. At a specific time period (typically the end of the week); if the inventory is below the threshold level, order forms to the specific suppliers are generated in order to restock the required items for the next week. The project also makes smart predictions on required inventory for the following week based upon the predicted climate and possible occasions or events that may influence near future sales. At the end of the week, the software takes into account all threshold levels, predictions, and other factors to generate an order form, which after being verified by the supervisor is sent out to the suppliers.

2.2.4 Functional requirements

The System functional requirements are:

1. User Login function (Manager, Admin, Super Admin, DEO)
2. User function, User type, User permission, system features and assign user responsibilities Function.
3. Dashboard Function alerts for Orders, GRN, Reorder Items and Zero quantities
4. Menu bar Notification for reorder and zero quantities.
5. Data filtering facility for each function.
6. Adding To do function in to the dashboard.
7. Customer Function with Suspend the Customer if it required.
8. Item Function and display Re order items
9. Supplier Function.

10. GRN Function.Order function with email notifications to Driver and Dialog SMS gateway (Offline sms name is Osura Order).
11. Item Re-order Function with SMS receiving to Manager and Driver (Offline sms name is Osura Stock).
12. Drivers' location details according to the Date, Vehicles details are maintaining as a function.
13. Print Function.
14. Reports Function (Income, GRN , Gross Profit , Highest Customers' sale, Highest item sale, Customers, Item and Suppliers information report,).
15. Vehicle tracking Integration by sending exact longitude and latitude using WhatsApp, as a location using Google Map via email). Voice communication is also possible.
16. Manager can view the drivers' and vehicles' location from anywhere

The simple interface of the System has functions like adding an item, removing or updating the item. [3]

2.2.5 Nonfunctional requirements:

1. Usability
2. Reliability
3. Supportability
4. Packaging
5. Implementation
6. Interfacing

Explanation of nonfunctional requirements

1.Usability explore the system must be easy to use by both managers and chefs such that they do not need to read an extensive amount of manuals, the system must be quickly accessible by both managers and staff, the system must be intuitive and simple in the way it displays all relevant data and relationships and the menus of the system must be easily navigable by the users with buttons that are easy to understand.

2.Reliability explore the System must give accurate inventory status to the user continuously. Any inaccuracies are taken care by the regular confirming of the actual levels with the levels displayed in the system, the System must successfully add any recipe, ingredients, vendors or special occasions given by the user and provide estimations and inventory status in relevance with the newly updated entities, the system must provide a password enabled login to the user to avoid any foreign entity changing the data in the system, the system should provide the user updates on completion of requested processes and if the requested processes fail, it should provide the user the reason for the failure and the system should not update the data in any database for any failed processes.

3. Supportability will explain and supports the software is designed such that it works even on systems having the minimum configuration, the system is adaptable even if additional plugins or modules are added at a later point, the data can be exported to the manager so as to make the system more portable.

4. Packaging will describe the system must be able to run on the Windows operating systems beginning with Windows XP, and must be able to run on future releases such as the upcoming Windows 8, the software must incorporate a license key authentication process. The packaging must come with a manual that details the use of the system, and also the instructions on how to use the program. This manual may be included either in a booklet that comes with the software, or on the disc that the software itself is on.

5. Implementation and Interfacing requirements will explain as full hardware and software which is going to use to implement this system and the system must offer an easy and simple way of viewing the current inventory. The system must be able to display and the relationships between vendors, ingredients, and recipes in an intuitive manner.

2.3 Similar systems and similar architectures and Technology

Most of industrial companies' core businesses are producing a product and deliver that product into the market. Hence if there is production, supply chain process must be in the company and as result Vendor management system, warehouse control systems, retail management system, Vehicle sales management system, Resource allocation management system, service parts maintaining system, Catalog management systems etc, could be easily found. In the first developing era, most these systems were locally developed and then evolve as below design architectural patterns. Hence to easy access. [1]

2.3.1 ABC Method

This is one of the common methods used across Stock management and it is at times coupled with other methods for better control on inventory. This is more of an inventory classification technique where in products are classified based on the sales contribution and importance of the same in their assortment plan. A- Category products will be the maximum grocers in sales and flagship products with higher margin. Usually top 20% of the products in the assortment contributing to 80% of the total sales are classified under A category where tight control on inventory is required to ensure no loss in sales. 20% of products contributing to 80% of sales is known as 80-20 Rule.
C-Category products are bottom of the line contributing less to sales. These items are marginally important for the business and are kept only for the sole purpose of customer requirement.
B-Category products are important to the retailer but are less important compared to A.

2.3.2 Two bin Method

This is a simple method used usually in warehousing where in an item is stored in two locations or bins in a warehouse and the stock is replenished in the first bin from the second bin once the first bin is consumed completely. The required quantity to be filled in the second bin is placed for ordering. The availability of stock in each bin is calculated based on reorder lead time to ensure enough stock is made available till the new stock arrives.

2.3.3 Three bin Method

This is a common method following in manufacturing where Kanban system is being followed. It is similar to two bins system with a third bin at the suppliers' location. The supplier will not manufacture spare parts for the manufacturer until the reserve bin is emptied. Three bins each with a Kanban card tracking movement of inventory is available, one at manufacturing/ shop floor, one at the shop/back store, one with the supplier. Once the inventory in manufacturing/shop floor bin/display is consumed/sold, it is replenished with the complete bin from the back store/shop. Later the back-store bin is sent to the supplier and replace with a complete bin from the supplier. Then the supplier will manufacture to fill the inventory in the third bin with him. This will act as a complete loop until manufacturing of the product is ceased.

2.3.4 Fixed order quantity

This method is used to avoid ordering mistakes and ensure regular replenishment of existing products. Only a fixed quantity can be ordered at one time for the item. This type of ordering is usually used in auto replenishment of goods where in auto reordering point is set in system and when the product's inventory level hits the reordering point or minimum stock levels, an order is placed to the maximum stocking capacity of the product. To use this method, the retailer should know the minimum and maximum stocking capacity of the product based on space allocated and the sales trend. In the above, the item has maximum stocking capacity of 24 and reorder point is set as 4, so when the inventory hits 4 units, a purchase order is auto generated for 20 units to full fill the gap.

2.3.5 Fixed period Ordering

In this system, there is fixed time interval between every order placed for the item. For example, a vendor will visit the store in person and check the inventory of the respective products and resupply the products based on the sales for the time duration. This kind of ordering is done in small format stores like pharmacies and grocery stores.

2.3.6 Just in time

The objective of JUST IN TIME method is to increase the inventory turnover and at the same time reduce the inventory holding cost. JIT inventory system also exposes the unwanted or the dead inventory held by the retailer/ manufacturer. This method is ideal for manufacturing organization and it is not used in Retail industry in general. This will also involve usage of Kanban card to track inventory management.

2.3.7 Client and centralized server architecture/web based

Client-server architecture (client/server) is a network architecture in which each computer or process on the network is either a client or a server. Servers are powerful computers or processes dedicated to managing disk drives (file servers), printers (print servers), or network traffic (network servers). In this Scenario, we can host the pharmacy database and the other files in the File server and client pcs as user computers.

Similar systems for client server architecture can be categorize as Client/Server with File Servers, Client/Server with Database Servers, Web Client/Server, Client/Server Groupware, 2.5

The data which are in the servers can be also delivered under 3 concepts such as

2.3.7.1 Centralized data process

A host computer (often a mainframe) handles all processing, including input, output, data storage and retrieval. Figure 01 below depicts how centralized File server connect and share data with multiple clients.
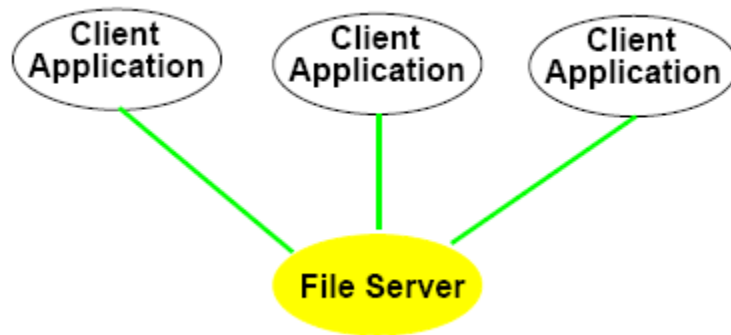
Figure 01: Centralized data process architecture

1. Clients can reside in the same machine or separate machines (typically PCs)
2. The client passes requests to the file server (software) for file records
3. Requests can be either local or over a network
4. Indispensable for documents, images, drawings, and other large data objects

2.4 Latest Technology and alternative solutions with examples

The latest system implantation is host the system in cloud based architecture. [2]
In that case this implementation can be categorized into main 2 platforms as below.

2.4.1 Full authentication: Whole responsibility is handed over to the cloud space owner. That company has only the administrative options. That cloud space owner will delegate authentications through the credentials and company can assign these permissions to their ICT administrator or system admin Teams. But all data with high security will be kept by the cloud owner. Company can ask any changes, add, and remove functions to the system. All infrastructure and platform structure will be handed by the cloud owner Team. When company is going to this kind of Solution Company management has to think in various angles and perspectives. Since company has some security data, future organization plans and other confidential data which cannot be kept under someone else. The other case is after implementation the system; company doesn't have any control until cloud owner assign the permission to the system. Hence company has to think whether they are going to keep secret data on premises or in cloud based.

2.4.1.1 Microsoft O365 cloud implementation,

Office 365 is the brand name Microsoft uses for a group of software and services subscriptions, which together provide productivity software and related services to subscribers. The Office 365 service consists of a number of products and services. All of Office 365's components can be managed and configured through an online portal. For consumers, the service allows the use of Microsoft Office apps on Windows and macOS, provides storage space on Microsoft's cloud storage service OneDrive, and grants Skype access. For business users, Office 365 offers service plans providing e-mail and social networking services through hosted versions of Exchange Server, Skype for Business Server, SharePoint and Office Online, integration with Yammer, as well as access to the Microsoft Office software.

- Office 365 uses the cloud-based user authentication service Azure Active Directory to manage users. Client can choose from three main identity models in Office 365 when client set up and manage user accounts as below.

- Cloud identity: Manage client user accounts in Office 365 only. No on-premises servers are required to manage users; it's all done in the cloud.

- Identity: Synchronize on-premises directory objects with Office 365 and manage client users' on-premises. Client can also synchronize passwords so that the users have the same password on-premises and in the cloud, but they will have to sign in again to use Office 365.

Federated identity: Synchronize on-premises directory objects with Office 365 and manage your users on-premises. The users have the same password on-premises and in the cloud, and they do not have to sign in again to use Office 365. This is often referred to as single sign-on. It's important to

Carefully consider which identity model to use to get up and running. Think about time, existing complexity, and cost. These factors are different for every organization; this topic reviews these key concepts for every identity model to help you choose the identity you want to use for your deployment. Client can also switch to a different identity model if your requirements change.

2.5 Summary and remarks.

I hope this chapter is well consisting with reasons, back ground story, why we decided to develop this kind of project, problem what was suffering by Osurapharma team. Also, how I dedicated to achieve this project objective throughout above mentioned scope would be very clear too.

Chapter 3: System Analysis and Design

3.1 Introduction

In first part of this chapter will discuss all requirements of the company, analysis of these requirement specification and proposed system. In second part will explicate the design part such as what is the methodical approach, what is the reason for that selection, solutions with appropriate diagrams and software engineering concepts.

3.2 System Analysis

3.2.1 Current system and SRS analysis

Osurapharma Company Staff has maintained a manual system for day today transactions with various documents. Since they don't have computerised system it was harder to find out systematic ways in stock controlling, administration of the vehicle management. Company main activities are consisting with operations including transactions, operational and none operational activities, in, out stock levels, agent return items, suppliers item issues, confirmation of deliveries, missing receipts, damage items and generating monthly and annual reports. In addition to that, huge racks with documents, agent return items which are not recorded in the files, communication issues with suppliers could be found. No Good received notes were maintained. It was highly noticed requirement of a database. In addition to that there wasn't a way to track drivers' issues and company vehicle issues.

- No method to manage users with different authorized levels. (Ex: view company records).
- How to assign business activities and their responsibilities based on user work experience.
- How to track user mistakes and errors in the operations. (Errors handling and responsible users for errors).
- How to Manage (View, add and delete) customer details and make easy way to contact them soon.
- How to View, add, edit and delete Supplier details.
- How to minimize the errors in maintaining Item names due high similarity drugs and tablet names.
- How to maintain good received notes, view and add GRNs.
- How to maintain records of orders, confirmation the orders, view orders (course order conflicts), and add orders.
- No method to view stocks and Reorder the items. Currently manually finding how many in the company.
- It was very difficult to create Monthly, and Annual GRN, Order and finally profit reports.
- How to monitor the live transportation including drivers and vehicle.
- Manage the Vehicle Fuel Consumptions, no way to optimize the transportation cost.
- To inform customer about the item deliveries.
- Update the delivery team about new orders with customer details and time, packing of new orders.

To develop this project, main requirements are that keeps track of inventory in the company and manage, update all records in a database accordingly. In addition to that, proposed to keep track of each and every item (medicine and drug) by dynamically linking it to the product name and as a result create a dependent relationship to the product category. In vehicle tracking system, main requirements are

1. Made drivers adherence to the company policies, compliance and make discipline them.
2. By using this process can identify exact driver and vehicle position via their communication with the office.
3. Keep online communication with drivers within office hours.
4. Cut down unwanted deliveries and delay order deliveries. Main idea is to control and save fuel consumption and Optimized driver's working time
5. Indirectly it will cause to minimize vehicle maintenance cost, repair cost (such as tire usage), save the spare parts cost and cut down unwanted Fuel usage.
6. Check online order deliveries and avoid the delay deliveries to customer.
7. Build up a good customer relationship and strong supply chain process.

3.2.2 Proposed system analysis

In Stock management control system, we propose to develop this software that keeps track of inventory in the Osurapharma and updates it according to daily sales and items supply to the company. Each item is linked to respective resources and when each item is sold and the supplier supply the items, changes in inventory are kept track of through a utilizing a database. Including the re-order level, it will create alerts to the system user, manager and drivers via SMS and E-mails.

In vehicle tracking system below steps will describe the proposals to integrate the 2 systems and by using this integration how system user or manager can track the drivers with the vehicle meanwhile they are in the operation.

How to Interrogate :(3 Ways)

- Mainly drivers with vehicles are going out to deliver the Orders on time. Just after created a new order this will informed to the Driver Mobile by an email and (SMS) via Internet. After Driver will receive that email and message driver has to do below.

Driver Send the data to the system as below ways:

As a URL with exact longitude and latitude.

- Driver has to open WhatsApp application and send the location as a URL to the office via WhatsApp application

As a Place: (Optional)

- Driver should go to the Google Map and get the place and share to the office via the e mail.

After received those data System users will alert the WhatsApp message and e mail and user has to do below.

1. Open driver WhatsApp message and track the driver exact place with the vehicle.

2. Check the driver e mail and go to system link Google map and track the close place

3. Add and maintain the Driver details with vehicle in the system table. (offline)

By using above three ways System users can track the Driver with vehicle soon online and offline. In addition to that integration can happen via Picture message, blue stack Message and Voice message.

Vehicle and driver are fixed to the stock control system via Driver mail, Driver voice, Driver Place, Driver responding time, Vehicle Meter Reading, Vehicle Close Points, Vehicle picture with driver at the same time, Driver what's up account and Schedule SMS

At a specific time period (typically the end of the week); if the inventory is below the threshold level, order forms to the specific suppliers are generated in order to restock the required items for the next week. The project also makes smart predictions on required inventory for the following week based upon the predicted climate and possible occasions or events that may influence near future sales. At the end of the week, the software takes into account all threshold levels, predictions, and other factors to generate an order form, which after being verified by the supervisor is sent out to the suppliers

3.2.3 System Models

3.2.3.1 Use case model:

Figure 02 below, depicts the main use case diagram and actors of the proposed system.
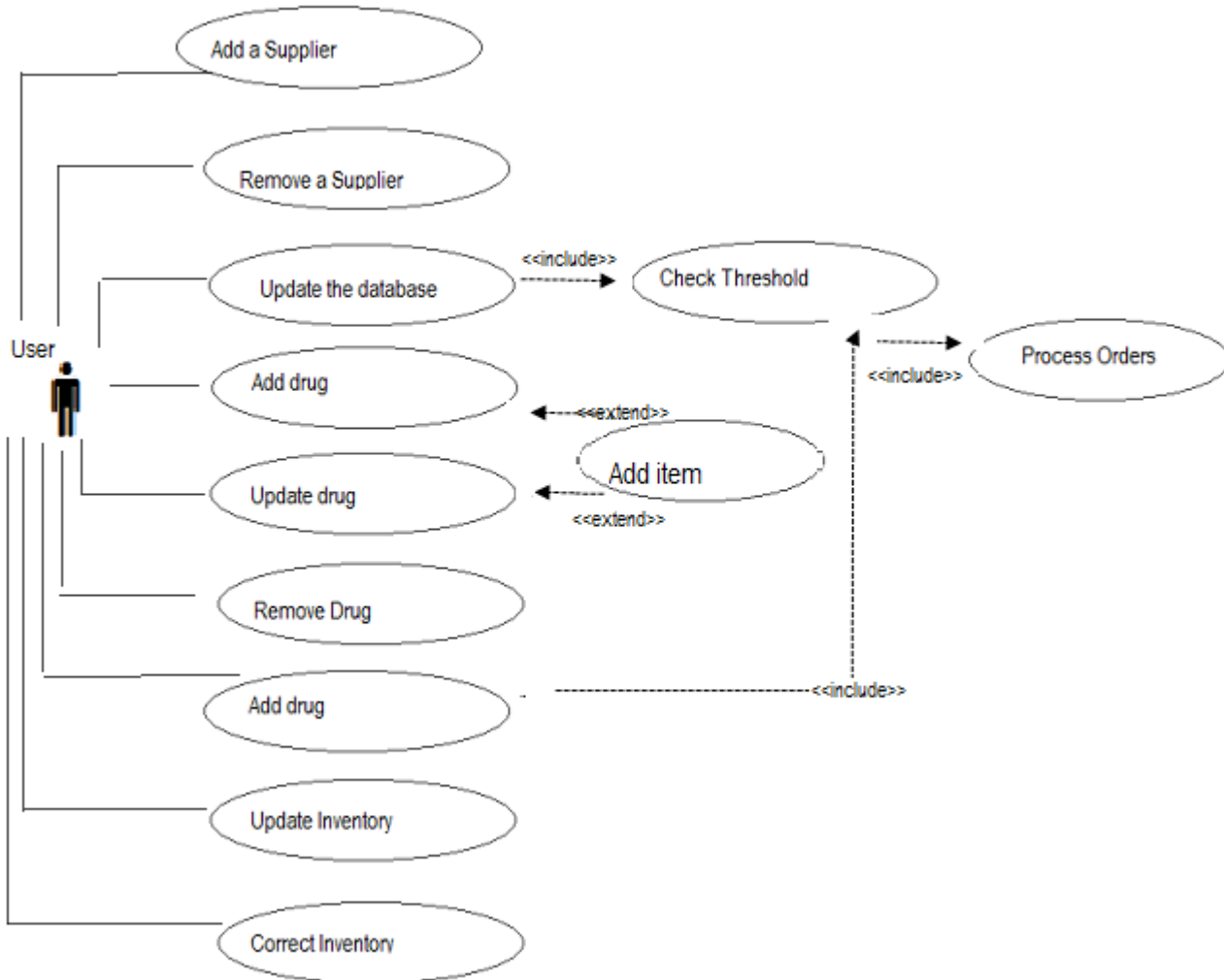
Figure 02: Use case diagram

3.2.3.2 UML diagram for main activities of User, Customer and supplier

User Types are as below:
1. Manager,
2. Administrator,
3. Data Entry Operator
4. Super Admin

User, Customer and supplier activities and transactions are show in Figure 03 as UML
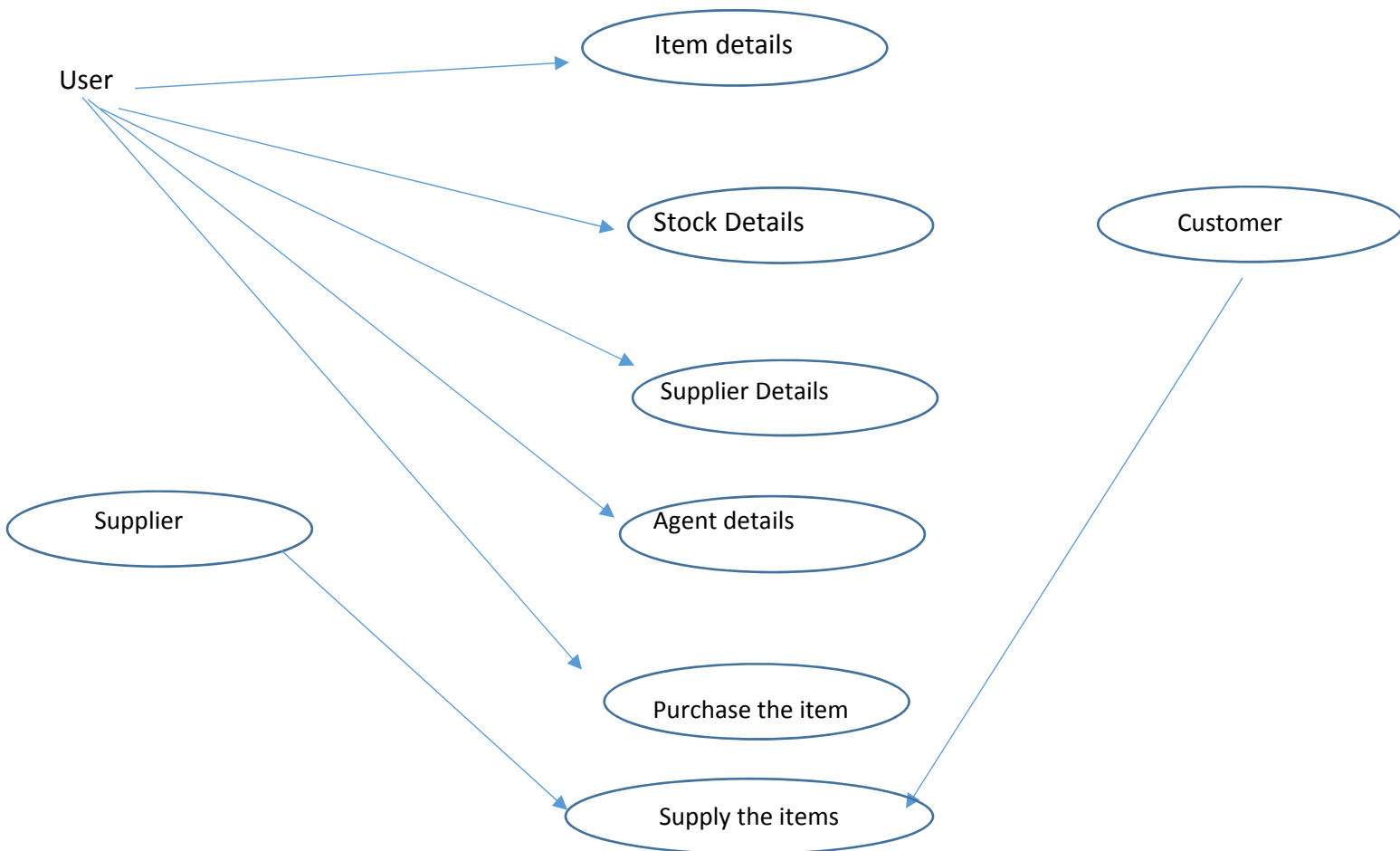
Figure 03: UML diagram

3.2.3.3 User case diagrams to manage the stock

Managing stock in this system is clearly described with each step in Figure 04.
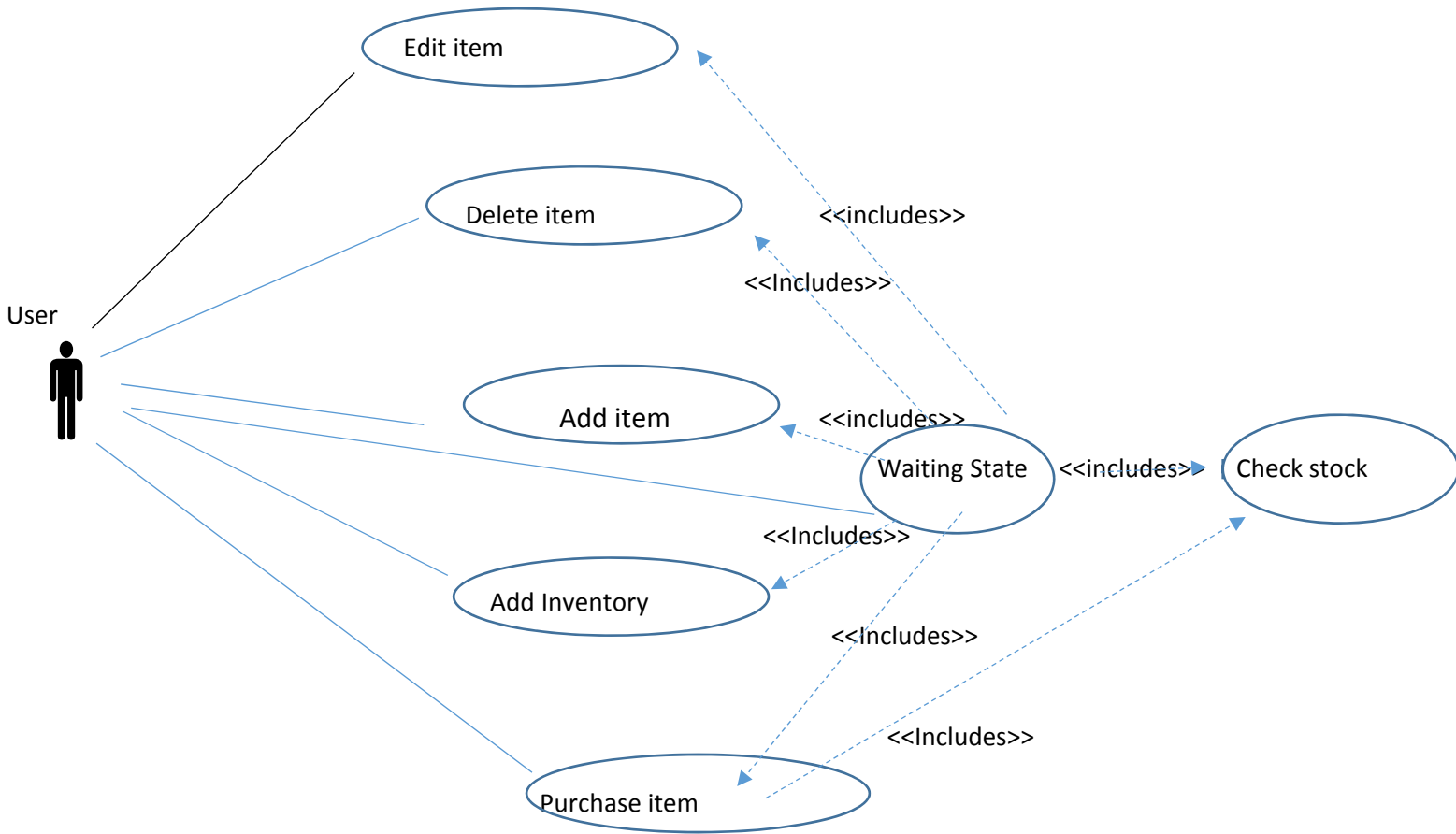
Figure 04: Use case diagram to manage the Stocks

3.2.3.4 User case diagrams to Track the driver and vehicle
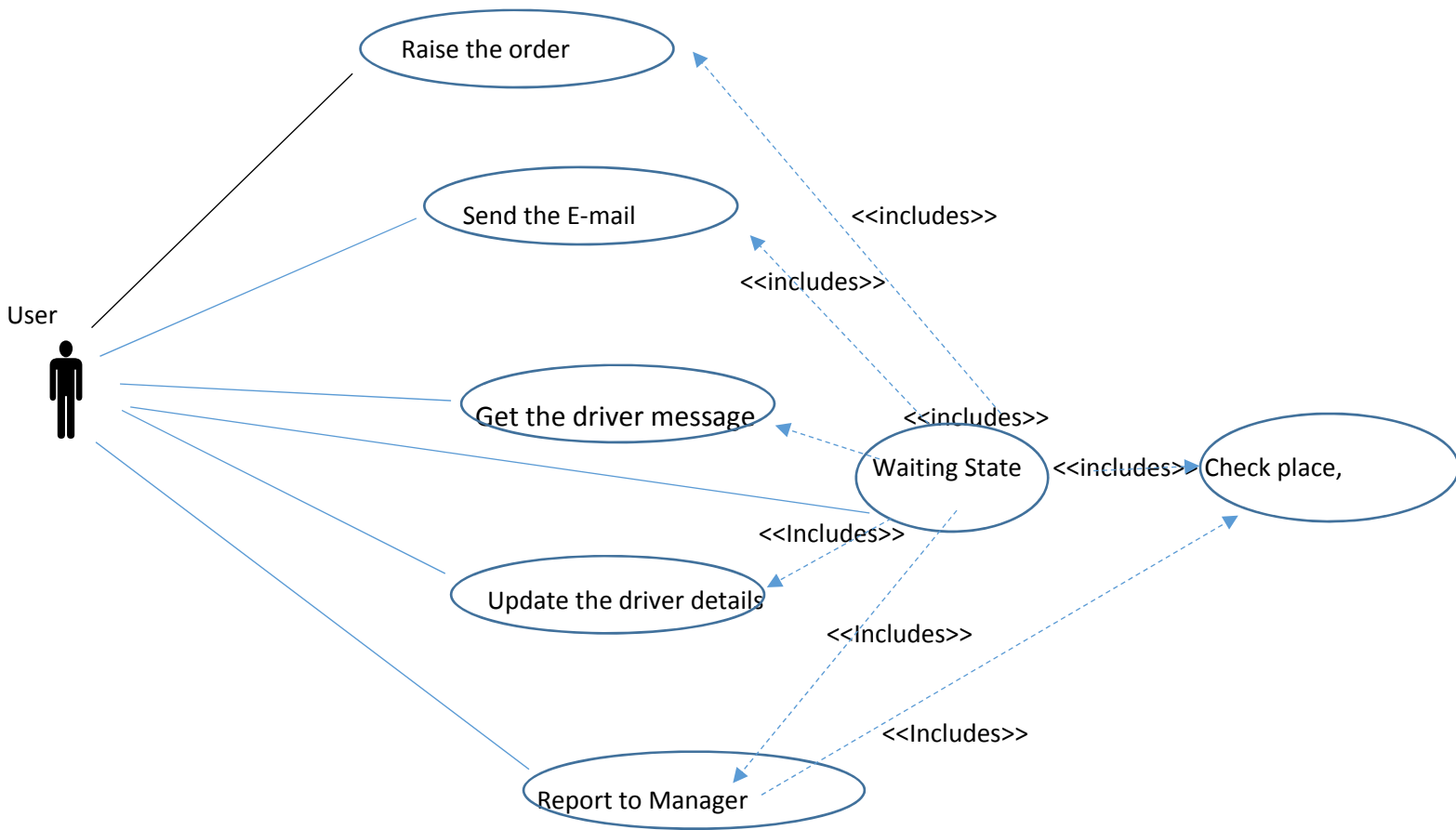
Figure 05: User case diagrams to Track the driver and vehicle

3.2.3.5 Scenarios

1. Add new item (medicine/drug) into the main data base process is explained below Table 01.

Scenario Name	Add an item (medicine/drug) in to the stock
Initiating actors	Manager: Manager
Flow of events	1. There is a new menu item drug or medicine offered by the supplier and the item is not on the main database. Thus, the manager initiates adding a new drug to the database by pressing the add button.
	2. The System brings up the add item (medicine/drug) form in front of the manager.
	3. The manager fills up the details of the medicine such as the name, brand, model, manufacturing data, expired date, related diseases to treat, weight, that will be used and the quantity of each one of the resource used is also entered by the manager. The manager also adds any new medicine not already on the list of items (medicine/drug) list by invoking the item (medicine/drug) function on the system.
	4. The manager submits the changes and the system adds the new item (medicine/drug) to the main database and any new item to the item database.
	5. The Manager receives an acknowledgement of the completion of the process.

Table 01: Scenario to add new item (medicine/drug)

2. Table 02 show how to remove old Item (medicine/drug) from the main data base

Scenario Name	Remove an Item (medicine/drug) in to the stock
Initiating actors	Manager: Manager
Flow of events	1. The manager is going through the sales and notices that transaction sales are down and decides to remove drug/medicine as a menu item. 2. The manager activates the removes drug function on the system. 3. The system brings out the list of items (drugs/medicines) that are currently on the database. The manager selects the drug to remove and submits the change. The System confirms if manager is sure to remove the drug from the menu items. 4. The manager confirms the change and the system acknowledges the removal of the medicine/drug from the database

Table 02: Scenario to remove medicine/drug

3. Adding new vehicle into the main data base is depicted by Table 03.

Scenario Name	Add a vehicle in to the main database
Initiating actors	Manager: Manager
Flow of events	1. There is a new menu vehicle purchasing and the item is not on the main database. Thus, the manager initiates adding a new vehicle to the database by pressing the add button. 2. The System brings up the add vehicle form in front of the manager. 3. The manager fills up the details of the vehicle such as the name, brand, model, manufacturing data, purchased date, running KMs, wheel condition, interior condition, allocated main driver that will be used and the quantity of each one of the resource used is also entered by the manager. The manager also adds any new vehicle not already on the list of vehicles. 4. The manager submits the changes and the system adds the new vehicle to the main database and any new database. 5. The Manager receives an acknowledgement of the completion of the process.

Table 03: Scenario to add new vehicle

4. Table 04 is the scenario to explain how to remove old vehicle from the main data base.

Scenario Name	remove old vehicle from the database
Initiating actors	Manager: Manager
Flow of events	1. The manager is examining the vehicle condition and notices that vehicle is not in running condition and further maintenance will be caused to high cost the company 2. The manager activates the removes vehicle from the system. 3. The system brings out all vehicles that are currently on the database. The manager selects the vehicle to remove and submits the change. The System confirms if manager is sure to remove the old vehicle from the menu items. 4. The manager confirms the change and the system acknowledges the removal of vehicle from the database

Table 04: Scenario to remove a vehicle

5. Update an item (medicine/drug) scenario. It will illustrate in Table 05.

Scenario Name	Update item (medicine/drug) in the main database
Initiating actors	Manager: Manager
Flow of events	1. The manager activates the update (ex: name edit, description edit, edit dose, drug) function on the system. 2. The system now brings out a list of drugs to be selected by the manager. 3. The manager now selects drug from the list and chooses to update it. 4. The manager is now presented with a form that presents the current properties of drug. The manager now add/removes sub data of the drug, their usage etc. and then submits the changes. 5. The system now updates the drug with main database with the new properties and acknowledges the changes to the manager.

Table 05: Scenario to update an item (medicine/drug)

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6. How to correct the inventory is showing in Table 06 as a scenario.

Scenario Name	Correct Inventory
Initiating actors	Manager: Manager
Flow of events	1. The manager feels that there is some difference between the inventory levels shown by the system and the actual inventory levels. The manager initiates the check inventory function on the system. 2. The manager is presented with a form listing all the drugs and medicines and their corresponding levels. 3. The manager now conducts a survey of the actual inventory and matches them with the levels shown by the system. If any discrepancies are found, the manager updates the new quantity next to the box that is presented next to the item (medicine/drug) name on the form. 4. After updating any inventory discrepancies, the manager submits the changes and the inventory is updated accordingly. 5. The threshold levels are also updated keeping in mind the errors that were incurred in calculations earlier and the manager receives an acknowledgement of process completion

Table 06: Scenario to correct the inventory

7. Update item (medicine/drug) in the database use case is represent below Table 07.

User name	Update item (medicine/drug) Database
Participating Actors	Initiated by manager (admin)
Flow of events	1. The Manager activates the update resource database function. 2. The Manager activates the update resource database function. 3. The System presents a form to the Manager. The form asks for details of the sold item (medicine/drug) during the course of the week and the corresponding quantity of the item (medicine/drug) sold. 4. The Manager inputs the data of the sold item (medicine/drug) for the week and the quantity that was sold and presses Ok button. 5. The System reads the sold item (medicine/drug) data and then further reads, from the drug/medicine database, the item (medicine/drug) that were used in making of the drug/medicine items that were sold. 6. The System now calculates the amount of resources used and will deduct the amount of item (medicine/drug) that were used up from the resource database. 7. The System now invokes the Check Threshold use case.
Entry condition	The Manager(admin) is logged on to the System
Exit condition	If the process was successful, the Manager receives an acknowledgement that the process was completed successfully or If the process was not successful, the Manager will receive an explanation of what error had occurred during the process.
Quality Requirements	The update process must complete successfully and without errors.

Table 07: Update item (medicine/drug) database use case

Entity Objects

1. Manager: The user who initiates and manages the whole use case. The Manager enters the sold

   Item (medicine/drug) into the form that is presented to him and also controls what actions are to be taken once all the calculations are over.
2. Resources: These are the item (medicine/drug) that are available for use in making of sales.

Boundary Objects

Update Resource Database Button: This is the Button the manager presses to initiate the processes in the use case.

Sold item (medicine/drug) Form: This is the form Manager fills to give details about the item (medicine/drug) that was sold in the course of the week.

Process Order Form: In this form manager enters the quantities corresponding to each item (medicine/drug) that manager wants to update.

Control Objects

Update Control Object:

This object is created when the manager activated the Update Resource database function. The Object is then responsible for creating the Sold item (medicine/drug) Form and requesting resource levels from the database, comparing new values with the threshold values and also sending the new values back to database. The Object also sends out acknowledgements to the Manager once the requested processes are completed.

8. Table 08 is illustrating how to add item (medicine/drug) Use case.

User name	Add item (medicine/drug) into the Database
Participating Actors	Initiated by manager (admin)
Flow of events	1. The Manager activates the Create New drug/medicine function on his/her terminal 2. The System responds by presenting a form to the Manager. The form asks for details associated with the item (medicine/drug). 3. The Manager completes the form by inserting drug/medicine to be used in the new drug/medicine. It also adds any new drug/medicine used in the list by executing the add item (medicine/drug) usecase which extends this usecase. The Manager also inputs the amount of sub menus to be used in a single order of the item (medicine/drug). After the form has been completed the Manager submits the form to the System. 4. The System acknowledges that the new recipe has been created. It also adds it to the item (medicine/drug) database and any new item (medicine/drug) to the Main database
Entry condition	The Manager is logged into System
Exit condition	The Manager has received an acknowledgment from the System. OR the Manager has received an explanation of why the process could not be completed. The update process must complete successfully and without errors.
Quality Requirements	This use case is extended by the Add drug/medicine use case. The process must complete successfully with the new item (medicine/drug) added to the main database without any errors.

Table 08: Add item (medicine/drug) database use case

Entity Objects:

Manager: The manager activates the use case to update an item (medicine/drug). The manager is responsible for adding/removing items (drug/medicines) to and from the main database. Items (medicine/drug): This is an entity that is being updated by the manager. The item (medicine/drug) is defined by the items that are used in making of the drug/medicines.
Items: The drug/medicines are the items that the drug/medicines are made of.

Boundary Objects: **Update item** (medicine/drug) **Button: This** button initiates the add item (medicine/drug) use case which helps in adding a new item (medicine/drug) to the database.
Update item (medicine/drug) Form: This form asks the manager to input any changes that are to be made to the drug/medicines.

Add item: This button initiates the add item use case. This is initiated in between the add item (medicine/drug) usecase if any item is not available to the manager while updating the item (medicine/drug) and the manager wishes to add that specific item to the item (medicine/drug).
Control Objects:
Update item (medicine/drug) Control: This control object manages the whole process of updating item (medicine/drug). It manages the process of adding/removing the ingredients from the item (medicine/drug). It also acknowledges the process status to the manager.

3.2.3.6 Object Model

1. Class Generalization and hierarchy diagrams as a tree structure is given below Figure 06.
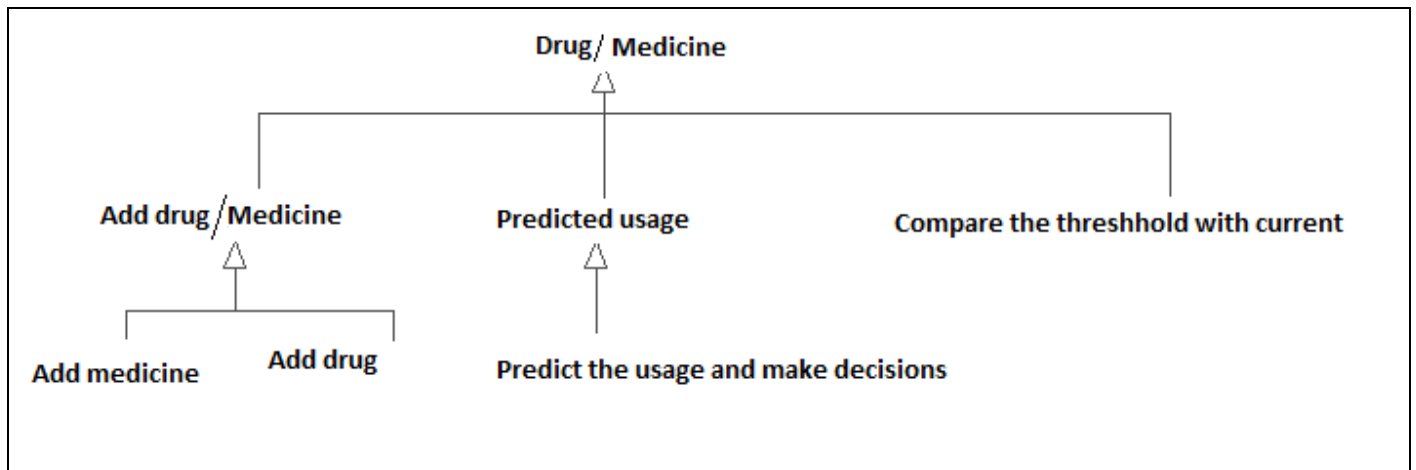
Figure 06: Class Generalization and hierarchy diagrams

2. Vendor Class Generalization and hierarchy diagram in below Figure 07 emerged how vendor or supplier can act in the system and their categorizations with appropriate levels
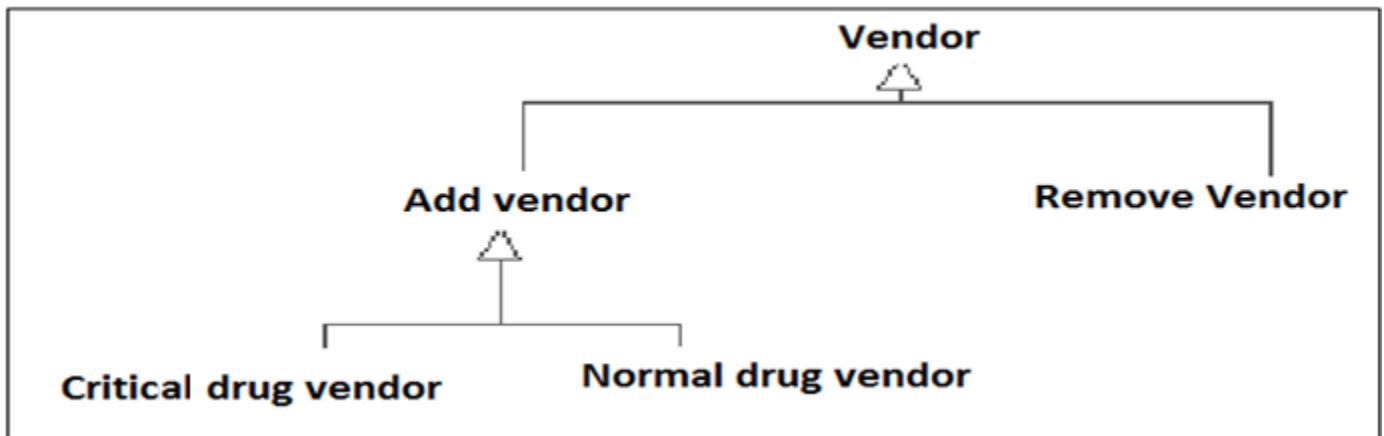
Figure 07: Vendor Class Generalization and hierarchy diagram

3.2.3.7 Dynamic model (Sequence Diagrams)

1. How to remove an item (medicine/drug) depicts below Figure 08 as a Sequence Diagram.
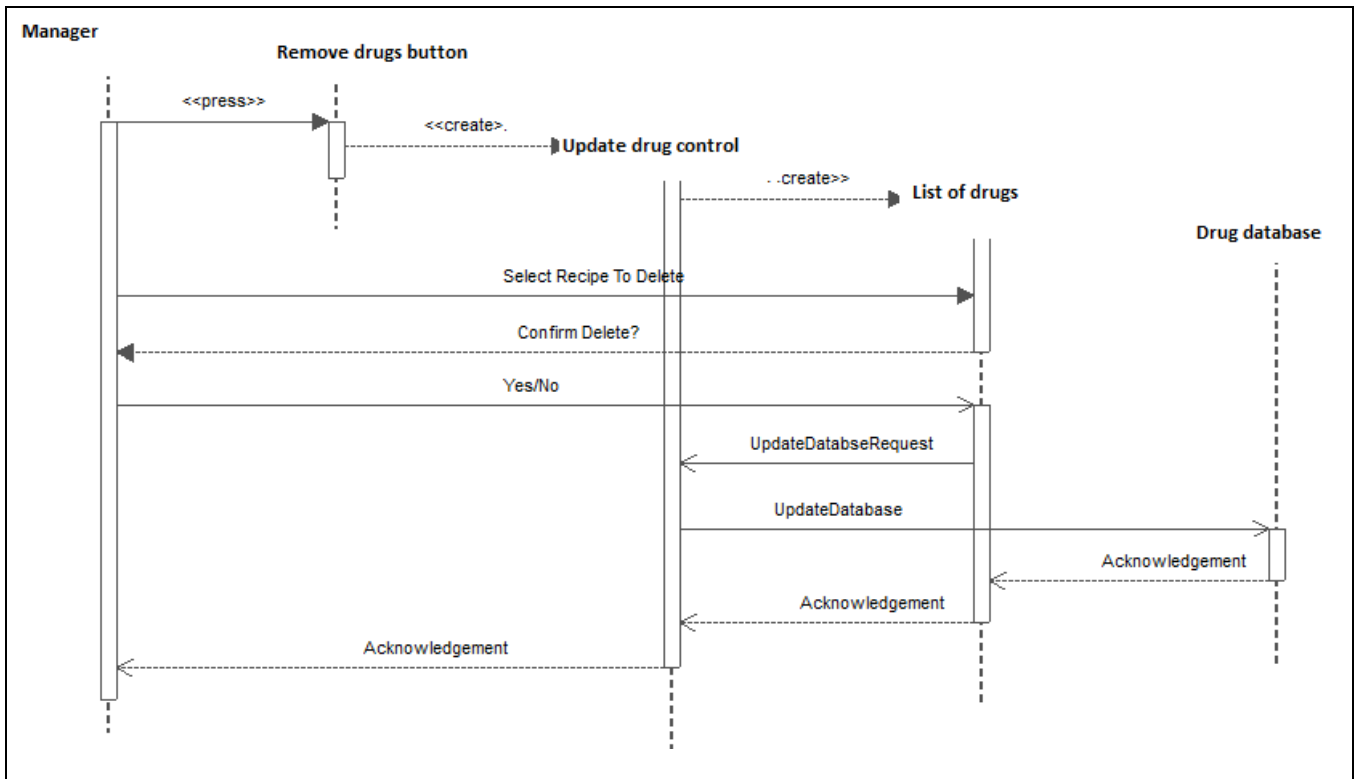
Figure 08: Sequence diagrams for remove item (medicine/drug)

2. How to add an item (medicine/drug) into the database is shown as a Sequence Diagram in Figure 09.
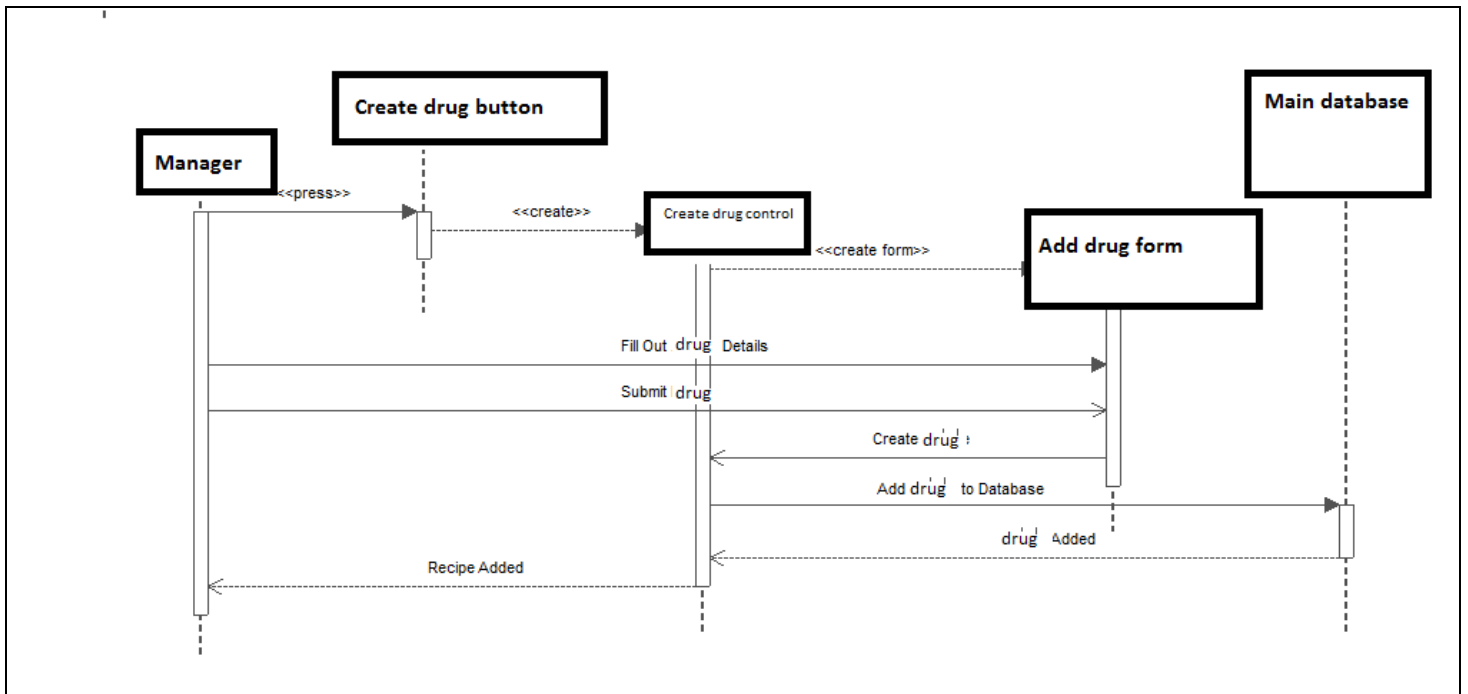
Figure 09: Sequence diagrams to Add item (medicine/drug)

3. Add Suppler Sequence Diagram is given below and steps are show in Figure 10.
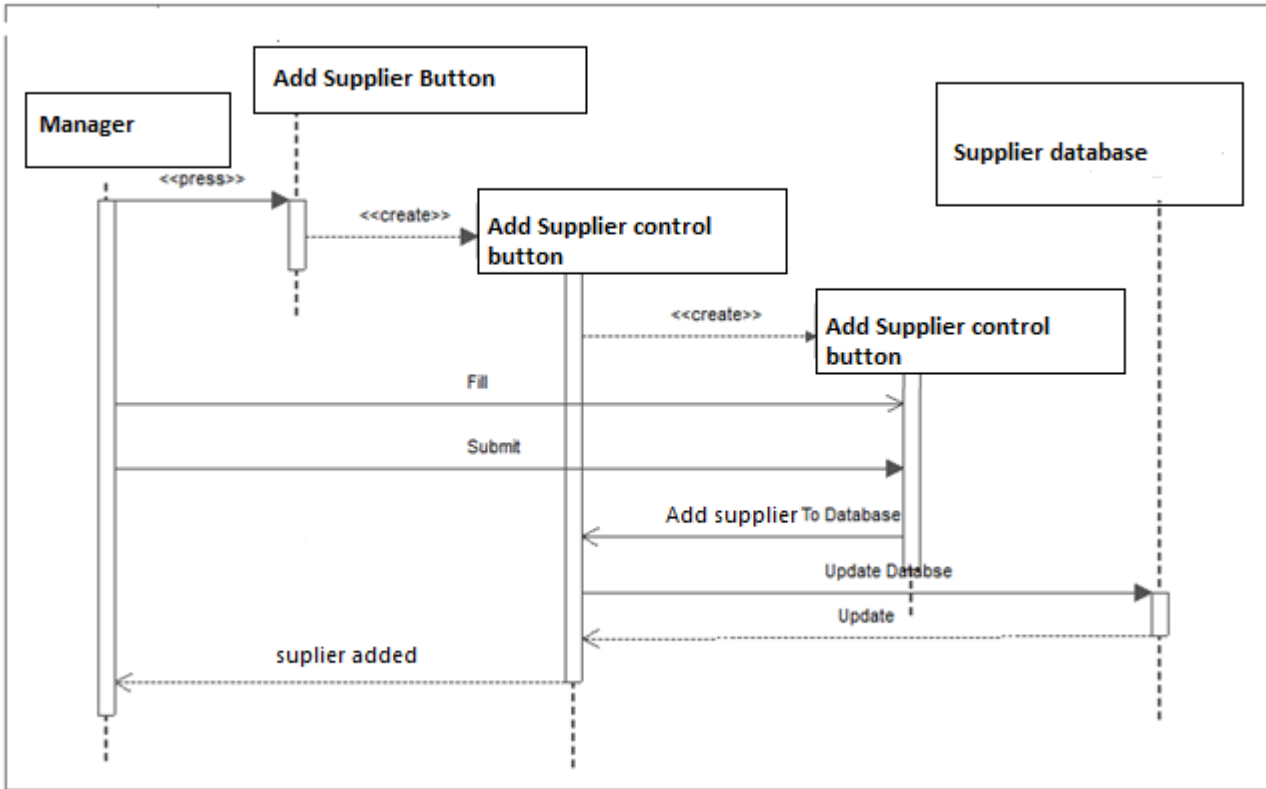
Figure 10: Add Suppler Sequence

4. Figure 11 is illustrating how to remove a Supplier from the system as a Sequence Diagram
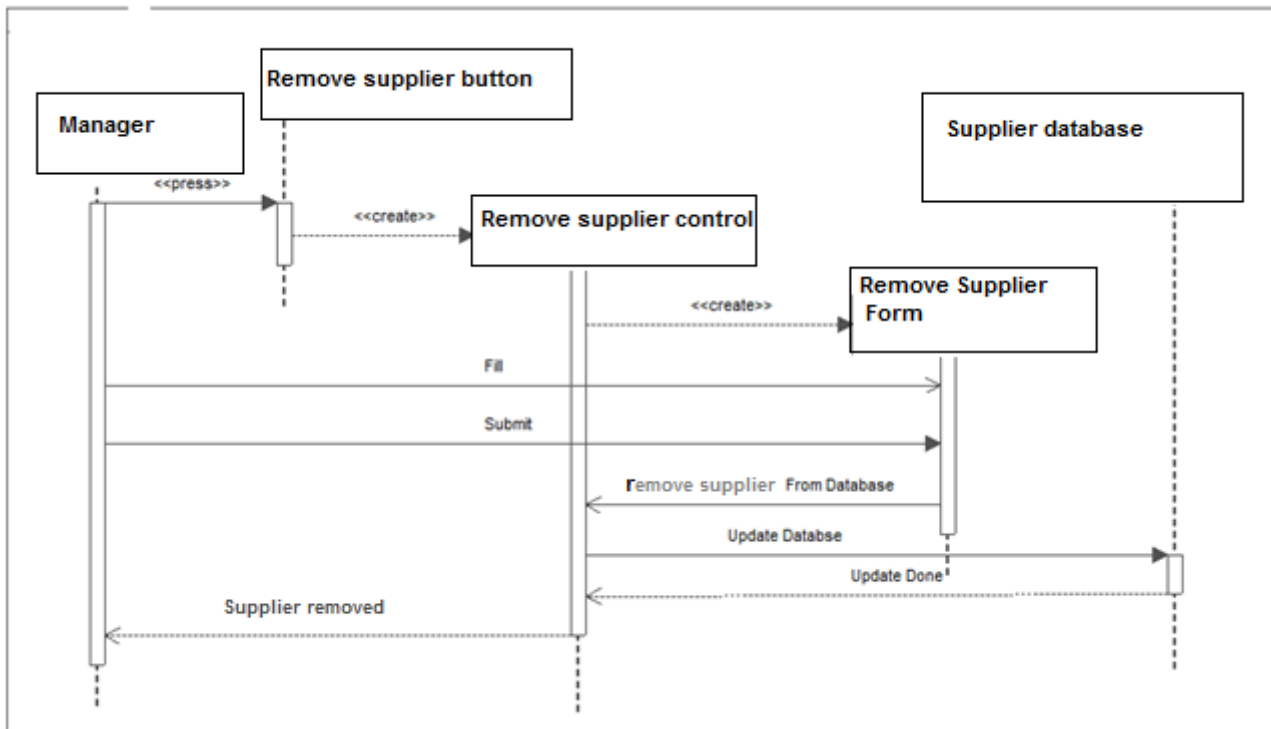
Figure 11: Remove Suppler Sequence

5. Update Inventory Sequence Diagram is given below and flow is shown in figure 12.
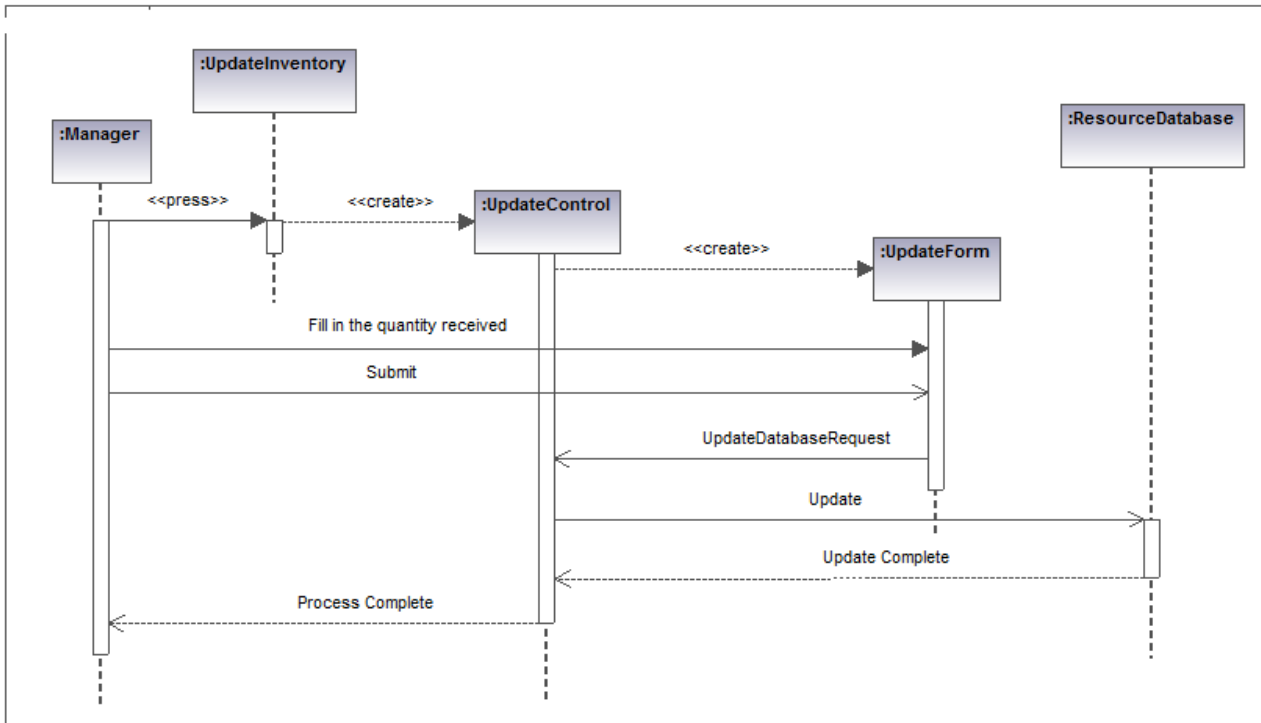
Figure 12: Update Inventory Sequence

6. Correct Inventory is most important task in as supply chain process and it is flowing as a Sequence Diagram in below Figure 13.
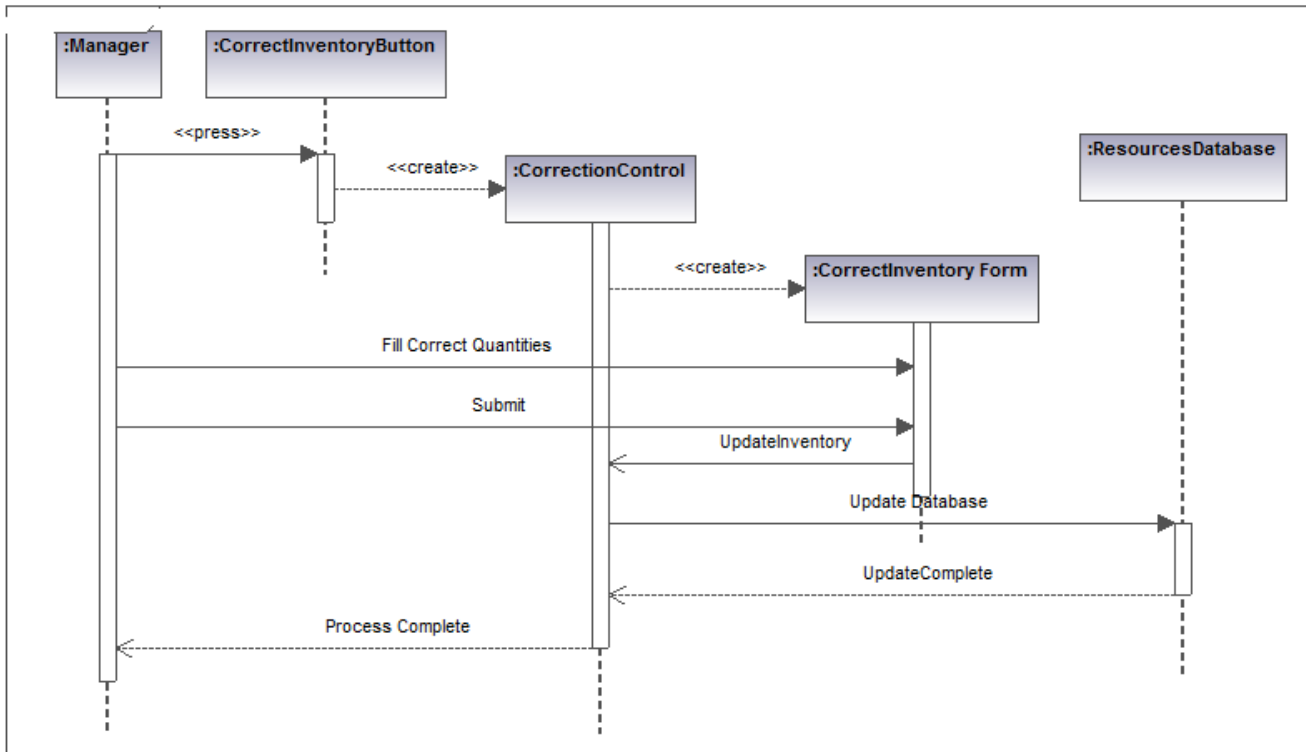
Figure 13: Correct Inventory Sequence

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3.2.3.8 Architecture Breakdown

Database Architecture: MySQL and MySQL workbench.
Backend applications:

a) WAMP server
b) IIS 7.5 Express
c) Visio
d) Sublime text
e) Java script
f) CSS
g) Client server architecture
h) PHP
i) Google Chrome
j) Joomla
k) GSM technology
l) GPS Gate

3.3 System Design

3.3.1 Methodical approach used

Since user requirements are gathered and those requirements were very clear and stable I have directly selected the water fall model as methodology to develop the system. Since it is a linear sequential model, Separate and distinct phases of specification and development. According to waterfall model whole project break into below steps. Such as

1. Requirements analysis
   After having many discussions with Osurapharma gathered the information. Understand his goals what I have to establish by implementing this project. As per the understood information are such as user interfaces, functionalities, performance level, how soon project should be completed, who will be the login users and their authority level.

2. System design & Program design
   In this level, selected the software components and software architecture since it would require to convert the gathered information into software. Selected software architecture was PHP codignitor MVC (model, view and controller).

3. Coding
   To write the coding selected language was PHP framework, to support this used java script, MySQL and MySQL work bench. [4]

4. Unit testing, System testing, Acceptance testing
   After developing the software and before launch the software I will give the whole software development result to Osurapharma. The testing process must ensure that the system works correctly and satisfies the requirements specified.

5. Operation & maintenance

3.3.2 Process flows and pseudo codes

Ex: 1. Place an order and delivery the item
Start
Agent will place the order (by email or call) to OsuraPharama.
Osurapharma check the stock
If Order item is available
Placed the order and confirm to agent
Osuraphrama will create the Invoice.
Generate the print out
Osuraphrama Send the invoice to the same agent.
Agent will pay or send the cheque to Osuraphrama.
Osuraphrama will check agent old pending payments.
If No old payments
Make arrangements to deliver item to agent at the invoice mentioned date.
Else
Ask Agent to settle down the payment before this delivery.
Else
Make awareness the Agent currently stocks are not available for that Item
Agent send the good received note to OSuraPharma.
End if
End if
Stop

Ex: 2 Supplier supply the item

Start
Osurapharma identify the item level is low in the stock
If the item level is low
Osurapharma call to supplier and ask for that item
If
 Item is available adequately with supplier
Do the price negotiations
Deliver the item
Else
Send an acknowledgment to Osurapharma, item is not available
Else
Not raise an order since item is in high level
End if
End if
Stop

3.3.3 Entity Relationship Diagram: Main Entity relationship diagram sprit out all activities, entity details, how the relationships are built internally and how integrity is build up among the entities. It is representing in below Figure 14. (**please refer the attached Excel Sheet for large view**)

3.3.4 MVC software Architectural Design Pattern

PHP codignitor architecture will divide the architecture of this project in to 3 parts as Model, view and controller. Combination of all 3 levels will complete the software architecture. [5]
Model:
This will explain what kind of entities, entries should be in the system and mapping with the database. Hence most important and core actors are in this level, state or full understanding level of the application is explaining via this Model. How the stock control system is functioning, how operations is flowing is defined in this level? Since this is directly linked to the database it will show the all entities of the project. If the client expects to have different view of this project, by using one model it is possible to connect many views. In Model level user interaction was less since he is not seeing anything background of the software.
Examples:
- Supplier table
- Agent table
- Item tables
- Order table
- Invoice table
- GRN table

View: This is the place client interact with the system. Osurapahrama wants to see some interface as they familiar, since I asked some of interfaces designs what they want to see when they will access the system. When osurapharam users will login to the system, give the credentials to the system and how users are interacting with the system, when system extract the data from database and give as output data, those functions will decide in this view level.
Examples:

- PHP codes
- Java script
- CSS style sheet codes

Controller:
This will connect the data and the interfaces. That level says how the interfaces behave or change depending on the user requests.
Examples:
Osurapahrama user requests annual data report by selecting date range from order and GRN tables to find how many placed orders have been GRN in a year.

3.4 Summary and remarks

I hope plenty of information have been described relative to the above introduction of this chapter. Since major part of this project implementation has been covered over this chapter in detail with supporting diagrams and architectural plans. I hope this would be the open gate to get deep understanding of the software engineering principles and how to make those concepts uniform for this project.

Chapter 4: Implementation

4.1 Introduction

This chapter will explain how it was executed all the plans and procedures what I explained and understood over the above topics. Hence this will describe the selected programming language, platforms, framework, Database architecture and other supportive software which I used to make this event success.

4.1.1 Main reasons to select this Architecture

One main objective of this project is to implement web based system to online access and online vehicle monitoring system. Based on this architecture it was in my mind go for a client server system design. The other reasons are; it will make easy to migrate to cloud service architecture since cloud hosting is the latest platform technology trend in the world now. Nowadays Technology is changing in rapid speed and current technology will be definitely changed within next 2 years. As a result, if we would develop a system for easy migration I thought it would be a reason to cut the transfer cost half to half. If we would develop web based system, we would have only transfer that web based system in to cloud hosting. Considering all aspects what I have described above, I selected the web based language as PHP, java script Cascading style sheet and HTML are as programming languages.

Since php language was fully oriented to web based application it was very helpfulllp to design this system.

4.2 Technical Background and Development

4.2.1 Technical Background

Basically, this implementation includes collection of Hardware, Software and networking Implementations and components as well. Under this MVC (Model View Controller) architecture Front end application created by Viewer. The main target of this implementation to create the Front-end application with Osuraphama website and create the Backend application which will manage the Front-end application. The MySQL data base directly connected to the back-end application and when user request/update/Modify/Insert data through the front-end application that coding will execute internally backend application (database) and it will prompt the Viewer to show data to the user. Database and Autoloader will be starting when the wamp server start simultaneously.

In the vehicle tracking system data will exchange between the driver and vehicle by using E-mail and the WhataApp application. Both will have interconnected via Internet and mail and the WhatsApp applications are integrated to the system. Mobile connectivity will be established through the GSM technology. Through the communication continues connection is established with the WhatsApp server. Hence server will have received the continues data to the server when the driver will send the data to the system. As a result, owner can find where the vehicle is online. [6]

4.2.2 Database Architecture and Table Names with table connectives:

1) Suppliers: Supplier table contain all the suppler details and it will directly connect with item, order tables.
2) Drugs:
   All drugs details are displayed and will connect Agents, Supplier, Drugs, Orders, Invoice tables
3) Agents
   All Agent details are containing and connected with item (medicine/drug), Orders, Invoice, Pricing tables.
4) Users:
   User table contain who has the access for the system and it consist with the access levels and authentication levels
5) GRN:
   This table contain the Good received notes data and Orders, item (medicine/drug) tables are directly connected
6) Drivers:
   This table contain the Driver details and connected with vehicle table
7) Vehicles: This table contain all company vehicles data and connected with Driver table.
8) Orders: Order table contain the all agent details and will directly

Client server architecture, PHP engine and MySQL server are communicating each other when there is user request. In that case how request and responds are flowing is describing below Figure 15.
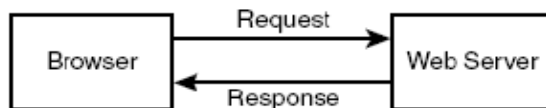
The client/server relationship between a web browser and web server requires communication.

The basic web database architecture consists of the web browser, web server, scripting engine, and database server.

Figure 15: Database architecture

4.2.3 PHP code to connect to database: It is explaining below as example.

```php
<?php
$host = 'localhost';
$username = 'Admin';
$pswd = '!?+&*';
$dbName = "myDB";
$con = mysql_connect($host, $username,
$pswd);
if (!$con){
die('Could not connect: '
. mysql_error());
}
$db = @mysql_select_db($dbName,
$con) or die(mysql_error());
```

4.3 MVC flow how to proceed with PHP execution in MySQL database

The index.php serves as the front controller, initializing the base resources needed to run CodeIgniter. The Router examines the HTTP request to determine what should be done with it. If a cache file exists, it is sent directly to the browser, bypassing the normal system execution. Before the application controller is loaded, the HTTP request and any user submitted data is filtered for security. The Controller loads the model, core libraries, plugins, helpers, and any other resources needed to process the specific request. The finalized View is rendered then sent to the web browser to be seen. If caching is enabled, the view is cached first so that on subsequent requests it can be served. This process is show in Figure 16.
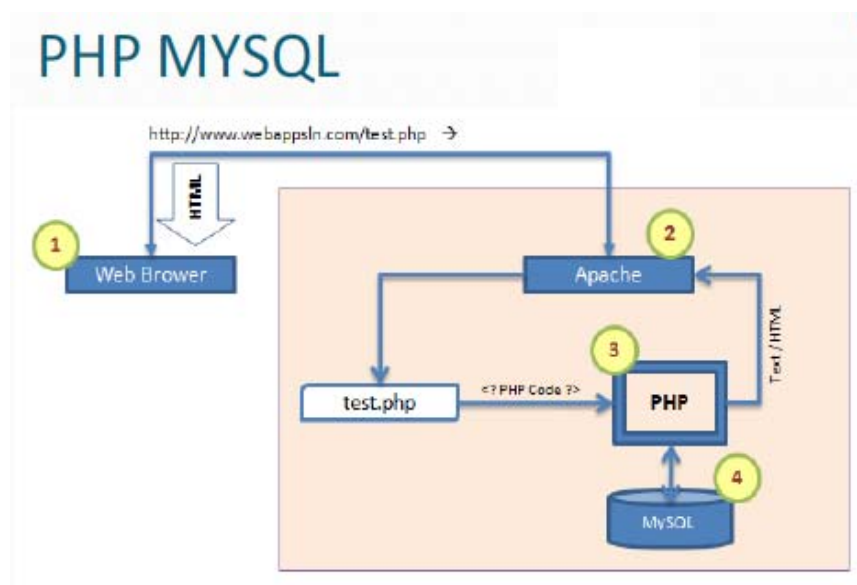
Figure 16: PHP-MySQL architecture

1. First you send the request through the web site what you are referring.
2. That request will go to as a client request to server, and that request will send to the scripting Language PHP.
3. It will process the request what system want to do.
4. Is it need to get data from the database according the request, code logic will extract the data out from the database
5. Then that information sends back to my web as the output of the system.

Locally we installed WAMP server in our machine and change the www folder in my programs folder. Then we can access the apache server and database as MySQL locally. PHP is server side scripting language and executed on servers like apache. PHP supports MySQL database architecture and I used this MySQL as the database architecture and database server.

Some of the features what I have used in the system is symbolized in Figure 17.

Text fields   A password field: [•••••••]

Buttons   A submit button: [Submit]

Check box   A checkbox: ☑

Radio Buttons

Figure 17: Used system icons

4.4 Explanation how database architecture is working in PHP with MYSQL

When user request some item through the web browser from the database it will first direct to the server. Then that request will process throughout the PHP coding/logic. After executing that logic, that logic steps show the user to item select interface. Once user will select the item it will generate as server respond and will receive to User.

4.5 PHP code to user name and password Authentications: Relevant code is shown below
Script

```
$active_group = 'default';
$query_builder = TRUE;

$db['default'] = array(
        'dsn'     => '',
        'hostname' => 'localhost',
        'username' => 'root',
        'password' => '',
        'database' => 'osurapharma',
        'dbdriver' => 'mysqli',
        'dbprefix' => '',
        'pconnect' => FALSE,
        'db_debug' => TRUE,
        'cache_on' => FALSE,
        'cachedir' => '',
        'char_set' => 'utf8',
        'dbcollat' => 'utf8_general_ci',
        'swap_pre' => '',
        'encrypt' => FALSE,
        'compress' => FALSE,
        'stricton' => FALSE,
        'failover' => array(),
        'save_queries' => TRUE
```

4.6 Module Structure of the System Components

System structure is collection of frontend application powered by company website and the back-end application. In codignitor architecture View part is displaying all front-end application with user permissions. The main frontend or application or main interface is collection of main entities such as Users, Customer, Item, GRN, and Order. Those entities will be connected to the main database through the executed coding part.

4.6.1 Module Structure as tree Diagram:

To access each module user needs permissions and all permission will be added by super administrator of the portal. After login to the portal each Module can by privilege user and manage, change, add, do modifications in that modules as below. In each Module can be handle separately. By this Module architecture I will except to remove redundancy and company entity in consistencies. In addition to that by assigning different privileges level to users. Implemented Module Structure as tree is given below Figure 18.
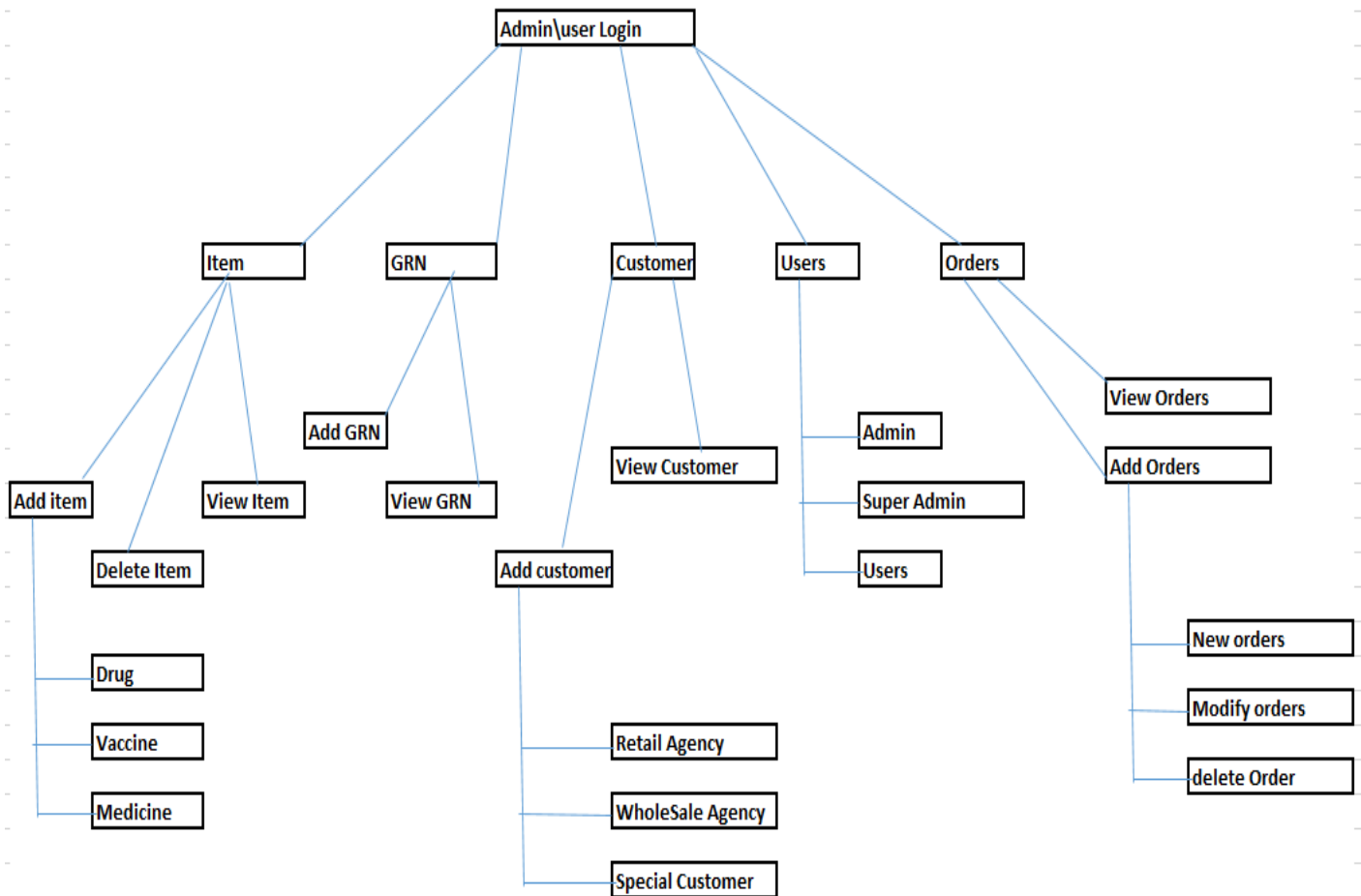
Figure 18: Module Structure as Tree

4.6.2 Module Structure coding for Customer and Item module: It is shown in below code structure

```php
<?php endif; ?>
<?php if ($this->User_model->if_set_privileges('view_item')): ?>
  <li class="<?php echo ($this->uri->segment(1) == "customer") ? "active" : NULL; ?> treeview">
    <a href="<?php echo base_url(); ?>index.php/customer/view">
      <i class="fa fa-users"></i> <span>customer</span> <i class="fa fa-angle-left pull-right"></i>
    </a>

    <ul class="treeview-menu">
     <li class="treeview">
        <a href="<?php echo base_url(); ?>index.php/customer">
          <i class="fa fa-share"></i> <span>Add customer</span>
          <i class="fa fa-angle-left pull-right"></i>
        </a>
      </li>-->
```

```php
              <li class="treeview">
                <a href="<?php echo base_url(); ?>index.php/customer/view">
                  <i class="fa fa-share"></i> <span>View customer</span>
                  <i class="fa fa-angle-left pull-right"></i>
                </a>
              </li>
            </ul>
        </li>
<?php endif; ?>
<?php if ($this->User_model->if_set_privileges('view_item')): ?>
    <li class="<?php echo ($this->uri->segment(1) == "item") ? "active" : NULL; ?> treeview">
      <a href="<?php echo base_url(); ?>index.php/item/view">
        <i class="fa fa-users"></i> <span>item</span> <i class="fa fa-angle-left pull-right"></i>
      </a>

      <ul class="treeview-menu">
        <li class="treeview">
          <a href="<?php echo base_url(); ?>index.php/item">
            <i class="fa fa-share"></i> <span>Add item</span>
            <i class="fa fa-angle-left pull-right"></i>
          </a>
        </li>
        <li class="treeview">
          <a href="<?php echo base_url(); ?>index.php/item/view">
            <i class="fa fa-share"></i> <span>View item</span>
            <i class="fa fa-angle-left pull-right"></i>
          </a>
        </li>
      </ul>
    </li>
```

4.6.3 Software (MVC) Module Structure as tree Diagram

In PHP I have selected the Codignitor MVC architecture as shown Figure 19 and the design framework with windows platform.
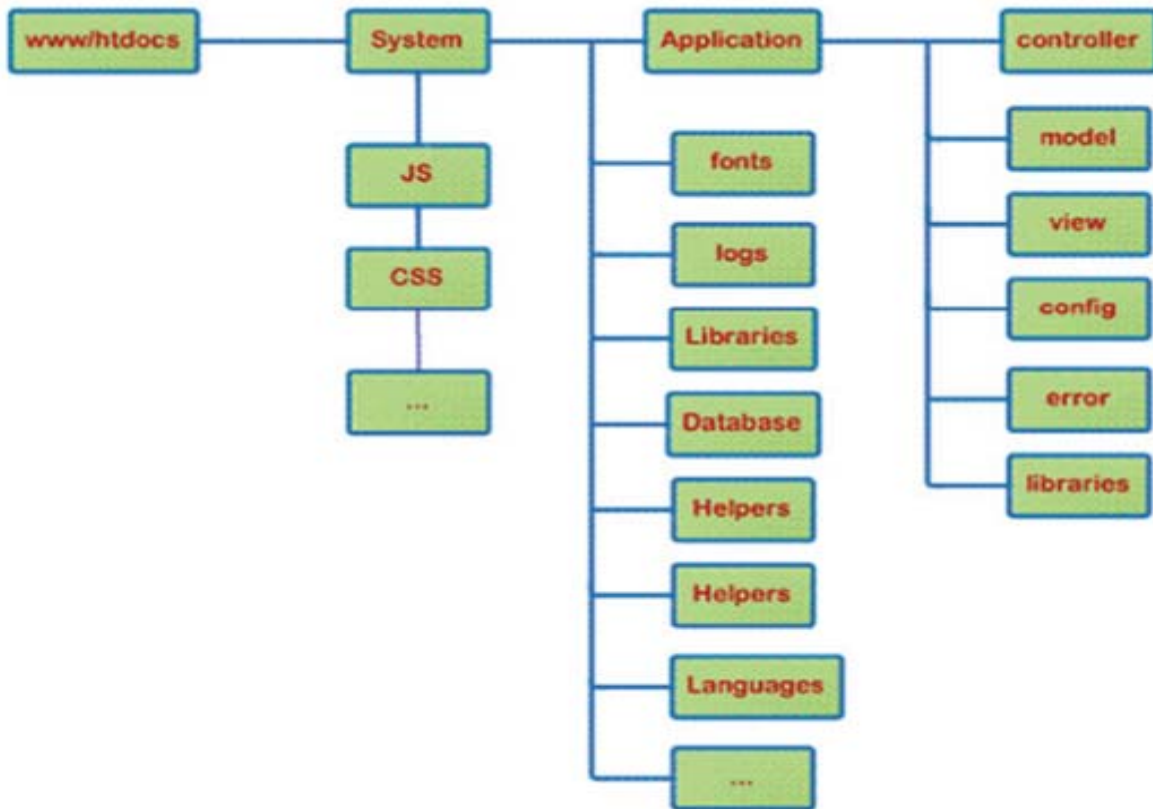
Figure 19: Software (MVC) Module Structure as tree Diagram

4.6.4 Client Server Architecture

Client is representing the request by using the web browser. He requests his requirements form the system and system will send the client request to Server. Server represent the processing of client request, database data extract and send the reply to client by using same browser. In my project implementation, most reports can be viewed through this architecture and user can locally and online access the system. Hardware Implementation: Hardware implementation two main hardware components. They are client and Server. I selected the WAMP server and it is used to install in recommended platform since it is a windows web development environment. It will allow to create web applications with PHP and MySQL databases. Once after installed the WAMP server there will be a www folder in C: drive and can see configuration files and other libraries in it. When we are running the server and database connectivity script in the execution code in backend server interface will give web site reference data. [7]

4.6.5 How MVC concept is working in PHP codignitor

MVC approach is in contact form and when there is a user requirement to check supplier details in the system, user have to fill all the details what should extracted from the database. Hence user will fill the browser details and submit it. The controller receives the POST data which was send by the user as

a form, and the controller sends this data to the model which updates in the database. The model then sends the result of the database to the controller. This result is updated in the view and displayed to the user. As a Pictorial image above process is show in below Figure 20.
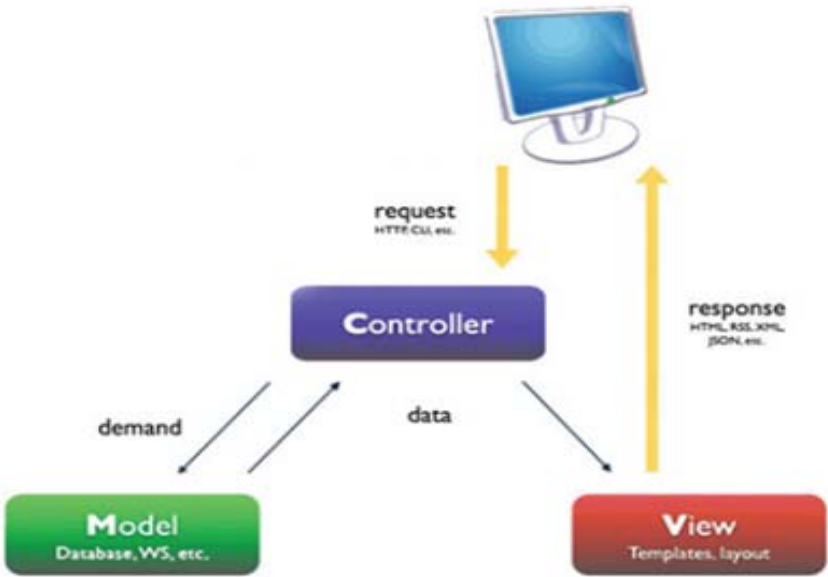
Figure 20: Internal Structure of MVC Architecture

When I was implementing the vehicle monitoring system I have used frameworks Such as, GPS gate server is leading web based GPS tracking platform used to track vehicles in many industries. Open GTS is the software in GPS to track the vehicles. This can be hosted in cloud based environment too. Quick link gv300 is compact GPS tracker unit which will fixed in the vehicles. [8], [9]. Both together systems dataflow can be drafted as an image in below Figure 21.
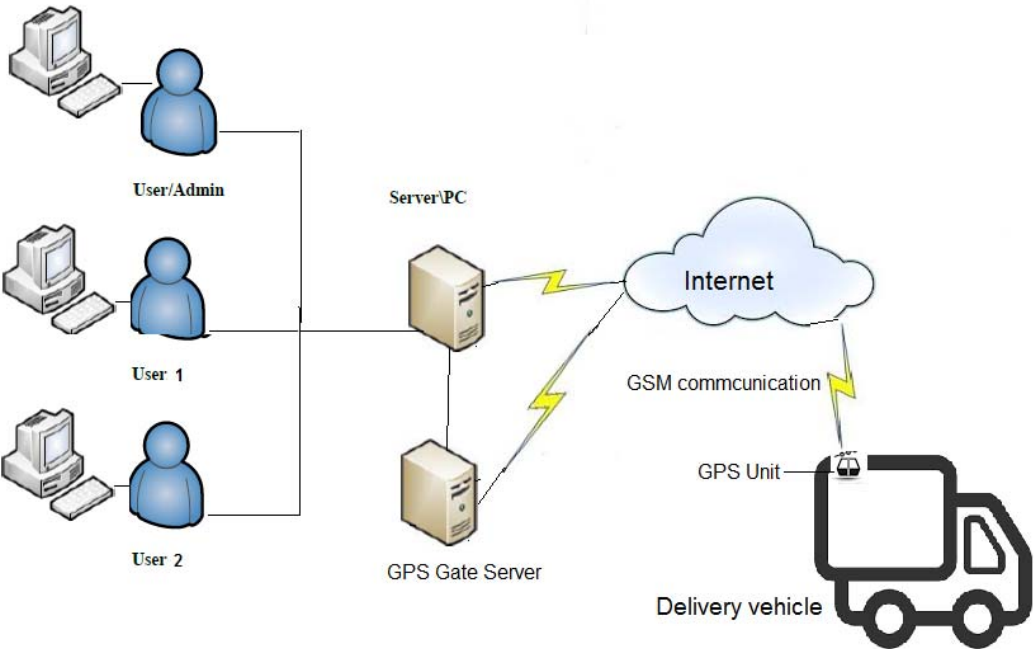
Figure 21: System Access over View

4.7 User Interfaces

1. After Implementation the system Users can view the main Menu of the System is show below Figure 22.
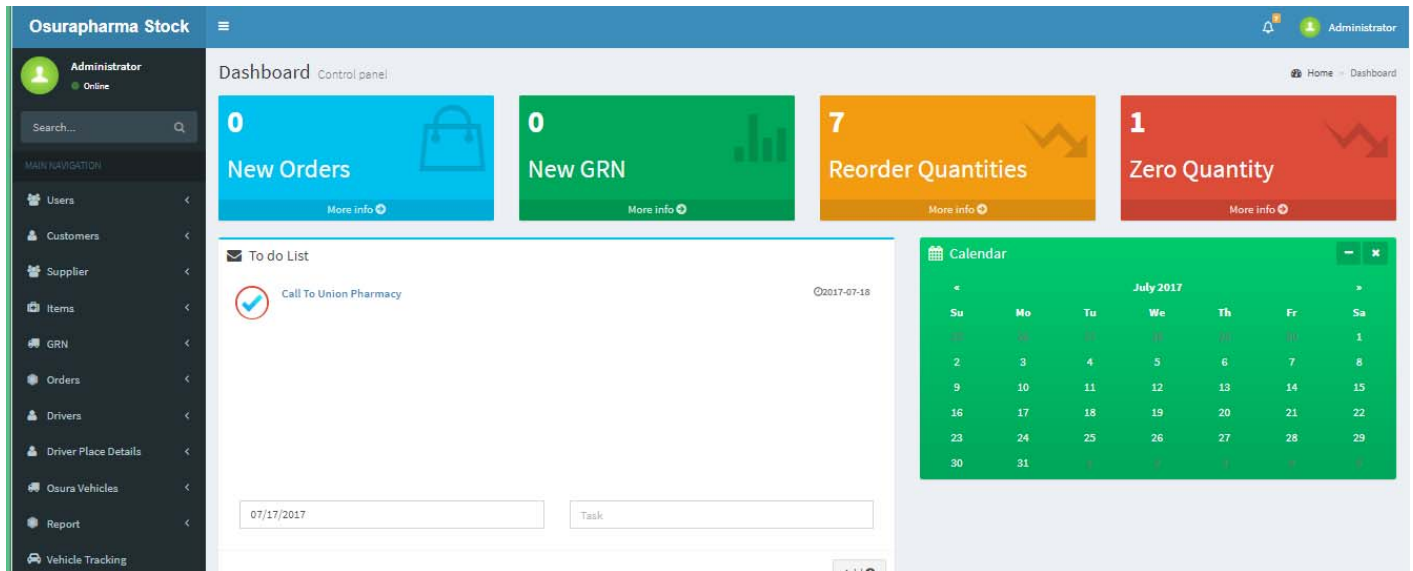
Figure 22: System Main menu

2. How to view a customer as an Interface is depicted below Figure 23.
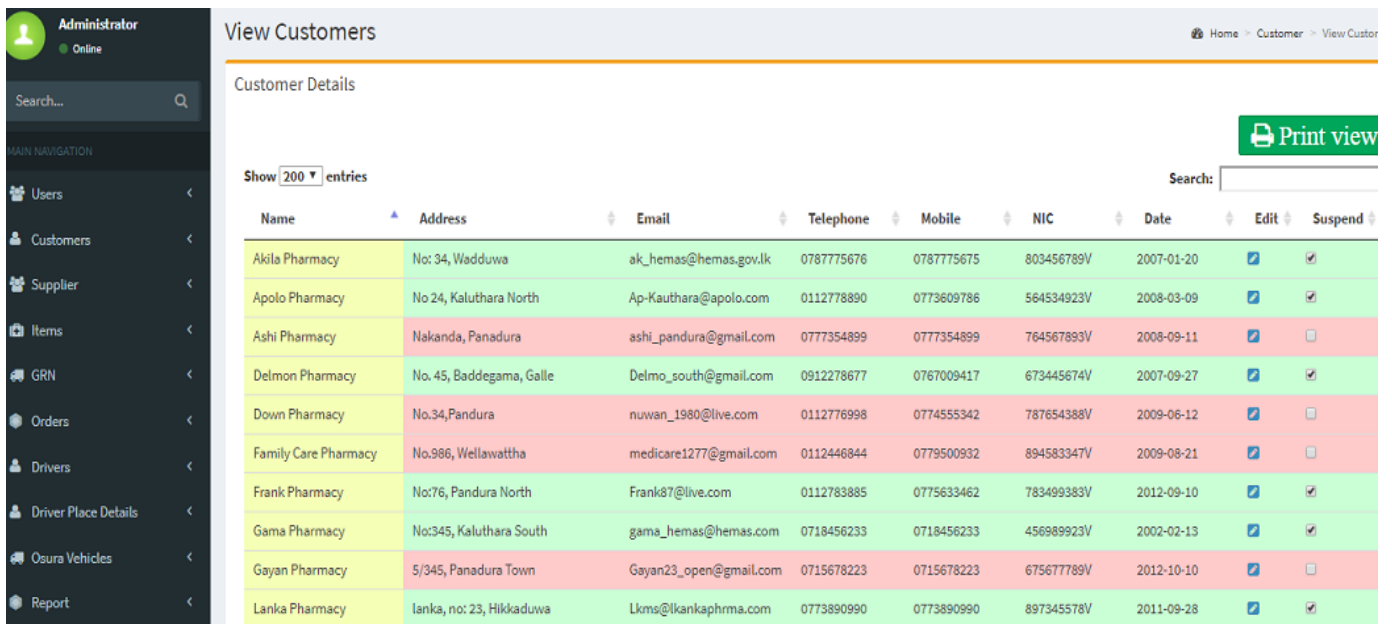
Figure 23: View Customer main window

4.8 Summary

I hope this chapter well explained the events, processes and procedures what I was engaged to implement this software in to live one product. In addition to that, aspects and other technical and communication technologies was well explained throughout this chapter.

Chapter 5: User Evaluations and testing.

5.1 Introduction

After build up the software it may contain various kind of issues such as coding errors, validation and system authentication errors etc. By using this chapter, I try to explain all the scenarios used, plans and methods what I used to build up an error free software.

5.2 Testing Plan

According to my test plan, can be divided into 3 levels as, the pre-requisites for the tests, the steps required to carry out the tests, the expected results of the test. I have done the testing before the coding and after coding. The main testing tool was V model. Since V model is purely run with waterfall model I used below steps to pick up errors, rectify those errors and build up an error free software.

5.3 Testing methods

5.3.1 Before coding/ pre-requisites for the tests I was done the below testing. [10]

Acceptance testing:

Which was used to check whether all Osurapharma details are collected correctly. To have correct details and correct information I visited more than 5 times Osurapharma and drafted all required information from them such as item list, suppliers list, Agent list etc. In addition to that met the users who were engaging with manual process and studied the process what were in operational level. Sometimes collected the data over the phone also. It helped me to understand and write down the exact customer requirement relate to this project. This step was examined when drew the dataflow and DFD diagrams. When there was any unclear relationship or miss information, they I asked Osurapharama to make the confirmation.

System testing:
Which was used to check the functions and non-functions, proposed system, objective of the project, Current system issues etc. And checked those are correctly interconnected to each entity mentioned in the SRS.
System integration testing:
This was used to check the relationships between the entities. Like what kind of partnership as one to one, one to many or many to many partnerships could be seen between entities. As examples:

 I. One order will deliver by one driver and many order will deliver many drivers.
 II. One Agent will purchase many items from OSuraphrma
III. Osuraphrama will purchase many items from one supplier and many items were supplied by one supplier.

1. White Box Testing

White box testing is a testing methodology where the system modules are tested by tracing the code for any anomalies. In the industry, this is mostly done by the developers. In this method, the tester can give the input and see how the input is processed within the code base. This method is beneficial when identifying unused codes, code coverage, coding standards used and modularity of the system. [11]
Following main items were concentrated upon during white box testing.

- Statements
- Conditions
- Loops
  As defects of this testing, code refactoring can be undertaken in order to fix them accordingly.

2. Black Box Testing

Black box testing is where certain inputs are checked against the output from the system. For invalid inputs, an error or warning message should appear. For valid inputs, the system would allow to continue processes. This testing method is highly used by the tester for the project. The system is considered a black box where the internal processing cannot be viewed or referred. Only the inputs given, will be tested against the expected outcome. This testing is highly similar to what the end user will experience once the system is handed over. Therefore, is important that the user is not exposed to the internal complexities of the system. It is also required that any message or notification from the system is useful to the end user and he/she is able to understand the cause of the message and act accordingly. The test scenarios for this system has been derived for black box testing.

3. Unit testing.

Unit Testing was carried out as a part of the coding task. This phase is based on the design of the software for a piece of code. The unit test plan was based on the design of the code and not the code itself. Therefore, the test plan was written after fully completion of design but before the start of the coding phase. When we are designing the project, we have to break whole customer requirement into small sub units to make easy to develop. In unit testing, each and every sub unit have been checked. Order, Supplier, Item, Agents, user login are checking, as an example a When user is created checked that created user is in the system and that user can login to the system. When a sign up in very first time, after this sign up, check whether that created user is able to login to the system. If any mistake will take place, like created user cannot login to the system or created user not in the user permission list and that user cannot login. Check when enter a new item those can be extracted through the system, when user will do any change for any entity, will those amendments be applied in to the system. Likewise, we can do this unit testing to check whether Osuraphrma user logins, add new users in to the system, remove users form the system, password is working for respective user logins, are correctly functioned in the system. Hence unit testing was very helpful to write the codes properly and reduce the mistakes and errors in the system.

4. Component testing.

I applied this testing for each system component, such as orders, items suppliers, invoices, reports, issued cheques, damaged items, invoiced items etc. when I add an order or place an order, by using this testing I was checking this order details are correctly entered. Same as I checked, when I will, add items, remove drivers, remove items, add supplier name, remove supplier names, update damaged items, update invoice cheques, check report details etc. those functions are properly working in the system with updated and correct data.

5. System integration testing.

This was applied in drop down list, combo box, text fields, radio buttons, submitting, cancel events.
As example if a user will add new supplier and enter the items into the database which he will supplied to Osuraphamara. After that database update, if we wish to check through the system those items should be in the item list under that supplier name. If those items won't list down in the item drop down list under that suppler then there will be an error in the system or database insertion of the item. Another example is items can be selected as drugs and medicines. When we raised an order, we have to select one kind of item among drug or medicine. We have to do this by using a radio button. When we click on drug item other medicine button should disable and vice versa. But if both buttons are active or disable at that point we cannot select one item at a time. It means there is an issue in the system. Like this we can check each event action by using system integration testing.

6. System testing

After fully compile the coding need to make sure system is functioning well. To make sure I checked whole programmers one by one. To do this task it takes huge time and it is very difficult to check error of codes. Need to be patient and since when I sorted one issue then it caused to create many issues. Hence top to bottom need to check and complete errors one by one. Sometimes I spend hours and hours to find errors. Any how to make sure that system is functioning well, I did system testing to whole project. When I applied this system testing I was checking below options and checked system security by login different passwords and by using different user names. Forced to crash system by changing the function, overload enter more data into the data fields and checked system is giving validation errors and tried to recovery it
Checked the functional and non-functional requirements are fulfilled by implementing this project.

7. Acceptance testing and Regression Testing

After fully completed the project customer will check the functionalities and check whether his objectives are fulfilled by implementing this project. To do that customer has to check functions and other actions in the system such as signup to the system, then sign in, sign out, passwords are working Oder details, agent, supplier details, reports, invoice details. Osurapharma checked this by using their staff users and operational team. This is the final testing applied to this project. After all, examines and doing regression Testing, Customer found that errors in the system and after correcting those errors again customer checked the system. Finally, customer will come to a conclusion system is working smoothly without an error. Then and only customer will sign the project finalize letter.

5.4 Test Case Writing Methodology Test Scenario Identification

Scenario based testing approach was used when writing test cases. This is a method that saves time for the tester and yet effective just as detailed test cases. The differences are that individual steps are not written in test scenarios. Instead, a clear description is given to the user on what needs to be tested for each test scenario. This method saves time spent on detailed test case design.
Following are the test scenarios identified for work request creation functionality [Please refer Appendix I for the remaining sets of test cases]. Test scenarios are stated in Table 09.

[1] Registration and Login-
   Invalid login, empty login, Verify new user creation
   Verify user details update and DB checkup

[2] Internet connection setup -
   Connection open, data Send, receive

[3] Verify report generation

[4] New Threshold update -

[5] Invalid data, empty data and DB checkup

ID	Test Description	Expected Results	Status
1	Register new user	New user should be able to register using the system	Pass
2	User ID validation in registration	Validate entered details with database content.	Pass
3.	Error invalid data	Display relevant Messages	Pass
4	Missing data for mandatory fields	Display relevant Messages	Pass
5	Duplicate user creation	Uniquely identify the user ID, if the user exists in the system	Pass
6	User login	Login with correct username and password	Pass
7	Update user details	System should be able to update existing user information	Pass
8	Delete user	System should be able to remove existing user information	Pass
9	Invalid user login	Display relevant Messages	Pass

Table 09: Test Scenarios

5.5 Testing process and practices what I did

- After applied testings' write down the all the errors

- Memories the coding places that same error would come, then it would become best practice

- Since small errors are the most important errors, counted all errors regardless of the criticality of errors.

- Without sorted out the present errors stop to proceed next step.

- Categorized critical errors and non-critical errors and write down those all errors.

- Repeat the process until no errors are identified or error rate is sufficiently low. If the error rate is low, then it may be sufficient to simply re-test the failed errors. If the error rate is high, then re-run the process.

- Record the outcome of each test in the test report, both success and failure was reported. For failed tests the nature of the problem was described by me because in sufficient detail was reason to be corrected and to allow analysis of the types of errors being found.

Validation and verification is the name given to the checking and analysis processes that ensure that software conforms to its specification and meets the needs of the customers who are paying for the software. In this project, I checked the validation errors as below.

There is a field it is only valid for Order number. And Invoice number is not consisted with letters. Order number is built with numbers only. Instead of a number if we insert a text in that invoice number box there would be an error prompted as "Invoice number is integers only ". When we insert a name instead an integer value above error would be displayed in the interface. In addition to this maximum digit should be limited to 10 digits. If one user will type more than 10 digits' system should say as "this number is not a valid number" likewise validation errors has been declared in the system.

5.6 Testing process for Vehicle tracking system

Following are the test scenarios to track the Vehicle and the driver with correct places. Test scenarios are stated in Table 10.

ID	Test Description	Expected Results	Status
1	Ask driver to send his place Via WhatsApp application	That place should be exact place what mentioned in Google Map	Pass
2	Checked User previously entered data with online data	Both data should be 95% equal	Pass
3.	Messages not coming due to internet slowness	Same time system has not updated	Pass
4	Changed the Mobile and check the place	Same result as previous Mobile	Pass
5	Check the place using voice messages	Same place displayed as WhatsApp data	Pass
6	Use Bluestacks application instead of Whatapp application	Correct placed was tracked	Pass
7	Check with different users can track the vehicles and driver places.	System users should be able to track the vehicles who has the permission to tracking	Pass
8	When delete user with his permissions. Tracking will be disable for that user	Deleted users cannot access the vehicle tracking	Pass
9	Invalid user login	Display relevant Messages	Pass

Table 10: Test Scenarios for Vehicle Tracking

5.7 Summary and conclusion

Hope this chapter is consisting with the methods what I used to rectify errors in this stock control system and vehicle tracking system. Both systems were checked after login different user logins and verified the results. Results are exactly correct. And after applied all above testing scenarios I was able to build up an error free software.

Chapter 6. Conclusion and Future works

6.1 Work carried out

According to selected system development methodology as waterfall, all its' steps was followed.

When I have started work this project, Osurapharma didn't had any idea about the process what kind of system they need to make their day activities easier. Hence, I have advised them what are latest technology and what are the adaptation of technology can be used to fulfill their system requirement. Then I have visited the place and gathered their information and day today transaction data. Spend lot of time to understand the process what they are currently following. Those were right down and record in my test book. After gathering the data, I created the customer system requirement specification and discussed with customer what are the missing point, customer objectives, how the operation is flow in the system etc. then I designed the whole project into main processes such as in stock, out stock, update the stock and monitoring the vehicles. Other sub functions are support service and process which are generated depend on main processes. Then I created the data flow diagram and the extended data flow diagram with all relationships to the all entities. With understanding of the process flows I have write the logical structure with psudo codes. One main project objective was to have web based system. As a result, I have to select the client server architecture and I was thinking it would be much better since it is easy to convert this architecture with latest cloud technology. Focused with this idea I selected the PHP, CSS and java script to coding. Throughout the many dedications, motivation, with patient I have drafted the coding and applied the above mentioned testing sessions. Then did a small presentation to the customer to make familiar with the developed system.

6.2 Challengers

1. Sometimes when user is trying to get an online monthly report, data may not be in the report. Just after having this user may understand it will be a system error. But actually, when we trying to get that same report in local system data are in the system. The reason when user is accessing the system online it will be accessed via the Internet or through a network. When there will be network jam, congestion or high network traffic that requested data packets may be destroyed. As a result, final report may not consist the data. To overcome this issue, need to check the system access throughout the different networks and different times. I also used dialog dongle and SLT ADSL line to rectify this error.
2. This was also monitored in the vehicle monitoring system, because when the traffic is going high we cannot find the vehicles and took long time.
3. Meanwhile the software is developing it is better to show each and every implementation to the customer. Otherwise if one process is not executing the result as customer says I had to do that process since it will depend on main process.

6.3 Contributions

1. It has been good fortune to have advices and guidance of very much talented senior lecture Mr. Kapila Dias. By using his skills and knowledge I got huge knowledge how to proceed this project.
2. In addition to that Osurapharma management and Staff gave me a fullest support without considering their day to day operational time and dedicated on behalf my software development. In last vising days, I was able to build up very familiar environment with this staff and it was very much help me to understand the processes and flows in Osurapharma since they had a relax mind to

say their understandings with the operation. And it was help me to understand everything without hiding for their experience since they genuinely open their ideas to me.

6.4 Lessons learnt

When I was advising the Osurapharma Team, they were able to build up some idea about the system what I was planning to implement. Then they started to discuss with other same industry leaders. After got their knowledge OSurapharma decided to change their first requirements. Likewise, they have changed their requirements thrice. Each and every time I have to change my all planning since some requirements was not steady and wasn't in their first discussions with me. But to be fair with the Customer I was waiting till they decided what they want exactly. Finally, they agreed not to change their requirement specification any more. But to be safety I got signed letter from them. Hence, I learned that in very first stages we cannot give an idea to the customer that is the system what we going to implement, because when customer became more powerful with their day today knowledge and technology they are trying to map their knowledge with latest technologies and try to compare with same industry level companies. Thereafter they prompt to change the SRS. Hence, we should give some enough time to take exact their requirement. We cannot push them or we cannot be panicked to finish the project soon regardless of the customer ideas. Because if we would in very first stages we can change the project plan, but later it is difficulty to change since we may already put high effort to do so far.

6.5 Points out limitations of the current work

In vehicle tracking system implementation I have faced lot of issues since it was very difficult to find a service provider who gives the GSM service to me. Because a unit cost was very high and they won't sale that product for a single customer, instead of a company.

6.6 Future works and how to extend this project

Since this project architecture is client server architecture I wish to host this system in cloud environment. When this option would come into live, the administration part, storage, cloud hosting, will become very easy and not being hosted in locally. Currently we have huge responsibility about the hardware and the network connectivity. But after implementing this system in cloud we won't take those responsibilities. In addition to that we can expect to have, increase the online accessibility, high reliability, disaster recovery, flexibility to have more storage and more administrative options, automatic software updates and no cost for software licensing as annually or monthly, no high cost for hardware since hardware is part of a cloud hosting, No network infrastructure high cost since cloud hosting become with internet, documentation is less and no need to allocate spaces to keep physical files, high competitive and security. To do this I have to select free hosting cloud storage and good cloud infrastructure which are most suit for this current system.

6.7 Achievement of objectives

By implementing this project, I was able to understand how to interact with customer and discussed what managers are expecting to have in future focus, how they wish to save their time, effort, save resources, money by having such kind of software. In addition to that they expect to build a huge market and predict more business in future. I have experienced all those things in managers' perspective view and understood their willingness to continue their business in a wide area network. Learned how to

break huge processes into small sub units and how to connect those sub units by using database and process flows.

By using DFDs and ER diagrams I learned how to design a system, how to select a software architecture and select the correct platforms suited for design. Then I learned how to wire coding suit for the design process throughout the logics and compile those codes, search the error place in the coding. By using software language how to connect a database to the coding. In addition to that I learn the software engineering principles, and used those principles in live environment. Going through out the testing plan I have applied the testing scenarios to this project, did the data validation. Finally, after doing the acceptance testing I was able to give fully completed system to the client. As a collection of above process, I was able to full fill the Osurapharma objectives by implementing this system. Since this an online web based system I achieved the below targets too.

By using this software streamline the Supply chain process in OsuraPharma ltd. And
1. Make a user-friendly environment the organization and staff.
2. Establish a fast report access facility to the customer.
3. Build up a vehicle tracking system to monitor the vehicles and its deliveries by using glance overview.
4. Build competitive business Model for the company and make best competitor among same industry leaders.
5. Forecasts the company future and make decision in time to time for better company growth.

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Appendices

Appendix A: Project Budget: Hardware devices, Software and communication
(Budget was change and requirement also changed depending on client desire)

No	Item	Quantity	Unit Price	Price
1	Client PCs	1	$210	**$210**
2	Client PC with more storage	1	$250	**$250**
	Printer	1	$38	**$38**
4	GSM Communication (per license) (Client decided to get this in future)	1	$460	**$460**
5	Internet Package (Monthly cost)	1	$10.00	**$10.00**
6	LAN wiring/cabling in the office	1	$120	**$120**
7	ADSL Router	1	$20	**$20**
8	Basic Main Switch	1	$150	**$150**
	Total			**$1258.9**

Table 11: Project Budget evaluation

Since the company is its' initial developing stage client advised to optimized the budget to develop and cover the system with most important and basic requirements. It is newly computerized system and first intention was to overcome all manual works in Osuraphrama. As advice by client when would company grow up and when company expansion would be taken place rest of additional facilities will be added to the system.

In vehicle tracking system the GSM communication package and annual subscription is very expensive. In addition, monthly rental and the GPS unit cost also high. This is not sustainable prices to a small and initial stage company. Thus, some client requirements won't be fulfilling in soon effect due to budget provisioning. All items and unit price are mentioned in above Table 11.

Appendix B: 1. Progress to Date and Project Plan depicts in the Table 12.
And Table 13: Grant Chart will explain the time lines for the Project

| Activity	Plan Start	Plan Duration	Actual Start	Actual Duration	Percentage Complete
Project proposal	30/06/2016	10	30/06/2016	7	100%
Literature Survey	05/08/2016	10	08/08/2016	6	100%
Feasibility Study	20/08/2016	5	20/08/2016	3	100%
Requirement gathering	01/09/2016	10	17/09/2016	12	100%
Requirement Analysis and Design (SW/HW)	25/09/2016	30	25/09/2016	28	100%
Interface and Database Design	17/10/2016	20	21/10/2016	30	100%
Software & Hardware Implementation	12/11/2016	90	14/11/2016	120	100%
Testing	20/01/2017	10	20/02/2017	8	100%
Finalizing product and documentation	08/2/2017	20	25/2/2017	30	95%

Table 12: Project Plan dates
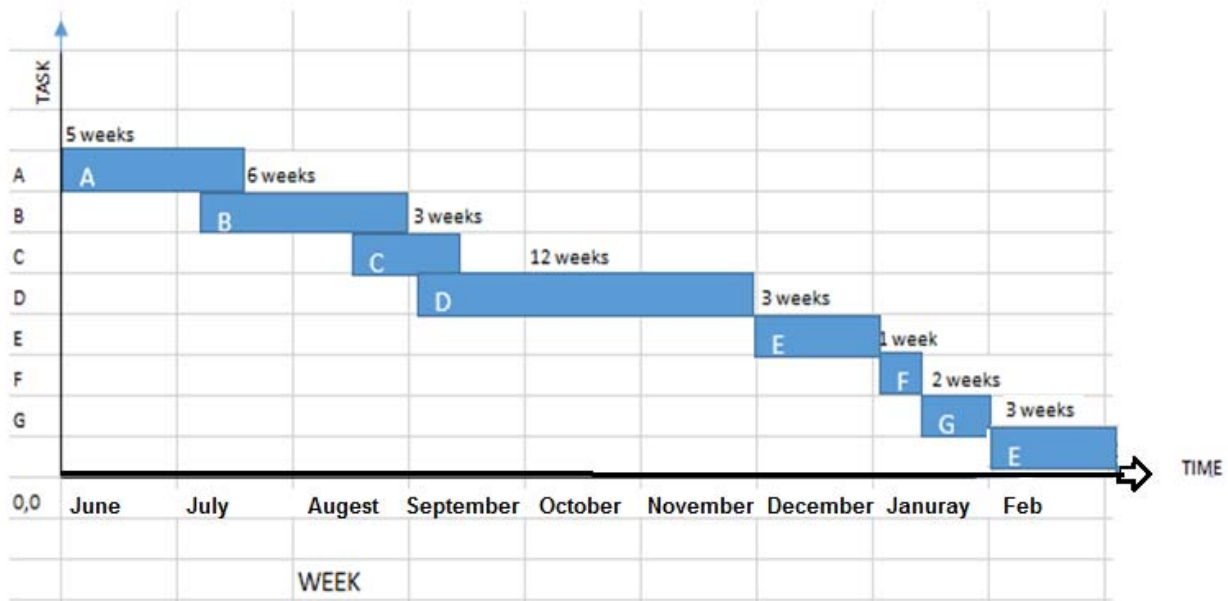
Table 13: Grant Chart for the Project

Appendix C: Below Table 14 depicts the documentation deadlines of the System Implementation.

Progress Report Number /Milestone	Deadline for Submission	Status
1	4th July 2016	Completed
2	10th September	Completed
		Completed
Interim Report	24th September	Completed
3	30th September 2016	Completed
4	31st October 2016	Completed
5	30th November 2016	Completed
Thesis Submission: Supervisor's Version	21st January 2017	Completed
		Completed
Final Thesis for Marking	9th March 2017 to the UCSC Exams Branch before 4:00PM.	Pending

Table 14: Documentation deadlines

Appendix D: Client Interview

Initial Interview with Client

Client Name: Osurapharma Ltd.

Date: 12-09-2016

Q1: What are the current activities in your company/office?

Make facility supply chain process for Pharmaceutical products. In the sense purchased items from suppliers and selling to customers.

Q2: What are the main activities in the supply chain process?

- Purchasing item from suppliers
- Make market pricing before the sales
- Take the orders from customers
- According to orders fill the customer requirements

- Take the good received notes
- Manage the vehicles to supply and deliver items to customers
- How to track the drivers and Vehicles

Q3: What are the current methods now company is processing?

All are manual activities such each and every action write down and do the documentation to see annual and monthly records

Q4: What are the feature you are looking for in a newer system?

Eliminate the manual workings and stream line the company process and day today activities by a computerized system

Q5: Do you have enough budgets for this implementation?

Since the company is in initial development process first need to computerized system for day today transaction. Keep provisioning the system to expand one day we would go for a fully functional and automotive system. For the first implementation, I have the capital

Q6: How soon do you need the new system?

As soon as possible.

Q7: what is the reason for such an urgency go for a new system?
Need to eliminate company wastage, and save staff time, Optimized the expenses, cost cutting for unwanted expenses. Save the users' effort and engaged their effort to uplift the company development and reduce the user mistakes.

Appendix E: System requirements
This is a Hardware and Software based solution. Here I have listed both software and hardware system requirements for the system. To use the system efficiently, all computer software needs certain hardware components or other software resources to be present on a computer.

Software Requirements for Hosting This System,
- .NET Framework 4.5 or greater
- WAMP server 2.5
- IIS 7.5 Express
- Visio
- Sublime text
- WhatsApp Application
- Java script/ CSS
- Bluestacks application(optional)
- Microsoft Outlook
- PHP
- Google Chrome
- Joomla 3.4

Hardware Requirements for Hosting This System,

- Windows Server operating system Server 2012 or Windows 7,8.1
- In built microphone, Inbuilt speaker
- 100 GB/SATA Hard disk
- System Memory - 2GB or greater
- Processor - Pentium IV or higher 2.1Ghz Processor
- Mobile Phone with SIM card

Network Requirements for Hosting This System,

- GSM Communication
- LAN
- WAN
- Switch
- ADSL Routers

Appendix F: User's Manual

(1) After installing the Software, make the database installation, start the WAMP server and open Osuraphrama web site through the local Host. Then it will load the very first interface as shown Figure 24 and it will prompt to have your user name and password. You have to give the user name and password and login the web site.

Figure 24: Osurapharma Login

(2) Once your login to the system it will open up the main menu. In the main menu user will find a dashboard as shown Figure 25 with live data feeding from the server. Also, you can see all main entities such as Item, Customers, and Suppliers etc.
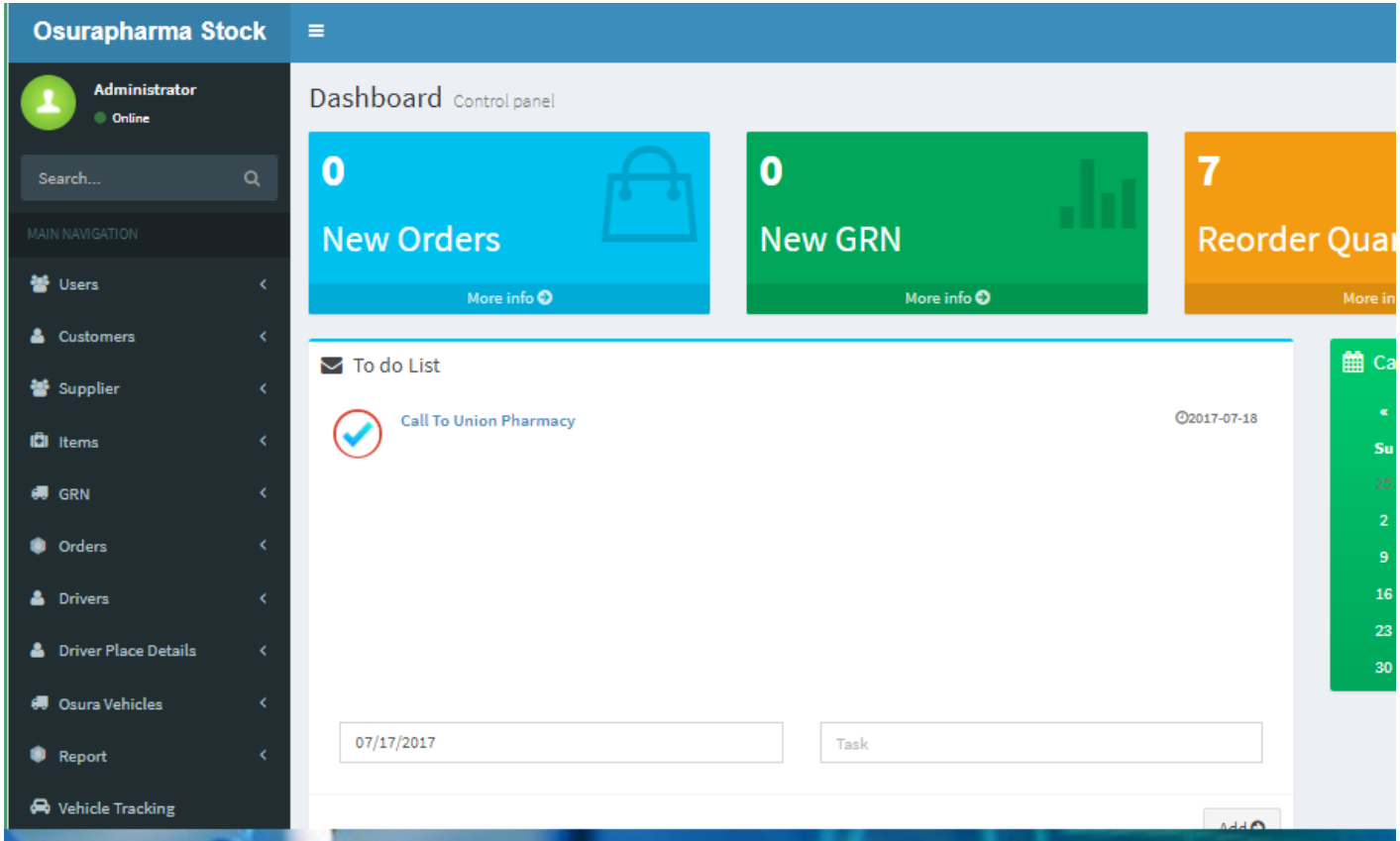

Figure 25: Osurapharma Dashboard

(3) First button on the left of the screen is 'Users' button. By navigating this button user can see who other users who has same privileges are. Each of user has different privileges levels to access the system. This screen is shown in below Figure 26.
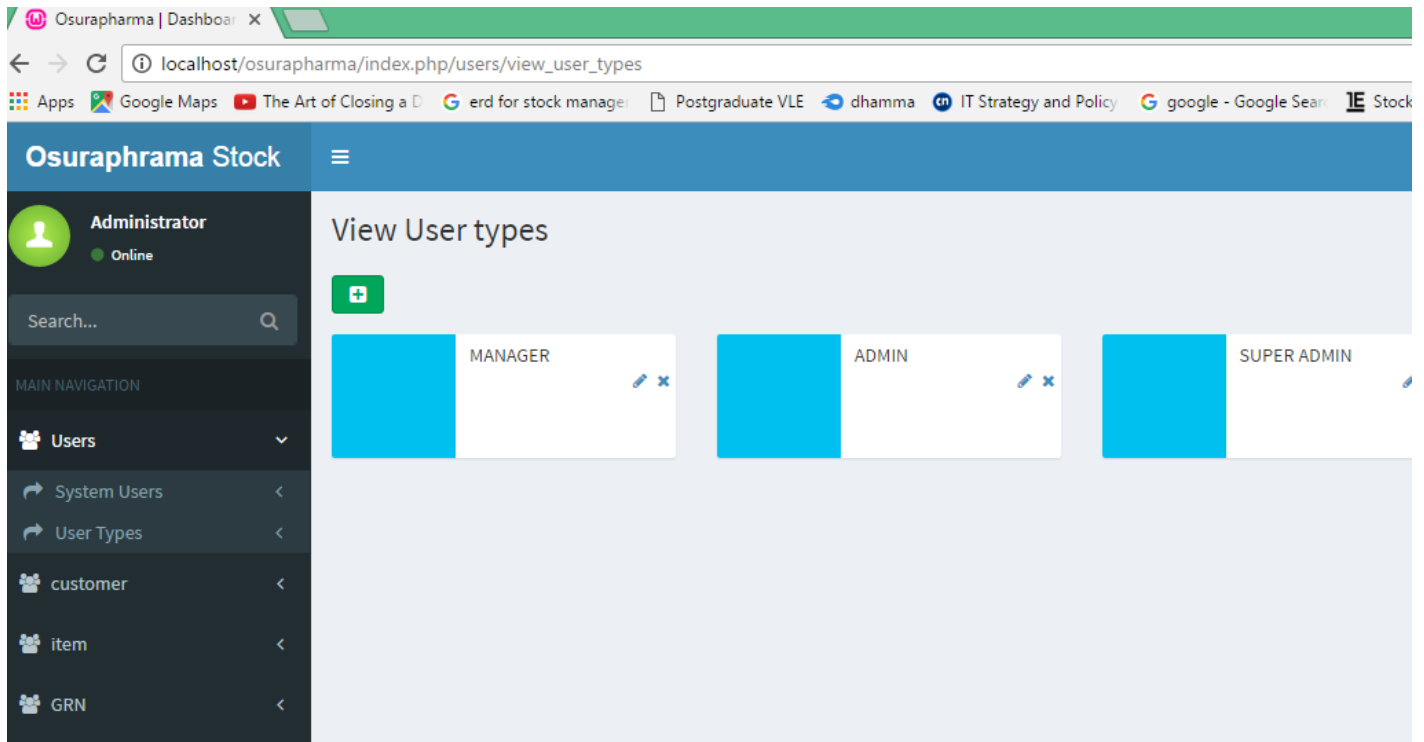

Figure 26: Osurapharma Users list

(4) Second button is Customers. By navigating this button, we can see the Figure 27 and it depicts as shown below customer details, add customers and delete the customers. User can view add and delete the customers going through these screens.
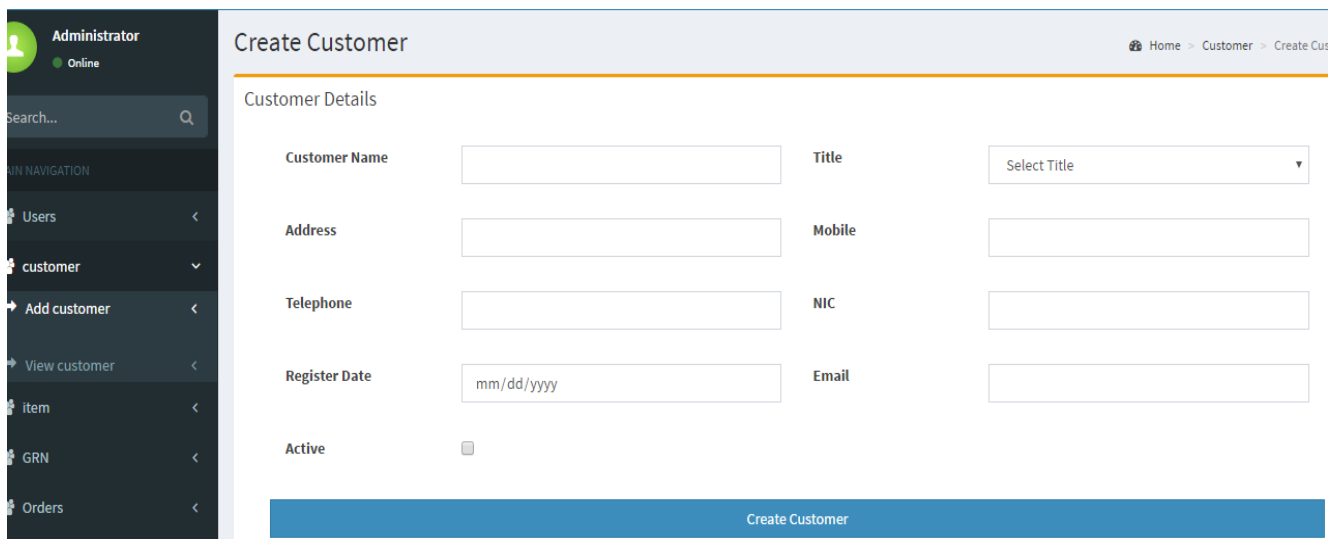

Figure 27: Osurapharma Customer Details

(5) Third button Item button. This interface is showing below Figure 28 and provides user to view content of Items and view items, add item and delete items. Users can add item, view item.
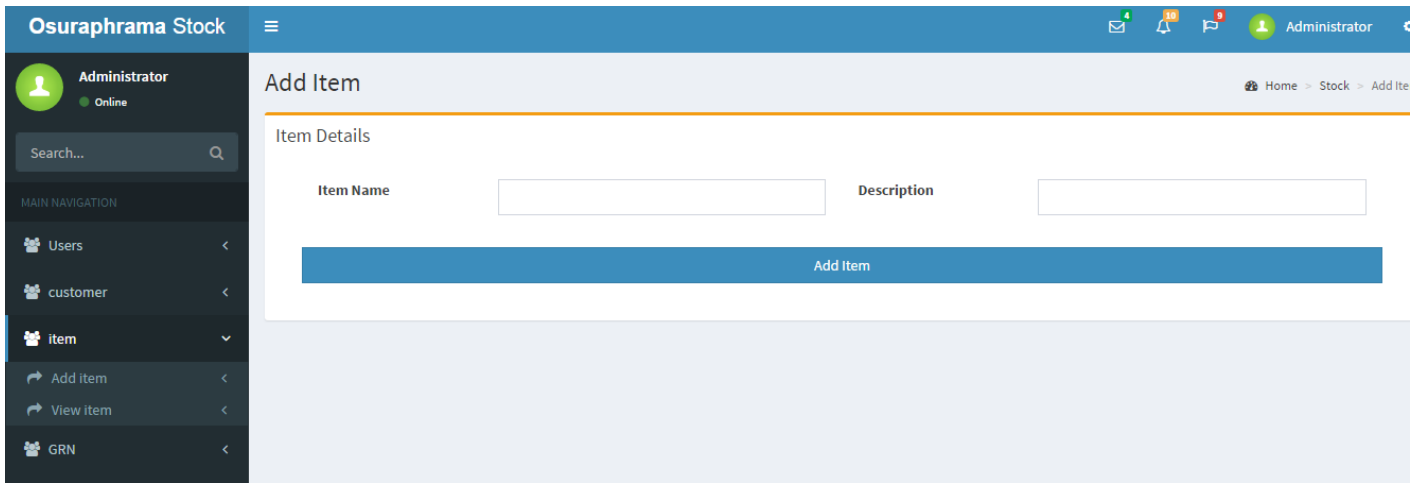

Figure 28: Osurapharma Items details

(6) Forth button will show the user to GRNs. By navigating GRN button user can view the number of GRN, add GRN and view GRN. Figure 29 is the interface for GRN screen.
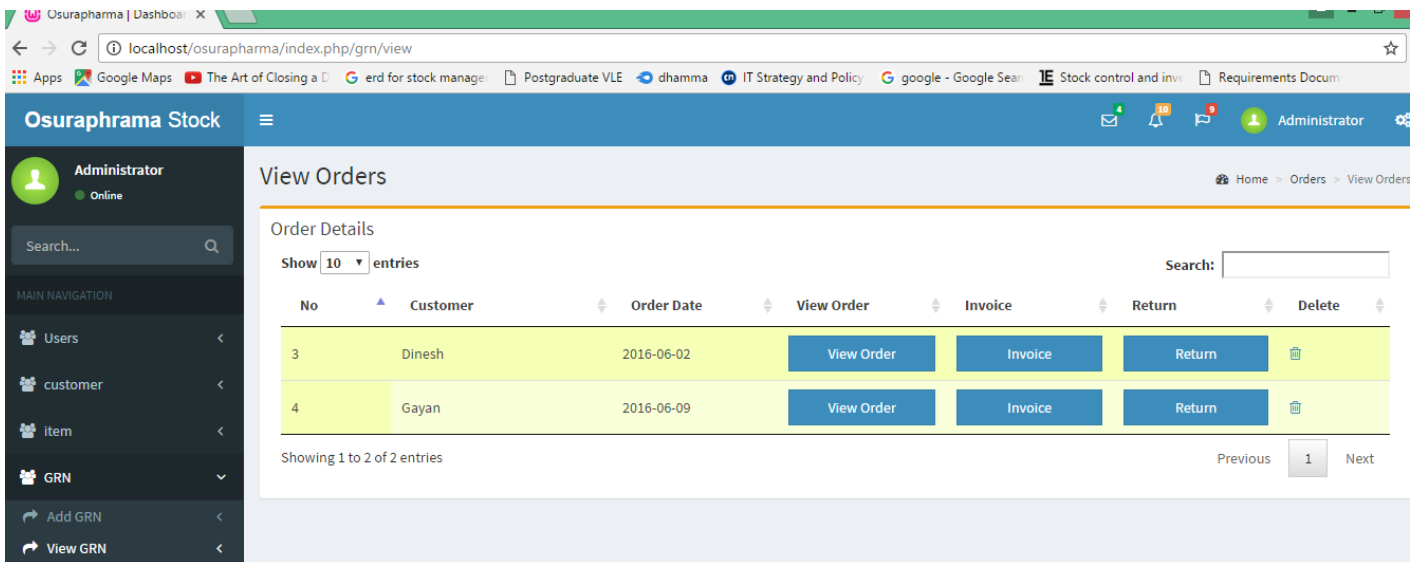

Figure 29: Osurapharma GRN details

(7) Fifth button will navigate the user to view orders as show in Figure 30 and inside this button user can see the raised orders, view orders and add orders.
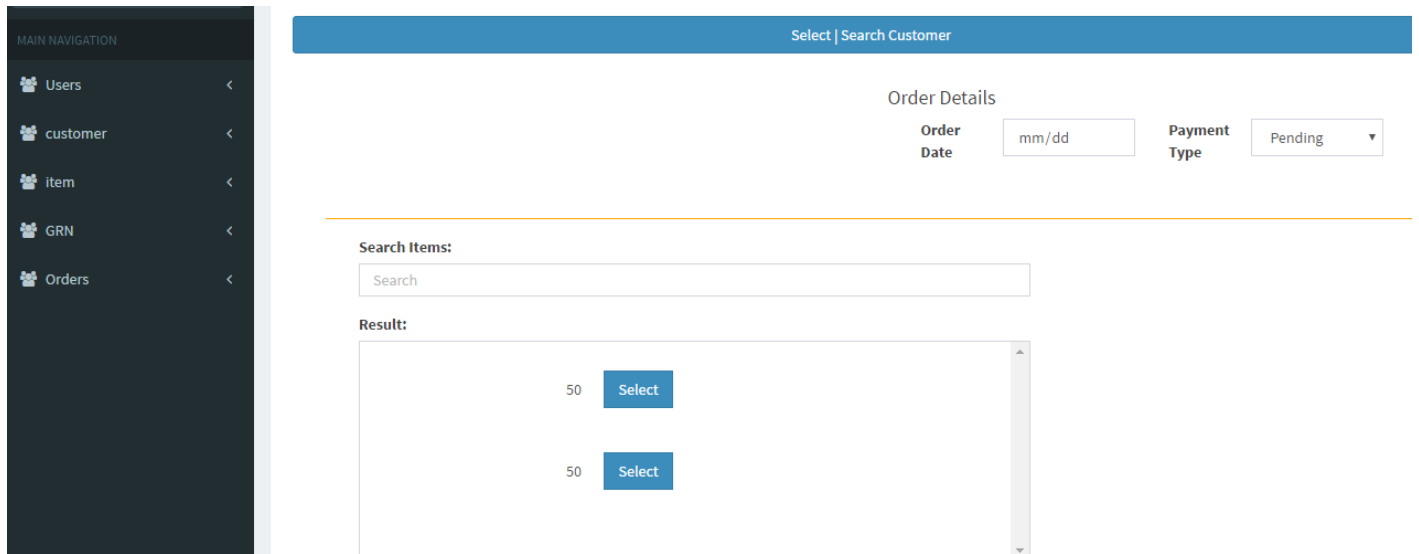

Figure 30: Osurapharma Order details

Appendix I: Test Cases

1. Test Case to add an item is represented in below table 15.

ID	Test Description	Expected Results	Status
1	New item adds to the system	New Item should be in the main database when login to the system next time	Pass
2	Delete an item from the system	After deleting the Item, it won't be in the main database when login to the system next time	Pass
3.	Edit an item in the system	After edit the details for an Item, changed details should be in the main database when login to the system next time	Pass

Table 15: Test case for add item

2. Table 16 is consisting how to do the Test Case to add a Customer

ID	Test Description	Expected Results	Status
1	New Customer add to the system	New customer should be in the main database when login to the system next time	Pass
2	Delete customer from the system	After deleting the customer, it won't be in the main database when login to the system next time	Pass
3.	Edit customer details in the system	After edit the details for customer, changed details should be in the main database when login to the system next time	Pass

Table 16: Test case to add customer

3. Test Case to add and delete an Order is depicting by below Table 17.

ID	Test Description	Expected Results	Status
1	New Order add to the system	New order should be in the main database when login to the system next time	Pass
2	Delete an order from the system	After deleting the order, it won't be in the main database when login to the system next time	Pass
3.	Edit order details in the system	After edit the details for order, changed details should be in the main database when login to the system next time	Pass

Table 17: Test case to add an Order