



E-Commerce Platform for Pharmaceutical Trade (iMedic)

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

J.K.T.S. Perera (2015/MIT/038)

University of Colombo School of Computing

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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.

Student Name: J.K.T.S. Perera

Registration Number: 2015/MIT/038

Index Number: 15550383

Signature:

Date:

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

Ms. J.K.T.S. Perera

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

Certified by:

Supervisor Name: Mr. G.K.A Dias

Signature:

Date:

Abstract

E-Commerce (Electronic Commerce) involves selling and buying services and goods via the internet, as the technology is enhanced more businesses are conducting E-commerce transactions to gain competition advantage. Even with technological development in Sri Lanka it is hard to find medical stream getting involve into E-Commerce by identifying the benefits they can achieve. As a result of that customer interaction with the medical stores or pharmacies always happens in physically. The purpose of this project is to provide E-Commerce platform for pharmaceutical trade from exploiting E-Commerce to their competitive advantage. This project was undertaken because drugstore pharmacies have failed to gain advantage of E-Commerce. Thus, this research is important because there is little information about pharmacies and E-Commerce in drugstore and this project provides a way to create an E-commerce platform for Pharmaceutical trade. By the help of this project customer will be able to search and buy the medicine from anywhere as per the requirements and delivery of the order will be done to their home. This project is an evolution in the medical drug shopping, it minimizes the effort and save the time to buy the medicine.

Current functionality of order management is semi-automated through the designed system due to the Sri Lankan legal framework and the complexity of the context.

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List of Abbreviations

- AU - Australian Dollar
- Brick and mortar - physical presence of an organization or business in a building or other structure
- EC - E-commerce
- NMRA - National Medicines Regulatory Authority Sri Lanka
- OTC - Over the counter
- UK - United Kingdom
- US - United States of America
- UI - User interface

Chapter 1

1. Introduction

Information and Communication Technology plays a great role in different fields and areas. Health care system is one area which is also affected. It is necessary to ensure a technologically appropriate, efficient, affordable, and environmentally adaptable and consumer friendly system to benefit the health care industry. This project therefore endeavors to fill this apparent research gap by developing electronic commerce platform for pharmaceutical trade, within the context of a developing country like Sri Lanka. The advent of the Internet has opened a vast new frontier to marketers. The Sri Lankan pharmaceutical industry is in its infancy in this area, thus the need to assess the usage of e-commerce in the pharmaceutical industry.

1.1 Motivation

Sri Lankan pharmacies have failed to capitalize on the use of the internet and opportunities for EC (e-commerce). With the increase in competition and evolving technology, pharmacies need to come up with creative ways to gain competitive advantage, increase market share and increase profit margins, through EC. In the aspect of customer, they need to physically be in pharmacy to purchase medicines and finding the relevant medicine according to prescription is a time-consuming task.

1.2 Statement of the problem

EC involves selling and buying services and goods via the internet, and the technology increases, more businesses are conducting e-commerce transactions to gain competition advantage. This project was undertaken because drugstore pharmacies have failed to opportunities for E-Commerce. Mostly people buy the product from the medical store that means people need to go there physically to buy the medicine. Customers consider purchasing goods online to be more convenient than traveling to a drugstore. So, providing an e-commerce

platform for the both customers and the pharmaceuticals will be more beneficial for both in several ways.

1.3 Aims and Objectives

The main objective of this project is to design and user-friendly e-commerce platform for pharmaceutical trade in Sri Lanka which helps customer in purchasing products as well as medical stores to sell their products by competing with other dealers. This web-based platform will link medicines in many medical stores to one centralized place where customer find easy to purchase, compare pharmaceutical products.

With the aim of achieving above ultimate objective, there are several goals which should be achieved. Those are,

- Provide security to both pharmaceutical and customer's personal data from physical harm and unauthorized access.
- Enable the pharmaceutical companies to advertise their products to their clients online hence attract more customers.
- Allow customer to access and purchase pharmaceutical products throughout the day without any time restriction.
- Analyzing Doctor Prescriptions and respond to customer within reasonable time.

1.4 Scope

The scope of this project is limited to the activities of a pharmaceutical store which includes use of a computer-based management system for improving the efficiency of pharmaceutical needs to the Sri Lankan society. Following features will be provided to both customer and the pharmaceutical stores.

- Uploading and Editing information of drugs

Pharmaceutical companies will act as suppliers in this project. Therefore, they will be given permission to upload details of drugs and editing any existing details. Most

critical information is required when uploading drug details such as availability of doctor prescription, expiry date, ingredients etc.

- Managing customer orders and Reminders

Supplier will be notified by email/SMS once customer order is done. There will be certain drugs which require doctor prescription to purchase, in this kind of scenarios supplier has to investigate uploaded prescription and provide necessary feedback to customer within reasonable time. With this feedback customers are informed about usage of drug within given period, this will be occurred as reminder to customer.

- Searching Pharmaceutical products

The searching process is based on the name of the drug. When the user searches item, results will be populated from different suppliers along with drug details. Since there's list of products is given customer can compare prices supplier wise and choose to cost effective and convenience drug.

- Purchasing products

In this e-commerce platform user will be able to purchase drug(s) in his/her shopping cart by online payment. For that already available payment gateways will be integrated. Furthermore, transportation will be handled by third party organization apart from the project.

- Report Generation and up-to-date information

Pharmaceutical stores will be provided an admin console where they can monitor their current stocks as well as generate reports monthly relate to their sales.

- Advertisements and Promotions

Suppliers can make customer aware of their special promotions or offers through website. Advertisement functionality is given to attract more customers by providing relevant information about pharmaceutical products and this makes competitive environment to vendors.

1.5 Structure of the thesis

Chapter 1-Introduction

The problems being faced currently and how to overcome those with the proposed system is described. Dissertation chapter organization is provided.

Chapter 2-Background

Literature review and sample projects are the main topics discussed under this. Basically this chapter provide facts to get good understanding of the solution.

Chapter 3-Analysis and Design

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

Chapter 4-Implementation

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

Chapter 5-Evaluation and Testing

Developed system will be tested against the user requirements which are gathered at the beginning. Actual data from the client's environment will be used.

Chapter 6-Conclusion and Future work

Discuss about the system enhancements which could be done in the future. This will also provide a summary note of the system achievements at last.

Chapter 2

2. Background

2.1 Introduction

The purpose of the site is to provide reliable and easily accessed pharmaceutical ecommerce platform for the community including pharmacies and consumers. Customers consider this to be more convenient than traveling to a drugstore, in the same way as ordering goods online rather than going to a shop. EC involves selling and buying services and goods via the internet, and the technology increases, more businesses are conducting e-commerce transactions to gain competition advantage. The purpose of this project was to determine the most influential factors withholding pharmacies from exploiting EC to their competitive advantage. This project was undertaken because drugstore pharmacies have failed to opportunities for E-Commerce.

2.2 E-Commerce (Electronic Commerce) in pharmaceutical retails

'E-commerce' was coined in 1999, and by 2004, online spending reached US\$ 117 billion [1] and Mahesh and Landry [2] has argued that total volume of EC has been growing by 15 to 25% yearly. Articles show [3] that EC allows the creation of new business models such as E-tailing, which is used by online pharmacies (a US\$ billion industry). Several recent studies [2,3,4] suggested that Click-and-brick models were found to be more successful than virtual pharmacies as they often use. Rangaswamy and Van [5] shows that EC in Multichannel marketing, and by tracking consumer behavior across channels, they can improve their understanding of their consumers' decision making and thus be able to satisfy their customers' needs with their online information system, product cost and availability, and customer service [6]. Presently, there is low penetration of e-pharmacies in less developed countries, like Sri Lanka [3]. There has been little research done about EC and the Pharmaceutical industry, and this is problematic for theory, research, and practice as Pharmacy managers are hesitant to enter the EC field.

2.3 Literature Review / Similar Projects

As described by Turban et al [7] EC allows the creation of new business models such as e-tailing (online selling). The 20th century thus saw the proliferation of e-pharmacies (selling medication over the internet). Globally, e-pharmacies is a US\$ billion industries and is forecasted to be about US\$ 51.75 billion by 2017. The US, Europe, and Canada holds the largest market share with the US representing the largest regional market with nearly 50%, and Europe representing the second largest and fastest growing market, growing at a rate of more than 20% annually [3]. Farrell and Fearon shows that [8] the Canadian e-pharmacy industry has grown to US\$ 1 billion in sales with over 100 Canadian e-pharmacies. Online pharmacies will be successful if they understand consumer behavior in order to satisfy their customers with their online information system, product cost and availability, and customer service [6].

Dudley [9] argue that In Europe, EC in healthcare began in 1998, but took off in 2004. Denmark, Germany, the Netherlands, Norway, Sweden, Switzerland and the United Kingdom allow prescription-only medication to be dispensed by e-pharmacies. Alliance Boots, UK, is ahead of the other European pharmacies in its level of online services integrated into its pharmacies especially with its very successful order-online-collect-in-store promotions [9]. In Poland, www.Doz.pl is said to be the largest online Pharmacy and information site with almost 3 million users placing 100,000 orders monthly in 2011, [9] and since 2004, Internet pharmacies have been licensed to operate in Germany. 'Pureplay' pharmacies represent 3.5% of the total pharmacy sales [9].

Some studies [2,3,4] associated with a conventional store, were found to be more successful than virtual Online Pharmacies pharmacies. The click-and-brick model (has a physical store but also conducts some EC activities) is a variation of the e-tailing model [7,10]. For example, E-pharmacy is an Australian online pharmacy (with a physical store in Calamvale) that was launched in the year 2000. The pharmacy industry in Australia is worth over AUD 10 billion yearly. E-pharmacy experienced sales increase of over 20% monthly since its inception. In one year, the site sold over AUD 500,000 worth of products. Lane and Koronios [11] suggest that E-pharmacy experienced such extensive and rapid growth within Australia that they planned to open a megastore to sell directly to the public and to serve as a warehouse.

It was designed as a functional site to support the purchase of pharmaceutical products and to provide product information to attract and retain customers. E-Pharmacy operated in a highly regulated industry thus, its' business activities and behavior were closely monitored by the

Pharmacy Guild and the Pharmaceutical Society of Australia, as it was subjected to the same controls as brick and mortar pharmacies [11].

E-Pharmacy faced little serious competition. Brick-and-mortar pharmacies were still very profitable, so other Pharmacies did not go online, thus enabling E-Pharmacy to have an extensive market reach within Australia and overseas and accumulating increased profit margins. Sales increased over 20% percent monthly, and in one year, E-Pharmacy sold over AUD 500,000 worth of products mainly prescription and OTC (over-the-counter) drugs. It achieved competitive advantage from its' prompt and efficient customer order-fulfilment, facilitated by the extensive distribution network of Australia Post. Thus, E-Pharmacy experienced success due to good business planning, and good web development and pharmacy experiences [11].

2.4 Summary

This chapter reviews several studies on online pharmacies and e-pharmacy implementations. The developments of e-pharmacy are summarized in two broad categories: OTC drug sale, and Prescription only drug sales. In OTC drug sale approaches e-pharmacy acts like regular online retail shop. But for the Prescription only drug sale; it will different from regular online retail shop. From reviewing literature, we identified for the Prescription only drug sale needs legal background and regular online retail strategies could not be applicable.

The advantages and disadvantages were also illustrated, and it can be concluded that these findings are in alignment with the conclusions of the Literature review. Finally, requirements of the proposed system were identified, and it was decided to implement the system with web technologies.

Chapter 3

3. System Analysis and Design

3.1 Introduction

System analysis is referred to the systematic examination or detailed study of a system to identify problems of the system, and using the information gathered in the analysis stage to recommend improvements or solution to the system.

System design is an abstract representation of a system component and their relationship and which describe the aggregated functionality and performance of the system. System design is also the plan or blueprint for how to obtain answer to the question being asked. The design specifies which of the various type of approach.

3.2 System Analysis

System analysis is the study of sets of interacting entities, including computer systems analysis. This field is closely related to requirements analysis or operations research. It is also "an explicit formal inquiry carried out to help someone identify a better course of action and make a better decision than he might otherwise have made. System Analysis is a methodology that involves the application of systematic approaches to collects facts about an existing system with the aim of improving it or replacing it with more efficient system within the context of the available resources.

3.2.1 Analysis of Existing System

Before we analysis the design of the proposed system, we need to carefully highlight the problems of the existing system to avoid recurrence. This analysis serves as a pointer on how to embark on building the proposed system that will help the Pharmaceutical industry vendors to provide optimal drug retail from e-commerce trade. The problems of the current system should be outlined. Below are some of the problems associated with the existing system;

- Significant amount of time is allocated for writing the order as the pharmacist needs to go through the stock balance and make rough estimate for the amount to order based on Figures.
- The state of drugs in stock is manually checked.
- Mistake of selling expired drugs to customers.
- Too much workload on employees.
- No comparison from the price in the vendors.

3.2.2 Analysis of Proposed System

This project provides a way to create an E-commerce platform for pharmaceuticals. While many internet pharmacies sell prescription drugs only with a prescription, some do not require a pre-written prescription. In some countries, this is because prescriptions are not required. By the help of this project customer will be able to search and buy the medicine from anywhere and as per the requirements. Project will provide information about different offers on buying of product/medicines. It would also provide methods to change the quantity of products purchased and edit the cart. Payment could be made through cash or online using credit card payment methods. This project is evolution in the medical Drug shopping, it minimizes the effort and save the time to buy the medicine.

3.3 Requirements Definition

Preliminary investigation plays an important role in developing a satisfactory requirement. Its' because of thorough investigation of how the current or the existing system works using the facts gathered at the preliminary investigation that leads to focusing on the possibility of replacing the existing system or improving upon the existing system. This task involves information gathering.

3.3.1 Method of Information Gathering

Collection of fact is the act of getting and gathering information from various sources to be able to compose the project. Data used for designing of the system were gathered through several means. Therefore, the method used in the design and collections of information from various sources are as follows:

- Collecting and analyzing existing materials on the project topic, written by different expert.
- Studying the present system in detail and the organizational style.
- Knowing and understanding the input and output processes of the existing system.
- Interviews: A qualitative form of interview was conducted in the pharmacy to know the equipment needed, and the mode of operation of the old system.

3.4 Functional Requirements

Functional Requirements are the main components of the system which are asked by the client and the users. Significant functional requirements, which are associated with specific functions, tasks or behaviors that the system must support are identified in below.

3.4.1 Uploading and Editing Information of drugs

Pharmacies will act as suppliers in this project. Therefore, they will be given permission to upload and edit drug details which are available in their stores. Most critical information is required when uploading drug details such as availability of doctor prescription, expiry date, ingredients etc. System should provide interface to input above information through a form. Input data must be validated before submitting form. Uploading and editing authority should be given to responsible person in each pharmacy as this information will reflect to their customers.

3.4.2 Managing customer orders and Reminders

Supplier will be notified by email and by a notification shown in his/her dashboard when there is customer order. There will be certain drugs which require doctor prescription to purchase, in this kind of scenarios uploaded prescription will be investigated by certified pharmacist in each pharmacy and will provide necessary feedback to customer within reasonable time. With these feedback customers are informed about usage of drug within given period, this will be occurred as reminder to customer.

3.4.3 Searching Pharmaceutical products

The searching process is based on the name of the drug. When the user searches item, results will be populated from different suppliers along with drug details. In the search results it will be displayed the drug is OTC or prescribed and if drug require prescription it will be also notified to customer to upload prescription. Since there's a list of products is given customer can compare prices supplier wise and choose a cost effective and convenience drug. And there will be filtering options based on the search results which narrow downs the drug list.

3.4.4 Purchasing products

In this e-commerce platform user will be able to purchase drug(s) in his/her shopping cart with pay later option, it means customer has to pay his/her bill after drugs are delivered. Each drug in shopping cart will be handled as different order and will be processed separately. Furthermore, transportation will be handled by third party organization apart from the project.

3.4.5 Report Generation and up-to-date information

Pharmaceutical stores will be provided an admin console where they can monitor their current stocks and their expiry dates as well as generate reports monthly relate to their sales. This functionality will be available for both admin as well.

3.4.6 Advertisements and Promotions

Suppliers can make customer aware of their special promotions or offers related to products through website. Advertisement functionality is given to attract more customers by providing relevant information about pharmaceutical products and this makes competitive environment to vendors. Pharmacy will be allowed to specify this information through their user profiles.

3.5 Non-Functional Requirements

There are requirements that are not functional in nature. Specifically, these are the constraints the system must work within. These requirements will help to provide more reliable and efficient service to the end user.

Here are some of the most important considerations

- Usability
- Reliability
- Availability
- Flexibility
- Adaptability
- Security

3.5.1 Usability

This solution will be used by all customers who wish to buy their medicines or health care products online. Since different kind of end users are there usability of the system is vital. It makes easier for the user to work within.

3.5.2 Reliability

The system is designed to be reliable in operation to give the user a hazard free experience. The system must provide more reliable environment for the users which have no domain knowledge

on information systems. The system is integrated with a back-up plan from the beginning for recovery purposes.

3.5.3 Availability

This E-commerce platform is a web-based service, so it is widely available on the World Wide Web and it can be accessed from anywhere where within the local area network. So, there must be good backend server and well-equipped network facility for the computers.

3.5.4 Flexibility

The system is designed to work on any platform regardless of the operating system. This way almost all computers can be used by the users. The system is not fully depending on browsers and the operating systems. It must be able to run within the cross browsers and within the cross platforms.

3.5.5 Adaptability

Main system is based on PHP 7.0, MySQL 5.7. So, to make it adaptable to any versions which is present now or upcoming versions the system should be includes capability of adaptability.

3.5.6 Security

Security requirements are included in a system to ensure:

- Unauthorized access to the system and its data is not allowed
- Ensure the integrity of the system from accidental or malicious damage

Examples of security requirements are:

- The access permissions for system data may only be changed by the system's data administrator
- All system data must be backed up every 24 hours and the backup copies stored in a secure location which is not in the same building as the system.
- We must ensure the safety of the patient's confidential data both way, within the online through the web access and offline within the server itself.
- We must encrypt the passwords and username and keep the track of the log files in the server also.

3.6 System Design

System design is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements through system modeling. One could see it as the application of systems theory to produce development. The design of this system will be user friendly. It shall be designed in such a way that employees will be able to navigate easily through the information supplied on the system.

The diagram above is a system development life cycle that illustrates how the design of the project is broken down into five different phases, which are Project Planning, Requirement Gathering, Project Implementation and Interface Design, Implementation and System Testing, Maintenance and System Upgrading.

The proposed e-trade platform for pharmaceuticals retail will start with project planning by determining the users of the system, aims and objectives of the project. After these, extensive research will be done to determine how to design an effective system, as well as to review the current system. Then, the design was with an initial prototype of the system, and then refined it based on their suggestions. Phases of analysis, design and implementation were performed iteratively until users and designers agreed on a final system specification. At this point, the project could move to the final implementation phase.

Desired name for the pharmaceutical platform also finalized as '**iMedic**'.

3.4 System Modeling

During the system requirements and design activity, systems may be modeled as a set of components and relationships between these components. These are normally illustrated graphically in a system architecture model that gives the reader an overview of the system organization. System modeling helps to give more detailed system specifications which are in form of graphical representations that can describe problem to be solved or the system that is to be developed. Because of the graphical representations used, models are often more understandable than detailed natural language description of the system requirements. Examples of such modeling tool are a Use Case Diagram, ERD Diagram and Class Diagram.

3.4.1 Use Case Diagram

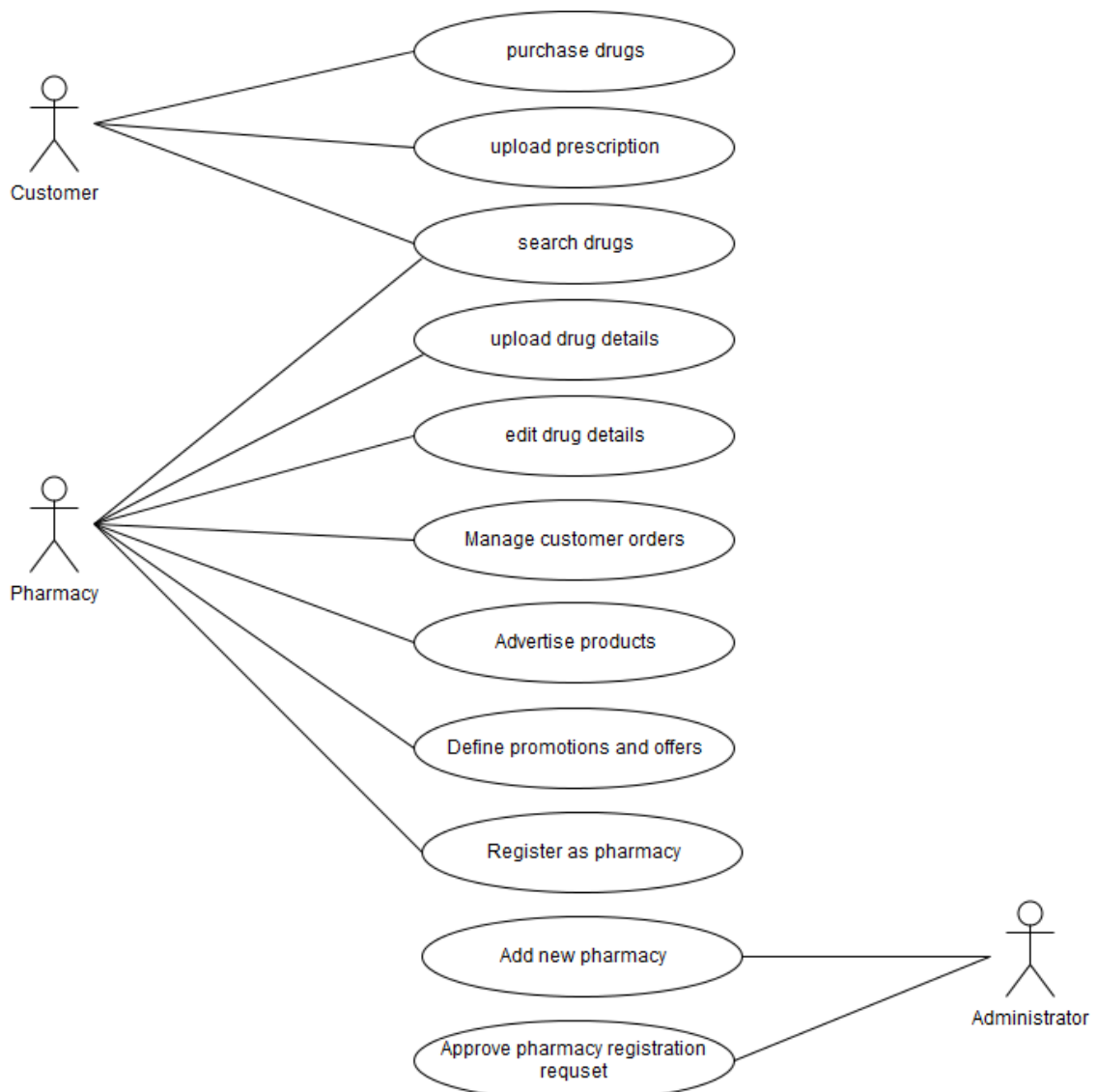


Figure 1 - Use Case Diagram

3.4.2 Site Diagram

Before beginning the coding, part site diagrams are designed. Site diagrams show how each user's functions are divided.

Administrator Site Diagram

Administrator is one of key role in this system and this diagram point out main functionalities of him/her. So, diagram provides basic understanding of each role to its stakeholders.

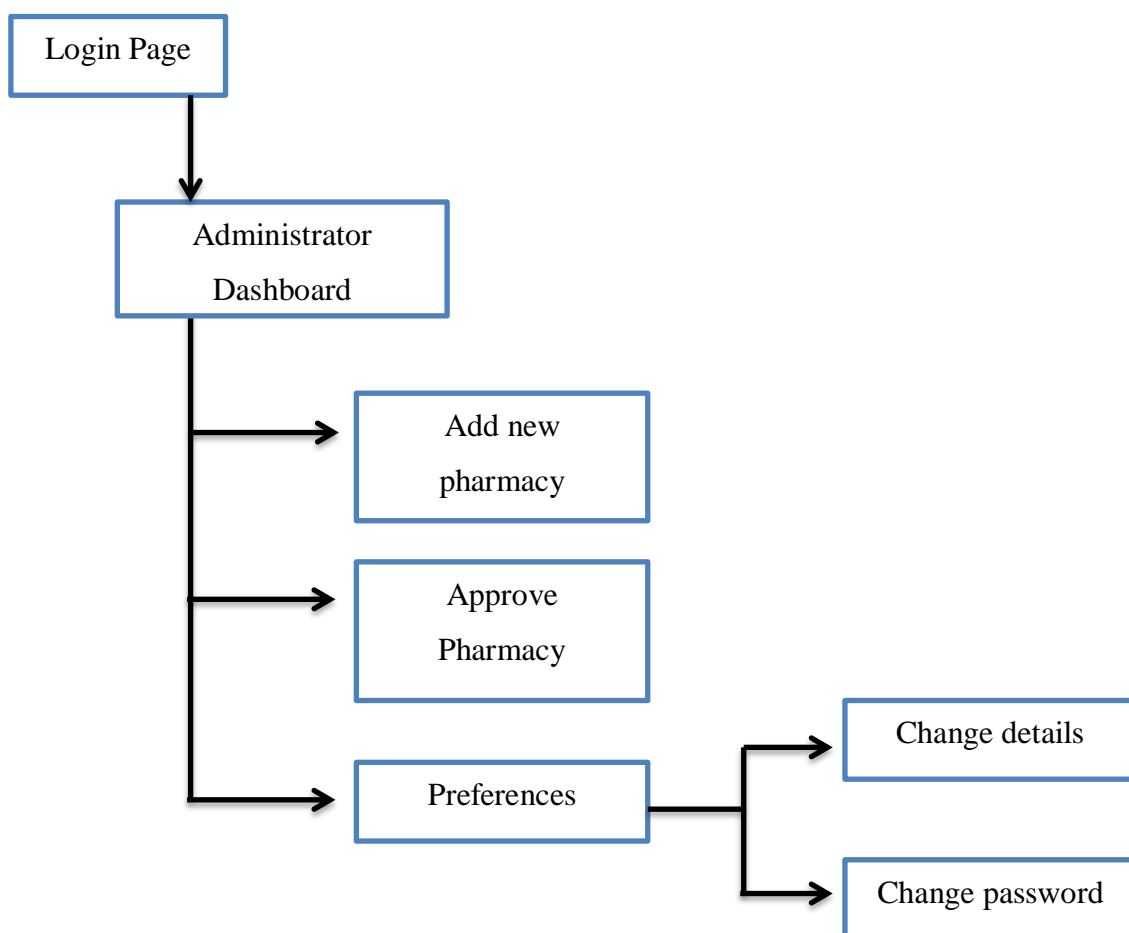


Figure 2 - Administrator Site Diagram

Pharmacy Site Diagram

Pharmacy (supplier) is one of key role in this system and this diagram point out main functionalities of him/her. So diagram provides basic understanding of each role to its stakeholders.

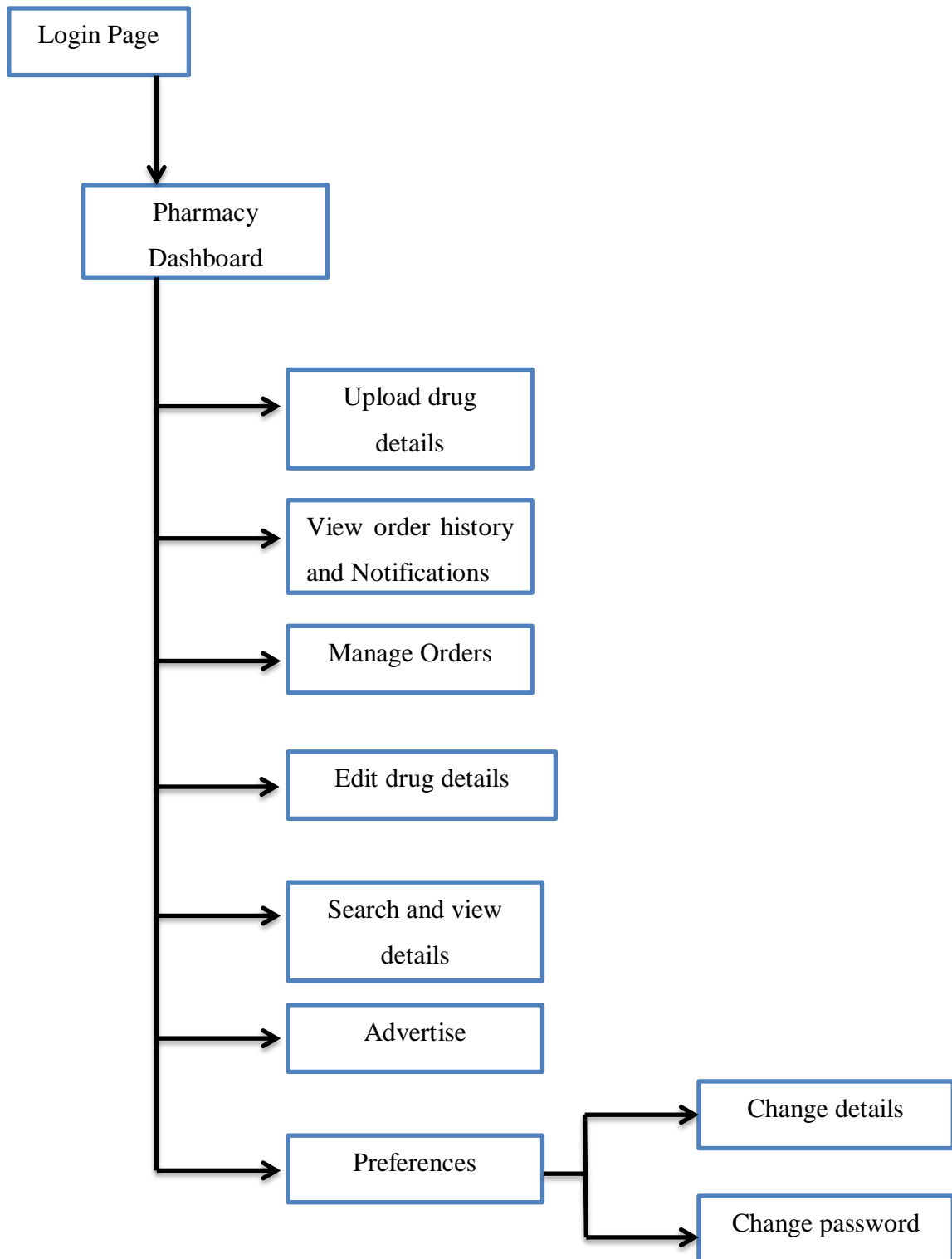


Figure 3 - Pharmacy Site Diagram

Customer Site Diagram

Customer is one of key role in this system and this diagram point out main functionalities of him/her. So diagram provides basic understanding of each role to its stakeholders.

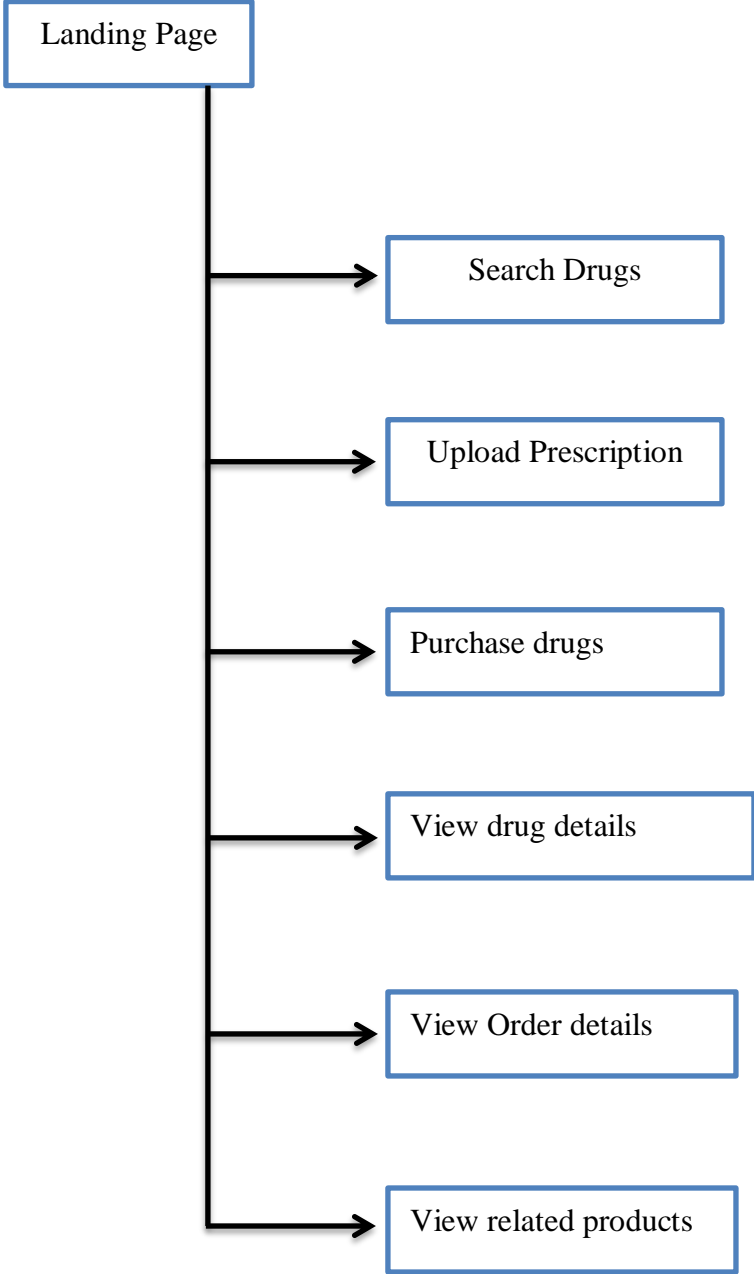


Figure 4 - Customer Site Diagram

3.4.3 Activity Diagram

Activity diagram is basically a flowchart to represent the flow from one activity to another activity. The activity can be described as an operation of the system. The control flow is drawn from one operation to another.

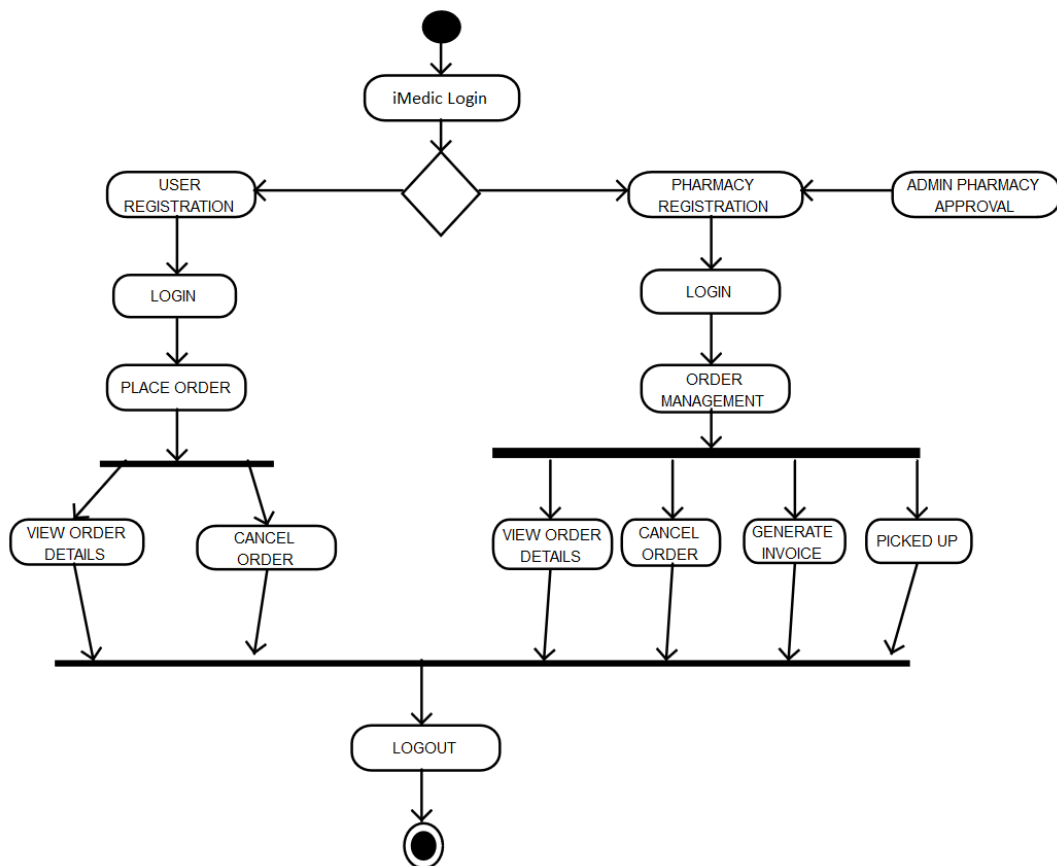


Figure 5 - Activity diagram

3.4.4 ERD Diagram

The graphical representation of entities and their relationships to each other, used to organize of data within databases and information systems is illustrated here.

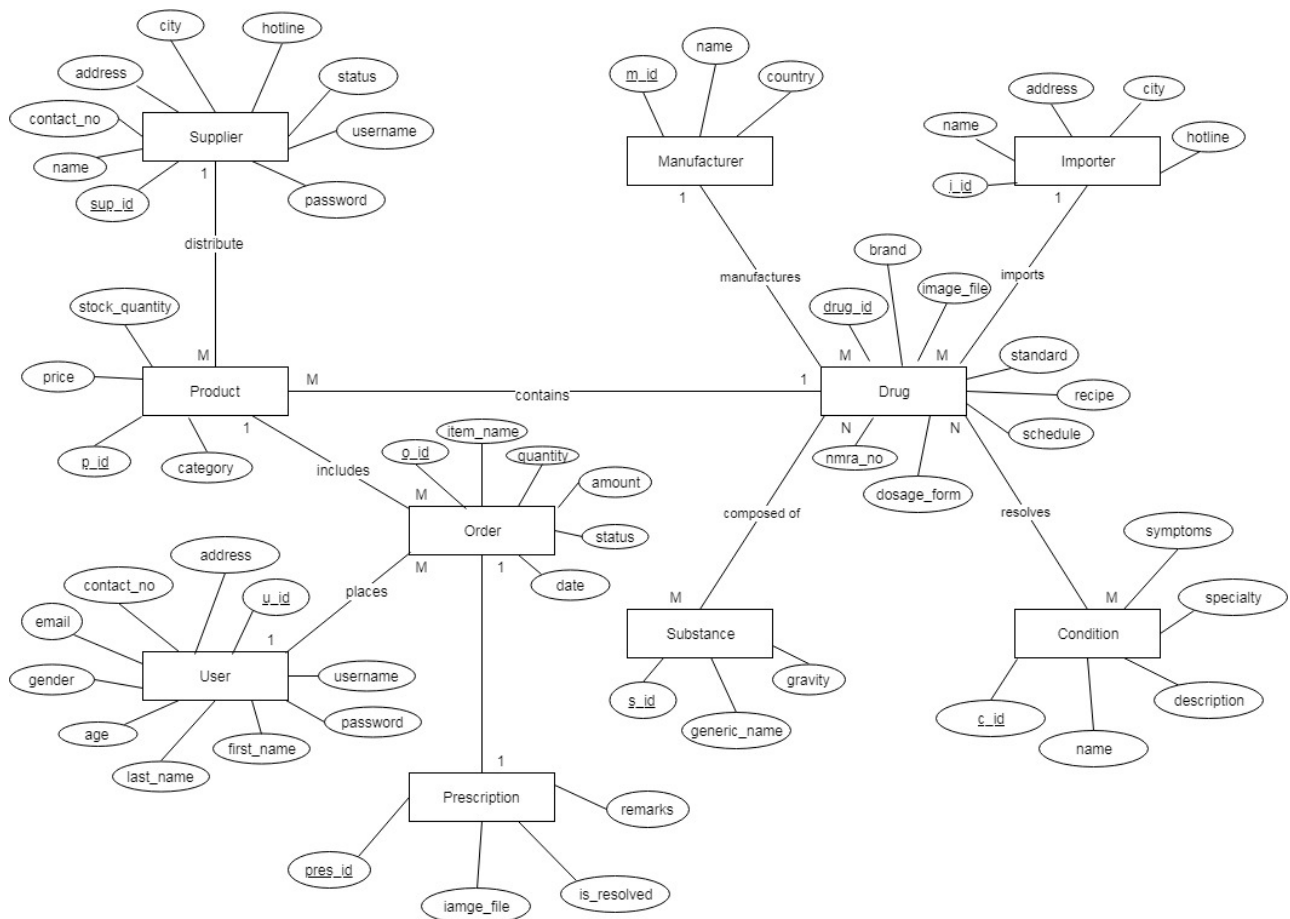


Figure 6 - ERD Diagram

3.4.5 Grant Chart

Task	May 2017	June 2017	July 2017	Aug 2017	Sep 2017	Oct 2017	Nov 2017	Dec 2017	Jan 2018	Feb 2018	Mar 2018	Apr 2018		
Analysis		■	■											
Requirement Gathering		■	■											
ERD Design			■	■										
UI Design				■	■									
Coding				■	■	■	■	■						
Unit Testing							■	■	■					
System Testing								■	■					
Integration Testing								■	■					
Bug Fixing									■	■				
Release									■	■	■			
Report Generation										■	■	■		
Regression Testing												■	■	■

Figure 7 - Grant Chart

3.5 Summary

In this chapter requirements of the proposed system were identified. Both functional and non-functional requirements explained in detail manner. Use case diagram, Site diagram, ERD diagram and other related diagrams designed upon the proposed project. System design stage also finalized the related technologies to design the proposed web platform. Finally design a grant chart for track the work brake down.

Chapter 4

4. Implementation

After finishing system design phase, the next important phase of the software development life cycle is implementation phase. In system implementation phase system design is transformed into the source code that describes an executable system so this section describes the software architecture and detailed components of the web-based system. Three-tiered client-server architecture is employed, which offers great flexibility, reusability and reliability.

Implementation also involves building and testing in many steps. Main forms of testing which carry out through the project are unit testing, integration testing and system testing. In unit testing, individual functionality is checked and integration testing, which is the testing of the operation of the entire application or system involving the available subsystem. Though there was testing for each individual and integrated part, we need system testing after developing whole project to check performs of entire system.

4.1 System Architecture

System architecture, along with specifics about its five main components, is presented in this section. As is the case for many Web applications, our system follows the three-tiered architecture. (i.e. client tier, application tier and the data tier)

- **The client tier** contains system clients such as general/subscribing users, experts in tourism forecasting, the system administrator, etc. The clients and their machines are not actually a part of the web-based system initially. They become a part of the system only when they visit the web server and interact with the system directly for data inputting, forecasting, analyzing, decision making, etc.
- **The application tier** is the center of the system. It provides the procedures used by the clients and controls the information communication between various tiers. Procedures residing in the application tier constitute six main components: security management, user interfaces, statistics, analysis/opinions and forecasting using models.

- **The data tier** is the data source (database) provides the data for the system. It is a remote computer running the MySQL.

4.2 Components of the Application Tier

1. Security Management

This component is responsible for authentication and permission regarding the level of service for the users, the entrance of a user to the system and the customization of the application environment. It supports the following basic types of users: administrator, general users/customers and suppliers.

Table 4.2 - Types of users

Administrator	General User	Supplier
The administrator can register a new drug and supplier. Thus, maintain the user details. He or she can also set the specific permission of a user and alter their details.	General user of the system can submit prescriptions and purchase OTC drugs via shopping cart.	Can add desired / registered drugs to their online stall and sell.

2. User Interfaces

User interfaces of the system are provided in the application tier in the format of Web pages. They are responsible for the interaction between the system and its users, especially acting on the users' preferences and commands and controlling the input/output data and the form of display.

3. Searching Module

This module is used for search prescription and non-prescription drugs from the website. User will search desired drugs from the search menu and results will be listed down accordingly.

4. Prescription upload module

This module is used for upload prescription on online purchase of drugs. User can upload doctor certified image of prescription to the website and receive order id.

5. Order Management

This module is used for managing order through the system. Order details, status, shopping cart, order cancellation is handle by this module. Placement of the order and the order flow will be handled by shopping cart option.

6. Drug catalogue management

This module handles the drug database of the website. NMRA certified drugs will be listed on the database and suppliers can update the status of the drug availability from this module.

4.3 Technologies

To build the front end of the application JavaScript, Ajax, Semantic UI, vue.js, JQuery and html technologies are used together with the bootstrap CSS Framework. Back end process is build using the Laravel 5.4 Framework.

4.4 User Interfaces

User interfaces of the prototype system are displayed below. The interface has been kept as minimal as possible with only the required items being displayed so as not to deviate away from the user's experience. Color combinations are used in way which specific buttons and input fields are highlighted so user can identify his/her way to interact with the system before getting help.

Home Page

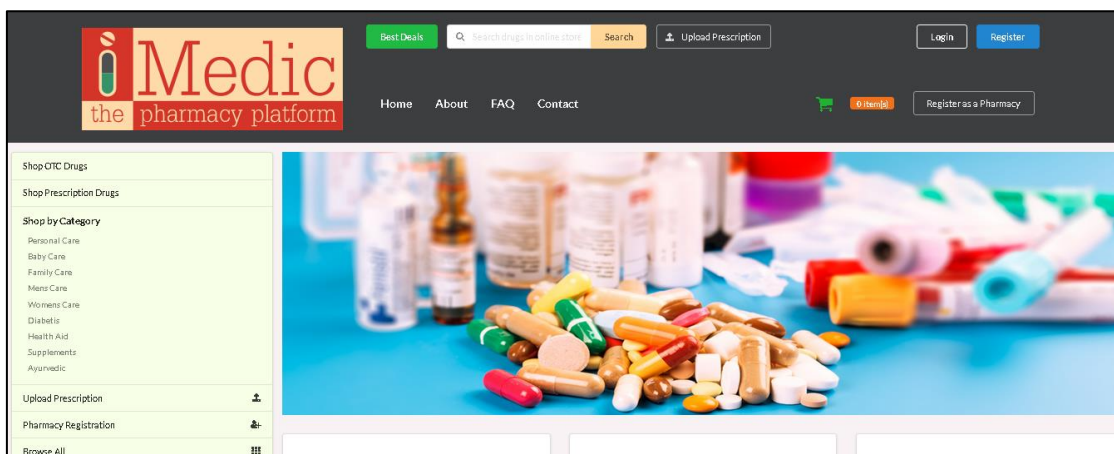


Figure 8 - Home Page

Homepage will give first impression of the website to the end users. Along with the sidebar and header, three main services are described in this interface to guide the users smoothly within the website. And by looking at the first page user can get an idea about the type of items which iMedic online store is selling.

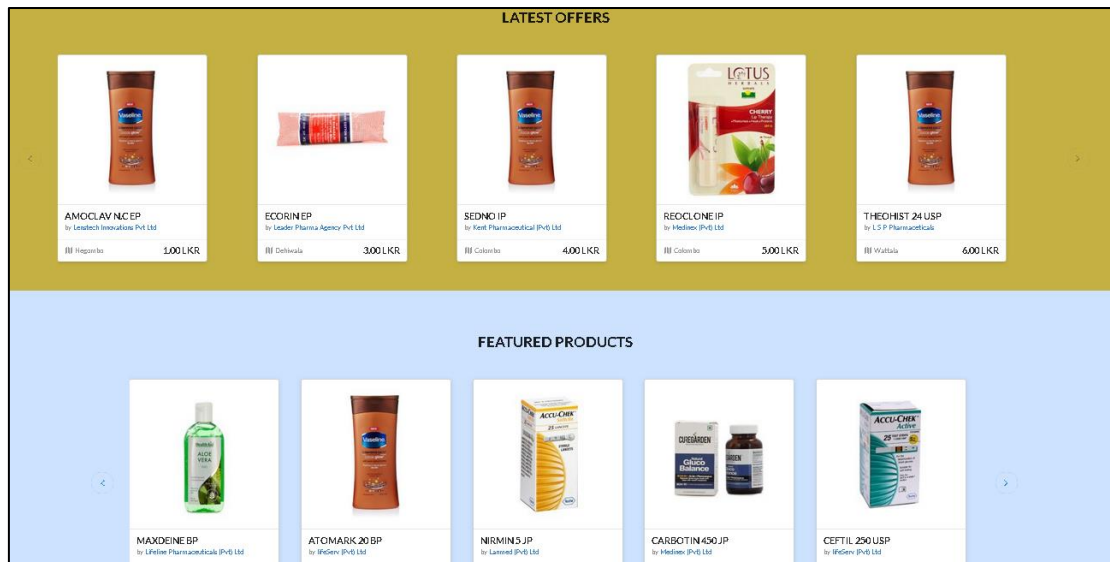


Figure 9 - Home Page - Offers

Login Page

iMedic Supplier Login

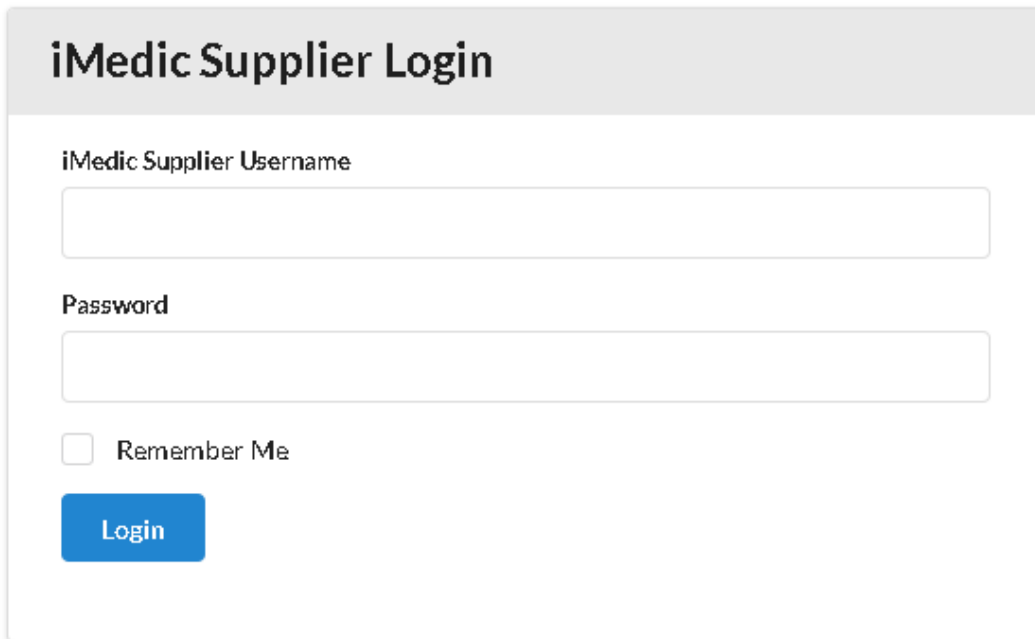
iMedic Supplier Username

Password

Remember Me

Login

Figure 10 - Supplier's Login

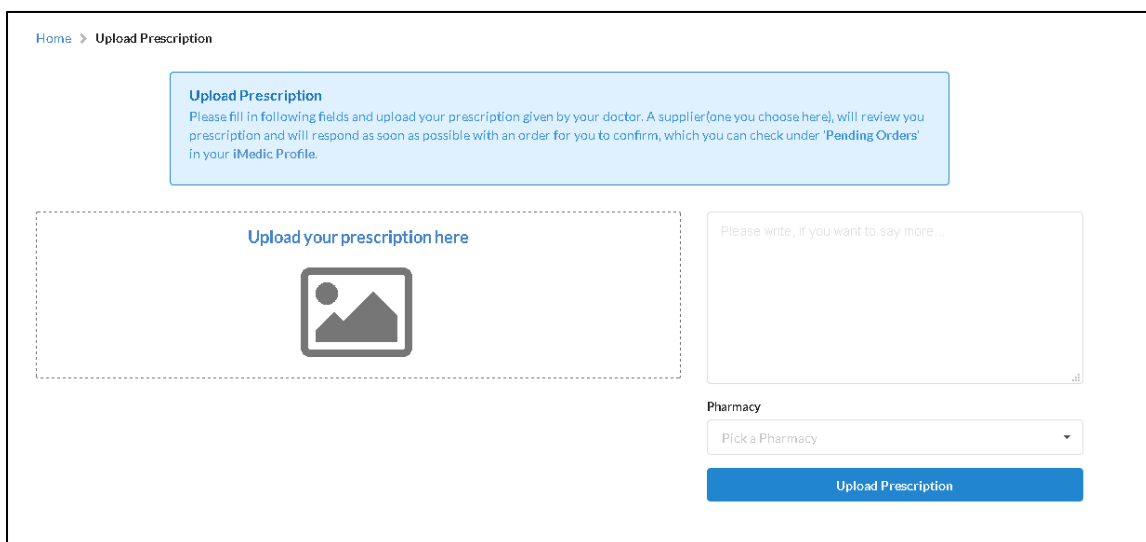


The image shows a login form titled "iMedic Supplier Login". It features a header with the title in a grey bar. Below the header, there are two input fields: "iMedic Supplier Username" and "Password". Below the password field is a checkbox labeled "Remember Me". At the bottom left of the form is a blue button labeled "Login".

Figure 11 - Customer's Login

There will be two separate login screens for suppliers and customers. Here they simply need to specify their username and password to login. Both navigating buttons to this user interfaces are shown in home page header.

- **Upload Prescription**



The image shows a form titled "Upload Prescription". At the top left, there is a breadcrumb "Home > Upload Prescription". Below this is a blue box with the title "Upload Prescription" and a paragraph of instructions: "Please fill in following fields and upload your prescription given by your doctor. A supplier (one you choose here), will review your prescription and will respond as soon as possible with an order for you to confirm, which you can check under 'Pending Orders' in your iMedic Profile." Below the instructions is a dashed box containing the text "Upload your prescription here" and a placeholder image icon. To the right of this box is a text area with the placeholder text "Please write, if you want to say more...". Below the text area is a dropdown menu labeled "Pharmacy" with the option "Pick a Pharmacy" and a downward arrow. At the bottom right is a blue button labeled "Upload Prescription".

Figure 12 - Upload Prescription

This functionality facilitate customer to upload their prescription to the system and, user needs to choose pharmacy by the given drop down. If there is a special note or message, system has provided text box to submit them. And this same user interface will appear when user trying to purchase prescribed drug but only difference is pharmacy name will be shown as filled with the name of supplier.

- **Search**

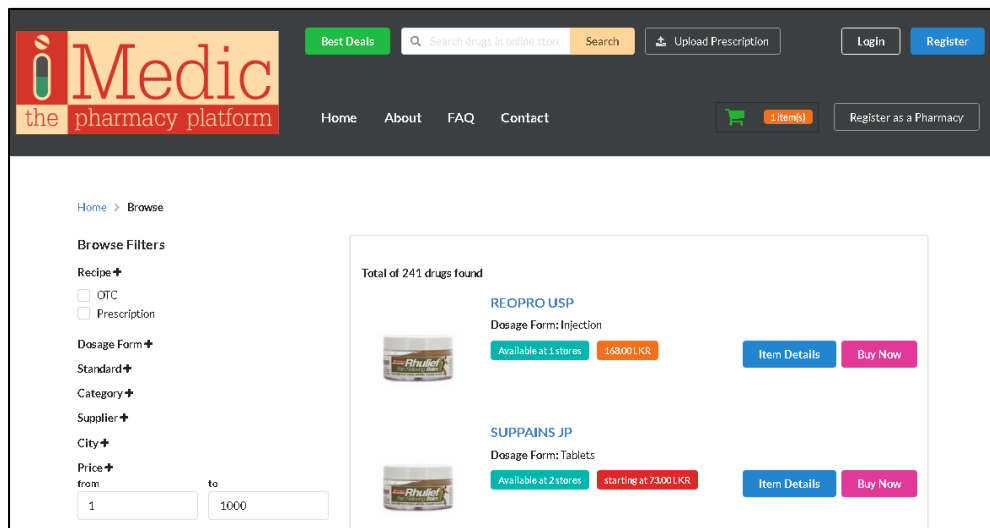


Figure 13 - Search Results

Search results are populated with filters to narrow down the result set. Customer can search specifying drug name directly or else system will suggest all matching results for any given letters.

- **Shopping Cart**

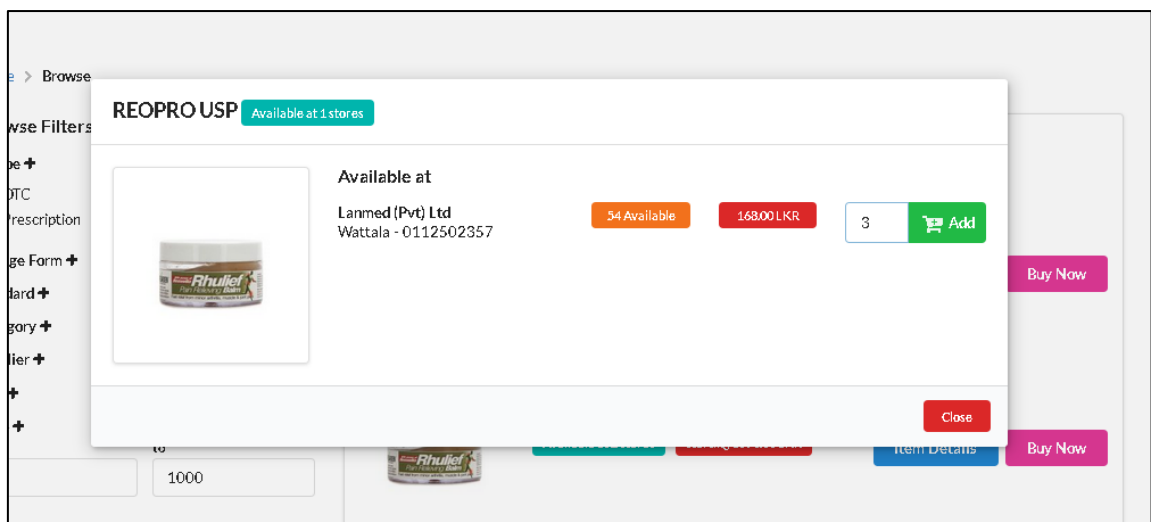


Figure 14 - Adding items to Shopping cart

[Home](#) > [Browse](#) > [Checkout](#)

Item Name	Supplier	Qty	Price (LKR)	Subtotal (LKR)	
REOPRO USP	Lanmed (Pvt) Ltd	3	168.00	504.00	×
ADAPCO GEL BP	Lifeline Pharmaceuticals (Pvt) Ltd	1	78.00	78.00	×
Total			582.00	LKR	

[Continue Shopping](#) [Submit Order](#) [Clear Cart](#)

Figure 15 - Shopping cart

There will be Show Details button to give more details about drug to customer. By clicking on Buy Now button shown in drug result customer can add items to shopping cart and, user can specify quantity in the pop-up screen or remove drug from shopping cart with delete button.

- **Order Submission**

Order ID	Item	Pharmacy	Qty	Status
#212	FECK.SR USP	Lanmed (Pvt) Ltd	3	Pending
#213	GESTON 5 USP	lifeServ (Pvt) Ltd	1	Pending
Total Amount			2,474.00	LKR

Figure 16 - Order Submission

When user submits the order, there will be confirmation message shown to user with order ID. If user had purchase more than one drug each will be handled as separate orders and separate order IDs will be given. Total price will be shown in bottom of the pop up window.

- **Supplier dashboard**

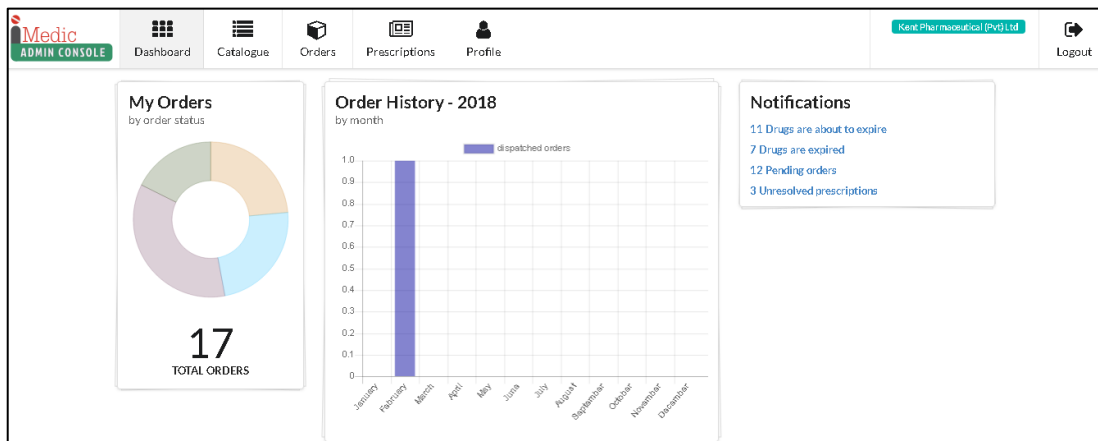


Figure 17 - Supplier dashboard

Supplier dashboard will give overall high-level information about orders and drugs. This will be the first screen to appear once supplier login to the system. Important information is provided to suppliers as notification.

- **Customer dashboard**

Item	Supplier	Prescription	Qty	Amount (LKR)	Order Status
DIPSOTREX EP	Kent Pharmaceutical (Pvt) Ltd	none	7	4,564.00	Pending
GASTROGEL BP	lifeServ (Pvt) Ltd	none	4	3,280.00	Dispatched
KELESTODERM BP	Klintas (Pvt) Ltd	none	5	2,340.00	Cancelled
LUMIGAN BP	Lifeline Pharmaceuticals (Pvt) Ltd	none	6	1,506.00	Pending
TAVEN EP	Leader Pharma Agency Pvt Ltd	none	10	4,110.00	Cancelled
CLARILET 500 USP	Klintas (Pvt) Ltd	none	2	886.00	Rejected
ACNESTAR BP 5% BP	L S P Pharmaceuticals	none	5	200.00	Rejected
CONCOR-COR 2.5 IP	lifeServ (Pvt) Ltd	none	6	5,130.00	Dispatched
LIPITAS 10 JP	Medinex (Pvt) Ltd	none	4	556.00	Cancelled

Figure 18 - Supplier dashboard

Customer dashboard will show all order details of customer and status of each order. This will be the first screen to appear once customer login to the system.

In each order there will be Details button to view more details about order and all more information will be shown in pop up screen.

There are four status of each order exists in the system and they are pending, delivered, cancelled, rejected and under status column status of drugs are shown.

In right side there is a side bar to filter results from status and order date.

Please refer **Appendix B**. User Documentation section.

4.5 Summary

In this chapter the design and the implementation of project is described. Implementation of project was done using Laravel PHP framework. By analyzing requirements and literature it was decided to implement the prototype system using web technologies. Also, system architecture, technologies and user interfaces of main modules of the prototypes system are illustrated in this chapter.

Chapter 5

5. User Evaluation and Testing

5.1 Introduction

Testing and evaluation of the system was conducted recursively when the implementation of the system. The main objective of the testing and evaluation of the system was to measure the functioning accomplishment of the system as well as the level of user acceptability of the final output of the project. Website was tested to ensure that the software has the functionality that has been specified and that conforms to and accommodates all functional requirements. The basic test environment details are mentioned in the table below.

Test Environment

Operating Systems	Windows 7, Ubuntu
Web browsers	Google Chrome, Mozilla Firefox, Internet Explorer
Computers	HP Elite Book, Dell Inspiron 15R
Screen Resolutions	1,366x768 (pixels)

In this section some of the significant test cases that were executed to assure the quality of the web-based system are illustrated in below test plan.

5.2 Test Plan

Table 1 - Test Plan

Test Area	Test Case No.	Effort(hrs)	Executed by	Status
Login	Login_1 Login_2 Login_3 Login_4	1h	Thara	Passed
Upload Drug Information	Upload drugs_1 Upload drugs_2 Upload drugs_3	2h	Thara	Passed
Managing Customer Orders and Reminders	Managing Customer Orders_1 Managing Customer Orders_2 Reminders	3h	Thara	Passed
Search	Search_1 Search_2	2h	Thara	Passed
Upload Prescription	Upload Prescription_1 Upload Prescription_2	2qh	Thara	Passed
Purchasing Product	Purchasing Product_1 Purchasing Product_2 Purchasing Product_3 Purchasing Product_4	3h	Thara	Passed

5.3 Test Cases

5.3.1 Login (For both customer and supplier)

Test Case ID: Login_1

Test Priority (Low/Medium/High): High

Test Title: Verify login with valid username and password

Pre-conditions: User has valid username and password

Assumptions/Dependencies:

Table 2 - Test Cases Login_1

Test Step	Test Data	Expected Results	Status
1. Navigate to login page 2. Provide valid user name 3. Provide valid password 4. Click Login button	Username=test Password=111111	User should be able to login	Passed

*Post-conditions: User is validated with database and successfully login to account.

Test Case ID: Login_2

Test Priority (Low/Medium/High): High

Test Title: Verify login with invalid username and valid password

Pre-conditions: User has invalid username and valid password

Assumptions/Dependencies:

Table 3 - Test Cases Login_2

Test Step	Test Data	Expected Results	Status
1. Navigate to login page 2. Provide invalid username 3. Provide valid Password 4. Click on login button	Username=test234 Password=111111	System must show an error message	Passed

Test Case ID: Login_3

Test Priority (Low/Medium/High): High

Test Title: Verify login with valid username and invalid password

Pre-conditions: User has valid username and invalid password

Assumptions/Dependencies:

Table 4 - Test Cases Login_3

Test Step	Test Data	Expected Results	Status
1. Navigate to login page 2. Provide valid username 3. Provide invalid Password 4. Click on login button	Username=test Password=222222	System must show an error message	Passed

Test Case ID: Login_4

Test Priority (Low/Medium/High): High

Test Title: Verify login with invalid username and invalid password

Pre-conditions: User has invalid username and invalid password

Assumptions/Dependencies:

Table 5 - Test Cases Login_4

Test Step	Test Data	Expected Results	Status
1. Navigate to login page 2. Provide invalid username 3. Provide invalid Password 4. Click on login button	Username=test123 Password=222222	System must show an error message	Passed

5.3.2 Upload Drug Information

Test Case ID: Upload drugs_1

Test Priority (Low/Medium/High): High

Test Title: Verify uploading drug successfully

Pre-conditions: Supplier is logged in to the system

Assumptions/Dependencies:

Table 6 - Test Cases Upload drugs_1

Test Step	Test Data	Expected Results	Status
1. Navigate to upload from sidebar	Product/Drug Name: paracetamol Trade Name: Panadol	Should be able to submit details successfully	Passed
2. Fill required fields specifying details given in test data	Description: test Disease: fever Quantity: 20 Unit Price: 3		
3. Click on submit button	Prescription Needed: no		

Test Case ID: Upload drugs_2

Test Priority (Low/Medium/High): High

Test Title: Verify required fields on form

Pre-conditions: Supplier is logged in to the system

Assumptions/Dependencies:

Table 7 - Test Cases Upload drugs_2

Test Step	Test Data	Expected Results	Status
1. Navigate to upload from sidebar	No test data	Pop up should appear to indicate each field is required	Passed
2. Click on submit button without filling any field in form			

Test Case ID: Upload drugs_3

Test Priority (Low/Medium/High): High

Test Title: Verify submitting form with invalid data types

Pre-conditions: Supplier is logged in to the system

Assumptions/Dependencies:

Table 8 - Test Cases Upload drugs_3

Test Step	Test Data	Expected Results	Status
1. Enter any text as input	1. 'abcd'	Product/Drug Name, Trade Name, Description fields should allow to input only texts	Passed
2. Enter any special character as input	2. "/*--+-"	Quantity, Unit price fields should only allow to input numbers	
3. Enter numbers as input	3. 50		
4. Try above inputs in each form field			

5.3.3 Managing Customer Orders and Reminders

Test Case ID: Managing Customer Orders_1

Test Priority (Low/Medium/High): High

Test Title: Verify functionality of view details

Pre-conditions: Supplier is logged in to the system

Assumptions/Dependencies:

Table 9 - Test Cases Managing Customer Orders_1

Test Step	Test Data	Expected Results	Status
-----------	-----------	------------------	--------

<ol style="list-style-type: none"> Navigate to customer Orders by sidebar Verify information shown in table view 		<p>Customer order should be displayed with below shown information</p> <ul style="list-style-type: none"> Order number Customer Name Order Date Drugs Price 	Passed
--	--	--	--------

Test Case ID: Managing Customer Orders_2

Test Priority (Low/Medium/High): High

Test Title: Verify dispatching an order

Pre-conditions: Supplier is logged in to the system

Assumptions/Dependencies:

Table 10 - Test Cases Managing Customer Orders_2

Test Step	Test Data	Expected Results	Status
<ol style="list-style-type: none"> Navigate to customer Orders by sidebar Select any row which include customer order details Click on dispatch option 		<p>User should be able to click on dispatch option</p> <p>Pop up should appear to indicate that order has dispatched successfully</p>	Passed

Test Case ID: Reminders

Test Priority (Low/Medium/High): High

Test Title: Verify reminders shown for customers

Pre-conditions: Customer is logged in to the system, customer's order which is analyzed and issued by pharmacist should be shown in his/her dashboard

Assumptions/Dependencies:

Table 11 - Test Cases Reminders

Test Step	Test Data	Expected Results	Status
1. Navigate to customer dashboard 2. Click on reminder icon 3. Verify showing dosage and time showing for each drug		2. User should be able to click on reminder icon 3. In reminder information related to each drug such as dosage, time should be mentioned	Passed

5.4 Search

Test Case ID: Search_1

Test Priority (Low/Medium/High): High

Test Title: Verify search with valid input

Pre-conditions: Customer should have loaded home page in the system

Assumptions/Dependencies:

Table 12 - Test Cases Search_1

Test Step	Test Data	Expected Results	Status
1. Navigate search bar shown in home page 2. Specify valid	Panadol, Acne aid	System should display search results (as a list)	Passed

inputs			
3. Click on search button			

Test Case ID: Search_2

Test Priority (Low/Medium/High): High

Test Title: Verify search with invalid input

Pre-conditions: Customer should have loaded home page in the system

Assumptions/Dependencies:

Table 13 - Test Cases Search_2

Test Step	Test Data	Expected Results	Status
1. Navigate to search bar shown in home page	Any text or numbers	System gives an error message	Passed
2. Specify invalid inputs			
3. Click on search button			

5.5 Upload Prescription

Test Case ID: Upload Prescription_1

Test Priority (Low/Medium/High): High

Test Title: Verify uploading valid document format

Pre-conditions: Customer should have loaded home page in the system

Assumptions/Dependencies:

Table 14 - Test Cases Upload Prescription_1

Test Step	Test Data	Expected Results	Status
-----------	-----------	------------------	--------

1. Navigate to Upload prescription link in home page	Document format: jpg, png	System should display success message	Passed
2. Upload valid document			

Test Case ID: Upload Prescription_2

Test Priority (Low/Medium/High): High

Test Title: Verify uploading invalid document format

Pre-conditions: Customer should have loaded home page in the system

Assumptions/Dependencies:

Table 15 - Test Cases Upload Prescription_2

Test Step	Test Data	Expected Results	Status
1. Navigate to Upload prescription link in home page	Document format: txt, xsls	System should display an error message to indicate document type is invalid	Passed
2. Upload invalid document			

5.6 Purchasing Product

Test Case ID: Purchasing Product_1

Test Priority (Low/Medium/High): High

Test Title: Verify drug details shown in purchasing flow

Pre-conditions: Customer should have loaded home page in the system

Assumptions/Dependencies:

Table 16 - Test Cases Purchasing Product_1

Test Step	Test Data	Expected Results	Status
1. Search for a drug after navigating to search bar 2. Select any drug listed 3. Verify the information shown in detailed view	E.g.: Acne Aid	Below information should be shown <ul style="list-style-type: none"> • Image • Drug name • Supplier name • Unit price • Quantity • Total price • Add to cart button 	Passed

Test Case ID: Purchasing Product_2

Test Priority (Low/Medium/High): High

Test Title: Verify total price with quantity selected by customer

Pre-conditions: Customer should have loaded home page in the system

Assumptions/Dependencies:

Table 17 - Test Cases Purchasing Product_2

Test Step	Test Data	Expected Results	Status
1. Search for a drug after navigating to search bar 2. Select any drug listed 3. In detail view select a quantity and verify changing price according to that	E.g.: Acne Aid	Price should be updates according to quantity and total price should be displayed correctly	Passed

Test Case ID: Purchasing Product_3

Test Priority (Low/Medium/High): High

Test Title: Verify Add to Cart button functionality

Pre-conditions: Customer should have loaded home page in the system

Assumptions/Dependencies:

Table 18 - Test Cases Purchasing Product_3

Test Step	Test Data	Expected Results	Status
1. Search for a drug after navigating to search bar 2. Select any drug listed 3. In detail view select a quantity 4. Click on Add to Cart button	E.g.: Acne Aid	Selected product should be added to shopping cart and correct price should be shown	Passed

Test Case ID: Purchasing Product_4

Test Priority (Low/Medium/High): High

Test Title: Verify Continue to Checkout functionality in shopping cart

Pre-conditions: Customer should have loaded home page in the system

Assumptions/Dependencies:

Table 19 - Test Cases Purchasing Product_4

Test Step	Test Data	Expected Results	Status
1. Search for a drug after navigating to search bar 2. Select any drug listed 3. Click on Add to Cart button after selecting quantity 4. Open the	E.g.: Acne Aid	Success message should be appeared with order number to indicate user that her/his order has created. More information of transportation and on cash delivery should be shown. Contact number should be shown for customer inquiries.	Passed

shopping cart			
5. Click Continue to Checkout button			

5.7 Evaluation

Evaluation of the prototype system was carried out to get feedback from the expected users of the system. The process on this evaluation was testing of the conceptual system with the expected users and gets their feedback. For the evaluation process, 24 students of Master of Business Management (MBA) and Postgraduate Diploma in Marketing in Department of Management, University of Sri Jayewardenepura were participated.

5.8 Questionnaire

Please refer Appendix A. Questionnaire section.

5.9 Questionnaire results analysis

The analysis and interpretation of data is carried out in five phases. The interpretation, which is based on the results of the questionnaire, deals with a quantitative analysis of data.

- Below diagram shows composition of the MBA students which is taken for the questionnaire. Majority of the students are in the 30 to 40 years age.

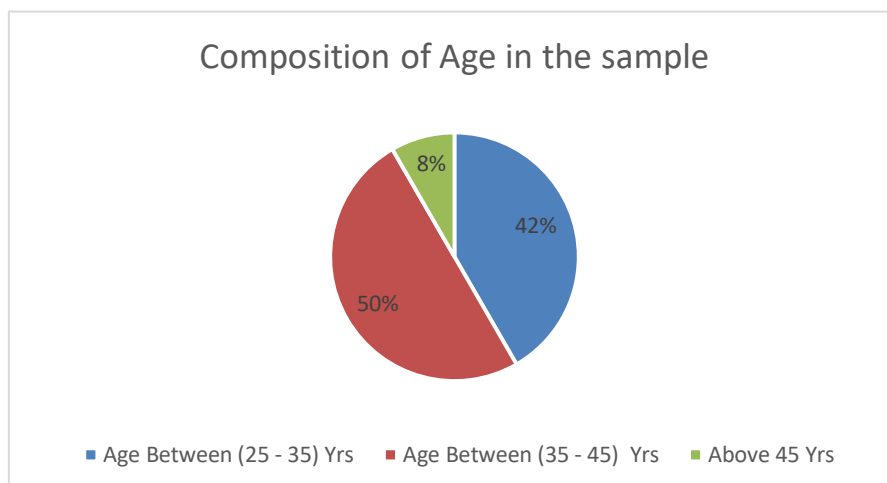


Figure 19 - Composition of Age in the sample

- Following diagram shows willingness to buy online drugs from the sample students. Majority of the students like to buy drugs online.

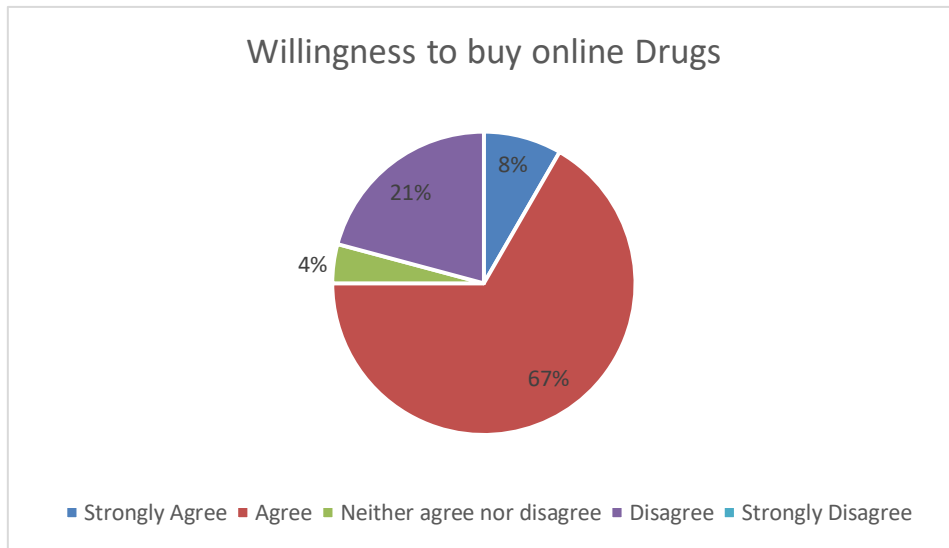


Figure 20 - Willingness to buy online Drugs

- Following diagram shows results of the question “Do you think that online pharmacies will violate user’s privacy?” from the sample students. Majority of the students think that it will violate their privacy when buying drugs from online platforms.



Figure 21 - Opinion on: “Will online drug stores violate privacy?”

- Following diagram shows the preferred method to buy in online in online pharmacy scenario. Majority of the students think to buy from Cash on Delivery method.

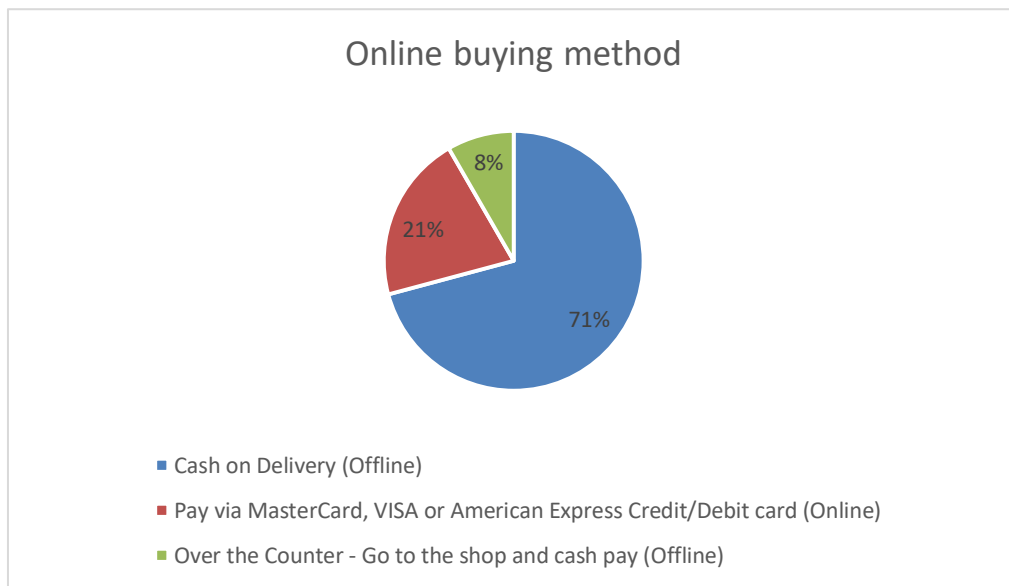


Figure 22 - Online buying method

Please refer **Appendix F**. Questionnaire Results section.

5.10 Questionnaire recommendations

When analyzing the results of the questionnaire we can clearly identify that most of the students like to buy online drugs (In percentage wise 67%). And they really concern about the privacy when dealing with online pharmaceutical trade. That is a major concern for the proposed system also. Non-Functional requirement like security module has major impact it. Finally, most of the users like to buy online goods with the Cash on delivery method. This is also aligning with current implantation of the proposed ‘iMedic’ design. Because it also currently handles their orders on Cash on Delivery method. Their recommendations and comments are vital for the system evaluation. In some of the comments they mainly concern about the delivery time and the delivery method. In those scenarios ‘iMedic’ comply according to the legal framework for the pharmaceutical trade in Sri Lanka.

5.11 Summary

In summary, the chapter has more focused on the User Evaluation and Testing of 'iMedic' system. First section describes the information on test plan of the developed system. It consists of test cases to validate the input and output of the system. Last section consists of the evaluation of the 'iMedic' system with the help of MBA students of Sri Jayewardenepura University. Results of the questionnaire analyzed, presented in detail manner, and some of the results impact on the changes to the system. Their recommendations and comments are vital for the system evaluation.

Chapter 6

5 Conclusion and Future Work

This is the last chapter of this dissertation and this part is often what a reader remembers best. This section provides a comprehensive overview of the project and its results and what type of decisions have taken by analyzing those results. Also, this contains possible future works that can be done using this project.

6.1 Conclusion

Since the ultimate goal of this project is to support buying needs of e-commerce users in Sri Lankan by providing online drugstore, a web-based system was implemented namely 'iMedic'.

This project work dealt with online pharmaceutical trade platform systems. It is eminent that the system provides a safe, secure and verified platform for all parties which help to bridge the communication gap and provide legitimate drugs. Because drugs are harmful when abused or misused by individuals or organizations, security checks have been added to the design logic. Therefore, if all recommendations are strictly adhered to, there will be strict monitoring and regulation of how drugs are circulated and a decrease in the spread of fake drugs.

Effective implementation of this platform will take care of the basic requirements of purchasing pharmaceutical products online because it is capable of providing easy and effective information related to pharmaceutical items. Users can only purchase drugs which is permitted by NMRA Sri Lanka. This provide an additional security on the customers to buy on legitimate drugs which is permitted by NMRA.

'iMedic' store the necessary information of the drugs for easy retrieval by implementing drug catalogue. It also gives automatic alert information on stock reaching minimum-level and online request generation of stock order to supplier. Uploading prescribing allows users to send prescriptions electronically to their desired pharmacy supplier to buy the drugs. Thus, its dashboard shows the efficiency of the system by effective monitoring of activities and services.

6.2 Challenges

Current challenges on the 'iMedic' system are competing with the offline retail pharmaceutical stores which has existing client base. 'iMedic' need to capture the current online buyers to buy pharmaceutical items from the platform. This needs additional marketing strategies on the social media platforms. 'iMedic' drug store database relies on the NMRA database therefore platform cannot add a new drug without confirmation from the NMRA record

6.3 Limitations

System has several limitations. Administrator cannot add new drug without confirmation from the NMRA record. This is because system need ensure that 'iMedic' has legitimate drugs in the drug store. Currently order placement and the order management in system is run on semi-automated state. It means that user only can place the order then waits for relevant supplier to response on its order (No online payment facility). Prescription upload also in semi-automated and that entire process cannot be automated due to the sensitive and complexity of its process. This only will be completed by consulting pharmacists.

6.4 Recommendations

The project that has been undertaken for this thesis has highlighted several topics on which further projects would be beneficial. There is a lack of regulation on e-pharmacies and the drug regulations. Even though NMRA registration done on the database and the quality details are not much visible.

6.5 Future Development

The pharmacy industry is unfavorably affected by a wide range of problems such as serious social conflicts on miss-use of drugs, quality issues and government initiatives on drugs. Quality issues have a prominent effect on pharmaceutical trade.

Suggestions for further development also include the expansion of the functionalities and techniques in order to address competitiveness of the current system.

System functionalities can be enhanced with following areas,

- Integrate payment gateway to purchase directly by paying online rather than cash on delivery method.
- Enhancing SMS facility to aware user after uploaded prescription is examined by pharmacist, and the order status of the generic drug purchasing order.
- Develop mobile application to cater majority of millennial community.
- Increase social media advertising campaign to cater online e0commerece users.
- Establish more partnerships with retail pharmacies to encourage to maintain their drugstore on the 'iMedic' platform.
- Conduct market research on buying patterns of the generic users in pharmacies to find their patterns.

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Appendix

A. Questionnaire

1. Name (Optional):
2. Designation:
3. Organization (Optional)
4. Age (Years)
5. Do you buy online products?
 - a. Yes
 - b. No
6. If answer is 'Yes' for above, how long have you being buying products from online?

7. Do you think that online pharmacies are useful for Sri Lanka?
 - a. Yes
 - b. No
8. Why we need/no need online pharmacies?

9. What is your preferred time period for order delivery?
 - a. 1 day
 - b. 2 days
 - c. 3 days
 - d. 1 week

10. What are your expectations from an online pharmacy system?

11. Do you think this web-based system covers every aspect of scenarios when it comes to buy online drugs?
 - a. Strongly Agree
 - b. Agree
 - c. Neither agree nor disagree
 - d. Disagree

e. Strongly Disagree

12. Do you think that online pharmacies will violate user's privacy?

- a. Yes
- b. No

13. What is your preferred online pay method for an order?

- a. Cash on Delivery (Offline)
- b. Pay via MasterCard, VISA or American Express Credit/Debit card (Online)
- c. Over the Counter - Go to the shop and cash pay (Offline)

14. Other comments

B. User Documentation

1. Introduction

- The product – “iMedic”

“iMedic” is pharmaceutical trading platform. It supports multiple pharmacy vendors to trade their pharmaceuticals in online market. Users can buy their desired OTC (over the counter) drugs in their preferred drug stores. In addition to that any user can upload their doctor certified prescription to the website and submit an order.

- Scope

The online order management system is currently run as semi-automated state. It means that user can place an order from online website, but payment is done on cash on delivery (payment will be done when order receives to the customer). Prescription only and OTC drugs will be delivered to the customer doorstep by agent of a pharmacy via air-conditioned vehicle. (According to the legal compliance of the government)

- Glossary

Following terms will be used in the website.

NMRA - National Medicines Regulatory Authority Sri Lanka

OTC - Over the counter

2. Prerequisites

- System requirements

Website will run on below internet browser versions.

FireFox: higher Version from 48.0 (32/64 bit)

Google Chrome: higher Version from 55.0 (32/64 bit)

Internet Explorer: higher Version from 11.0 (32/64 bit)

- Platform Support

Windows, Linux, Mac OS's that includes above internet browsers can access to the website without any difficulties.

3. Using the website

- Steps to perform the required tasks

Customer and Supplier Login

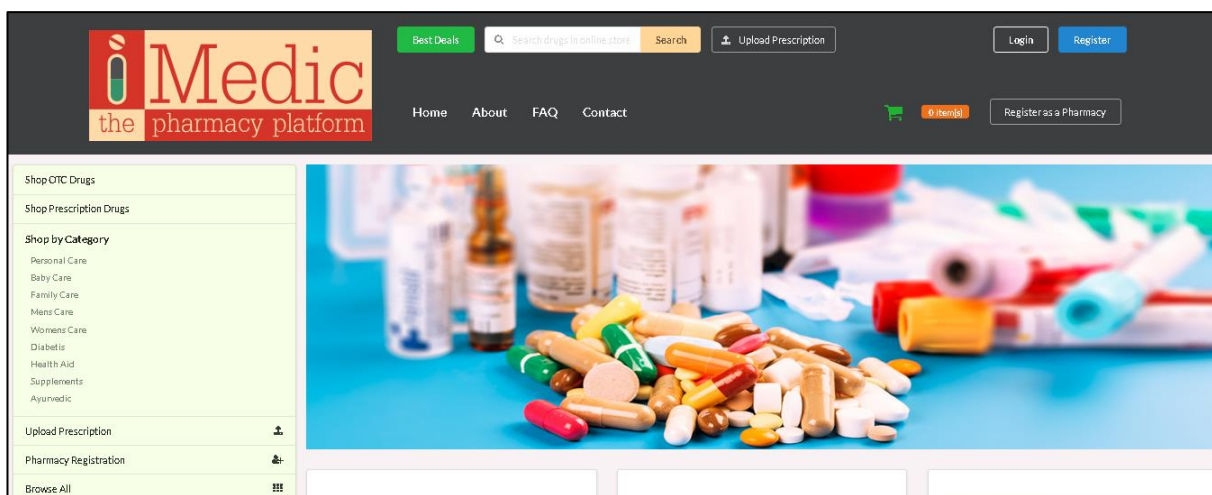
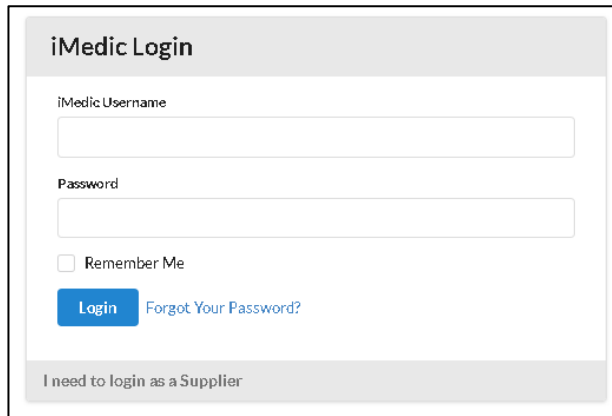


Figure 23 - Home page iMedic

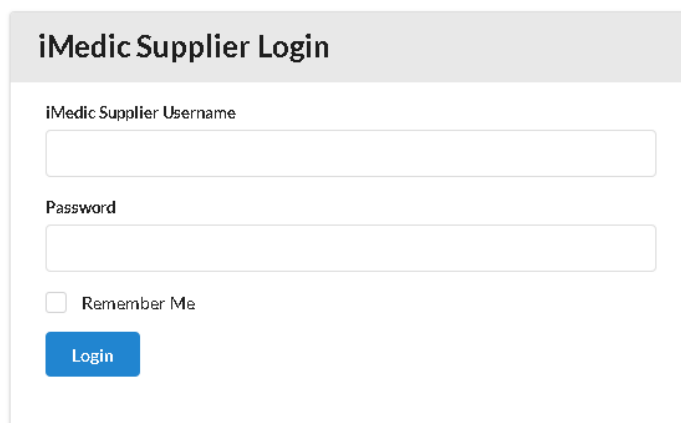
- User needs to click the login button on the right corner in the home page.
- When user clicks on the login button, login page appears and this is the customer login, then user needs to login with username and password.
- The end user is responsible for keeping their details secure.
- Ensure that you are logout from all locations
- Always click logout button to securely leave the iMedic.



The image shows a web form titled "iMedic Login". It features a header with the title. Below the header are two input fields: "iMedic Username" and "Password". There is a checkbox labeled "Remember Me". A blue "Login" button is positioned to the left of a blue text link "Forgot Your Password?". At the bottom of the form, there is a link that says "I need to login as a Supplier".

Figure 24 - Customer login

If user is a supplier he/she need to click on “I need to login as a Supplier” link to navigate to login page. Their he/she can specify correct username and the password to login.

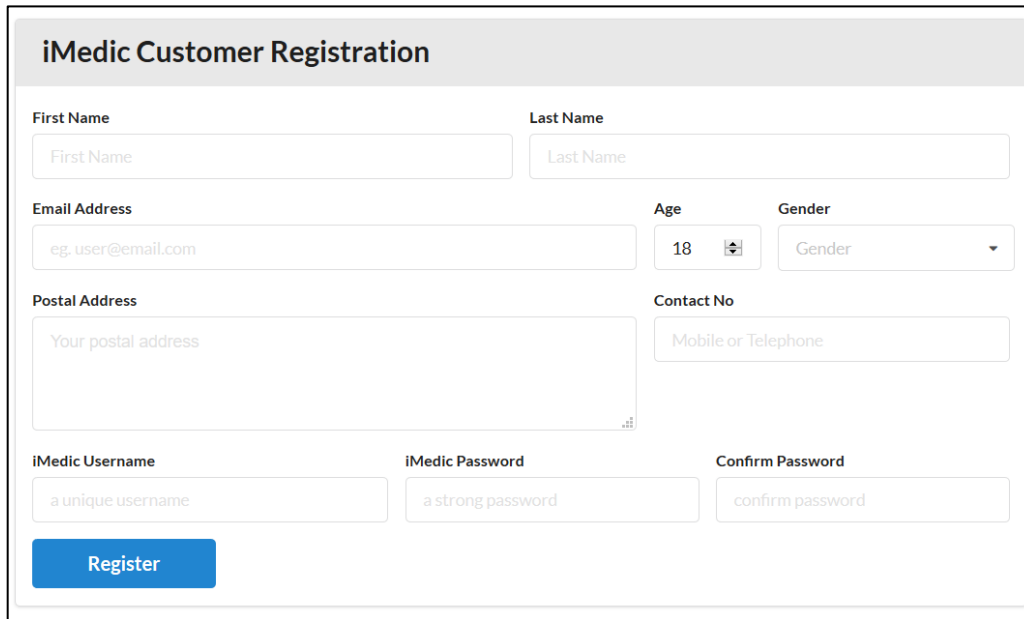


The image shows a web form titled "iMedic Supplier Login". It features a header with the title. Below the header are two input fields: "iMedic Supplier Username" and "Password". There is a checkbox labeled "Remember Me". A blue "Login" button is positioned below the "Remember Me" checkbox.

Figure 25 - Supplier login

Customer Registration for the iMedic

User needs to click the Register button on the right corner in the home page. When user clicks on the Register button, register page appears; then user needs to fill the necessary information and click the Register button.



The image shows a web form titled "iMedic Customer Registration". The form is enclosed in a light gray border and has a header with the title. It contains several input fields and a button:

- First Name**: A text input field with the placeholder "First Name".
- Last Name**: A text input field with the placeholder "Last Name".
- Email Address**: A text input field with the placeholder "eg. user@email.com".
- Age**: A text input field with the value "18" and a small calendar icon.
- Gender**: A dropdown menu with the text "Gender" and a downward arrow.
- Postal Address**: A large text area with the placeholder "Your postal address".
- Contact No**: A text input field with the placeholder "Mobile or Telephone".
- iMedic Username**: A text input field with the placeholder "a unique username".
- iMedic Password**: A text input field with the placeholder "a strong password".
- Confirm Password**: A text input field with the placeholder "confirm password".
- Register**: A blue button with white text.

Figure 26 - Customer Registration

Pharmacy Registration for the iMedic

User needs to click the Register as a Pharmacy button on the left corner in the home page. When user clicks on the above button, pharmacy register page appears; then user needs to fill the necessary information and click the Register button.

Once registration request is done that will be visible to admin user. Before accepting their will be a background check for given registered pharmacy. Pharmacy login will be available only after admin accept registration request.

Supplier Registration

We are glad that you chose to extend your business with iMedic. Please fill in following fields and we will get back to you for further proceedings.

After we received your request, our administration will run background checks on your business to comply with regulations & policies. Upon a successful request, you will be notified via email or contact number you provided with the request with your **iMedic credentials**.

iMedic Pharmacy Registration

Business Name

Email Address

Contact No

Postal Address

Send Registration Request

Figure 27 - Pharmacy Registration

Upload Prescription for the iMedic

User needs to click the Upload Prescription button on the middle in the home page.

Home > Upload Prescription

Upload Prescription

Please fill in following fields and upload your prescription given by your doctor. A supplier (one you choose here), will review your prescription and will respond as soon as possible with an order for you to confirm, which you can check under 'Pending Orders' in your iMedic Profile.

Upload your prescription here

Pharmacy

Upload Prescription

Figure 28 - Upload Prescription for the iMedic

This functionality facilitate customer to upload their prescription to the system and, user need to choose pharmacy by the given drop down. If there is a special note or message text box is shown to submit that.

Search drugs in iMedic

User needs to type desired drug in the Search box on the middle in the home page. When user clicks on the Search button, Search page appears; then user needs to fill the necessary information and select the desired drug.

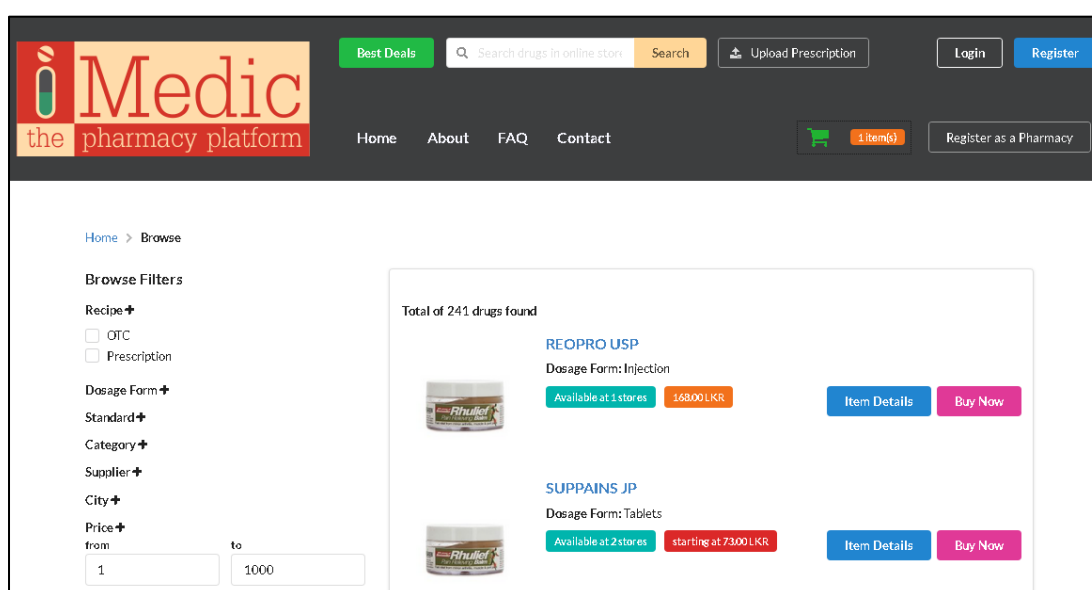


Figure 29 - Search drugs in iMedic

Search results are populated with filters to narrow down the result set. Customer can search specifying drug name directly or else system will suggest all matching results for any given letters.

Shopping Cart in iMedic

User needs to select desired drug in the Search page. When user clicks on the Buy Now button, Popup appears; then user needs to add those drugs to shopping cart (Please note that only OTC drugs can be purchased from the shopping cart; if user needs to buy prescription only drugs user needs to upload the doctor's prescription). By clicking on Buy Now button customer can add items to shopping cart and, user can specify quantity in the pop-up screen.

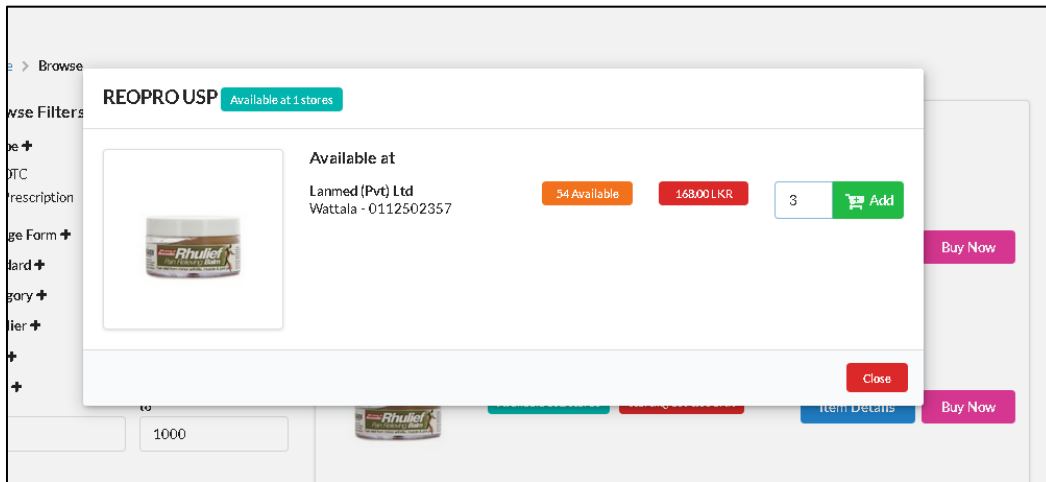


Figure 30 - Shopping Cart in iMedic

Checkout shopping cart in iMedic

When User needs to checkout desired drug in the shopping cart. User needs to click on the Cart button on the right corner in the home page., Then it shows the user’s shopping-cart, by using this page user can manipulate the orders in shopping cart (e.g. removing the orders or clear cart).

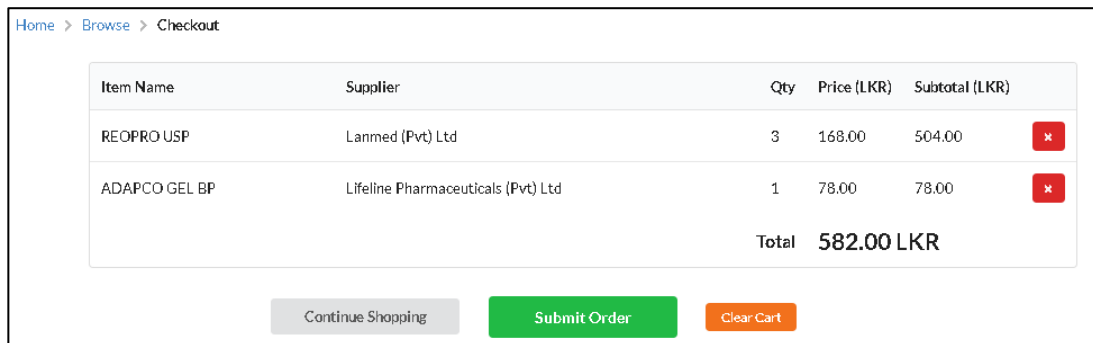


Figure 31 - Checkout shopping cart in iMedic

Order submission

In the shopping cart page user can submit the order to the system. When user submits the order, there will be confirmation message about user order with order ID. Upon this submission relevant pharmacy will contact the user and continue the order flow.

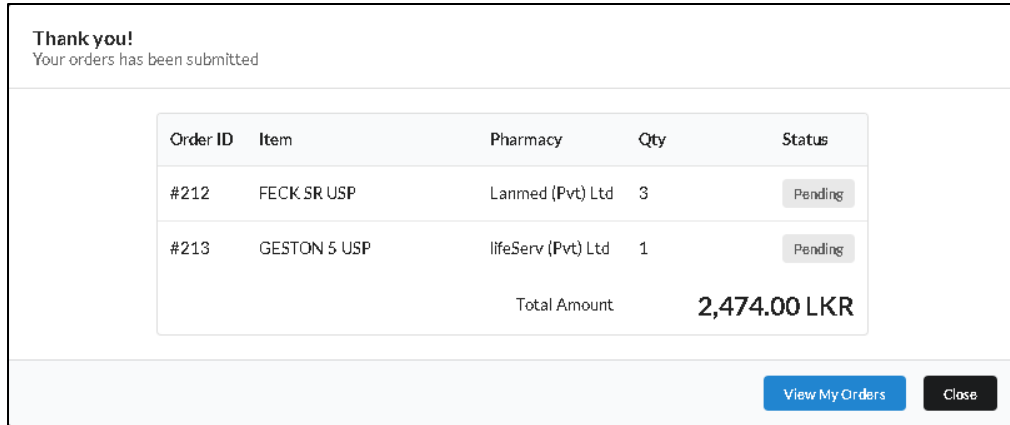


Figure 32 - Order submission

4. Administration

- Customer dashboard** – User can view profile by clicking user’s name on right corner on the home page (please see the below screenshot) and navigate to My Profile after login to the system. Customer dashboard will give information about orders and profile details.

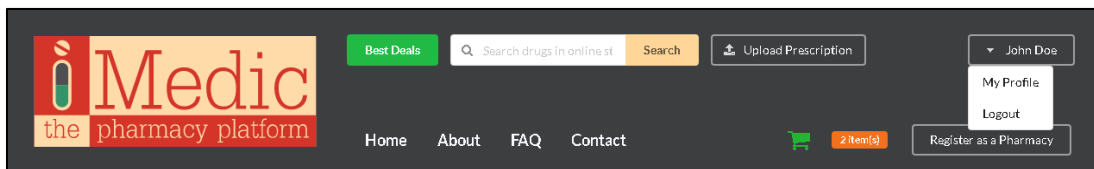


Figure 33 - Customer profile

My Orders

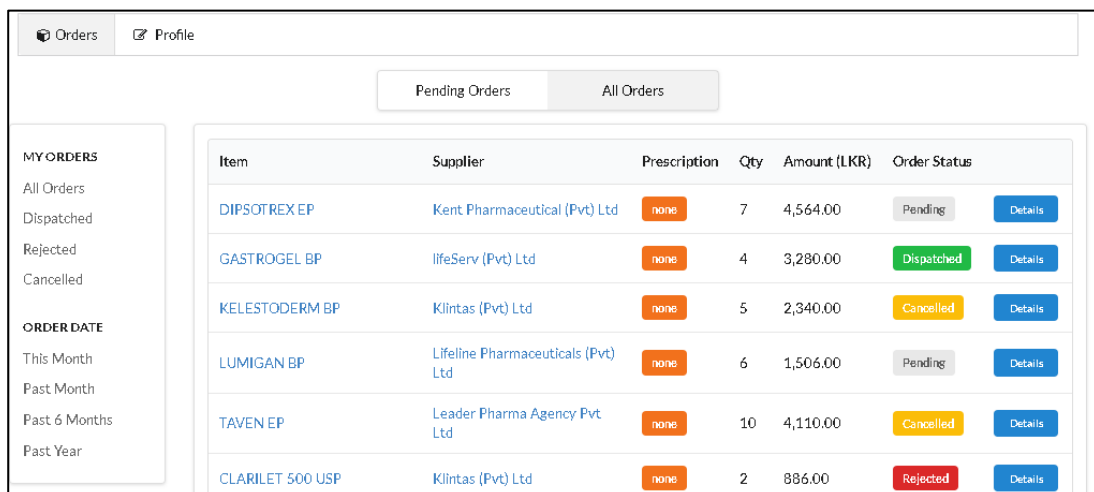


Figure 34 - Customer dashboard

This page provide customer to edit order status details. (Edit and complete). In all orders tab there's a history of all transactions done through iMedic by logged in customer. Form the side bar user can filter results set from give n parameters.

My Profile

The screenshot shows a user interface for editing a customer profile. At the top, there are two tabs: 'Orders' and 'Profile'. The 'Profile' tab is selected. Below the tabs, there are two buttons: 'Edit Profile' and 'Change Password'. The main form contains several input fields: 'First Name' (John), 'Last Name' (Doe), 'iMedic Username' (john), 'Email Address' (john@mail.com), 'Age' (25), 'Gender' (Male), 'Postal Address' (123, No Place, Nowhere), and 'Contact No' (0123456789). A large yellow 'Update Profile' button is at the bottom.

Figure 35 - Customer profile

This page provide customer to edit profile details. There are two tabs as Edit Profile and Change Password.

- **Supplier dashboard** - Supplier dashboard will give overall high-level information about orders and drugs.

Dashboard

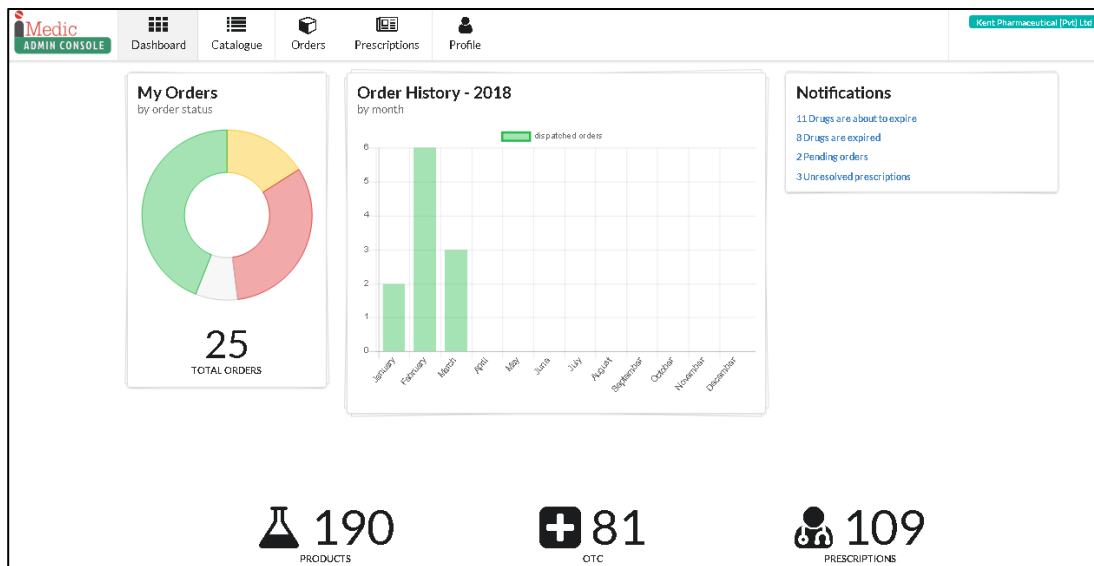


Figure 36 - Supplier dashboard

When supplier is logged in he/she will be taken firstly to this page. It includes number of orders, order history, useful notifications. Upon clicking on notification link more details can be viewed.

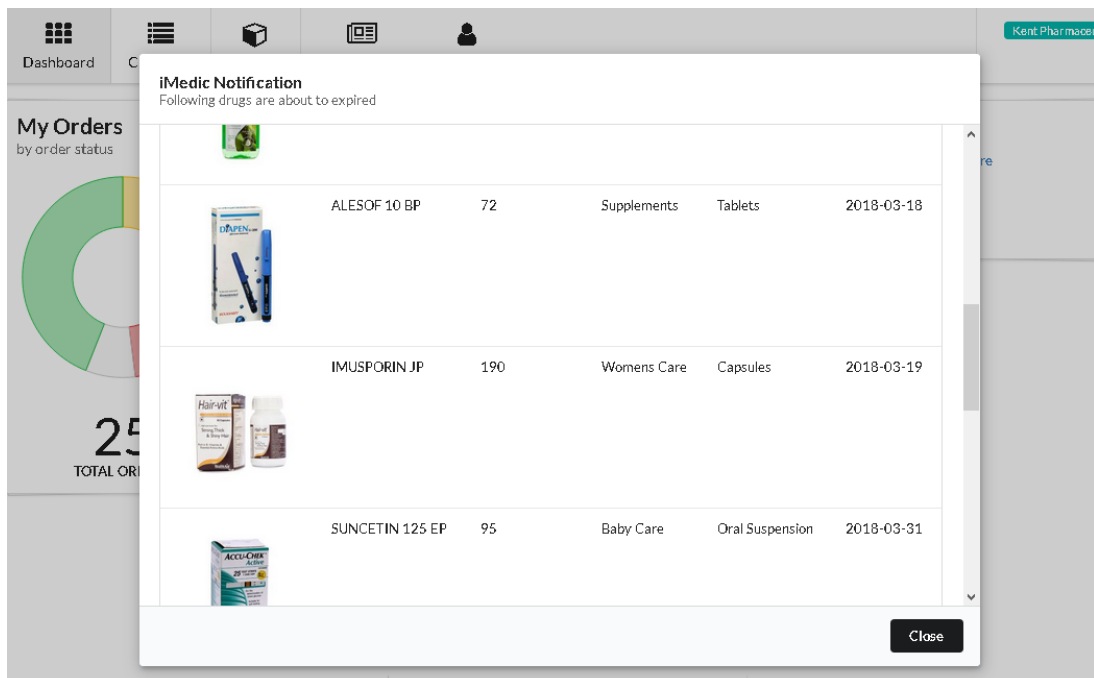


Figure 37 - Notifications pop up

Catalogue

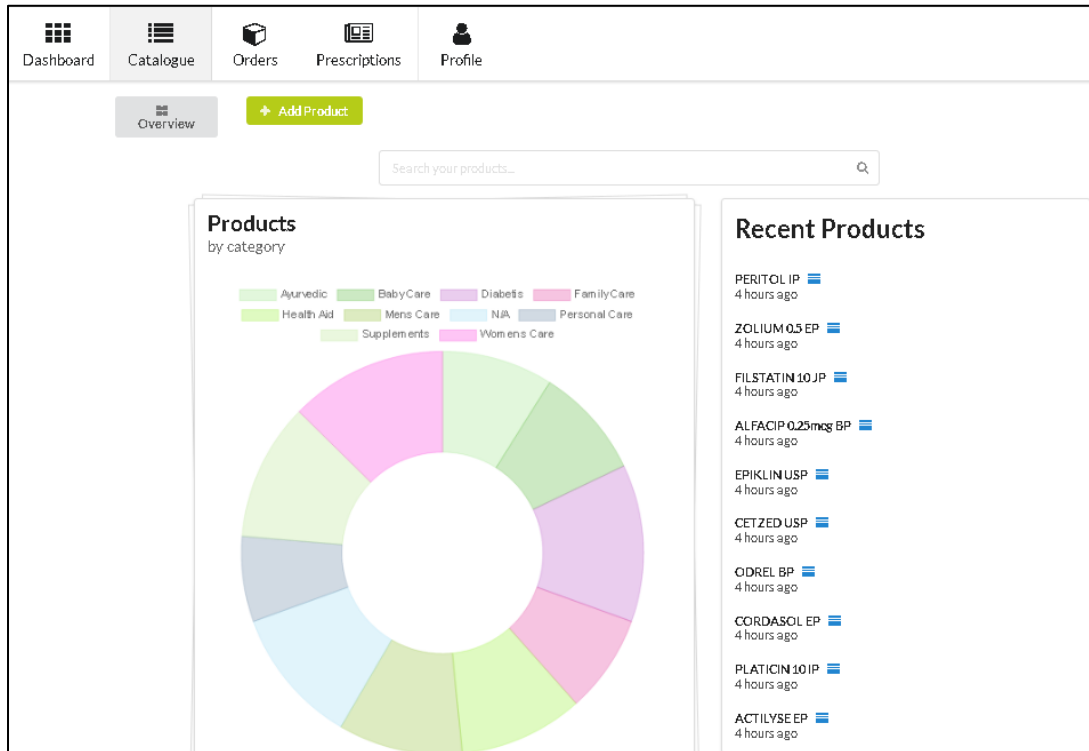


Figure 38 - Catalogue

This page provides information about products categories and recent products. And there's a button named as 'Add Products' to add drug.

The 'Add Products' form includes the following fields:

- Drug:** A dropdown menu with the placeholder text 'Choose a Drug'.
- Category:** A dropdown menu with the placeholder text 'Pick a Category'.
- Price:** A numeric input field with the value '0'.
- Stock Quantity:** A numeric input field with the value '0'.

A green 'Create' button is located at the bottom of the form.

Figure 39 - Add Products

Supplier only can add drugs which is available in drop down. He/she simply has to select drug from drop down and specify its price and stock quantity and submit.

Orders

This page provides supplier to edit order status details. When customer makes an order to particular pharmacy it will be listed down in order list. Two actions Dispatch and Reject are given to supplier to manage orders. Only OTC drug requests will be listed here.

Order ID	Item	Customer	Prescription	Date	Qty	Amount (LKR)	
56	CEFUROX BP	Jane Doe	None	a month ago	5	1,415.00	Dispatch Details Reject
86	DIPROGENTA EP	Jane Doe	None	a month ago	9	6,228.00	Dispatch Details Reject

Figure 40 - Composition of the age in the sample

Prescriptions

This page provides supplier to edit prescription only order details. Here all process will be handled manually and supplier has to resolve when the medicines are ready to deliver to customer.

Prescription	Customer	Customer Address	Placed	
	Jane Doe - 0123456789	123, No Place, Nowhere	4 hours ago	Resolve Reject
	Jane Doe - 0123456789	123, No Place, Nowhere	4 hours ago	Resolve Reject
	John Doe - 0123456789	123, No Place, Nowhere	4 hours ago	Resolve Reject

Figure 41 - Prescriptions

Profile

The screenshot shows a web application interface for a user's profile. At the top, there is a navigation menu with icons and labels for 'Dashboard', 'Catalogue', 'Orders', 'Prescriptions', and 'Profile'. The 'Profile' tab is currently selected. Below the navigation, there are two tabs: 'Edit Profile' and 'Change Password'. The 'Edit Profile' tab is active, displaying a form with the following fields:

- Business Name:** Kent Pharmaceutical (Pvt) Ltd
- iMedic Username:** (empty)
- Hotline:** 000111111
- Postal Address:** 15/2, 1/2, Barnes Place Colombo 07
- City:** Colombo
- Contact No:** 0123456789

At the bottom of the form, there is a blue button labeled 'Update Profile'.

Figure 42 - Profile

This page provide supplier to edit profile details. There will be two tabs for Edit Profile and Change Password.

5. FAQ's

- Why users can not by 'Prescription only' Drugs from Buy Now option?

Please note that only OTC drugs can be purchased from the shopping cart; if user needs to buy prescription only drugs user needs to upload the doctor's prescription.

- What is COD (Cash on Delivery)?

Customer only places the order from the system. Payment will be settle when user receives the goods in his doorstep.

- Why Pharmacy cannot login to the system like normal user?

Pharmacies need to be verified by the admin. Upon the admin's permission suppliers can log in to the system.

C. Questioner Results

1. Composition of the age in the sample group that used for the project. Below diagram shows composition of the MBA students which is taken for the questionnaire. Majority of the students are in the 30 to 40 years age.

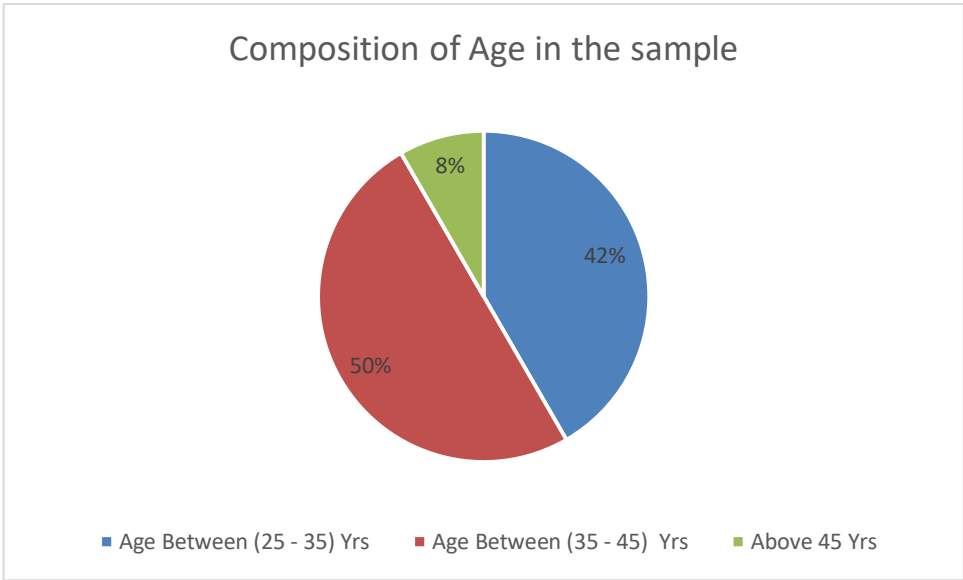


Figure 43 - Composition of the age in the sample

2. Composition of the gender in the sample group that used for the project. Below diagram shows composition of the MBA students which is taken for the questionnaire. Majority of the students are female.

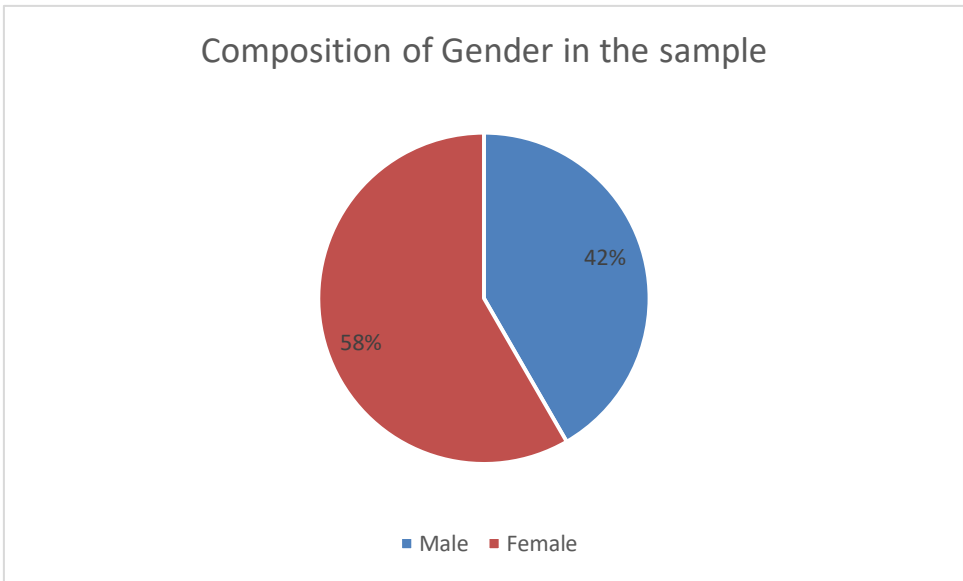


Figure 44 - Composition of the gender in the sample

3. Following diagram shows willingness to buy online from the sample students. Majority of the students like to buy goods from the online platforms.

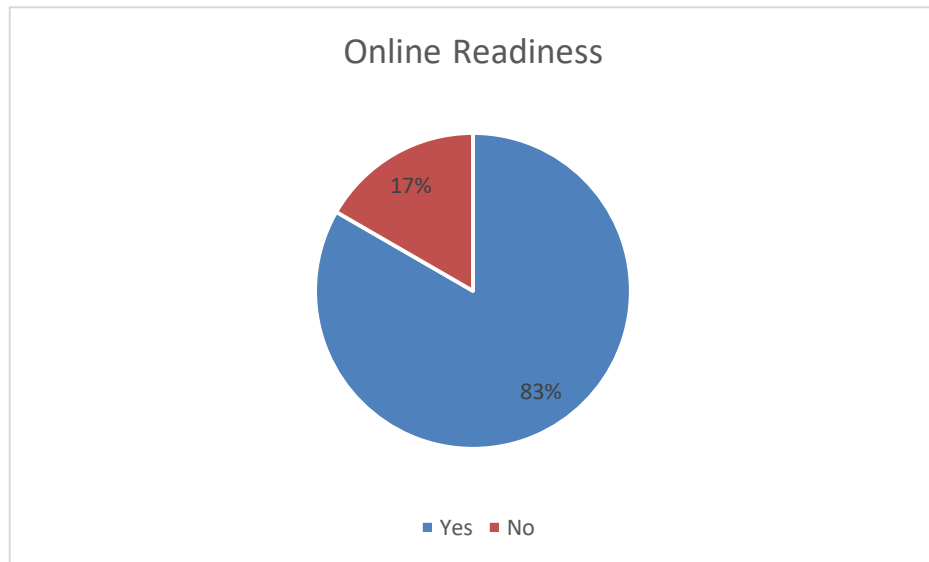


Figure 45 - Online Readiness

4. Following diagram shows willingness to buy online drugs from the sample students. Majority of the students like to buy drugs from the online platforms.

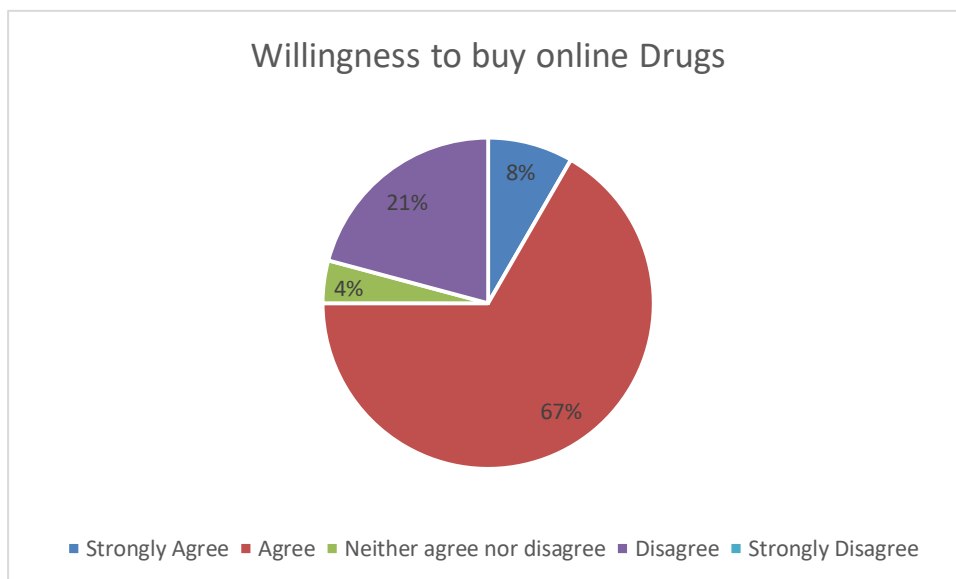


Figure 46 - Willingness to buy online drugs

5. Following diagram shows results of the question “Do you think that online pharmacies will violate user’s privacy?” from the sample students. Majority of the students think that it will violate their privacy when buying drugs from online platforms.



Figure 47 - Opinion on: Will online drug stores violate privacy?

6. Following diagram shows the preferred method to buy in online in online pharmacy scenario. Majority of the students think to buy from Cash on Delivery method.

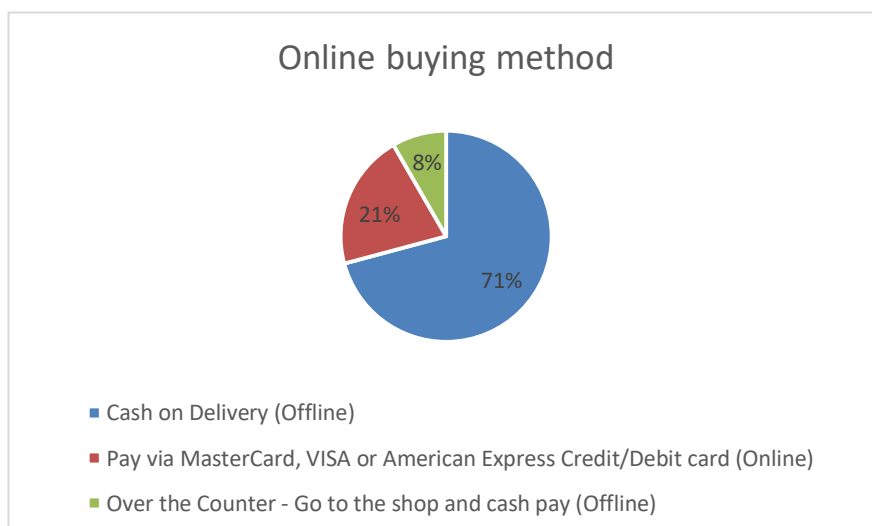


Figure 48 - Online buying method

D. Sample Codes

Source codes of certain major functions of the system are included in this chapter and for easy reading, only major sections will be listed.

Login Function

```
<div style="padding: 2em 1em;">
  @if ($errors->any())
    <div class="ui tiny orange message">
      Credentials your provided do not match our records. Try again!
    </div>
  @endif
  <form method="POST" action="{{ route('supplier-login') }}" class="ui form">
    {{ csrf_field() }}

    <div class="field{{ $errors->has('username') ? ' error' : '' }}">
      <label for="username">iMedic Supplier Username</label>
      <input id="username" type="text" name="username" value="{{ old('username') }}"
required autofocus>
    </div>

    <div class="field{{ $errors->has('password') ? ' error' : '' }}">
      <label for="password">Password</label>
      <input id="password" type="password" name="password" required>
    </div>

    <div class="field">
      <div class="ui checkbox">
        <label>
          <input type="checkbox" name="remember" {{ old('remember') ? 'checked' :
" }}>&nbsp;&Remember Me
        </label>
      </div>
    </div>

    <div class="field">
      <button type="submit" class="ui primary button">Login</button>
    </div>
  </form>
</div>
```

Figure 49 - Supplier Login View(Login.blade.php)

```

public function login(Request $request) {
    $this->validate($request, [
        'username' => 'required|string',
        'password' => 'required|string',
    ]);

    if (Auth::guard('supplier')->attempt(['username' => $request->get('username'), 'password' =>
$request->get('password')])) {
        return redirect('/supplier/console');
    }

    throw ValidationException::withMessages([
        'username' => [trans('auth.failed')],
    ]);
}

```

Figure 50 - Supplier Login Controller

Register as Pharmacy

```

<div id="v-supplier-register" class="ui grid container" style="margin-top: 3em;">
    <div class="row">
        <div class="six wide column">
            <div class="ui breadcrumb">
                <a href="/" class="section">Home</a>
                <i class="right chevron icon divider"></i>
                <div href="/supplier/registration" class="active section">Supplier Registration</div>
            </div>
        </div>
    </div>

    <div class="centered row">
        <div class="ten wide column">
            <div class="ui blue message">
                <div class="header">
                    Supplier Registration
                </div>
                <p>We are glad that you chose to extend your business with iMedic. Please fill in
following fields and we will get back to your for further proceedings.</p>
                <p>After we received your request, our administration will run background checks on
your business to comply with regulations & policies. Upon a successful request, you will be notified
via email or contact number you provided with the request with your <b>iMedic
credentials</b>.</p>
            </div>
        </div>
    </div>

```

```

<div class="ui segment">
  <div class="ui top attached label">
    <h2 class="ui header" style="padding: 5px 10px;">iMedic Pharmacy
Registration</h2>
  </div>
  <form class="ui form" style="padding-top: 2em;">
    <div class="field">
      <label for="">Business Name</label>
      <input type="text" placeholder="Your business name" v-
model="data_business_name">
    </div>
    <div class="fields">
      <div class="ten wide field">
        <label for="">Email Address</label>
        <input type="text" placeholder="eg. business@email.com" v-
model="data_email">
      </div>
      <div class="six wide field">
        <label for="">Contact No</label>
        <input type="text" placeholder="Your private contact no" v-
model="data_contact_no">
      </div>
    </div>
    <div class="field">
      <label for="">Postal Address</label>
      <textarea name="" id="" rows="4" placeholder="Your postal address..." v-
model="data_address"></textarea>
    </div>
  </form>
</div>
<div v-show="errors.length > 0" class="centered row">

```

Figure 51 - Supplier Registration View

```

public function register(RegistrationRequest $request) {
  $reg_request = new RegisterRequest($request->all());
  $reg_request->save();
  return redirect('/');
}

```

Figure 52 - Supplier Registration Controller

Upload Drug

```
<form action="" class="ui form">
  <div class="fields">
    <div class="ten wide field">
      <label for="">Drug</label>
      <div id="drug-find" class="ui search selection dropdown">
        <input type="hidden">
        <i class="dropdown icon"></i>
        <div class="default text">Choose a Drug</div>
      </div>
    </div>
    <div class="six wide field">
      <label for="">Category</label>
      <div id="drp-category" class="ui search selection dropdown">
        <input name="category" type="hidden">
        <i class="dropdown icon"></i>
        <div class="default text">Pick a Category</div>
      </div>
    </div>
  </div>
  <div class="fields">
    <div class="three wide field">
      <label for="">Price</label>
      <input type="number" v-model="data_price">
    </div>
    <div class="three wide field">
      <label for="">Stock Quantity</label>
      <input type="number" v-model="data_stock_quantity">
    </div>
  </div>
</form>
```

Figure 53 - Upload Drug view

```
public function create_product(CreateProductRequest $request) {
    $product = new Product($request->all()); //TODO
    $product->supplier_id = Auth::guard('supplier')->user()->supplier_id;
    $product->save();
    return $product;
}
```

Figure 54 - Upload Drug controller

Upload prescription

```
<div class="centered row">
  <div class="twelve wide column">
    <div class="ui blue message">
      <div class="header">
        Upload Prescription
      </div>
      <p>Please fill in following fields and upload your prescription given by your doctor. A
supplier(one you choose here), will review you prescription and will respond as soon as possible with an
order for you to confirm, which you can check under '<b>Pending Orders</b>' in your
      <a href="/profile"><b>iMedic Profile</b></a>.</p>
      <p></p>
    </div>
  </div>
</div>
<div v-show="errors.length > 0" class="centered row">
  <div class="eight wide column">
    <div class="ui error message">
      <div class="header">
        There were some errors with your submission
      </div>
      <ul class="list">
        <li v-for="error in errors">@{{ error }}</li>
      </ul>
    </div>
  </div>
</div>
<div class="row">
  <div class="ten wide column">
    <div class="ten wide field" style="border: dimgrey dashed 1px; border-radius: 2px;">
      <image-uploader hook="#prescription-image"></image-uploader>
    </div>
  </div>
</div>
```

Figure 55 - Upload Prescription View

```
public function add(UploadPrescriptionRequest $request) {
    $image = $request->file('prescription');
    $filename = date_format(Carbon::now(), 'YMd-Hisu') . ".{".$image->getClientOriginalExtension()}";

    $prescription = new Prescription();
    $prescription->image_file = $filename;
    $prescription->remarks = $request->get('remarks');
    $prescription->is_resolved = false;
    $prescription->supplier_id = $request->get('supplier_id');
    $prescription->customer_id = 1;

    $prescription->save();
    $image->move(public_path('images/app/prescriptions'), $filename);
    return $prescription;
}
```

Figure 56 - Upload Prescription Controller