



Masters Project Final Report

December 2016

Project Title	Data Management System for Anusha Medical Center		
Student Name	R M Thilini Kawshika Ratnayake		
Registration No. & Index No.	2012/MIT/043 12550436		
Supervisor's Name	Ms jeewani Gunathilake		
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**Data Management System
for Anusha Medical Center**

R M Thilini Kawshika Ratnayake

2016



Data Management System for Anusha Medical Center

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

R M Thilini Kawshika Ratnayake

University of Colombo School of Computing

2016



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: R M Thilini Ratnayake

Registration Number: 2012/MIT/043

Index Number: 12550436

Signature:

Date:

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

Mr./Ms.

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

Certified by:

Supervisor Name: Jeewani Goonethilake

Signature:

Date:

Abstract

Anusha medical center is a Private Medical Center which attached to a Pharmacy and it is situated in Mallawapitiya Divisional Secretariat in Kurunegala District.

Medical center does not have a way to record the patient personal details, the past and present health details and the medicine given. Additionally, no way to record the medicine details are available in the Pharmacy. Thus, pharmacy running out of the stocks. And highlighted the medicine wastage is high due to expiring the stocks.

Developed system made to overcome all the issues highlighted above. It gives facility to maintain the Patient Personal details and added a new function to select the name of a Doctor assign to the patient. Also, system provide facility to check patient, bed, and ward allocation. Furthermore, doctors can record the medicine details and the patient health details in the system. Before write the prescription, doctor can view the medical history of the patient. Able to print the prescription. In the pharmacy side, added functionalities to record the medicine details, maintain the stock level and expiring dates. Additionally, pharmacist can to check the Expired Medicine, the medicine which are about to expired and added the safety stock level to re-order the medicine. Facilitate to maintain the staff profile and doctors profile. Provided reports to check the patient Details and medical history. Extra functionally added in to system is proper discharge process.

Evolutional Prototyping is the based methodology for the project. System is designed based on the Entity Frame work. Data layer build in SQL server 2012. Business Logic is written in C#. ASP.Net, HTML, CSS and Bootstrap used for the System designed (UI).

One of the benefit of the new system is data centralization and maintain the patient and medicine records. System help to increase efficiency and accuracy of the when prescribing the medicine. Because it facilitates the accessibility of the patient information such as patient history. Besides it will help doctors to decision making. Even for the patients, they do not need to bring the physical files or previous medical details since all are recorded in the system. Another main advantage is, reduce the wastage of the medicine. This will help to reduce the cost. New system maintains the re-order level of the medicine therefore there will be a rare case the medicine is not available in the pharmacy so, the patient does not need to go some other place to buy medicine resulted the easy access for the medicine and reduce the time consume of the patients.

Acknowledgments

It would be most appreciated to have this opportunity to express my sincere gratitude for those who assisted me on my proper completion of this report.

First of all, I would like to express my gratitude to supervisor Ms. Jeewani Gunathilakefor being with me throughout the assignment. Especially I must thank her for giving me a thorough guidance and expertise experience to do this project accurately. Her immense support and advice she gave throughout the project was excellent. In additionally, her advice and guidelines helped me successfully to overcome issues faced during the project duration. Plus, the motivation, she has given is a major success of my project.

Secondly, I express my gratitude to the Anusha Medical Center Director, Dr P. Ratnayake to giving permission to conduct an interview with his staff and questionnaires distributed around the staff.

My grateful thanks also due to my loved parents who encouraged me to do this project.

Thilini K Ratnayake

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1.0 Introduction to the Project

1.1 Company Background

Anusha medical center is a Private Medical Center which is situated in Mallowapitiya Divisional Secretariat in Kurunegala District. As this is a Private Medical Center, it do have a competition with the other Medical Institutions in Kurunegala suburb. Although this is the one and only Private Medical Center in this area it has lesser facilities with limited resources than the other medical institutions in Kurunegala District.

The core functions of this Medical Center, such as; Handling an Out-Patient Department (OPD), Maintaining In-House Services and Facilitates Other Laboratory Services. This Medical Center has a capacity to maintain approximately 10 In-House patients.

They have 10 Beds and 1 Head Nurse. And 4 nurses to help the Nurse and the Doctors. They give 24-hour service.

They are maintaining a Pharmacy attached to this Medical Center.

1.1.1 Company Structure

Administrative Services

- Medical Center Administrators
- Owners of the Medical Center.

Informational Services

- Admissions
- Billing & Collection
- Medical Records (Medical Administration Office)
- Computer Information Systems

Therapeutic Services

- Physical Therapy
- Medical Psychology
- Social Services
- Pharmacy
- Nursing - provide care for patients

Diagnostic Services

- Medical Laboratory

1.1.2 Company Figures

Refer the Table 1, given the breakdown of the staff attached to the Anusha Medical Center.

Table 1 : Company Figure

Post	Figures
Doctors	04
Nurses – Head Nurse	01
Help Girls	04
Wards	02
Beds	10 (5 each)
Administrative Staff (Admin)	01
Accountant	01
Laboratory Staff/ Pharmacist	01
Supports Staff for Pharmacy	02

1.2 Problem Domain

The medical Centre which have been chosen does not have a System to record their day to day records/Transactions. They record everything in books and financial Details are in the Excel sheets. Sometimes it is difficult to find the details when you need it. Because of this adhoc data entering method the medical Centre does not have a link between all the processes.

Example, if you want to view the patient history, you cannot access to the records (from the administration) easily. Sometimes you have to refer more than one book and still I feel some records are missing in the books.

So below are the main issues have been noticed and to overcome this issues we need to build a best system.

1. Patient history is not recorded correctly and every time when the same person admitting or taking medicine from this place you need to make a new record. (Duplication of the work load).
2. No stock control method is using for the medicine and no accurate record/s for the medicine ordered. Sometimes there is an unavailability of the stock and patient should have to take medicine from outside. On the other hand, sometimes there is wastage of medicine.
3. No Expiry date management is used for medicine. Because of that wastage is increases.
4. Nurse's profile not maintained.
5. Doctor's profile and allocations are not recorded against to the Patient.
6. Account entries are recorded through an Excel sheet.
7. There is no link between allocations of nurses. So, sometime one nurse has assigned to two tasks at the same time.
8. No details of the Bed allocation.

1.3 Scope of the Project

Project scope is limited to maintain the Patient details, patient medical/ medicine details and pharmacy medicine details. The scope is limited only to the Development and testing. Not provide the training to the users. Payment module is not covered. Direct sales from the pharmacy is not handling. Medicine purchasing module is not included in to the scope.

1.4 Project Objectives

To build a high-quality system which increases the data accuracy, decrease the wastage, improve the workforce productivity, reduce the time consuming and deliver the safe and effective patient care, within six months at cost not to exceeds given budget.

1.5 Limitations

1. Child patient details are not handling.
2. Cannot print Reports and Parameterize Report
3. Cannot save the sessions, per the users.
4. Goods are selling directly from the pharmacy is not entered to the system. Eg: Purchase 100 Panadol boxes only 50 added to the system.

1.6 Assumptions

1. Assume that every user is good in English
2. For a privacy concern assume that the users do not know the other Users ID's
3. Users are Good with Computer Knowledge.
4. Full stock is not added to the System. Therefor maintain separate location in physically to keep the goods which are added to the system.

2.0 Background / Literature Review

2.1 Primary Research

2.1.1 Interviews

2.1.1.1 Why Use interview

High in validity – The interview should measure what it claims to measure, and the responses should give a true and accurate picture. Their flexibility enables the clarification of meanings.

Qualitative data – The responses provide insights about peoples' feelings, attitudes, beliefs, opinions – about the experience of being a human being. They may yield hypotheses for testing.

2.1.1.2 Interview summaries

Interviews has been done with the staff members to identify the problems that they face. Please refer Appendix A to see the Interview Summary.

2.1.2 Conclusion of the Interviews

While conducting the interviews the author has identified many problems, which has faced by the Front officer, Accountant, Pharmacist and the Head Nurse. The main problem is that they do not have a way to keep history records of the patient. And they do not have a way to stock maintenance. And over work load for Accountant.

2.2 Secondary Investigation - Business Analysis

2.2.1 STEEP

STEER analysis is conducted in order to analyze the external environment factors of a business. There are many factors in the macro-environment that will affect the decisions of the managers of any organisation. New laws, Trade barriers, Demographic change and Government policy changes are all examples of macro change.

In this project the main criteria's (criteria is) which need to analyse according to the STEER are **Technological, Political and Environmental**. Technology is the one of the main factors which we need to consider as the private do use new technology.

Next one is Political Factor.

Support Note:

Table 2 gives the figures to measure the scale of Impact.

Table 2 : Result Analysing Chart

Factors		Scale of Impact	Type of Impact
S	Socio-cultural	H High	+ Positive (-) Negative
T	Technological	M Medium	
E1	Economical	L Low	
E2	Environmental		
P	Political		

(Concept Template: ISOM class notes, Padumadasa. E, 2015)

Table 3 shows the STEEP analysis, results according to the give Results analysis chart: Table 2.

Table 3 : STEEP Analysis

F a c t o r	Change	Impact on business					Description
		H	M	L	+	(-)	
S	Life style / Social trends	X			X		<ul style="list-style-type: none"> Present customers are busy with their day today work. Social trend is more towards to the western pattern since they think the private Medical Centers are better than the Government Medical Centers. This is Positive to this Medical Center.

	Demography			X	X		<ul style="list-style-type: none"> An increase in the proportion of older people within the area population it directly affected to the Medical Center.
	Health conditions						<ul style="list-style-type: none"> According to the “National Institute of Occupational Safety and Health Act, No. 38 of 2009” has to provide the establishment of the national institute of occupational safety and health for the formulation of a policy on occupational safety and health standards; to create an environment for occupational safety and health at all workplaces to protect both the employers and employees; and for matters connected therewith or incidental thereto.
	Work environment conditions						
	Education Conditions		X			X	<ul style="list-style-type: none"> More educated people do not like to come to the Medical Centers. They try to get medicine from their own. E.g. they just call a family doctor and ask about the medicine
	Changes in values/attitudes	X				X	<ul style="list-style-type: none"> As mentioned before the attitudes are more change than the past. Always thinks the private Medical Centers gives better service than the governments sector. E.g.: More kind Nurses, Friendly combatable environment, Cleanliness.

Conclusion

Socio-cultural factors are heavily affected to the Medical Center. According to the above mentioned criteria socio-cultural factors have a high impact on this Medical Center with Positive influence.

T	Introduce the New technology to the medical Industry	X				X	<ul style="list-style-type: none"> This is affected in a negative way to this Medical Center. Since they do not want to follow new technology.
	New patent and products	X				X	<ul style="list-style-type: none"> The Medical Center is using new patent and equipment's but they do not have facility for all the medical requirements.

Conclusion

According to the above investigation, can come into a conclusion that the Medical Center has to face many challenges as they do not grab the new technology. Nowadays technology plays a major role for the development of medical sector. Because of that technological factors have a high impact on the company's operations and it may affect the company positively.

E1	Inflation Rate			X		X	<ul style="list-style-type: none"> Normally cost of drugs increasing due to 6.7 inflation rate. This is mainly impact to this Medical Centre. Because of this the Charges of this medical centre is little high.
	Wage Level			X	X		<ul style="list-style-type: none"> Regulations on minimum employee wage level (i.e. According to the Employee's provident fund Act the minimum wage level for a Nurse is Rs.25,000/=). This also handles through the private sector Negative impact to the Medical Center.

Conclusion

The economic conditions which have mentioned above have not showed the direct impact to the Medical Center. Its shows a Low impact to the company.

E2	Ecology	X			X	<ul style="list-style-type: none"> According to the “The Health policy of Sri Lanka”, (2005-2015) Medical Center has to maintain hygienic and environmental friendly surroundings around the Medical Center. This affects a lot to this Medical Center as this is situated in the middle of the Malawa Pitiya town & directly faces to the Kandy Road. (Very crowded. This environment is not suitable for a health care centre.
	Pollution conditions	X			X	<ul style="list-style-type: none"> Pollution condition is highly affected to this Medical Center as it is situated near to the main road.

Conclusion

Cleanliness environment is mandatory for a Medical Center. This Medical Center situated in a highly-commercialized area; Because of those environmental conditions they have to keep their environment cleanly and have to maintain it daily This will have high impact on the company's and concern towards its patients and affect positively.

P	Government Regulations on - Health Care	X			X	<ul style="list-style-type: none"> According to the “National Institute of Occupational Safety and Health Act, No. 38 of 2009” there are many rules for Medical Centers. <ul style="list-style-type: none"> ➤ Emergency surgical services should be organised for a population of 450-500,000. ➤ The ideal unit for fully comprehensive medicine and surgery is a Medical Center or group of Medical Centers serving a population of 450-500,000.
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						<ul style="list-style-type: none"> ➤ The lowest catchments population for ‘district Medical Centers’ providing 24 hour children’s services, 24 hour surgical services and maternity services as well as acute medicine and surgery is 250,000 ➤ ‘local Medical Centers’ serving a population less than 250,000 are unlikely to be able to sustain 24 hour/emergency surgery or inpatient paediatrics or consultant led obstetrics and may have to operate a ‘selected medical take’
	Government Regulations on Employment on the Medical Center	X			X	<ul style="list-style-type: none"> • According to the “Sri Lanka Nurses council (Amendment) act, no. 35 of 2005”, Nurses can get 4 casual leaves for the month and do consider public holidays as over time working days. In total to work 36 hours a week. • According to the “National Institute of Occupational Safety and Health Act, No. 38 of 2009” there are many rules about the employees. It is mainly an employee protection act. This act advises the employers; how to protect their employees and the best way to treat them. If they met an accident while working hours at work places; what are step that employers should take kind of information.
	Government Regulations on	X			X	<ul style="list-style-type: none"> • According to the “Registered Nurses act” every Nurse should have passed the exam

	Employment education level						which conducted for a Nurses and must be a well-educated.
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Conclusion

According to the above analysis, it shows the government rules and regulations have direct impact on the company's operations. Government had established many rules for the medical sector. The affect of political factors have high impact and may benefit positively.

(Concept Template: ISOM class notes, Padumadasa. E, 2015)

2.2.1.1 Conclusion

According to the analysis, can come into the conclusion which the Environmental factor does not show major effect to the company but minimally it's affected than the other two as the Medical Centers situated in a residential area and mainly near in Kandy road. Next Technological factor affects as the Medical Center does not have sufficient enough Technology. Legal factor affects mainly to the Medical Center as every action have to do according to the Act that means many rules and regulations. Below figure 1 shows the graphical view of the Summary.

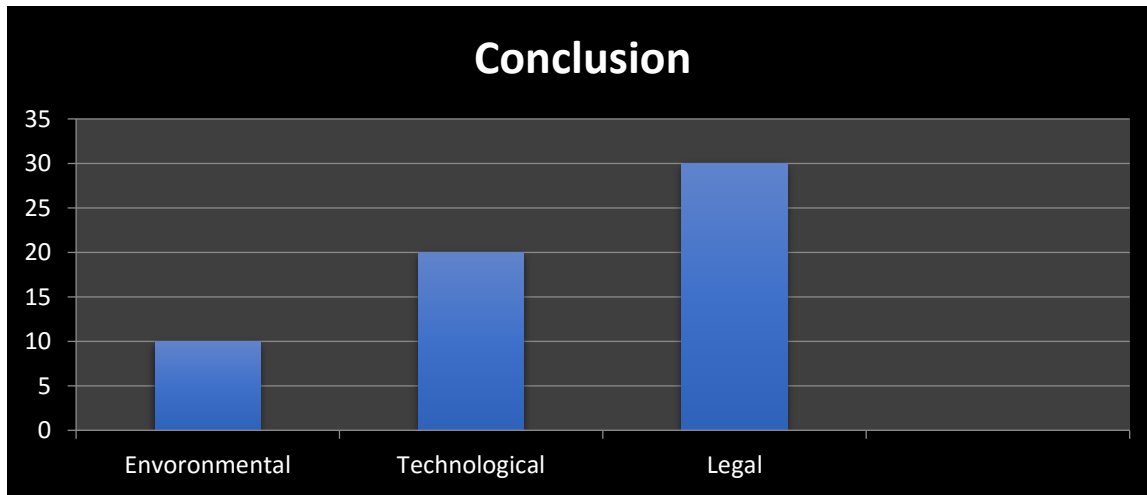


Figure 1: Graphical View of STEEP Analysis Summary

2.2.2 SWOT

SWOT analysis is a part of auditing an organization and its environment. It is the first stage of planning and helps marketers to focus on key issues. SWOT stands for the Strengths, Weaknesses, Opportunities, and Threats. Strengths and weaknesses are internal factors. Opportunities and threats are external factors. Table 4 shows the detail analysis of SWOT.

Table 4 : SWOT Analysis: S & W

<u>Strength</u>	<u>Weakness</u>
1. Availability of expertise nursing staff (more than five years), in spite of the problem of nursing shortage	1. Low commitments of Medical Center polices and regulations. 2. Lack of resources support (time, money, and support) for development.

<ol style="list-style-type: none"> 2. Availability of well recognized and qualified OPD doctors 3. Availability of the laboratory facilities. 	<ol style="list-style-type: none"> 3. No competition with other health care providers. 4. Short-staffed departments and high workload on Medical Center staffs 5. Insufficient accountability regarding medical errors. 6. Unavailable of ideal standards that required protecting patient's confidentiality and privacy such as exceeded the ideal number of patients' bed in a given room. 7. High Nurse; patient ratio. 8. Weak of guard protection security Medical Center system, that could increase the chance of workplace Violence. 9. Un-Availability of the Medical Center infrastructures
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<u>Opportunities</u>	<u>Threats</u>
<ol style="list-style-type: none"> 1. Strong relationships and form of collaboration with other governmental Medical Centers and health departments. 2. Location of Medical Center serves large population, more available connections, and resources. 	<ol style="list-style-type: none"> 1. Low staff income in comparison with other private Medical Center sector. 2. Lack of technology advancement and updated devices 3. The inability to attract and retain nursing staff due to lower salaries

3. Easy of the public transportation to the Medical Center. Near the main road.	4. Nurses' staff recruitment process derived from Ministry Of Health
4. Ability to expand in Medical Center departments and health care services.	5. Nursing shortage
	6. Lack of information technology system

2.2.2.1 Conclusion

The Author has done SWOT to identify the Strengths, Weakness, Opportunities and Threats. While analysis SWOT can come in to the conclusion, the Medical Center has more weaknesses than the strengths. But they can reduce those weaknesses if they come up with better development plan. According to the SWOT, the opportunities also they have lot. If they identify those Opportunities, they can become a Medical Center which has lees weakness and further Strength.

2.3 Similar System Study

Before implement this system refers few other data management systems which made to deliver the good service for Hospitals and Medical Centers.

2.3.1 Case Study 01 - Hospital Patient database management system – A case of General Hospital North – Bank Makurdi – Nigeria.

According to A. Shrey, 2013, General Hospital, North – Bank Makurdi – Nigeria as below,

2.3.1.1 The Old System

“The procedure involved in the current system is that, when a patient visit the hospital for medication, the patient will first of all buy the identification card which contains name, and other relevant information needed, and card identification number. The patient will then wait for the card to be processed together with a file jacket that holds the card that has column for diagnosis made by physician, drugs prescribed, and date at the waiting room for the arrival of the card. When the file arrived, the patient joints the queue to see a doctor. In this current system, file cabinets are used for keeping individual patient card enclosed in a file. This system is so tedious in tracing a record files slow in processing of records, space occupied by the file time waiting while waiting for the patient file to be retrieve by the receptionist”.

2.3.1.2 Proposed System

“This new system is design for medical practitioner/physician to keep track of all patient’s medical record/information such as diagnosis, drug prescribed, admission and discharged, etc the new system will take care of the long processes and tedium work involved in tracing and retrieving a patient’s record in the old system in a nut shell this will improve the efficiency of the management in a daily work as it can provide required records on time”.

2.3.1.3 System Specification

“For maximum and effective execution of the task by the system, there are the hardware and software requirement”.

2.3.1.3.1 Hardware requirement

- System unit
- Monitor (VDU)
- Uninterrupted power supply (UPS)

- RAM (64)
- CD Rom
- Hard disk capacity of 40GB
- Printer

2.3.1.3.2 Software Requirement

- Window XP operating system
- Microsoft access
- Microsoft visual basic

“The programming language to be use in designing the program is Microsoft visual basic MS, access 6.0. In designing the program with Microsoft visual basic the design will include the following.

1. Use case diagram
2. Database design and
3. Normalization

2.3.1.3.3 Database Implementation

“The database of this application was implemented in Microsoft office Access. MS-Access is database application with which one can create database files using the relational model. With this model, you can create tables, store and manipulate data within the tables as required.

Relationship can also be established to create communication among them”.

2.3.2 Case Study 02 - General Hospital, Minna

According to Intelligent Information Management, 2016, General Hospital, Minna case study as below,

2.3.2.1 The Old System

Currently the General Hospital Minna, electronic system of operation as not been implemented in any of the unit of the hospital. The step by step activities carried out at the Hospital for registration and consultation includes the following:

1. The patient must be registered with the Hospital before he/she can visit the Hospital for consultation. The registration process involves filling the medical form by both the patient and Doctor. Information filled by the patient is necessary personal detail about the patient, while those filled by the Doctor are the result obtained from the test conducted on the patient.
2. After the forms, have been completed they are submitted to the staff in charge of the record room. Then a folder is created for the patient and he is given a Hospital card.
3. Whenever the patient is visiting the Hospital for consultation he/she present the card which contains information like name, address, folder name and the passport of the patient. Then the patient is sent to see the doctor.
4. The patient meets the doctor for consultation. The doctor view the necessary information needed to conclude his diagnosis and aid prescription given to the patient.
5. Then the patient is sent to the appropriate unit depending on the diagnosis and prescription

2.3.2.2. Proposed System.

1. Data retrieval module

This provides quick access to patient record using identification number. It reduces the stress and time needed to retrieve patient's folder. If the folder is to be retrieving manually, the time, energy and importantly efficiency of service is degraded.

2. Drag prescription module

It allows doctors to prescribe drug to patient. The prescribed drug will be prescribed attached to the patient's profile automatically. It allows the doctor or any other doctor in future to view the prescribed drug and the illness they were prescribed for.

3. Laboratory test require and report module

This allows laboratory test and result to be properly documented. It is use by the doctor to request at a test be performed on a patient. After the test have been conducted is then attach to the patient profile.

4. Security module

This module is use to prevent unauthorized user from performing certain task e.g. diagnosis, updating nurses roster and so on.

5. Online complain, diagnose and prescription module

This module allow patient to complain online and receive their diagnosis and prescription that has been made by the doctor base on them complain.

Figure 2 shows the activity diagram of the proposed system.

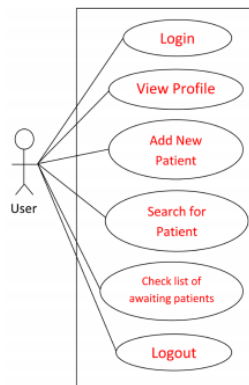


Figure 2: Activity Diagram for the Proposed System

2.3.2.2.1 Database Implementation

“The combination of MySQL and Adobe Dreamweaver was used for this research because they are open source which implies that they are cheap to get since one just need to download them from net. Adobe Dreamweaver is used by web designers and webmasters for novice and professionals to create and dynamic websites while MySQL is chosen as the database management system because of its efficient data handling”.

2.4 Alternative Solutions

Below section discuss the alternative methods which we can implement.

2.4.1 Improved Manual System

One of the alternative solutions is the improvement of the manual system. Whatever we use automated methods, can be done manually. But the question arises how to perform thing manually in a sound manner. The following are some suggestions, which can be useful in manual system.

1. More sophisticated register maintenance for various patients’ information, Doctor, nurses and medicine so on can be maintained at central place.
2. Eligible person for work should be made responsible so that a better efficiency could be achieved. This needs a lot of work force.

2.4.2 Online System

This system provides online storage/updating and retrieval facility. This system promises very less or no paper work and also provides help for Doctors and operational staff. In this system, everything is stored electronically so very less amount of paper work is required and information can be retrieved very easily without searching here and there into registers.

2.5 Conclusion

After analyzing all above factors and case studies the Author can come in to a conclusion that the data management system is needed for all the medical centers. Therefor final decision is to implement a web-based system (Online System). Since then doctors can access to the system at any time and check the details of the patients. Additionally, another benefit is going to the web base system is as future enhancements can add online booking portal plus chat facility with the doctors. Therefore this online outpatient database system is the proposed system.

3.0 Proposed system Discussion

3.1 Functional Requirements

Below Table 5 shows the functionalities of the proposed system. Under Proposed Solution user discuss about all the functionalities in detail.

Table 5 : Functional Requirement of the new System

Requirements	Uses
View Home Page	Front Officer (Admin), Head Nurse, Doctors, Pharmacist
Be able to enter Patient's information.	Front Officer (Admin)
Be able to enter Diseases' information.	Doctor
Be able to enter Doctor's information.	Front Officer (Admin)
Be able to enter Nurse's information.	Front Officer (Admin)
Be able to enter Medicine's information.	Pharmacist
Be able to assign the medicine	Doctor
Be capable of Modify details.	Front Officer (Admin), Doctors
Delete records.	Front Officer (Admin), Doctors
Search records.	Front Officer (Admin), Head Nurse, Doctors
View Records	Front Officer (Admin), Head Nurse , Doctors
View Reports	Front Officer (Admin), Head Nurse , Doctors
Change Password	Front Officer (Admin), Head Nurse , Doctors

This authorized level has given according to the requirements of the User.

3.2 Non-Functional Requirements

- Authentication
- Availability & Usability
 - The system can use at any given time.
- Accessibility
 - The system must be accessible to authorised users.
- Safety & Security
 - The system will be free from unauthorised access.
- Use friendliness and Interface
 - The system must not be a complex one and helpful to the user.
- Reliability
 - The required functions of the system will be predictable.
- Extensibility
 - The system will be able to add new features, effects upgrading and enhancements
- Performance requirements

3.3 Proposed Solution

The proposed Management Information System is developed for a web base System which enables multiple users to access.

3.3.1 User Login.

Each user has separate logging. User login has been introduced to give each profile to the user and implement the security to the system. Then every user does not have access to all the functionalities.

3.3.2 Manage the profiles

New system can manage a user profiles. Each Admin Person has registered into the system through this profile. This has only basic information.

3.3.3 Change Password

This facilitate to the Staff Members and doctors to change their Password if they need. Since Admin user only has access to create the new profiles. User should able to change the password Admin has been assigned. Therefor Chane Password facility added to the system.

3.3.4 Add Patient Details

New System can manage the Patient Details. Admin officer is the one who is adding the patient details in to the system. This is the main page where patient can register in to the system.

3.3.5 Edit Patient Details

Once you added the patient details some field you can edit. Such as Surname, Email, contact number address. This will have done by the admin user upon patient request.

3.3.6 Patient Discharge Process

Doctor can request to discharge the patient. After that only admin office can discharge the Admitted patients. Without doctor's request admin user, unable to discharge a patient. When doctor request to discharge, it can view by the admin office.

3.3.7 Re-Admitted Process

Discharged patient can re-admit again. No need to enter the patient details again. By checking the NIC number admin office can select the record and proceed with the re-admit process.

3.3.8 Add Medicine Details

New System can add the Details about the Medicine. Pharmacist only has access. This will have added to the stocks in the system. When pharmacist adding the medicine in to system allows to put the expiry date.

3.3.9 Stock Level and Expiry Date Management

Pharmacist can check the expired medicine, about to expire medicine, and Stock levels from the system. Two weeks before expire the medicine, system is giving you the details about the medicine which are about to expire. From the system, you can check the stock levels and as per defined safety stock levels for the medicine, pharmacist can check what are the medicine that need to re order.

3.3.10 Add new medicine Batch

This function is introduced to add new medicine batch to the system under same serial number with different expiry date. Only difference is the expiry date and the quantity of the item.

3.3.11 Delete

Medicine page has delete functionality. Since if the medicine is expired we do not take the record of the expired medicine.

3.3.12 Give Medicine

From this, Doctor can assign the medicine to the Patient and write the comments about the patients. All the available medicine in the pharmacy will appear to the doctor. If prescribe medicine is not available in the pharmacy doctor can request the medicine to buy to the pharmacy.

3.3.13 View History of the patient

Doctor can view the medical history of the patient before assign the medicine. This will show the admitted date and discharge date, reason for admit and the medicine given etc.

3.3.14 Print the Prescription

Doctors are able to print the Prescription from the system.

3.3.15 Request for Discharge.

Doctor only can request the patient to discharge. Once doctor request the discharge it will show to the admin, then only admin can proceed with the discharge process.

3.3.16 Request Medicine

If the medicine is not available in the Pharmacy Doctor can request the new medicine. This new medicine request can view by the Pharmacist and can place the order. (Placing Order is not handle by the System- Out of scope).

3.3.17 Edit Details

Can edit the profile Details such as; last Name, Address, Married Status, Tel Number and User Level.

3.3.18 Search

Through the system, Admin users and the Doctor can search details. Head Nurse can serch the details of the patient medicine and medical details.

3.3.19 Report

End of the month the admin users can generate reports. Such as: Patient Reports, Medicine Stock Reports.

Doctors can view the patient details by the medicine given date.

Admin and Doctors both can view the patient details by the admitted and discharge date of the patient.

4.0 Analysis and Design

4.1 Method used to develop the system (UML)

The UML uses as a design tool for the new system since UML mostly graphical notations to express the design of software projects.

The Unified Modelling Language (UML) is a standard language for specifying, visualizing, constructing, and documenting the artefacts of software systems, as well as for business modelling and other non-software systems.

The UML represents a collection of best engineering practices that have proven successful in the modelling of large and complex systems. Using the UML helps project teams communicate, explore potential designs, and validate the architectural design of the software. (Gooch.T, 2000)

4.2 Process Diagram

4.2.1 Use Case Diagram

Figure 3 shows the use case diagram for the designed system.

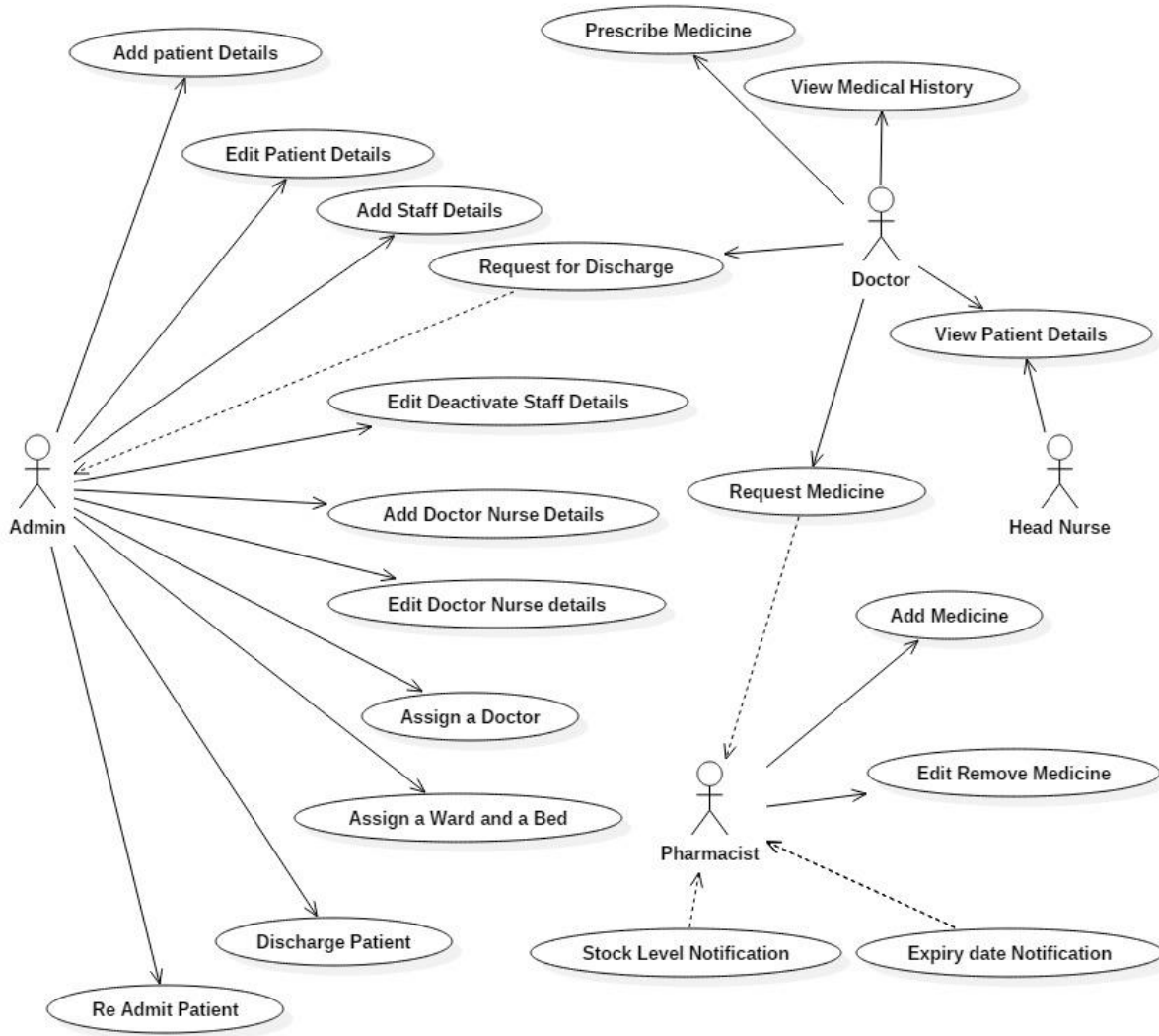


Figure 3 : Use Case Diagram

4.2.2. Activity Diagram

4.2.2.1 Admin Profile – Profile Page

Figure 4 shows the flow of the admin profile of the system. This shows the steps to add the staff user details to the System.

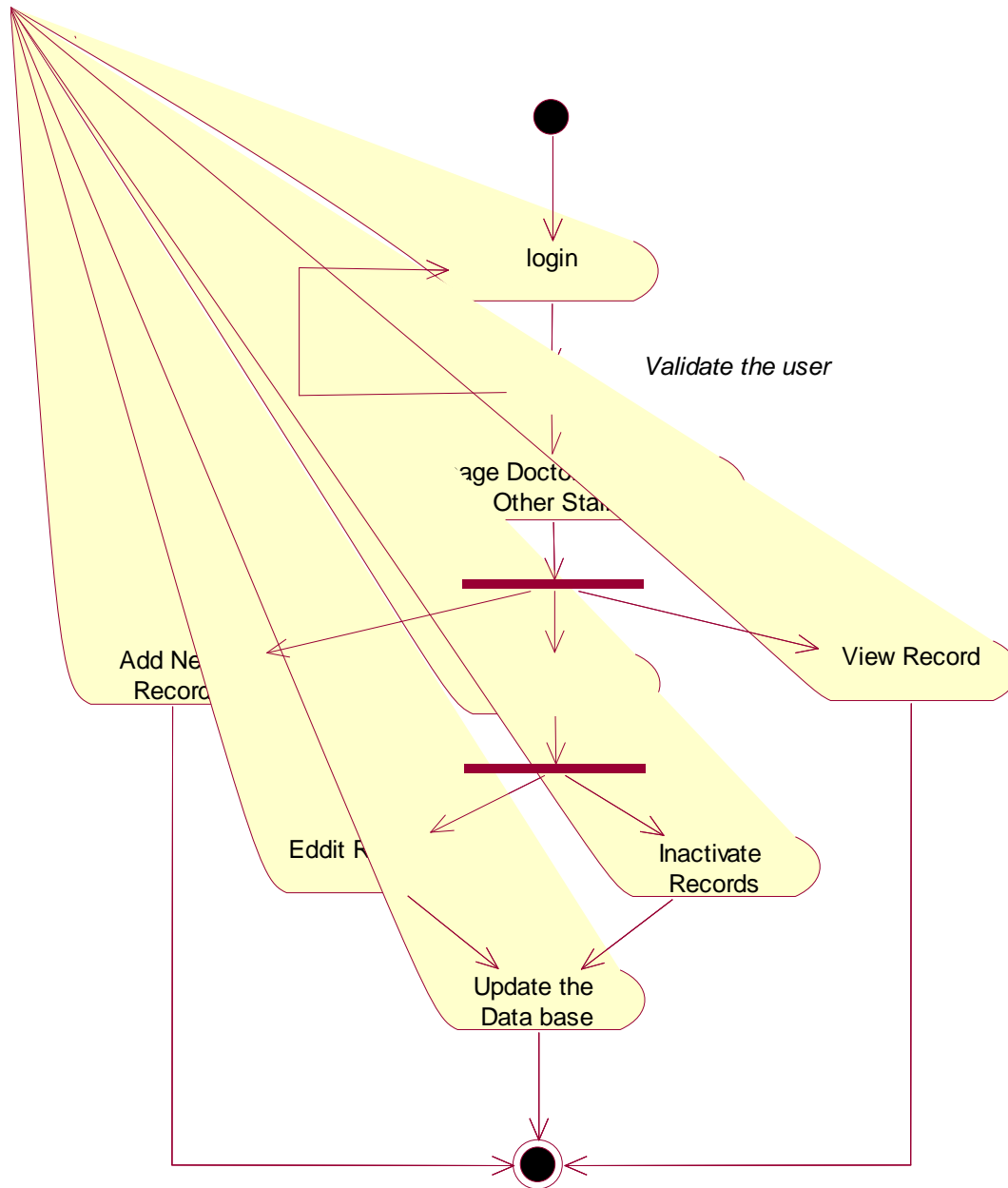


Figure 4 : Activity Diagram Admin Profile

4.2.2.2 Admin Profile - Patient Page

Diagram 5 shows the admin profile of the system. This shows the steps to add the patient details to the System by admin

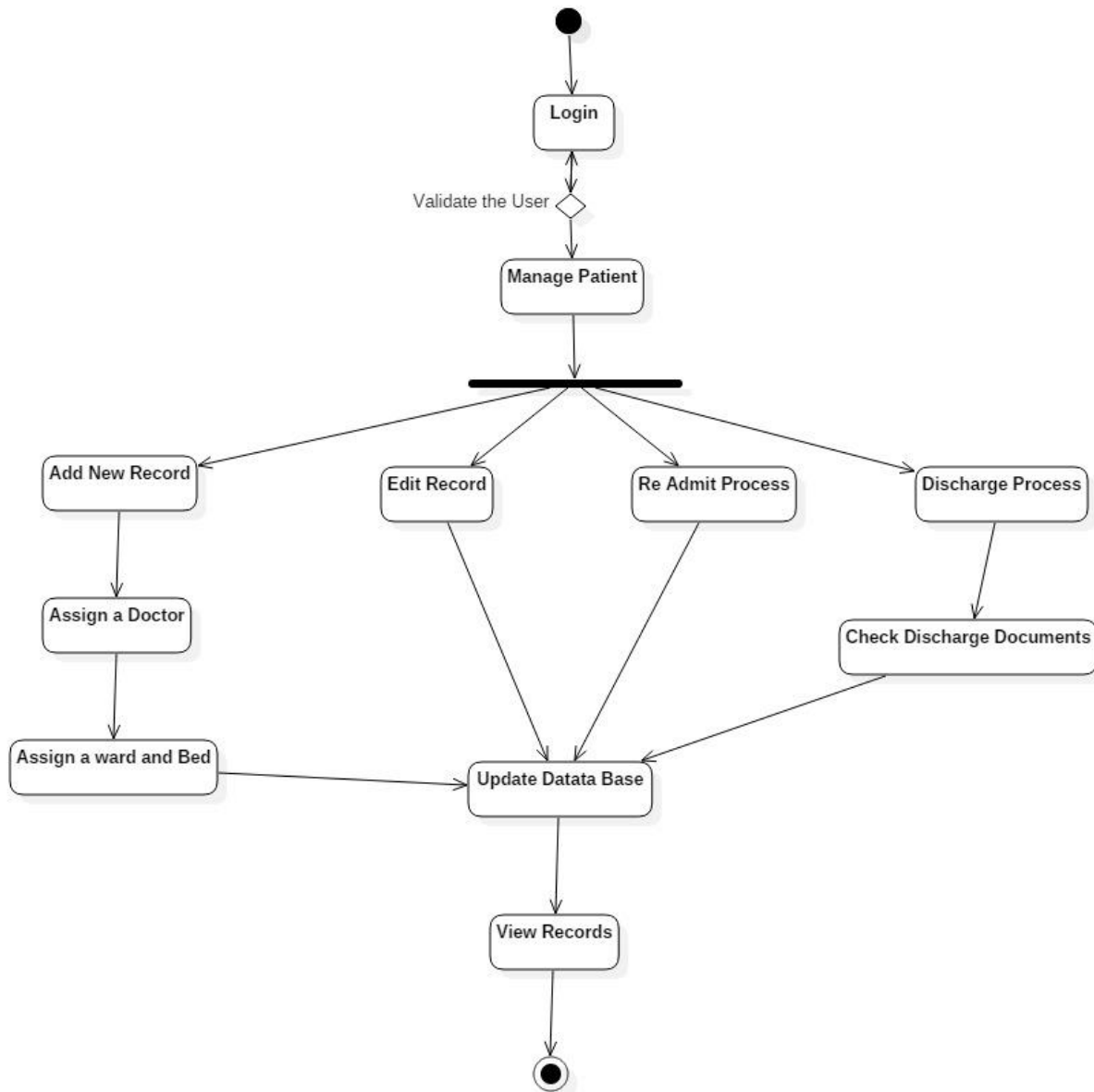


Figure 5: Use Case Diagram: Patient Page

4.2.2.3 Pharmacist Profile – Medicine Page

Below Figure 6 diagram shows the Pharmacist profile of the system. This shows the steps to add the medicine details to the System and other functionalities available in the system

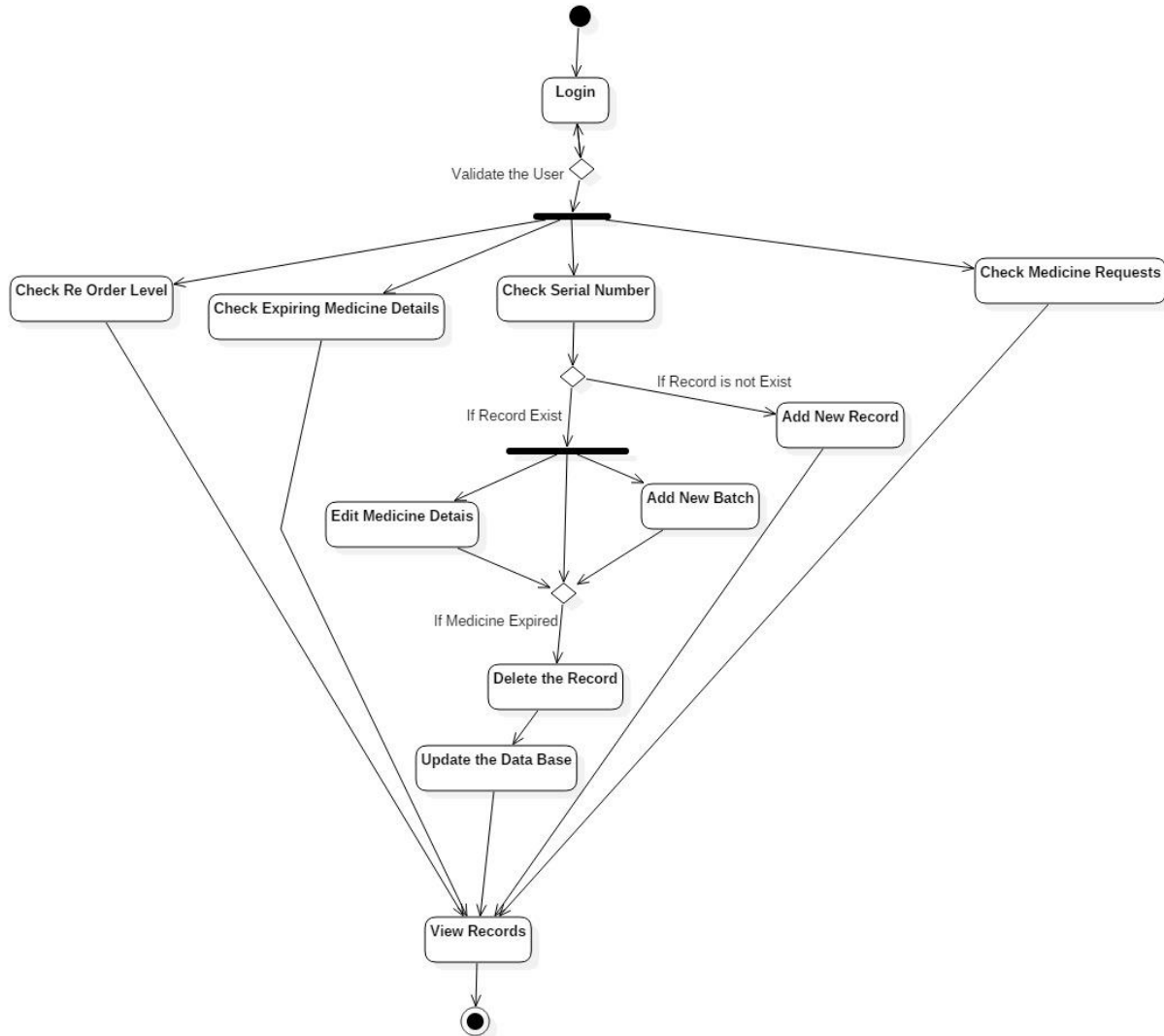


Figure 6 : Activity Diagram: Medicine Page

4.2.2.4 Doctor Profile – Give Medicine Page

Below Figure 7 shows the Doctor profile of the system. This shows the steps to recommend the medicine details to the System.

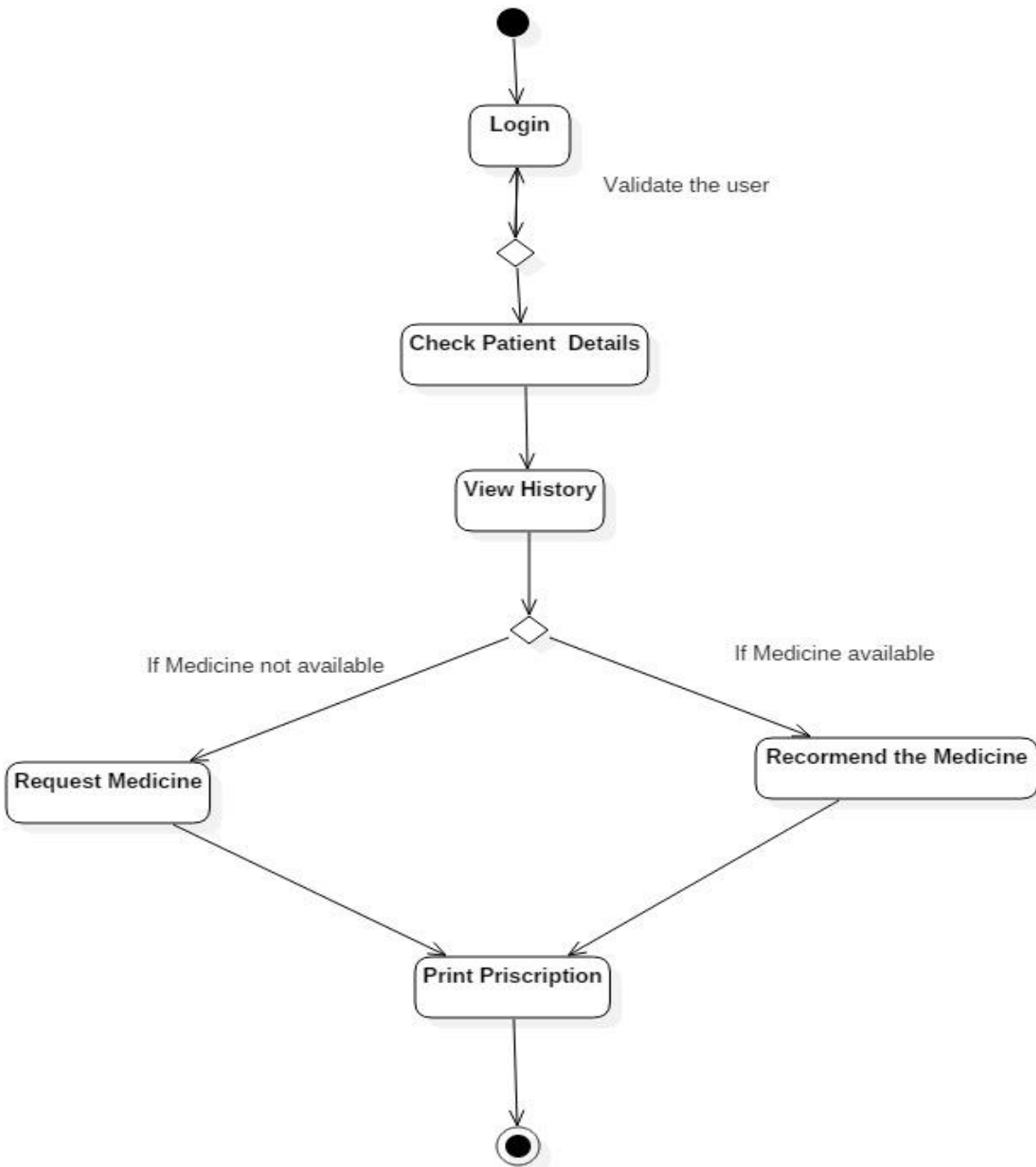


Figure 7 : Activity Diagram: Give Medicine Page

4.2.3 Class Diagram

Below Figure 8 is the class diagram of the System. In this system, it has 6 tables.

One is Patient table. Which contains the details about the patient. Next staff details table. Doctors also categorized under staff. There for all the staff details are included in this table. Medicine details are included in the Medicine Details table. All the stock related details are included in this table. Patient History is recorded in another table. This is linked to the patient table. Medicine History table has a foreign key which is patient ID.

Ward details are included in the Ward Table and the Bed details are included in the Bed table.

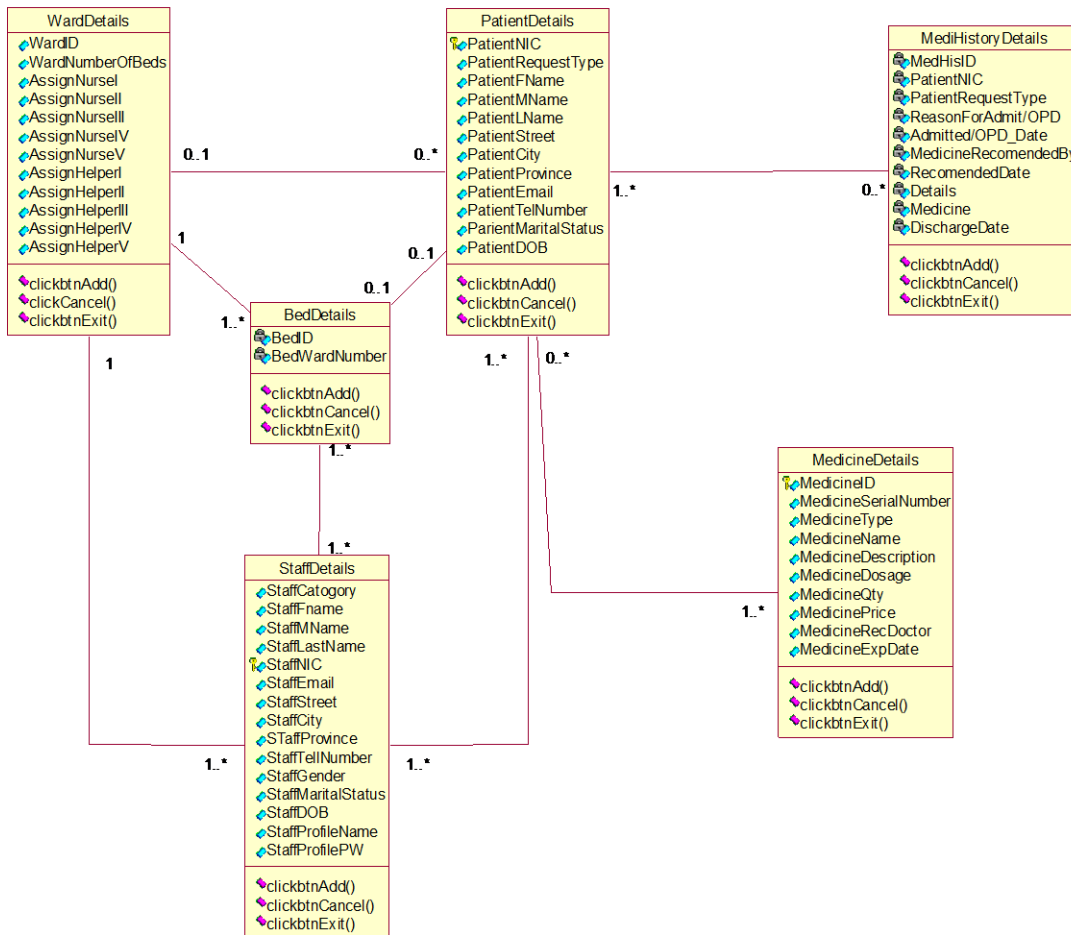


Figure 8: Class Diagram

4.2.3.1 Normalized Table Structure

4.2.3.1.1 StaffTable

Table Staff Details Table (StaffCategory, StaffFName, StaffMName, StaffLName, StaffNIC, StaffEmail, StaffStreet, StaffCity, StaffProvince, StaffTellNumber, StaffGender, StaffMaritalStatus, StaffDOB, StaffProfileName, StaffProfilePW)

1st NF **Primary Key : StaffNIC**

Staff Details Table (StaffCategory, StaffFName, StaffMName, StaffLName, StaffNIC, StaffEmail, StaffStreet, StaffCity, StaffProvince, StaffTellNumber, StaffGender, StaffMaritalStatus, StaffDOB, StaffProfileName, StaffProfilePW)

2nd NF Already In 2NF

3rd NF Already In 3NF

4.2.3.1.2 PatientTable

Table Patient Details Table (PatientNIC, PatientRequestType, PatientFName, PatientMName, PatientLName , PatientStreet, PatientCity, PatientProvince, PatientEmail, PatientTelNumber, PatientMaritalStatus, PatientDOB)

1st NF **Primary Key : PatientNIC**

Patient Details Table (PatientNIC, PatientRequestType, PatientFName, PatientMName, PatientLName , PatientStreet, PatientCity, PatientProvince, PatientEmail, PatientTelNumber, PatientMaritalStatus, PatientDOB)

4.2.3.1.3 MedicineTable

Table Medicine Details Table (MedicineID, MedicineSerialNumber, MedicineType, MedicineName, MedicineDescription, MedicineDosage, MedicineQty, MedicinePrice, MedicineRecDoctor, MedicineExpDate)

1st NF Primary Key : MedicineID

Medicine Details Table (MedicineID, MedicineSerialNumber, MedicineType, MedicineName, MedicineDescription, MedicineDosage, MedicineQty, MedicinePrice, MedicineRecDoctor, MedicineExpDate)

4.2.3.1.4 PatientHistoryTable

Table Medicine Details Table (MedHisID, PatientNIC, PatientRequestType, ReasonforAdmit/OPD, Admitted/OPDDate, MedRecomendedBy, RecomendatedDate, Details, Medicine, DischargeDate)

1st NF Primary Key : MedHisID

Medicine Details Table (MedHisID, PatientNIC, PatientRequestType, ReasonforAdmit/OPD, Admitted/OPDDate, MedRecomendedBy, RecomendatedDate, Details, Medicine, DischargeDate)

4.2.3.1.5 WardTable

Table Ward Details Table (WardID, WardNumberOfBeds, AssignNurseI, AssignNurseII, AssignNurseIII, AssignNurseIV, AssignNurseV, AssignHelpI, AssignHelpII, AssignHelpIII, AssignHelpIV, AssignHelpV)

1st NF Primary Key : WardID

Ward Details Table (WardID, WardNumberOfBeds, AssignNurseI, AssignNurseII, AssignNurseIII, AssignNurseIV, AssignNurseV, AssignHelpI, AssignHelpII, AssignHelpIII, AssignHelpIV, AssignHelpV)

4.2.3.1.6 Bed Table

Table Bed Details Table (BedID, WardNumber)

1st NF **Primary Key : BedID**

Bed Details Table (BedID, WardNumber)

4.2.4 Sequence Diagram

4.2.4.1 Admin Profile for Patient page and Staff page

Figure 9 shows the admin profile activities for Patient page and staff page. (Profile Page)

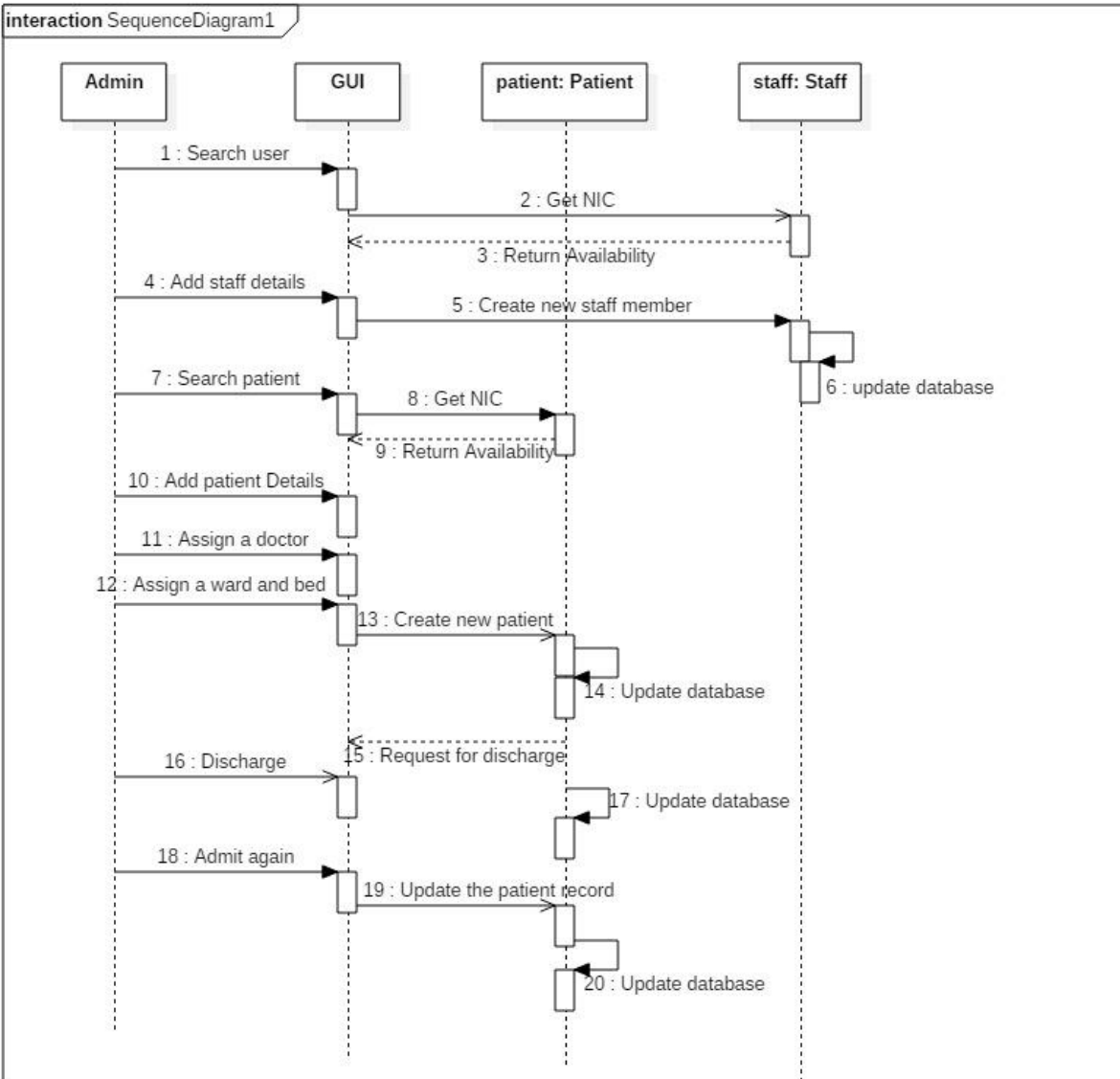


Figure 9 : Sequence Diagram - Admin Profile for Patient Page and Staff Page

4.2.4.3 Doctor Profile for Give medicine page

Figure 10 shows the doctors profile activities for Give Medicine Page.

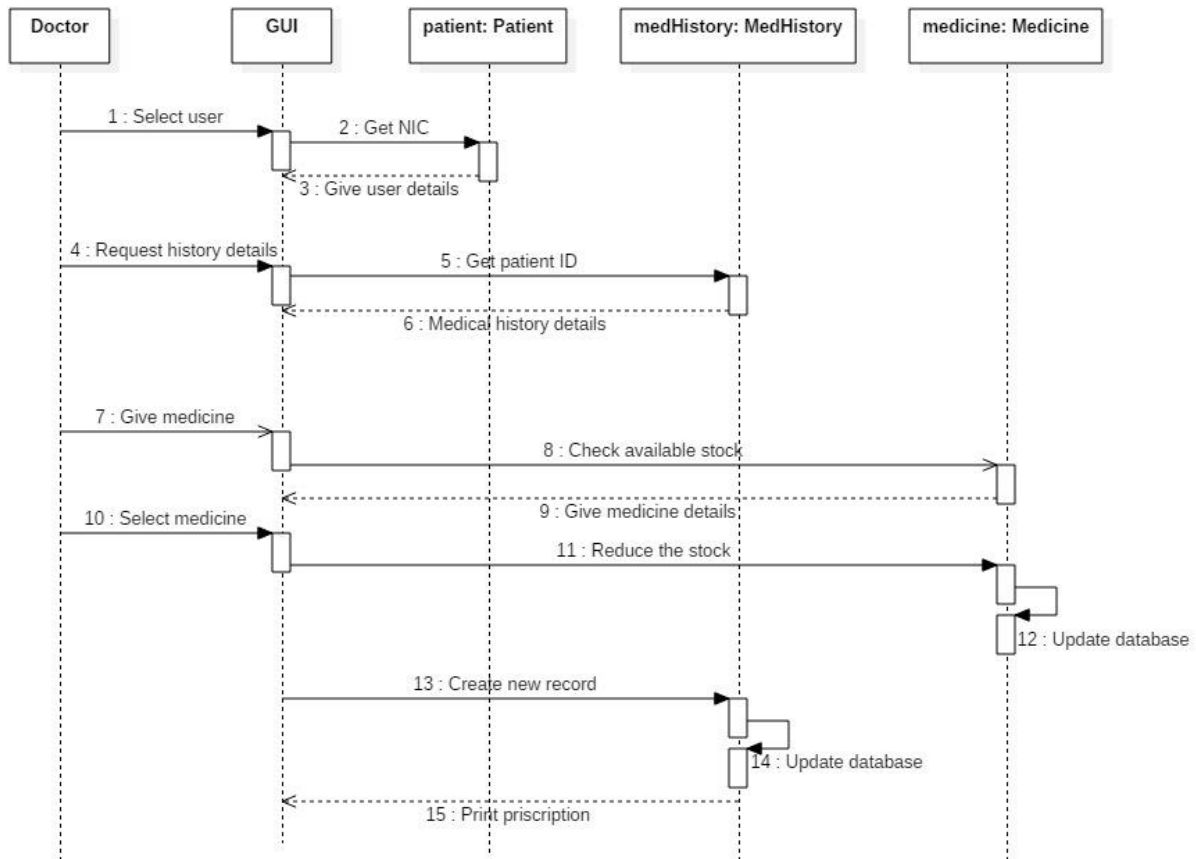


Figure 10 : Sequence Diagram for Doctors Profile Give Medicine Page

4.2.4.4 Pharmacist Profile Medicine Page

Figure 11 shows the Pharmacist profile, Medicine page functionalities.

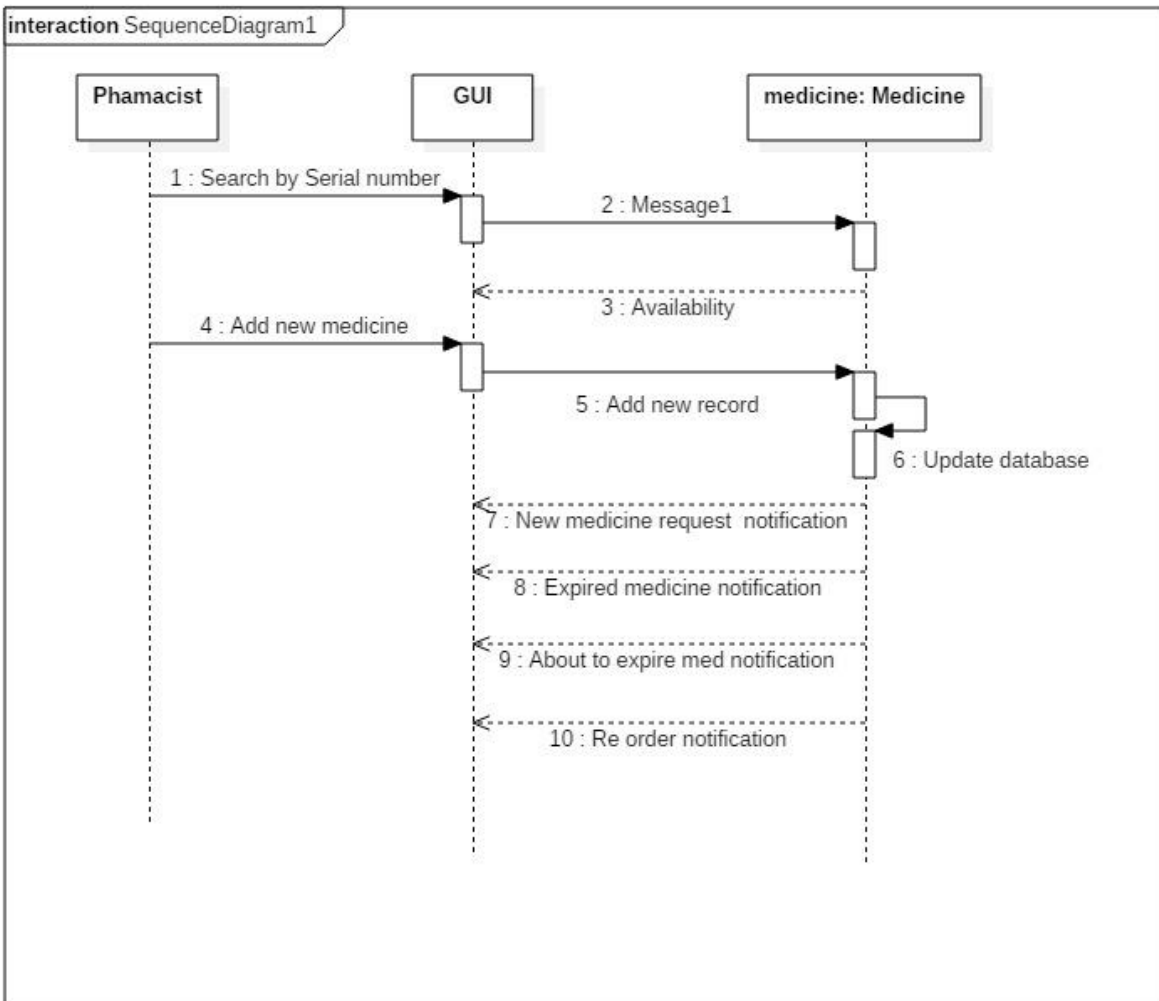


Figure 11 : Sequence Diagram: Pharmacist Profile Medicine Page

4.3 Screen Design

4.3.1 Home Page

Figure 12 shows the Home page of each user.

The screenshot shows the 'HOSPITAL SYSTEM' header with a 'Welcome Thilini Rattnayake' message. A navigation bar contains icons for Patient, Medicine, Give Medicine, Search, Edit, Profile, Report Patient, Patient Medicine, and Logout. The main content area is titled 'Profile' and contains a form with the following fields:

Full Name :	<input type="text" value="Thilini K Rattnayake"/>	<input type="button" value="Change Password"/>
NIC :	<input type="text" value="925863759V"/>	
Date Of Birth :	<input type="text" value="1/11/2016 12:00:00 AM"/>	
Email :	<input type="text" value="thilli@yahoo.com"/>	
Address :	<input type="text" value="6, New Street, Colombo 07, Western Provi"/>	
Marital Status :	<input type="text" value="Single"/>	
Gender :	<input type="text" value="Female"/>	
Telephone Number :	<input type="text" value="077546746"/>	

Figure 12: Screen Design - Home Page

4.3.2 Change Password Page

Figure 13 shows the page which you need to access when a user needs to change the password.

The screenshot shows the 'HOSPITAL SYSTEM' header with a 'Welcome Thilini Rattnayake' message. A navigation bar contains icons for Patient, Medicine, Give Medicine, Search, Edit, Profile, Report Patient, Patient Medicine, and Logout. The main content area is titled 'Change Password' and contains a form with the following fields:

Username :	<input type="text" value="thilli@yahoo.com"/>	
Current Password :	<input type="password"/>	
New Password :	<input type="password"/>	
Confirm Password :	<input type="password"/>	
	<input type="button" value="Change Password"/>	

Figure 13: Screen Design - Change Password Page

4.3.3. Patient Page

Figure 14 shows the detail view of the Patient page which you can add patient details.

HOSPITAL SYSTEM Welcome Thilim Rathnayaka

NIC	First Name	Last Name	Type	Gender	Doctor	Options
875737231v	Gagani	Thilakarathne	Admit	Female	Dr. Pavith Goonathilaka	Select

Form Fields:
 First Name:
 Middle Name:
 Last Name:
 NIC:
 Email:
 Street:
 City:
 Province:
 Telephone Number:
 Patient Type:
 Doctor:
 Ward:
 Bed:
 Reason:
 Admitted Date:
 Discharged Date:
 Date Of Birth:
 Marital Status:
 Gender:

Figure 14 : Screen Design: Patient Page

4.3.3 Give Medicine Page

Figure 15 shows the give medicine page which has access to the Doctors. From this page you can request the new medicine if needed only.

HOSPITAL SYSTEM Welcome Pavith Goonathilaka

NIC	First Name	Last Name	Type	Gender	Doctor	Options
121234124v	Poonitha	Rathnayaka	Admit	Female	Dr. Pavith Goonathilaka	Select

Form Fields:
 Patient NIC:
 Patient Name:
 Admit ID:
 Ward:
 Bed:
 Reason for Admit:
 Doctor:
 Medicine:
 Description:
 Doseage:
 Qty Type:
 Available Qty:
 Qty:
 Description:

Medicine	Doseage	Qty	Description	Doctor	Options
<input type="button" value="Save"/>					

Request for Medicine:
 Medicine Name:
 Doseage:
 Description:

Figure 15 : Screen Design: Give Medicine

4.3.3.1 View History Function

Figure 16 shows the view of the patient history report.

Medicine	Qty Type	Qty	Description	Doctor	Date Given	Admit Date	Reason	Discharge Date
Atorvastatin	Tablets	1.00	Night only - 4 days	Pavith Goonathilake	7/2/2017 11:08:14 AM	7/2/2017 10:52:30 AM	Flue	7/2/2017 12:13:15 PM

Figure 16 : Screen Design: View Patient History Report

4.3.4 Medicine Page

Figure 17 shows the page which Pharmacist can add the medicine details in to the system.

HOSPITAL SYSTEM Welcome Rakhitha Samarakoon

Patient Medicine Give Medicine Search Edit Profile Report Patient Patient Medicine Logout

RG7325346 Serial No

Serial No	Batch No	Name	Dosage	Qty	Expiry Date	Options
RG7325346	1001	Atorvastatin	80 mg	166.00	7/31/2017	Select

Serial No : Qty Type :

Batch No : Qty :

Name : Price (Rs) :

Description :

Dosage :

Expiry Date :

< July 2017 >

Sun	Mon	Tue	Wed	Thu	Fri	Sat
25	26	27	28	29	30	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5

Figure 17 : Screen Design: Medicine Page

4.3.4.1 Medicine Page Search Function

From this search function, pharmacist can search the medicine by name and serial number. Additionally, Doctor requested medicine, Expired Medicine, about to expire medicine and medicine that need to re order are available to check. Please refer Figure 18.

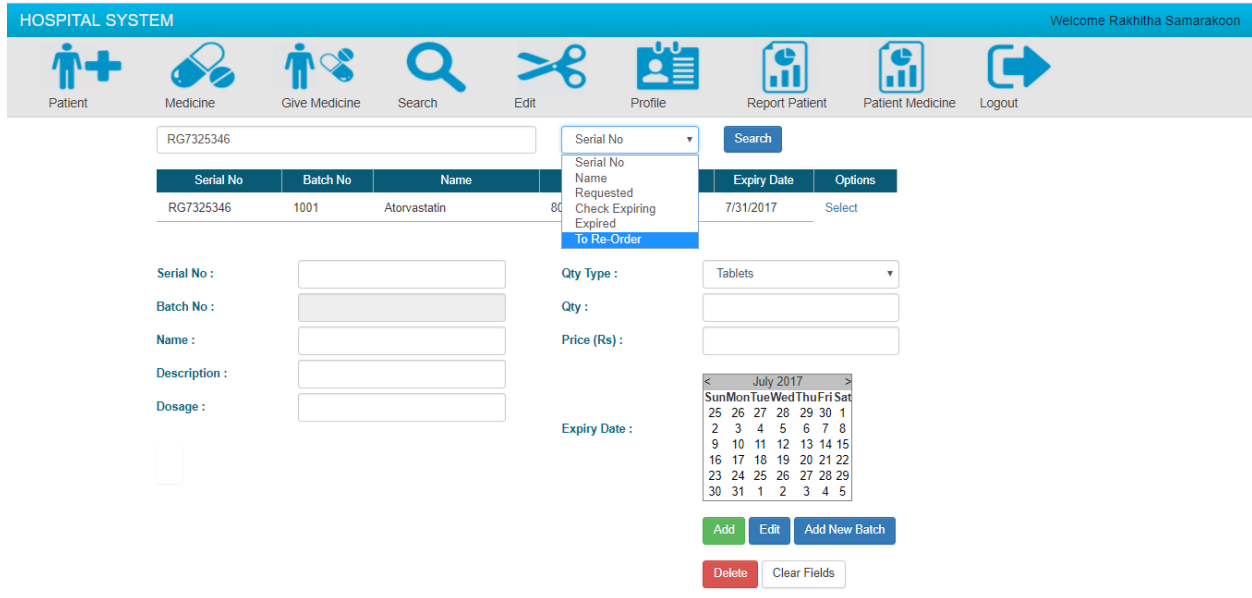


Figure 18 : Screen Design: Search Function in Medicine Page

4.3.4 Search Page

Figure 19 shows the patient personal details search page.

HOSPITAL SYSTEM Welcome Thilini Rattnayake

Patient Medicine Give Medicine Search Edit Profile Report Patient Patient Medicine Logout

521234123V Search

NIC	First Name	Last Name	Gender	User Type	Options
521234123V	Ranjani	Rattnayake	Female		Select

First Name :

Middle Name :

Last Name :

NIC :

Email :

Street :

City :

Province :

Telephone Number :

Gender :

User Type :

Date Of Birth :

Marital Status :

Figure 19 : Screen Design: Search Page

4.3.5 Edit Profile Details Page

Figure 20 shows the page which admin can edit the user details

HOSPITAL SYSTEM Welcome Thilini Rattnayake

Patient Medicine Give Medicine Search Edit Profile Report Patient Patient Medicine Logout

521234123V Search

NIC	First Name	Last Name	Gender	User Type	Options
521234123V	Ranjani	Rattnayake	Female		Select

First Name :

Middle Name :

Last Name :

NIC :

Email :

Street :

City :

Province :

Telephone Number :

Gender :

User Type :

Date Of Birth :

Marital Status :

Profile Password :

Profile Password Confirm :

Figure 20 : Screen Design: Edit Profile Details Page

4.3.6 Report View Pages

Figure 21 shows the report view which admin, doctor and head nurse can view the patient details by the discharge and admitted date.

NIC	First Name	Last Name	Type	Gender	Doctor	Options
121234124v	Poshitha	Ratnayake	Admit	Female	Dr. Pavith Goonathilake	Select
875737231v	Gagani	Thilakaradne	Admit	Female	Dr. Pavith Goonathilake	Select

First Name :	<input type="text"/>	Patient Type :	<input type="text"/>
Middle Name :	<input type="text"/>	Doctor :	<input type="text"/>
Last Name :	<input type="text"/>	Ward :	<input type="text"/>
NIC :	<input type="text"/>	Bed :	<input type="text"/>
Email :	<input type="text"/>	Reason :	<input type="text"/>
Street :	<input type="text"/>	Admitted Date :	<input type="text"/>
City :	<input type="text"/>	Discharged Date :	<input type="text"/>
Province :	<input type="text"/>		

Figure 21 : Screen Design: Patient Details View by Admit/Discharge Date

Figure 22 show the report which shows the provided medicine details by the medicine provided date.

Medicine Name	Patient Name	Patient Typq	Qty	Date Time	Doctor
Pirton	Kasun Ratnayake	Admit	7.00 Tablets	7/2/2017 10:55:26 AM	Dr. Pavith Goonathilake
Atorvastatin	Kasun Ratnayake	Admit	1.00 Tablets	7/2/2017 10:55:26 AM	Dr. Pavith Goonathilake
Atorvastatin	Poshitha Ratnayake	Admit	1.00 Tablets	7/2/2017 11:08:14 AM	Dr. Pavith Goonathilake
Atorvastatin	Gagani Thilakaradne	Admit	1.00 Tablets	7/2/2017 11:56:05 AM	Dr. Pavith Goonathilake
Atorvastatin	Thilini Ratnayake	Request to Discharge	1.00 Tablets	7/2/2017 12:06:28 PM	Dr. Pavith Goonathilake

Figure 22 : Screen Design: Patient Details View by Med. Recommended Date

5.0 Methodology

5.1 Considerations before select the methodology

There is no such methodology which we can consider as a perfect development methodology.

There are various factors that need to be considering before choosing the development methodology. The methodology proves the frame work necessary to develop the system successfully. The criteria for choosing a methodology will be based on some factors like END USER, TIME and THE COMPLEXITY OF THE PROJECT.

End User

The end users in proposed system will be Front Officer (Admin), Doctors and Pharmacist. End user involvement is the way to the success of the project so the chosen methodology should facilitate the enrolment of end user.

Time

The time duration plays a huge role of a project. The completion of the project with the time duration is essential. By minimizing the implementation and development time, it will reduce the chance of competitors gaining an advantage in the industry.

Complexity of the Project

The complexity of the system will have an effect on the choice of development methodology. The number of persons who involves the project during the development will increase the complexity of the system. The development methodology is crucial in coordinating work. The expertise of different personnel is required at different stages and this has an effect on the time of development too.

5.2 Rapid Application Development (RAD)

5.2.1 What is Rapid Application Development

According to Martine.J (2000) “Rapid Application Development (RAD) is a development lifecycle designed to give much faster development and higher-quality results than those achieved with the traditional lifecycle. It is designed to take the maximum advantage of powerful development software that has evolved recently.”

5.3 Evolutionary Prototyping

5.3.1 What is Evolutionary Prototyping

This is an approach to system development where an initial prototype is produced and refined through a number of stages to the final system. It is used for systems where the specification cannot be developed in advance and is based on techniques, which allow rapid system iterations. Advantages include accelerated delivery of the system and user engagement with the system.

(Bell Collage, 2014)

Evolutionary prototyping focuses on gathering a correct and consistent set of requirements. The process lends particular strength to building quality software by means of the ongoing clarification of existing requirements and the discovery of previously missing or unknown requirements.

(ITC382- Business to Business, 2015)

5.4 Rational Unified Process (RUP)

5.4.1 What is Rational Unified Process (RUP)

The Rational Unified Process is by far the most complex model. The RUP looks at a project in terms of cycles. One cycle consists of four phases:

- Inception (i.e. concept exploration),
- Elaboration (i.e. planning and allocating resources)
- Construction (i.e. implementation)
- Transition (i.e. installation).

In each of these phases many different workflows (like management, environment, design, implementation workflow, etc.) can be addressed simultaneously. At the end of each cycle some kind of prototype or artefact are produced. The phases can be repeated many times (i.e. iterations),

producing one or many prototypes or artefacts. In each of the iterations other workflows can be addressed and involved. The Unified Process is described as ‘use-case driven, architecture centric, iterative and incremental’

(Ambler. S, 2012)

5.5 Spiral Development Model

5.5.1 What is Spiral Development Model

According to SearchSoftwareQuality (2010) this model also calls as the spiral life cycle model. This is a system development life cycle method (SDLC) model which uses in information Technology. Spiral model is a combination of both prototyping model and the waterfall model. This model is fevered for large expensive and complicated projects.

5.6 Comparing the Methodologies

Table 6 shows the result of comparing the above mentioned 4 Methodologies.

Table 6 : Comparing the Methodology

	RAD	Prototyping	RUP	Spiral
Complexity	- Suitable for the small project team	- Suitable for a large project but not for more complex projects. Moreover, Real world needs to be tested	- Too complex system.	- The spiral model is suitable for complicated and large projects.
Cost	- Cost is high.	- Often thought to be expensive, but is actually a lot cheaper than the real development costs are. - Costs can be reduced concentrating more verification and validation effort earlier in the life-cycle	- High Cost as the development team must be an expertise.	- In the spiral model the important issues are discovered in an earlier stage there for the budget can be balanced well
Risk	- In RAD the risk analysis methods are working positively.	- Ability to manage the Risk.	- Inability to manage Risks but can reduce risk at some level.	- The spiral model relies heavily on assessments of risks and also it provides an easy identification for the Risks
Practicality	- Many Small medium projects use this model	- Any kind of project.	- Many projects small and medium scale projects used RUP.	- The spiral model is used most often in large projects.

5.7 Evaluation of the Methodologies

Each methodology has benefits and at the same time they have failures. Before selecting a suitable methodology, its need to be analyzed very sharply. The below discussion is about how to choosing a suitable methodology.

According to the above research, Rapid Application Development is not appropriate for the proposed project. Modern techniques and technology is used by RAD methodology to speed up the development process. The development speed is the main advantage of RAD. This would require a lengthy and costly debugging process at the end of the project. But the client of this project does not want to spend a huge budget for this project. This methodology requires the scope of the project to be clearly defined because it does not accommodate the degree of chance the project will probable required. The methodology works best for projects where the scope is small or work can be broken down into manageable chunks. Designed project scope is not small. Since with this project need to implement the Safety stock management, Re-order point management and expiry date management. Which is little complicated. And the scope also can be varying during the project. However, in RAD, business objectives will need to be well defined before the project can begin, so projects that use RAD should not have a broad or poorly defined scope. Furthermore, to keep the project within a short time frame, decisions must be able to be made quickly, so it imperative that there be very few client decision makers, preferably only one, and they must be clearly identified up front. Client decision makers need to understand and agree to a RAD approach and ideally should be willing to accept a product that is less full featured and/or be willing to accept higher development cost in exchange for increases in speed. The client of this project is not with decision making and not only one person is involving in to the decision making in this project. Two parties are directly involved. That is the main reason to delay in decision making. Because both people need to come in to one conclusion and it takes little time and arguments also take places. Therefore, decision making is not easy and quick. By considering about facts author decided not to follow the RAD methodology.

RUP is a complete methodology in itself with an emphasis on accurate documentation less time is required for integration as the process of integration goes on throughout the software development life cycle. The development time required is less due to reuse of components. Rational Unified

Process is a well-documented and complete methodology. But author has decided to not to use this methodology as the implementation methodology because of the below reasons. The process is too complex, too difficult to learn, and too difficult to apply correctly. In RUP the team members need to be expert in their field to develop software under this methodology. And its development process is too complex and disorganized. On cutting edge projects which utilize new technology, the reuse of components will not be possible. Hence the time saving one could have made will be impossible to fulfil. In addition to that Inability to manage the risks and uncontrolled changes can happen. This is dangerous for the authors designed project. Those are some of negative sides of RUP and will affect authors project as well. Considering all those aspects the RUP is not a suitable methodology to develop above-mentioned system. As the project, team cannot obtain high risk for this kind of less budgeted project.

Spiral Model is another iterative development methodology, which the processes continue till the application is completely developed and a model is a software development process combining elements of both design and prototyping in stages, to combine advantages of top down and bottom up concepts. This model of development combines the features of the prototyping model and the waterfall model. The developer's skill of risk assessment is a key factor of the success of the project. The numbers of iterative processes are not determined in this model. So, this is time consuming model. Process of the project is hard to measure. The spiral model is intended for large, expensive and complicated projects. In this case the authors project is not a large project. Therefore, decided not to go with Spiral Model.

Evolution Prototyping is the process of building a model of a system. In terms of an information system, prototypes are employed to help system designers build an information system that intuitive and easy to manipulate for end users. Prototyping is an iterative process that is part of the analysis phase of the systems development life cycle. This is a good advantage for the designed project. Because it will give the developers to time to develop the system and the test the system. Evaluation prototype is suits for this system because its Reduces development costs at the same time require user involvement. Since the owners of this project has clearly mentioned at the begging of the project that they are unable to give a huge budget for this system development. And it can help Developers receive quantifiable, early feedback from the stakeholders is needed user feedback. Since this methodology has more user involvement compare to the other methodologies

it will help to reduce the risk also. Evolutionary prototyping is a good quality methodology for this project. As it can apply in situations, where there exists a great deal of uncertainty about the requirements. This is a major advantage of this methodology for the designed system. Suitable for a system's correspondence to real world needs to be tested. This methodology is able to manage the Risk. Which is a positive thing to use this methodology. Since the owner of the project and the users are not too clear about the new technology. Often thought to be expensive, but is actually a lot cheaper than the real development costs are. This prototype will Facilitates system implementation since users know what to expect. On the other hand, it is Results in higher user satisfaction and Exposes developers to potential future system enhancements. When talking all those fact, evolutionary Prototyping is corresponding to conduct this project.

Analyzing all those factors plus compares that with the objectives and the challenges of the proposed system, come up to a conclusion which the evolutional Prototyping is a Best methodology for this new system.

6.0 Project Plan

6.1 Project Roles and Responsibilities

The below Table 7 shows the stakeholders analysis of the project and role in the project

Table 7 : Project Roles

Role	Name of Person
Head of the Project	Ms Jeewani Gunathilake
Product Owner	Anusha Medical Center - Kurunegala
Team Member	Thilini Ratnayake

6.2 Project Scope

The scope is limited only to the Development and testing. Not provide the training to the users. The top-level Managers (Director of the Medical Center) cannot log in to this system as they are an out of scope. The system mainly develops to reduce the problems related to data entering.

6.3 Risk Management

Managing Risk is a main aspect for the success of a project or a development. According to Sommerville (2007) Risk has illustrated in the aid of several stages,

Different types of Risks that have been listed out by him are as follows,

- Technology Risks
- People Risks
- Organizational Risks
- Tools Risks
- Requirements Risks
- Estimation Risks

6.3.1 Risk Management Plan

Table 8 shows the risk management plan during the project.

Table 8 : Risk Management Plan

Risk Type	Risk Description	Likelihood	Mitigation of Risk
Technology and Tools Risk	Database classes while Integrating.	Medium	Keep a backup of the database.
	Technology platform unavailable	Medium	
	Hardware Failure.	Medium	Always keep a backup of the system and keep extra development machine when one gets crash.
People Risk	Project team member falling ill and being unable to finish work on time	High	Make sure that there are extra developers if required.
	Unable to breakdown of work load	Medium	
	The lack of experience among the developer may result in poor software	Medium	Do research about the past system development, related to the scheduling techniques.
Organizational Risks	Resistance to change by employees and the management.	High	Introduce part of the proposed system to the users, so that drastic change may not take place
Estimation Risk	Low quality development	Medium	Make sure the scope is within a scope which the developer can develop.

	Information gathering may require greater time than estimated and wrong information	High	Try to switch in to the fixed schedule and always try to gather information more than one person.
Requirements Risk	Wrong identification of inputs and outputs of the system	High	Make sure the information which get from the Interviews are in detailed.
	Unable to meet the overall requirements of the system to be developed.	High	Gather issues that are raised by developers and clarify them with the client occasionally.
	The scope may expand due to (with the) requirements and extra requirements.	Medium	New request and change should go through a change management plan and has been accepted based on that.

6.4 Work Break Down Structure

1.0 Investigation about the Company

1.1 Project Overview

1.1.1 Problem Statement

1.1.2 Requirements Analysis

1.1.3 Proposed System

2.0 Business Analysis

2.1 Value Chain Analysis

2.2 STEEP Analysis

2.3 SWOT Analysis

2.4 AS-IS Analysis

3.0 Primary Investigation

3.1 Interviews

3.2 Questionnaires

4.0 Methodology Selection

4.1 Rapid Application Development

4.2 Evolutionary prototyping

4.3 Rational Unified Process

4.4 Spiral Development Model

5.0 Develop the Project Plan

6.0 Similar System Study

7.0 Technical Research

7.1 Programming Language

7.2 Database Technology

8.0 Proposed System Discussion

8.1 Functional Requirements

8.2 Non-Functional Requirements

8.3 Limitations and Assumptions

8.4 Proposed Solution

9.0 Design

9.1 Logical Design

9.1.1 Use Case Diagram

9.1.2 Screen Design

9.1.3 Report design

9.1.4 Input and the Output of the system

9.1.5 Activity Diagram

9.1.6 Class Diagram

9.1.7 Sequence Diagram

9.2 Physical Design

9.2.1 Data Base Design

9.2.2 Normalization

10.0 Implementation (**Iteration 01**)

10.1 Implementation Techniques

10.2 Implementation Plan

10.3 Change Management Plan

10.4 Development Plan

10.5 Development

11.0 Testing (**Iteration 02**)

12.0 Cost Benefit Analysis

7.0 Implementation

Once a proposed system is accepted, the organization may take necessary action to develop or purchase the system. After the development or purchasing is completed the next step is to implement the system in the client environment. A typical system can be implemented using one of four available strategies namely, Direct Conversion, Parallel, Phased or Pilot and are explained below.

7.1 Implementation Techniques

Implementation Methods

- Direct Implementation (Direct conversion, also called plunge or direct cutover)
- Parallel Running
- Phased implementation
- Pilot Implementation
- Rollout Implementation

7.1.1 Direct Implementation

Figure 23 shows the diagram view of Direct implication.

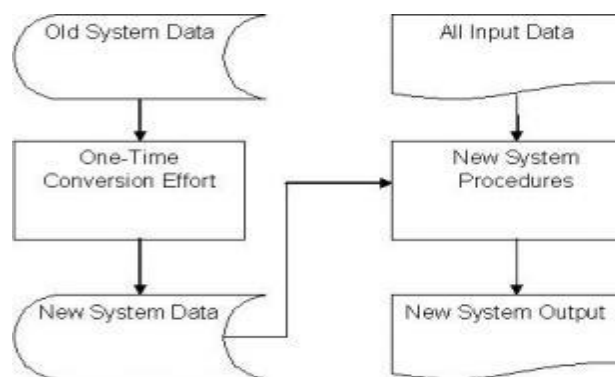


Figure 23 : Direct Implementation

(Source: <http://modhu.files.wordpress.com/2009/05/direct-cuover.jpg>)

As mentioned by Shelly & Vermaat (2013), direct conversion is a quick implementation technique which does not require any transition costs where the user stops using the old system on a specified date and starts using the new system. However, Shelly & Vermaat (2013) further states that this method is highly risky and may disrupt operations if the system does not work once implemented.

This approach causes the changeover from old system to the new system to be occurred immediately after the new system is ready to use. This is the more risk system; This operates daily but needs to produce reports at monthly after the cruise. Here in this system risk is more.

7.1.2 Parallel Running Implementation

Figure 24 shows the diagram view of Parallel Running implementation.

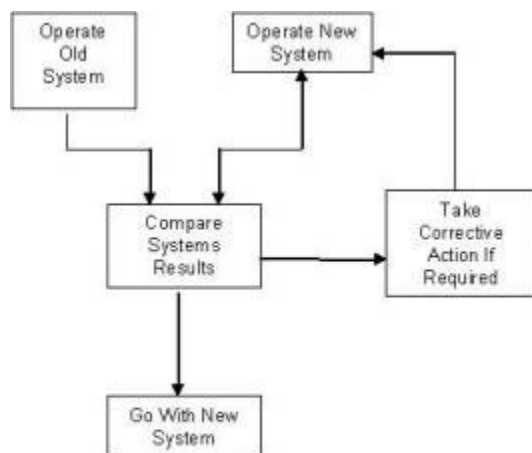


Figure 24 : Parallel Running Implementation

(Source:<http://modhu.files.wordpress.com/2015/05/parallel-method.jpg>)

This type of implementation is most suitable for large, mission critical systems where the user organization likes to operate the new system in parallel with the old system for quite some time before the old is cut over and the new change is authorized as the sole provider of IT services for the operation. (Van Horn, Schwarzkopf & Price, 2015)

Parallel adoption is a method for transferring between old (IT) systems to a target (IT) system in an organization. In this method in order to reduce risk conversion involves the simultaneous operation of both new and old systems until the new systems are ready and can be judged to work effectively. This is the secure method for the systems operation, if any problem is there in the new systems the operations continuously with the manual system operation. This approach is costly because it needs the both systems work parallel and needs more staff for the both systems operation and maintenance, even though it is more secure.

7.1.3 Phased Implementation

Figure 25 shows the diagram view of Phased implementation.

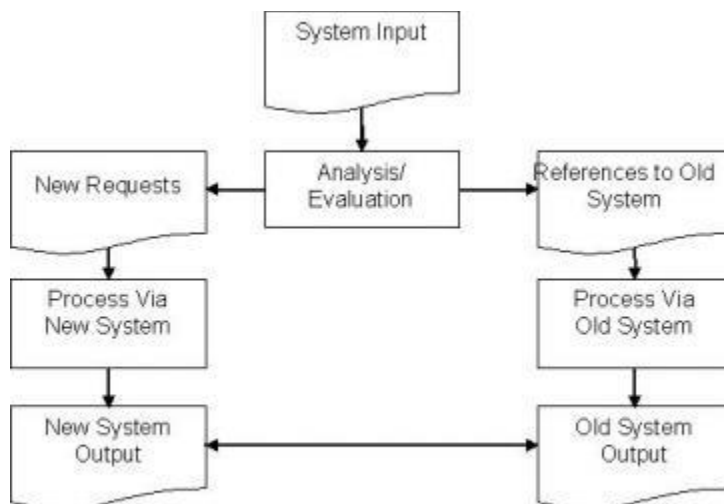


Figure 25 : Phased Implementation

(Source;<http://modhu.files.wordpress.com/2015/05/phased-operation.jpg>)

As the name suggests phased is a method of implementing the new system in phases or modules. Shelly, Cashman & Rosenblatt (2015), explains that this method is only suitable for systems that can be broken down into separate logical modules or segments and the module or segment selected for a given phase is provided to all users of the system.

This method allows the new system to be implemented by gradual steps or phases; this reduces the risk factor. This method is more suitable method for implement because apart from changing the

new system at once it is changing one module at a time and allowing all users to use the system carefully with assessment for its own performance.

Once a proposed system is accepted, the organization may take necessary action to develop or purchase the system. After the development or purchasing is completed the next step is to implement the system in the client environment. A typical system can be implemented using one of four available strategies namely, Direct Conversion, Parallel, Phased or Pilot and are explained below.

7.2 Evolution of Implement Strategies

7.2.1 Characteristics of the Implementation Strategies

Table 9 shows the evaluation summary of the Implantation strategies.

Table 9 : Characteristics of the Implementation Strategies

Characteristic	Direct	Parallel	Phased
	Type of Systems	Smaller, non-mission critical	Large or mission critical
Cost	low, when working without major problems high, due to additional costs when major problems occur	Incurs extra cost of operating two systems	May involve extra expenses to create APIs
Risk	High risk if the system does not operate correctly the first time	Low risk. If the new does not work properly can use the old one until errors are fixed	Low risk, as the risk of errors or failures is limited to the implemented module

Characteristic	Direct	Parallel	Phased
	Time for changes and Revisions	No	Allowed, as the old system acts as a backup until the errors are fixed.
Implementation Time	Fast Implementation	Fast Implementation	Takes time to implement the entire system

7.2.2 Advantages and Disadvantages of the Implementation strategies

Table 10 discuss the advantages and disadvantages of the implementation strategies.

Table 10 : Advantages and Disadvantages of the Implementation strategies

Implementation Method	Advantages	Disadvantages
Direct Implementation	<ul style="list-style-type: none"> - Cheapest - Easiest from user viewpoint. 	<ul style="list-style-type: none"> - High Risk - Requires extensive planning and testing
Parallel Running	<ul style="list-style-type: none"> - Safest - Low risk - Strong end user satisfaction and Approval. 	<ul style="list-style-type: none"> - Cost of using two systems - End users are opposing to double work for IS validation
Phased implementation	<ul style="list-style-type: none"> - Reduce the risk - Before complete the entire system, user can get the benefits from the part of the system - Users see part of the system faster 	<ul style="list-style-type: none"> - May need interfaces between new and old system

	<p>- An error in one part of the system can be corrected in the other parts before implementation.</p>	
--	--	--

Each strategy has its advantages, disadvantages in terms of costs, risk involved, etc and should therefore be compared with each other in order to identify the most suitable for a given system scenario.

7.2.3 Implementation Strategy Selection for the proposed system

When looking at the Earl’s Risk & Return Portfolio, (For more details refer Appendix B) the Employee Scheduling System was categorized as a “Sweetmeats”.

While talking about the costs involved in implementation, Shelly, Cashman, Rosenblatt (2014) states that Parallel is the costliest method and the Direct Conversion the cheapest (if the system works fine at the initial stage).

The most appropriate implementation strategy should ideally cater to error handling, change management and revisions at recoverable scales. Therefore, the smallest impact it can have on the business is the best for a large-scale project such as the one discussed.

When taking an overall decision, consider the Risk of the implementation. In addition to that consider about the safeties of the implementation.

Direct Implementation has high risk with comparing to the others. So, reject that system to use as an implementation method. If new schedule system get fail after implementing the system, it will be a high risk for the medical center. After that, the management will refuse the whole system since this medical center does not have many system and they do not have a best idea about this types of systems.

Parallel running method main disadvantage is Cost of using two systems. In addition to that End users are oppose to double work for IS validation. And it’s not realistic way to implement a new system to the mentioned medical center.

Phased implementation is to be used in the implementation. For the reason that Safeties is high and it has low risk. Cost is low with comparing to the other implementation methods. This can run

half parallel to the old system. Before complete the entire system, user can get the benefits from the part of the New system. An error in one part of the system can be corrected in the other parts before implementation. This is an advantage for the Phrase Implementation Method.

8.0 Testing

In order to get a quality product, we need testing. Testing is a process in which the faults are Identified and ensure that the defect is set right in order to get a quality product at the end and hence the customer satisfaction.

8.1 Test Plan

Testing Strategies

According to Sommerville.L (1995) there are few Testing strategies.

- Top-down Testing
- Bottom-up- Testing
- Thread Testing
- Stress Testing
- Back to back Testing

As a testing strategy for a developed system the author has selected Top-Down Testing Strategy.

The Testing Process

1. Unit Testing

Unit testing focuses verification effort on the smallest unit of software design the software component or module. (Pressman.R,2005; p. 394). Author has conduction this as the need of the Functional and reliability testing in an Engineering environment.

2. Accuracy Testing

3. Performance Testing

4. User Acceptance Testing

This is the final stage of the testing process before the system is accept for operational users.

Requirement Traceability

1. Test the accuracy of the system
2. Identify the errors before deliver the system
3. Test the system meeting the requirements or Not

8.2 Unit Testing

Individual components are tested to ensure that they operate correctly. Each component is tested independently, without other system components. (Sommerville.L, 1995: p.449).

8.2.1 Login

Table 11 shows the unit testing results for Login Page

Table 11 : Unit Testing - Login Page

Test case	Description	Input	Expected Outcome	Actual Outcome
01.	User Name, Password or User Level Cannot is Empty.	User Name, Password or User Level field are empty.	Message Box “Fields cannot be empty” and clear the fields	Success
02.	Wrong User Name Password, or User Level	Type wrong user name, password or Select Wrong User Level	Message Box “Wrong user name password or User Level” and clear the fields	Success
03.	Load main form after a successful login.	Add valid User Name, Password and select correct user Level.	Show main form. Hide Login form	Success

8.1.2 Change password form

Table 12 shows the unit testing results for Change Password form.

Table 12 : Unit Testing: Change Password

Test case	Description	Input	Expected Outcome	Actual Outcome
01.	User Name, Current Password New Password and confirm Password fields cannot be empty	User Name, Current Password New Password or Password confirm	Message Box “ERROR” and clear the fields	Success

		Password fields empty		
02.	The new password and Confirm password are not Matching	Give different value for the New Password and the confirm password field	Message Box “ERROR” and clear the fields	Success
03.	Update the New Password in the Database	Give same values to the new password field and confirm password field.	Save the data’s in to the system and disable the text boxes	Success

8.1.3 Add New User / Patient

Table 13 shows the unit testing results for Profile (Add New User) or Patient Page.

Table 13 : Unit Testing: Add new user / Patient

Test case	Description	Input	Expected Outcome	Actual Outcome
01.	Check whether the user is already registered to the system before	Write the NIC number which is not in a database and Click the Availability Button	Message Box “NIC or Passport Number is already saving in to the Database”	Success
02.	Check whether the user is already registered to the system before	Write the NIC number which is in a database and Click the Availability Button	Message Box “NIC or Passport Number is already saving in to the Database”	Success
03.	Check whether the password and confirm password matching to each other	Give same values to the Password and Confirm password	Display Message” Good Luck. Password matching”	Success
04	Check whether the password and	Give different values to the	Display Error Message “Sorry.	Success

	confirm password matching to each other	Password and Confirm password	Password does not match. Try again”	
05	Check the functionalities of the “Clear button”	Clear button click	Clear All Fields	Success
06	Check the functionalities of the save button: Felds are empty	Click save button	Message Box “Fields are Empty”	Success
07	Check the functionalities of the “Save button”; all fields are filled	Click save button	Message Box “Record Successfully Saved!!!!!!”	Success
08	Check the “Save Button”	Click Save button	Disable the Fields	Success
09	Check the functionalities of the “Add new button”	Add New button clicked	Clear and Enabled all Fields. Auto generate the Staff ID	Success
10	Check the functionalities of the “Exit button”	Click exit button	Message Box Display “Are you sure you want to exit?” If Say “YES” Exit the form. If not , form not closed	Success

8.1.3 Edit user Details

Table 14 shows the unit testing results for Edit User Page.

Table 14 : Unit Testing: Edit User

Test case	Description	Input	Expected Outcome	Actual Outcome
01	Check the Functionality of the “Search” Button	Type the user ID in the text box and Click the Button	READ the ID and Display the user Details in to the Data Grid View	Success

02	Check the Functionality of the “Mouse Click” Event	Click the Data Grid View Index	Display all required fields in the Test Boxes	Success
03	Check the Functionalities of the “Save Edit Fields” Button	Click the “Save Edit Fields” Button	Message Box “Record Successfully Saved!!!!!!!”	Success
04	Check the Functionalities of the “Save Edit Fields” Button	Click the “Save Edit Fields” Button	Disable the Fields except the “Add New Button”	Success
05	Check the functionalities of the “Add new button”	Add New button clicked	Clear All Fields, enable the fields and auto generate the Complain ID	Success
06	Check the functionalities of the “Exit button”	Click exit button	Message Box Display “Are you sure you want to exit?” If Say “YES” Exit the form. If not , form not closed	Success

8.1.4 Remove User Details

Table 15 shows the unit testing results for Remove user details.

Table 15 : Unit Testing: Remove User Details

Test case	Description	Input	Expected Outcome	Actual Outcome
01	Check the Functionality of the “Search” Button	Type the user ID in the text box and Click the Button	READ the ID and Display the user Details in to the Data Grid View	Success
02	Check the functionalities of the “Clear button”	Clear button click	Clear and enable All Fields	Success

03	Click the “Delete Button” without giving the Request ID	Click the “Delete Button”	Display the Message box saying “Select Item to Delete”	Success
04	Click the “Delete Button” by giving the Request ID	Click the “Delete Button”	Display the Message box saying ““Are you sure you want to Delete this Entry?”	Success
05	Click the “Delete Button” by giving the Request ID	Click the “Delete Button” and message box will appear. Click the message Box “YES”	Disable the Fields	Success
06	Check the functionalities of the “Exit Button”	Click exit button	Message Box Display “Are you sure you want to exit?” If Say “YES” Exit the form. If not , form not closed	Success

8.1.5 Search user Details

Table 16 shows the unit testing results for search user details.

Table 16 : Unit Testing: Search user details

Test case	Description	Input	Expected Outcome	Actual Outcome
01	Check the functionality of the “Search By Drop Down”	Select the Drop Down	Enable the Selected field data’s	Success
02	Search user Details through the “user ID”	Select the Drop Down	View the data’s in the data grid view (User	Success

			Profile and Request Details)	
03	Search user Details thought the “Request”	Write the user first name in the Text box and Click the “Search Button”	View the data’s in the data grid view (User Profile and Request Details)	Success

8.2 Performance Testing

Table 17 shows the results of the performance testing.

Table 17 : Performance Testing Results

INTERIM TEST STATUS REPORT					
Tester Names: Accuracy Testing				Date:	
Functional Areas	Number of tests executed	Subtotal of tests passed	Subtotal of tests failed	Percent Failed	Accuracy of the Function
Login	10	10	0	0%	100%
Reset Password	10	10	0	0%	100%
Sign Out	10	10	0	0%	100%
Main Menu	10	10	0	0%	100%
Add New User	10	10	0	0%	100%
Add Patient	10	10	0	0%	90%
Add Medicine	5	5	0	0%	100%
Recommend Medicine	12	12	0	0%	90%

View Notifications	5	5	0	0%	100%
Edit User Details	5	5	0	0%	100%
Remove User Details	5	5	0	0%	100%
Search User Details	8	8	0	0%	100%

8.3 User Acceptance Testing

Testing to verify a product meets customer specified requirements. A customer usually does this type of testing on a product that is developed externally.

To test the usability of the system, author has conducted a Questionnaire (Appendix C). This questionnaire had given only to the Admin. According to the result of the questionnaire it proves the system is useful to the user and they satisfied about the system. As a failure, the author can mentioned, users are not 100% satisfied with the floor of the system. Since, they do not familiar with the ID related systems.

9.0 Critical Evaluation

9.1 Degree of success (Prove it)

As the author mentioned in the 'Executive Summary' this whole document is an answer for “**How to Solve the Problems in Anusha Medical Center?**”

This is a challenge for the author. To give a proper solution for this question the author had to analyse the problem first. For this author, has used many data gathering techniques such as Interviews and Questionnaires. Those are mentioned under Chapter 02. While conducting, those data gathering techniques the author has identify the reasons for the above problem. Those problems are mentioned under the problem domain in Chapter 01. After figuring out the reasons for the problems the author has started to research about that kind of problems and the solution has identified.

Interesting thing the author can mention here is, once the author has visited to Navaloke OPD author has seen the Hospital has implemented the same kind of System which see need more improvements. Author has identified the drawbacks of the Navaloka Hospital System and corrected that issues in authors System.

According to the unit testing results it is proving the system functions are 99.5% accurate. The main required functionalities such as; Add Patient details, Add staff details , Recommend Medicine modules are 100% accurate. Apart from that the Search Functionality, and System notifications are also 100% accurate. After analyzing those entire unit testing results, proves that the developers target is success.

As the end, the Anusha Medical Center System is the overall success of more than 8 months' work.

9.2 Problems Encountered and Solutions

According to the problem domain the medical center has mainly faced below problems.

- Patient history is not recorded correctly and every time when the same person admitting or taking medicine from this place you need to make a new record. (Duplication of the work load). – **All the records are saved in the Data base. Therefore, no need to enter the data again and again. You can search by the user NIC and check the record is already available in the System. If it's available, you can use the “Admit Again” button.**
- No stock control method is using for the medicine and no accurate record/s for the medicine ordered. Sometimes there is an unavailability of the stock and patient should have to take medicine from outside. On the other hand, sometimes there is wastage of medicine. – **Stock maintaining function has been developed and give the notifications for the re order point and the Expire date of the medicine.**
- Nurse's profile is not maintaining. – **All the Staff details are saved in the database.**
- Doctor's profile and allocations are not recorded against to the Patient. - **All the Staff details are saved in the database.**
- There is no link between allocations of nurses. So, sometime one nurse has assigned to two tasks at the same time. – **All the allocations are recorded as a result of that allocation problem is solved. If the Nurse is available only system shows she is a vacant one.**
- No details of the Bed allocation. – **All the Ward and bed details are recorded and saved in the data base.**

Those are the problem areas, which the author has mainly, consider.

9.3 Limitations and Issues overcome

Mail limitation is Payment details are not handling in this System. Author can increase the scope. With the time author, has omit the payment module from the System.

The first issue the author has faces is the “Finding a Suitable topic for the project”. For this the author, has visited many companies such as; Peoples Bank, Sri Lanka Port Authority, Colombo university and as persons, interview a Lawyer and a Teacher to identify the problems which they faced in day to day life while their working and had an interview with them. After that author, has visited to the “Anusha Medical Center in – Kurunegala. Then realized few problems with their data entering process. Even as the author has seeking visited to the Thalangama North Hospital to talk with a Nurse to identify the problems which they faced at their Work. After summarising the facts which collected while the interview, came in to the conclusion to give suitable solution to overcome the problems which Anusha Medical Center has.

Next Problem was this medical Center is located in Kurunegala. So Travelling will be a huge problem. First few months every weekend author has visited Kurnegala because needed to do the Primary research.

Another major problem is Author has to travel oversees for business work. Due to this had very tough time to take for the project and meeting supervisor. Last few months the author was out of the country.

The next problem which author has faced was hard to deal with the users. They were fear to give details and share their problems with the author. This is the main reason author has decided to conduct a questionnaier. To leave out this problem the author has follow many tips such as; share the personal details, try to give them something like sweets and all.

Those are the Limitations and the Issues which are the author has face while doing the project and has recovered all those issues in positive way and come up with a success solution to the Anusha Medical Center.

9.4 Learning Experience

When starting the project the knowledge about the Hospital Administration and the medicine was none.

At the starting point to end point the things which have done was Learning Experiences.

This is the first-time author has given a solution to the general problem. It's good experience for a future enrolment. While doing this project, the author has learnt the sequences steps to follow a Project.

The way which the author has identify the Project Title was a good experience. After starting the project for a primary investigation, author conducted Interviews and Questionnaires. It was a huge experience for author's life. This is the first time the writer has conducted a primary investigation such as; questionnaires and interviews. Conducting an interview is not an easier way. This project helped to learn a way to identify the correct primary investigation tools.

At the past, author had poor knowledge about "Analyzing". While doing this project, author has gain knowledge about a way of doing an Analysis. Other field is, Compare and contrast ideas against a specific requirement in order to map the most suitable idea to it.

From this project the author has learned the floor of a correct documentation. This is a major advantage to the author's future work.

9.5 Future Recommendation

9.5.1 System related

This system can develop more complex than the system which has been already made. In addition to those initiatives it can be taken to improve functionalities of the system which are discussed below.

As mentioned before the Payment module is not included in this Phase. It can have developed in Next phase.

Once payment module is developed you can add the direct sales from the pharmacy also. Then user can enter purchased full stock in to the system.

The system cannot save sessions. This can be done as a next development. If the user log in to the system, the session of the user login is not save in a session. Privacy wise this was not a good method. If the system can re develop with facility it would be more accurate than the present system.

System is not save the details of the age below 18 people. This can develop in future.

9.5 Conclusion

The main objective of the project was to develop a system that helps to give a solution to the problems which had in the Anusha Medical Center. The developer has developed a system which gives facilities to overcome all the problems had in Anusha Medical Center.

10.0 Reference

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Appendix A

Please refer the Table 18 which is contain the summary of the Interview which has with the Front office of Anusha Medical Center.

Table 18: Interview Summary Front Officer

Front Officer				
Purpose of the Interview		To get the Work Load details from the Front Officer.		
Name	Date	Place	Summery	
Ms.M. De Silva	28/05/2015	At her place	According to the Ms De Silva, she has to keep the record of all the patients. She is maintaining a book to record all the details. If a same Patient comes twice she has to make the same record again. And its difficult to find previous records.	

Please refer Table 19 which is contain the summary of the Interview which has with the Head Nurse of Anusha Medical Center.

Table 19: Interview Summary : Head Nurse

Ward Head Nurses			
Purpose of the Interview	To identify the Issues		
Name	Date	Place	Summery
Ms.R. Senanayake	27/05/2015	In the Medical Center	According to Ms Senanayake there is no History records of the patient. Thus every time they treat a patient as a New Patient. According to her it will be good if we can implement a solution which provides to keep History Details of the Patient. Under her guidance there are 4 girls working.

Please refer Table 20 which is contain the summary of the Interview which has with the Accountant of Anusha Medical Center.

Table 20: Interview Summary : Accountant

Accountant			
Purpose of the Interview	Identify the account handling details and problems that they face.		
Name	Date	Place	Summery
Mr.Sanjeewa Waidyasekara	28/06/2015	Over the phone	According to Mr.Sanjeewa Waidyasekara he is maintaining all

	the Accounts details by using an Excel. They use receipt book for payments. At the end of the day he put all the records in to the Excel. He says it a duplicate work load for him.
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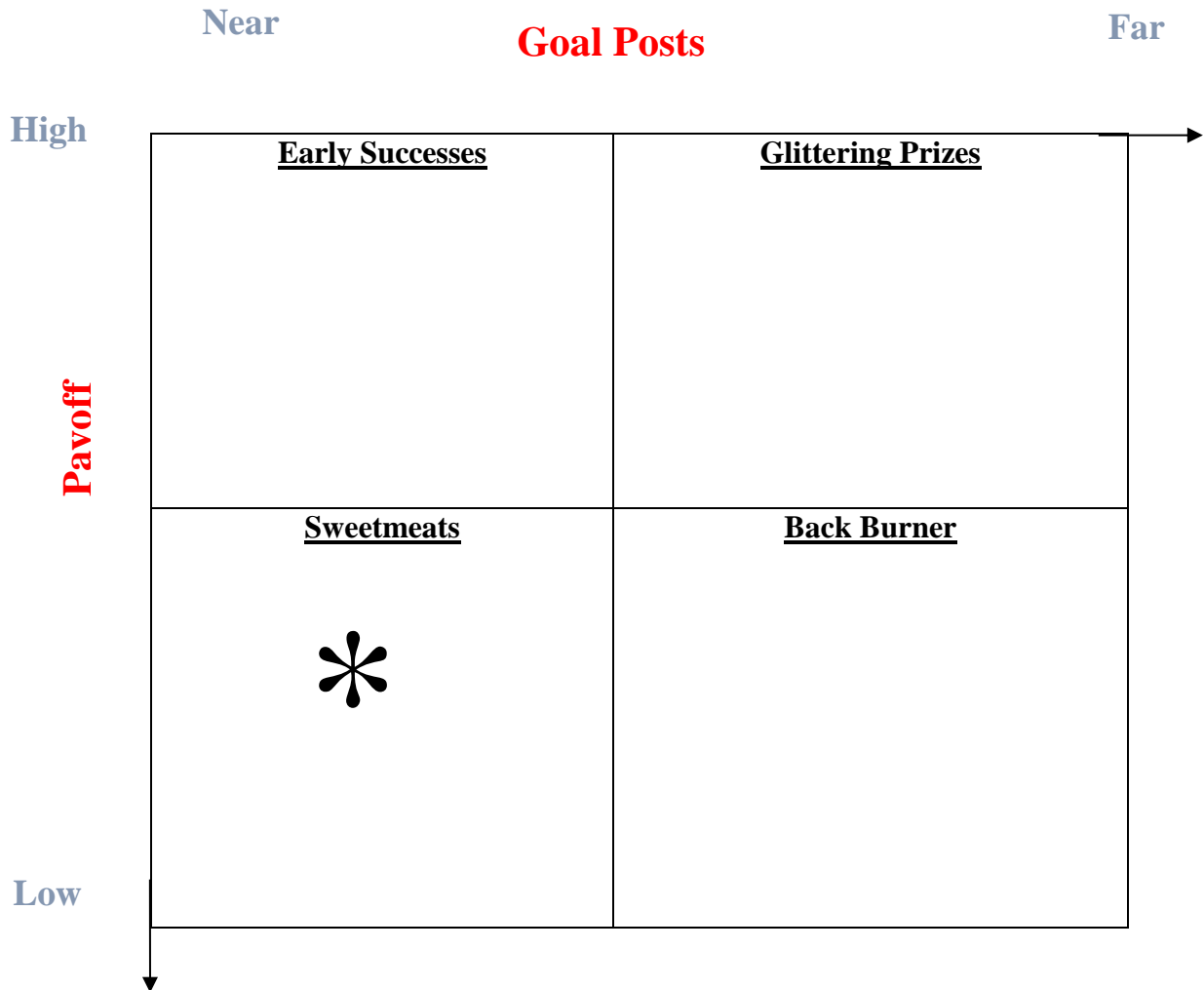
Please refer Table 21 which is contain the summary of the Interview which has with the Front office of Anusha Medical Center.

Table 21: Interview Summary : Pharmacist

Pharmacist			
Purpose of the Interview	To get an idea about Stock maintenance.		
Name	Date	Place	Summery
Mr.Sanjeewa Waidyasekara	28/06/2015	Over the phone	This Pharmacy is Open for Everyone. So they have high demand for this Pharmacy. According to Mr Sanjeewa Waidyasekara they do not have any mechanism to stock control or order. Sometimes they have more demand than supply. And their wastage also high amount.

Appendix B

Earl's risk & return portfolio analysis



Appendix C

High Satisfied - (100%-80%) 05	Satisfied - (79%- 60%) 04	Average - (59%- 40%) 03	Dissatisfied - (39%-20%) 02	High Dissatisfied - (19%-0) 01
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		Scale				
		01	02	03	04	05
01	What do you think about the system Design?					*
02	The floor of the Finding Information				*	
03	Do you satisfy with new System?					*
04	Do you satisfy about the New data entry System?					*
05	Easy to navigate within the system					*
06	The system has all the functionalities and capabilities expected					*
07	What is your overall satisfaction with this system					*