

# **Patient's Record Management System for the National Eye Hospital in Sri Lanka**

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**April 2015**

“This dissertation is submitted in partial fulfilment of the  
requirement of the degree of the MSc in Information Technology  
of  
the University of Moratuwa”

## Declaration

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## Abstract

Eyes can be treated as one of the most important parts of the human body. People are very much bothered when they encounter eye related health problems. National eye hospital is the prime national body which comes to one's mind when it comes to an issue related to eyes in Sri Lanka. But, it is apparent that stakeholders of National eye hospital are not well benefited by existing manual management practices of the hospital which are unproductive. The existing manual system in hospital is not patient supportive since it leads to unnecessary time wasting of patients. Administrative staff of the hospital often suffers from with data related issues such as loss of data and data redundancy of clinical patients. Doctors find it difficult to obtain most critical and updated medical information of patients on timely manner. All those concerns have resulted in making an additional workload on people.

The prime objective of this research project is to overcome above issues by developing a web based Patient's Record Management System which adds values to stakeholders of the hospital. This system has been developed on a web based platform using PHP and MySQL and Adobe Dreamweaver CS6 has been used in designing the system.

The system can facilitate administrative staff of the hospital with updated patient data managing and processing methods which are very safe, convenient and time saving. Furthermore, patient details can be seared faster. The system helps doctors become more productive as the system allows doctors to access all the necessary and updated information refer to patients.

The project has been centered on design and implementing of this state-of-the-art trilingual web based Patient's Record Management System, which provides an integrated holistic view of patient data among doctors, nurses and other authorized personnel.

## Acknowledgement

It is with pleasure that I express my gratitude to University of Moratuwa which provided me an opportunity to carry out a project which I believe will satisfy a keenly felt need to improve my skills in applying learnt subject knowledge on a practical context.

I offer my sincere appreciation and special thanks to Dr.Prasad Wimalarathne, whose heartfelt teaching, guidance, suggestions and constant inspiration I have received, ever since I became one of his students in M.Sc in ICT class few years ago.

I express my gratitude and special thanks to all of my university lectures who made me competent with necessary knowledge which is compulsorily required to perform this kind of a hard work.

I'm no less grateful to my friends for their various efforts taken to help me in executing this project.



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I must acknowledge my debt to my family members who lent me their hands giving me freedom and space of mind to fulfil my effort.

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## List of Acronyms

PRMS	– Patient’s Record Management System
VistA	– Veterans Health Information Systems and Technology Architecture
HER	– Electronic Health Record
VA	– Veterans Affairs
VHA	– Veterans Health Administration
CPRS	– Computerized Patient Record System
GUI	– Graphical User Interface
PACS	– Picture Archiving and Communication System
MUMPS	– Massachusetts General Hospital Utility Multi-Programming System
PHP	– PHP Hypertext Pre-processor
WWW	– World Wide Web
CSS	– Cascading Style Sheets
OOP Object	– Oriented Programming
GPL license	– General Public License



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### 1.1 Introduction

This chapter gives an introduction to the dissertation. It will specify the overview of the selected topic and how it contributes to the operations of the establishment. Also this chapter illustrates how chapters are organized.

### 1.2 Overview

National Eye Hospital has a long history in the health care of Sri Lanka. This is [01] the tertiary care hospital with the centre of excellence which was established in 1905. It is the referral hospital in special management of many ophthalmic conditions.

This is the only specialized unit in Sri Lanka for the treatment of eye problems. This hospital is under the supervision of a director and a deputy director with eight consultant ophthalmologist, one vitreoretinal surgeon one pathologist, two anaesthetists, one consultant resident physician and about 100 medical officers. There are special clinics for retinal patients, diabetic glaucoma, and post operative patients. The daily attendance of outdoor patients is about 1000 and clinic patients are about 650. There are eighteen In-Wards and four operation theatres. In addition to that there are Class one and Class two paying wards.

Most of the patients have to come repeatedly for follow up treatment, and the doctors need their earlier documents relating to their illness and medicine to give an efficient treatment. Currently a manual file system is maintained for this purpose. Most of the eye related investigations have images for doctor's reference. Therefore they should be stored in a manner that their quality does not deteriorate. The main problem with the manual file system is loss of documents and loss of quality of reports due to the long period of storing.

Patients must register for surgery and the tentative date will be provided to them. But the consultants or the surgical doctors can change the surgery date based on several reasons. Once the surgery date is changed the staff must update the changes to the patients immediately. Communicating this message is a critical task for the staff because of the weakness of manual system.

### 1.3 Aim and Objectives

The aim of this project is to implement a web based Patient's Record Management System (PRMS) for National Eye Hospital in Colombo, to store the diagnostic history of patients, retrieve diagnostic history by the hospital authorized person, doctors and patients themselves and update the diagnostic history of patients, online channelling, doing e-mail/SMS.

Objectives of this project are

- Improve patient safety - The system can be used to store the history of the patients without losing the data of their disease and the system is created a backup of all the details of patients
- Support effective and efficient health care delivery
- Facilitate management of chronic conditions - The system can be used to send alerts to the patients about their next appointments. It will be useful to manage their diseases effectively.
- Facilitate better access to the information- The patients/doctors themselves can be able to access their information online of the system in a secure manner.
- To facilitate diagnosis of patients thereby reducing patients wasting time
- Minimize the cost - Specially patient can get a appointment for consulting a doctor through the system without paying money. And eliminated the paper work.
- Give high level confidence among the patients & general public- From the web base system the general public of Sri Lanka can also get some information about the National Eye Hospital, their services and about Eye diseases.

### 1.4 Proposed Solution

Since the system has been stored the diagnostic history of patients, retrieve diagnostic history by doctors and patients themselves and update patient's details by the hospital authorized person, it is reduced duplication of diagnostic testing, imaging and history taking.

The system improves patient's safety by protecting their medical data and supports effective efficient health care delivery. The system also gives better medication management.

Eye Chronic diseases are now the leading cause of illness in Sri Lanka. Many patients with chronic disorders may not receive the best possible care. They have different health care providers, and thus may receive conflicting information or undergo duplicate tests or/and

procedures. Therefore the system should facilitate management of chronic conditions for patients who are coming to the National Eye Hospital.

### **1.5 Structure of the Dissertation**

Chapter 1 laid down a brief introduction of the project. Chapter 02 describes background information of the project and literature review. This chapter provides details of various similar systems. Chapter 03 describes analysis part inside the system which is discussed on functional and non-functional requirement analysis in detail manner.

Chapter 04 outlines the system design architecture of the project. Chapter 05 deals with the implementation of the system. Chapter 06 discusses about the evaluation & testing of the project. Chapter 07 includes the conclusion of the project and suggests further enhancements.



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#### 2.1 Introduction

The first part of this chapter describes the overview of the similar systems carried out for this project. Then it will briefly discuss about the similar systems in Sri Lanka and other countries. After this, the chapter presents the drawbacks & weaknesses of the existing system.

#### 2.2 Overview of the Similar Systems

Many organizations use web based resource management systems to gather required information and disseminate them to relevant users. Through these systems organizations want to collect various types of data related to physical and human resources, transportation, precipitation etc. and also systems help organizations update quickly on latest information which is supportive of decision making.

These systems are more reliable than earlier systems when it is compared together. So in recent past, many organizations use the web based resource monitoring systems to accelerate their businesses via online processes.



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At present there is no web based information system available for government hospitals in Sri Lanka. But most of the private hospitals found in Sri Lanka have web based information systems. Examples for these systems are Nawaloka Hospital PLC [2], Lanka Hospita PLC [3] and Asiri Group Hospitals PLC [4].

In other countries, many open source systems are used to solve problems. Those systems are very fast, reliable and developing is very complex and more features are included. Examples for these similar systems are the Care2x [5], VistA [6], OpenEMR[7], GNUHealth [8], Bayanno Hospital Management System Pro [9].

#### 2.3. Similar Systems

Theses similar systems helped in developing the Patient's Recode Management System for National Eye Hospital.

### 2.3.1 Care2x

#### Description

Care2x is an open-source, integrated hospital information system, practice management, and electronic health record system. The Care2x consists of four main components. Those are Hospital/Health service Information system, Central Data Server, Practice (GP) management, and Health Xchange Protocol.

Care2x has been designed to overcome integration problems in a network of multiple incompatible programs [10]. Its design can also handle non-medical services or functions such as security and maintenance. It is modular and highly scalable. This has modules for the different functions and departments. It has used a single database and single data format. The current beta version supports the MYSQL database and uses a standard database language (currently uses SQL). Care2x has been used the PHP and Java script & scripting languages. All program modules are server side processed.

The system can be accessed via the internet since Care2x uses standard internet protocols. (Physicians or surgeons can access patients data from outside the hospital without using specialized software.)



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Care2X is highly flexible and configurable and supports multiple languages [11] which currently supports English and German. The user can configure his own GUI interface according to his personal preferences, language, and level of technical understanding

#### Features

The search functions of Care2x [12] are programmed to be “*SMART*”, which is smart data validation. In addition to the usual validation techniques like rejecting alpha characters or out range numbers in a date entry field, this validates the entered data “*smartly*”.

*Example: when the user enters "35" into a date entry field, the validation automatically converts “3rd of May”. And when the title for a patient is chosen as Mr or Mrs. the sex will automatically set to "M" or "male". Or “F” or "female”.*

Most validation routines are done with JavaScript. Furthermore, it supports custom languages and there are 15 languages to choose in 2003. The user can configure background and font colors and choose between two main display modes also. Care2x platforms [13] which

supported are Windows 2000, XP, Vista, 7, Apple OS X, Linux, Unix, freeBSD, netBSD, openBSD, BSD/OS, tru64 Unix, Debian, OS/2 WARP, GNU OS.

The Care2X system which is very complex, it has included many fields for getting information of the patient. Hence it is very time consuming.

Functionalities include Medical Product database management has product search and archive functions. Patient admission system with search and archive functions and currently supports English and German languages are the other features.

### **2.3.2 VistA**

#### **Description**

The VistA is an enterprise-wide information system built around an EHR, used throughout the United States Department of Veterans Affairs medical system, known as the VHA. It includes of nearly 160 integrated software modules for clinical care, financial functions, and infrastructure.

VA has had automated data processing systems, which is including extensive clinical and administrative capabilities [14]. Established in 1996, VistA is built on a client-server architecture written in MUMPS, Delphi and Java. VistA [15] is used by the Department of Veterans Affairs (VA) health care facilities to keep track of patient data in a database. The entire system has been placed in the public domain. VistA increases the efficiency of patient care documentation and remote data interoperability which allows for VA providers from one facility to view data from other facilities. VistA [16] is increased secondary data use at the point of care (analytical, research, population health) and VistA is high end user satisfaction.

#### **Features**

VistA supports both ambulatory and inpatient care, and includes several significant enhancements. The most significant is a graphical user interface for clinicians known as the CPRS, which was released in 1997. In addition, VistA includes computerized order entry, bar code medication administration, electronic prescribing, and clinical guidelines.

VistA Imaging - A PACS used to digitally store medical images such as X-rays, PET scans and ultrasounds. Incident Reporting - Organizes incident data and reports and sends it via the Internet to the National Quality Assurance Database for Headquarters.

The largest, most useful aspect of VistA is the CPRS. It is a program with a GUI that allows for the viewing and editing of patient information.

CPRS has been included Real-Time Order Checking System which alerts the clinician of possible ordering problems before they are processed. It has a notification system that notifies the clinician of important upcoming clinical events.

CPRS has been developed Patient Posting System which displayed on each patient's CPRS screen with patient specific notices, such as allergies and health warnings. And it is also included Remote Data View that allows doctors to view data from VA facilities other than their own. This system has been included Electronic Prescriptions it is enable for the ordering of patient prescriptions directly to the pharmacy from the GUI.

VistA [17] has a proven track record of supporting a large variety of clinical settings and medical care delivery systems. This system focuses on clinically relevant record keeping [18] that improves patient care by improving clinical and administrative decision-making.

### 2.3.3 GNUHealth

#### Description

GNUHealth is a free Health and Hospital Information System including Electronic Medical Record (EMR), Hospital Information System (HIS), Health Information System [19].

The goal of this project is to contribute with health professionals around the world to improve the lives of the underprivileged, providing a free system that optimizes health promotion and disease prevention.

#### Features

Strong focus in family medicine and Primary Health Care including Diseases and Medical procedures standards, Writing Prescription, Billing, Patient Genetic and Hereditary risks, Epidemiological and other statistical reports, 100% paperless patient examination and history taking, Patient Administration, Doctor Administration/ Lab Administration/ Medicine / Drugs information and Hospital Financial Administration are some of the main features.

### Special Functionalities

GNUHealth is scalable in functionality, database size and transactional volume. For instance, GNUHealth can be installed in a single doctor office, or in country public hospitals network.

GNUHealth system has a special functionality. That is the system generates a patient card. It has a unique Patient ID. It allows to export the information to the patient card, and it provides the framework to synchronize data between health centres. Quick patient identification in different health care network, the patient ID can be read, for example, with a QR reader, speeding up the registration process and avoiding common human errors.

Other functionalities are same as above other systems.

### **2.3.4 OpenEMR**

#### Description

OpenEMR [20] is a Free Open Source electronic health records and medical practice management application. It runs on Windows, Linux, Mac OS X, and many other platforms.

OpenEMR is ONC Complete Ambulatory EHR certified and it is one of the most popular open source electronic medical records in use today.



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#### Features

Its features are fully integrated electronic medical records, practice management, patient scheduling, electronic billing, prescription, patient demographics [21].

### **2.3.5 Bayanno Hospital Management System Pro**

#### Description

Bayanno Hospital Management System in Bangladesh [22] is an Advanced, powerful, flexible complete management software for hospital, clinic and medical institutes. This is also open source software. The system integrates user area of Administrator, Doctor, Patient, Nurse, Pharmacist, Laboratorist and Accountant.

#### Features

Seven types of accounts including Admin monitors total hospitals, Doctor manages prescriptions, appointments are some of the key features. Further Patient gets facilities online,

Nurses create reports of patients, Pharmacist maintains medicines, Laboratorists attached diagnosis reports, Accountant takes payment online, Creates backup of individual items, Supports 20 languages in version 1.2, Supports desktop, laptop, Smartphone and tablet.

### Security

Highly secured against security threats

SQL-injection, xss attack, csrf protected

### **2.3.6 Nawaloka Hospital PLC – Colombo**

Nawaloka Hospital uses a web information system to handle their patients and their medical treatments. This system is used by their staff for their administrative purposes. Since it is not opened for general public, the patients cannot access the information about their treatments or any history about them. But the hospital has its own web site. This is a static website and most of the information found in this site is about services offered by the hospital and the basic information about the medical packages. No interaction found between hospital and patients or general public. But recently they have included a new functions of channelling doctors, online payments for their services and hospital bills.

### **2.3.7 Asiri Hospitals – Colombo**

It is also same as the Nawaloka Hospital's web information system. General public or the patients have no interaction with their information system or their web site to get their medical history or any appointment updates. All these systems have interaction with their staff only.

### **2.3.8 Lanka Hospitals – Colombo**

Although Lanka Hospital uses a separate information system to handle their administration activities, it is not open for general public. Their web site offers a link to view the laboratory reports. Even though the link is created, that facility is still not available.

## **2.4 Drawbacks and Weaknesses of the Existing System**

Presently, at National Eye Hospital, patient records are stored as manual data. Outdoor patient records are stored as original prescription formats. Clinic patient data are stored as files with papers. Reports of outdoor and in-ward patient data are stored as Bed Head Ticket (B.H.T) format.

The hospital encounters following drawbacks and weaknesses of their existing system.

- Data duplication:

The same data gets repeated over and over since the hospital workers find it hard to keep track of the documents, patients' information and transactions.

- Lack of Security:

Since data is stored in filing cabinets, sometimes it is freely available to anyone. If information falls into the wrong hands, it can be used against the hospital and patients.

- Inconsistency of Data:

There will be unavailability for future use since data might get misplaced during manual filing. Therefore data will not be preserved properly for future use.

- Repetition of Work:

If there are any changes to be made, the data will have to be updated again and again. If a nurse forgets to make required changes to a document or file, it will result in nurse repeats the same work. Repetition of work leads to unnecessary time consuming.

- Too Much Paper Work:

Since every detail is written down manually in paper, there will be too much paper works.



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- Space & Consuming:

Since medical documents are stored in filing cabinets, it consumes too much places. The higher the amount of work done on paper the more the filing cabinet requirement will be.

- Slow Retrieval of Data:

The information of patients is stored in different parts and so takes a long time to retrieve the data. It takes a long time to find the information about a relevant patient. Sometimes delivery will be held back.

- Repeatedly follow up treatment:

If a patients losses a prescription which had been prescribed early, doctors find it difficult to define which medicine to next. This will result in repeating the same medicine.

## 2.5 Advantages of Proposed System

The ability to exchange health information electronically provides higher quality and safer care for stakeholders.

Providing accurate, up-to-date, and complete information about patients at the point of care, enabling quick access to patient records for more coordinated and efficient care as well as securely sharing electronic information with patients and other clinicians are among the primary benefits of this system.

In addition, facilitating doctors in diagnosing patients more effectively, reducing medical errors, Improving patient and provider interaction, enabling safer, more reliable prescribing and enhancing privacy and security of patient's data can be treated as some other important advantages of the PRMS. Also improved efficiency of patient's documentation, reducing costs through decreased paperwork, improving safety and reducing duplication of testing can also be highlighted as significant rewards of the system.

Data can be converted easily to information, Readiness of the information and data. Can get summarized reports of patient information and diseases any time, Data cannot be corrupted easily since patient information is backed up and it can be easily retrieved any time. Other additional features are integrated for the system. As they are easy of data handling and well-preserved and well-maintained patient's data (patient cannot be allowed to see information of other patients).



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Following table compares differences of features in proposed system vs existing system.

Feature	Present manual system	Web based system
Storage of material	High	N/A
Printing document cost	High	Low
Software cost	N/A	Very Low
Maintenance log book	Need	No need
Backups Data	N/A	Can get anytime
User Friendly	N/A	High
Delivery	Doubtfully	Accurate
Monitoring	Manually	Automate

Table 2.1: Proposed System vs Existing System

## 2.6 Summary

This chapter explained about some of similar systems in Sri Lanka and other countries. This section has also included the drawbacks and weaknesses of the existing system in National Eye Hospital while describing advantages of the proposed system. Finally the chapter has been concluded with a summarized comparison of features between the proposed system and the existing manual system. Next chapter will deals with the requirement analysis of then system.



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#### 3.1 Introduction

This stage is very important for the system developers. The success of the system depends on the suitability of techniques used in gathering requirements. This chapter will explain the feasibility study and the other requirements needed in improving the proposed system.

#### 3.2 Feasibility Study

The feasibility study has considered the technical, economical and operational aspects in the proposed system. From the systems analyst perspective, the feasibility analysis is the main tool for recommending whether to proceed to the next phase or to discontinue the project.

##### 3.2.1 Technical feasibility

Technical feasibility refers to the ability of the process to take advantage of the current state of technology in pursuing further improvement [23]. Technical feasibility is concerned about hardware and software which will be compulsorily needed to satisfy the user requirements.

In terms of technical feasibility, the compatibility of PHP 5.3.5 and MySQL is very good in this proposed system. PHP makes dynamic and interactive web systems fast and it also has required scalability, extensibility, flexibility and robustness. PHP is platform independent and easy to debug & maintain too. It also provides excellent reporting features with good printing support.

PRMS has been used MySQL for its database since it is capable of managing even a larger database. MySQL provides a strong data protection too.

The proposed system can be considered as technically feasible if the internal technical capability is sufficient to support the project requirements.

##### 3.2.2 Economical Feasibility

Cost can be divided in to two folds called tangible and intangible. Tangible costs are determinable, but the intangible costs are not determinable. Equipment cost, training cost, material cost, miscellaneous cost, personal cost and engineering cost are some of important tangible costs which have to be compulsorily born in developing the proposed system.

Cost effective tangible economic feasibility involves in ensuring whether the client can afford for the changes made in the system. Client has to afford the cost of extra changes of the system in now or in future.

### **3.2.3 Operational Feasibility**

Operational feasibility [24] depends on human resources available for the project and involves projecting whether the system will be used if it is developed and implemented.

The system is operationally feasible if it is very easy for the end users to operate. It only needs basic information about Windows platform. If the system operator of the hospital has not the required skills about the Patient's Record Management System he or she must be fully trained.

## **3.3 Requirements for the Patient's Records Management System**

Analysing the client's requirement is a prerequisite for the project success. Once the feasibility study has been completed and the project has been acquired, the requirements analysis process is to be implemented.

In analysis part, it is important to identify both functional and nonfunctional requirements which are equally essential for a successful software project.



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### **3.3.1 Non Functional Requirements**

Non-functional requirements are requirements which specify criteria that can be used to judge the operation of a system, rather than specific behaviors. The non-functional requirements of the Patient's Record Management System for National Eye Hospital can be stated as follows.

#### **- Security**

Ever since Patient's Record Management System for Eye Hospital will be implemented, its security will have to be considered as prime important. The view of the system in electronic form raises concerns about patient privacy and data security. System should facilitate every patient in having a separate & unique user account. This will prevent patients or unauthorized personnel from viewing, editing, changing or disabling other patients' data.

The patient information also needs to be readily available to all authorised persons, in order to ensure the proper treatment of the patient.

- *Backup*

The system should be able to be backed up of all the information of patients who have been registered in the Eye hospital. The primary purpose of backing up is to recover data after its loss, deletion or corruption.

- *Documentation*

The system should facilitate in providing online documents such as doctor prescriptions, doctor notes and patients' history records to the patients.

- *Accessibility*

System should be a web based multi user accessible

- *Usability*

System has to offer more user friendly interfaces. The user interface needs designing such a way that any naive user will be able to operate and use the features of the application.

- *Portability*

In an event of hardware failure, the system should be able to be relocated to another PC easily and with minimum system configuration.



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### **3.3.2 Functional Requirements**

Functional requirements are functions of a system or its components. They may be calculations, technical details, data manipulation and processing and other specific functionalities.

The Functional Requirements Specification [25] is designed to be read by a general audience. Readers should understand the system, but no particular technical knowledge should be required to understand the document.

The system shall facilitate different access privileges for director of Eye Hospital, doctors, and registered patients of Eye Hospital in order to gain access to the data.

Functional Requirements of the PRMS are as follows.

- Registering/storing patients details and search patients
- Updating clinic details with the feedback of the consultant and given medicines
- Scan facility of patient's drugs prescription recommended by the consultant

- Support three languages (English, Sinhala and Tamil)
- Update Surgery
- Scheduling Appointments
- Resource Allocation ( Room Availability, Theatre Availability)
- Backup system
- SMS/E-mail functionality

The system should give the following privileges for the Director of Eye Hospital

- View daily attendance of patients who get treatment from Eye Hospital
- View the number of patients treated for different eye diseases category wise
- Get the information about surgeries done by different consultants

The PRMS shall offer following rights for Doctors

- Get the past history of the patients using their ID
- Compare past and present investigation reports/images
- View their surgery details
- View clinic events of relevant doctors

The system needs to provide following facilities for Patients

- Get their history of clinic/ surgery from the system
- Receive email or SMS alerts/reminders on their next visit date, or operation
- Get printouts of their investigation reports

The system should facilitate general public for following activities

- E-channelling facilities to consult a doctor
- Access to web page of Eye Hospital to get information
- New Activities of the Eye Hospital

### **3.3.3 Requirements Gathering Method**

In order to define requirements, it is much essential to have a clear understanding of the main issues and the system model. Following methods were used for collecting data.

#### ***Interviews***

Interviewing is a generally used technique in analysis. Interviews have been done in order to get a clear understanding of the requirements of each layer of the organizational staff. It was

made frequent visits to the National Eye Hospital and interviewed the management staff. The ideas which they pointed out were very useful in developing this research project.

#### ***Talk with stakeholders continuously***

Gathering information from doctors, patients who make frequent visits (clinic patients) to eye hospital, nurses, etc. was very effective in designing the proposed system.

#### ***Referring the relevant Documents***

National Eye Hospital supported a lot in collecting important information. Relevant and important documents which were provided by the hospital were very much effective in designing the system.

### **3.4 System Requirements**

The following resources are required for the proposed system.

The system must have the following **hardware requirements**

Processor	2.0 GHz or higher
RAM	1 GB
Storage	80 GB or higher
Printer	Normal

**Table 3.1: Hardware Requirements**

Following **software requirements** are needed for the new system

Operating System	Microsoft Windows XP or latest
Languages	PHP, HTML, CSS, Java Script
Reporting Tools	Jquery
Database	MySQL
Web Server	Apache / WAMP Server or XAMPP
Microsoft Office Package	MS office 2007
Adobe Collection	Dreamweaver CS5, Photoshop CS5
UML Designing tools	Star UML, MS Visio

**Table 3.2: Software Requirements**

### 3.5 User Requirements

Meeting user requirement is one of the most critical tasks in almost every phase of project development. Following requirements are identified from the users.

#### *Internal Client (Staff members)*

Doctors, nurses, directors should be attached to the National Eye Hospital. They should have a sufficient knowledge of the subject area.

#### *External Client*

The person who needs to register as a patient of the National Eye hospital. It is enough for him or her to have a bit of knowledge of interaction in web.

### 3.6 Summary

The core objective of this project is to develop a Patient's Record Management System. As the first phase, a feasibility study was carried out to ascertain the extent to which the new system improvement is practicable in terms of technically, economically and operationally.

This chapter also described functional and non-functional requirements of the Patient's Record Management System. The section finally described requirement gathering methods used in the project while outlining user requirements related to the proposed system.

#### 4.1 Introduction

This chapter will examine the system design part. It describes methodical approach to the design of the solution. Design is the first step in the development phase for any techniques and principles with the view of defining the system.

Once the software requirements have been analysed and specified, the software design involves three technical activities - design, coding, implementation and testing that are required to build and verify the system [26]. Design is the only way to accurately translate the customer's requirements into a finished system.

The design activities are of main importance in this phase, because in this activity, decisions ultimately affecting the success of the software implementation and its ease of maintenance are made.

#### 4.2 Proposed System

Web based PRMS which is developed for the National Eye Hospital has more dynamic features than most of other health care systems discussed here. The proposed system was mainly designed to keep patients' records (registering patients generate patient's reports and update clinic data of the patients etc.). And also system has given more spaces for patients and their diseases.

The system has been designed in such a way which ensures maximum productivity of its stakeholders. The system will further confirm the protection and accuracy of data which will be delivered to both patients and doctors.

### 4.3 System Architecture

Systems design is the process or art of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. During System design phase, identified system requirements are translated into specifications needed to build the system.

The proposed system is client server architecture since it suits tree tire architecture diagram for the Patient's Records Management System.

Three-Tier client-server architecture has three essential components.

- A Client PC
- An Application Server
- A Database Server

Three-Tier Architecture [27] is considered client program contains presentation logic and less resources needed for client workstation. And it is less code to distribute to client workstations and one server handles many client requests, more resources available for server program and reduces data traffic on the network.



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Typically, the user interface runs on a desktop PC or workstation and uses a standard graphical user interface, functional process logic may consist of one or more separate modules running on a workstation or application server, and an RDBMS on a database server or mainframe contains the data storage logic. Following 4.1figure exposes three-tier architecture for the proposed system.

The 3-tier architecture has the following three tiers.

- Presentation tier
- Business logic tier
- Data tier

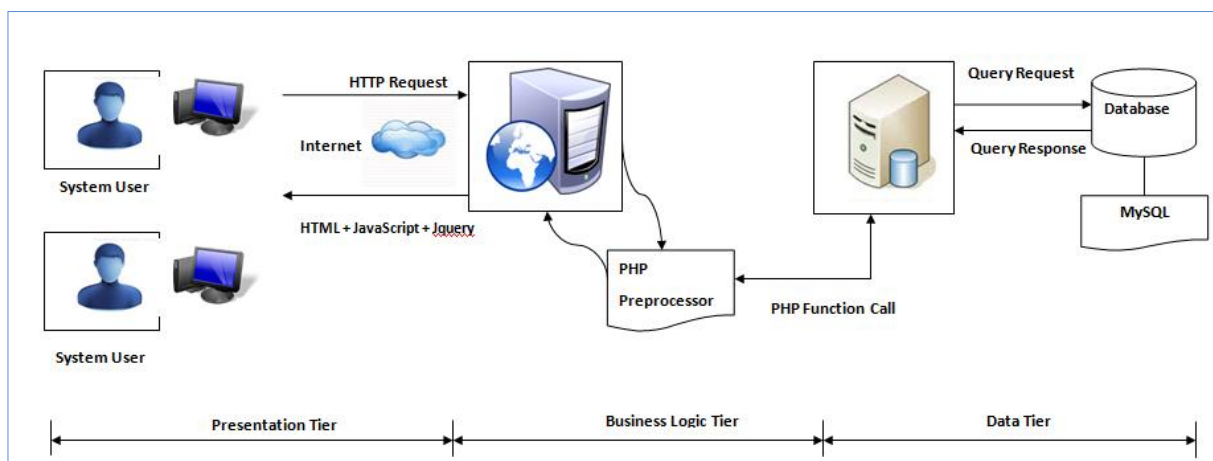


Figure 4.1: Three-Tier Architecture for the Proposed System

Following table describes advantages and disadvantages of Three-Tier Architecture which is very important for the new system.

Advantages	Disadvantages
<u>Development Side:</u> <ul style="list-style-type: none"> <li>- Complex application rules easy to build in application server.</li> <li>- Business logic off-loaded from database server and client, which improves performance.</li> <li>- Changes to business logic automatically enforced by server changes require only new application server software to be Installed.</li> <li>- Application server logic is portable to other database server platforms by virtue of the application software.</li> </ul>	<u>Development Issues:</u> <ul style="list-style-type: none"> <li>- More complex structure.</li> </ul>
<u>Performance:</u> <ul style="list-style-type: none"> <li>- Superior performance for medium to high volume environments.</li> </ul>	<u>Performance:</u> <ul style="list-style-type: none"> <li>- The physical separation of application servers containing business logic functions and database servers containing databases may moderately affect performance.</li> </ul>

Table 4.1: Advantages and Disadvantages of Three-Tier Architecture

## 4.4 UML Diagrams

UML defines four types of diagrams in this research project. Application of Use case diagram, Activity diagram, sequence diagram and class diagram is described below.

### 4.4.1 Use Case Diagram

Use case diagram in UML is a type of behavioural diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals which are represented as use cases, and any dependencies between those use cases.

The main purpose of a use case diagram is to show what system functions are performed by which actor. Roles of the actors in the system can be depicted. It is helpful in exposing requirement analysis.

With the help of system analysis and requirements studies, three main actors are identified for PRMS of Eye Hospital. They are Doctors, Patients and Administrator. The following use case diagram (figure 4.2) illustrates the actions of each actor of the proposed system.



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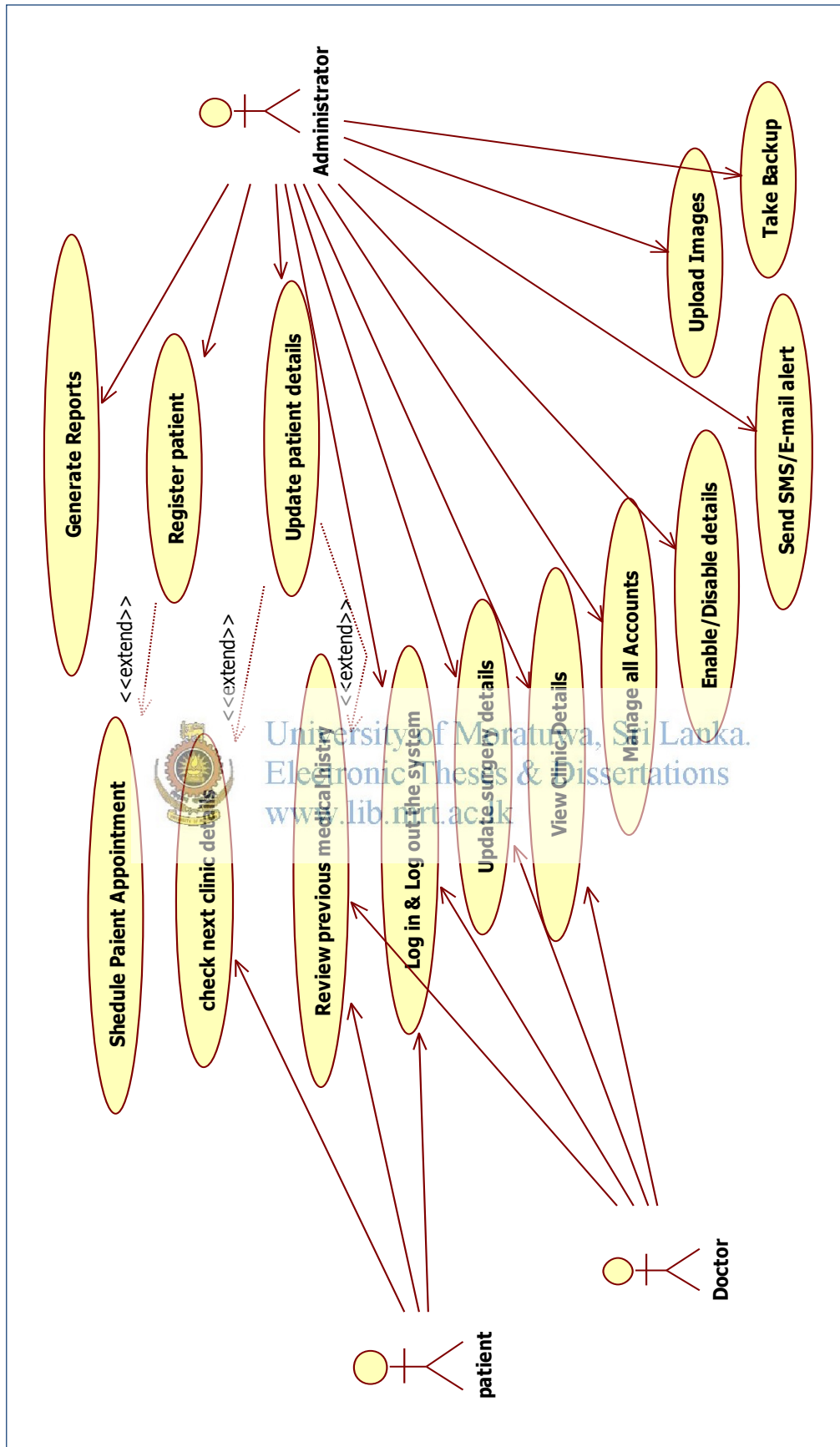


Figure 4.2: Use Case Diagram for the Proposed System

#### ***4.4.2 Activity Diagram***

Activity diagram is a graphical representation of workflow of stepwise activities and actions which support for choice, iteration and concurrency. Activity diagram illustrates the overall flow of control.

Activity diagram of proposed system shows the entire process from registering of a patient to his or her discharge from the hospital. There are three levels of fulfilling this task. This activity diagram can map out processes at both a high and a more granular level. Swimlanes divide the steps by who's doing what.



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## Activity Diagram for Proposed System

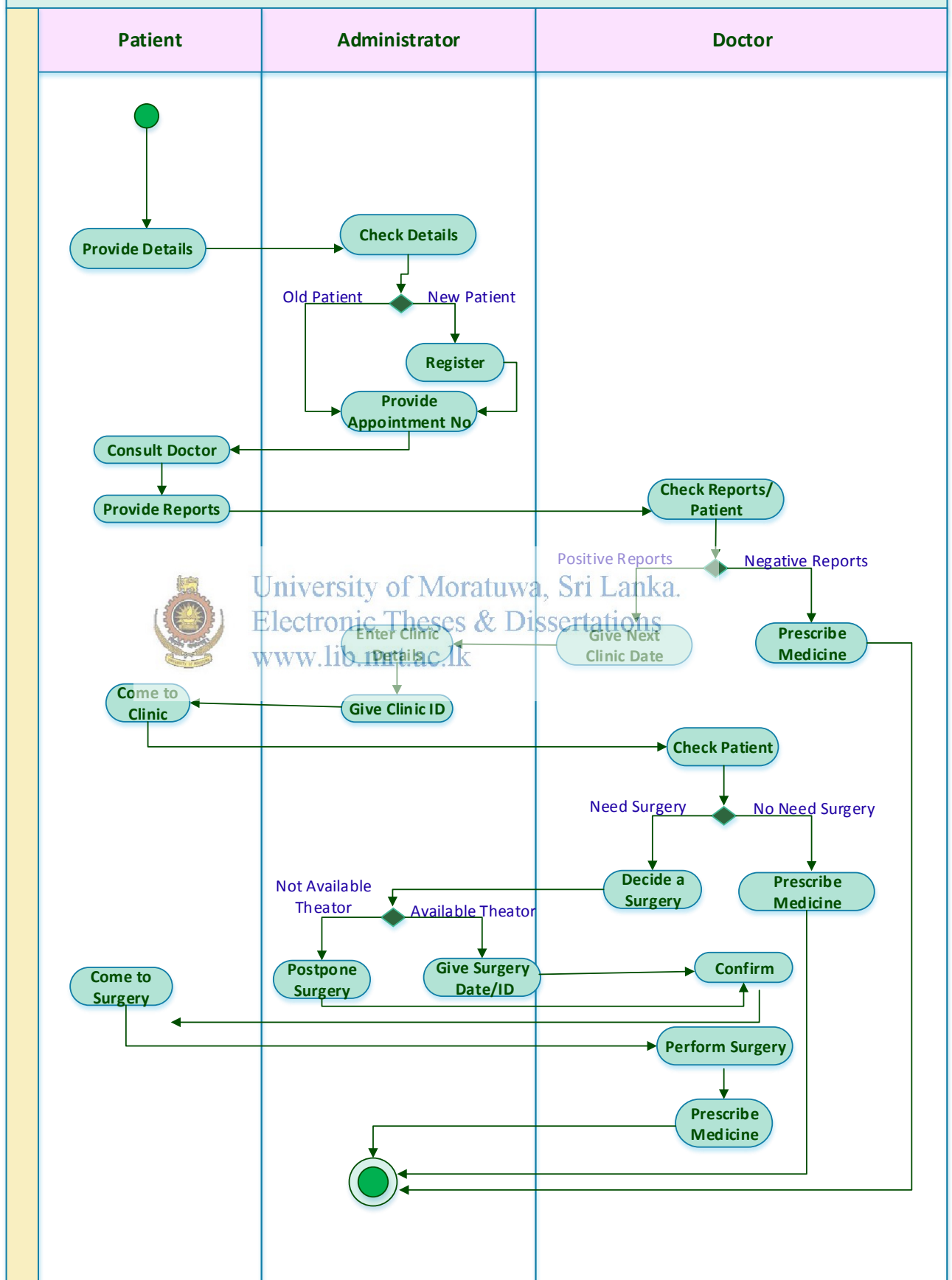


Figure 4.3: Activity diagram for the proposed system

#### ***4.4.3 Class Diagram***

In a class diagram in UML, actors are not limited to the human players in a system. This chart shows how the patient interacts with both healthcare providers (front officer or doctor), and the healthcare system itself.

The Class Diagram is shown a set of classes, interfaces, collaborations and their relating ships. This is the most common diagram in modelling the object oriented systems and it is used to give the static view of a system. It shows the dependency between the classes that can be used in the proposed system. The interactions among the modules or classes of PRMS are shown below. Each block has contained Class Name and Methods.



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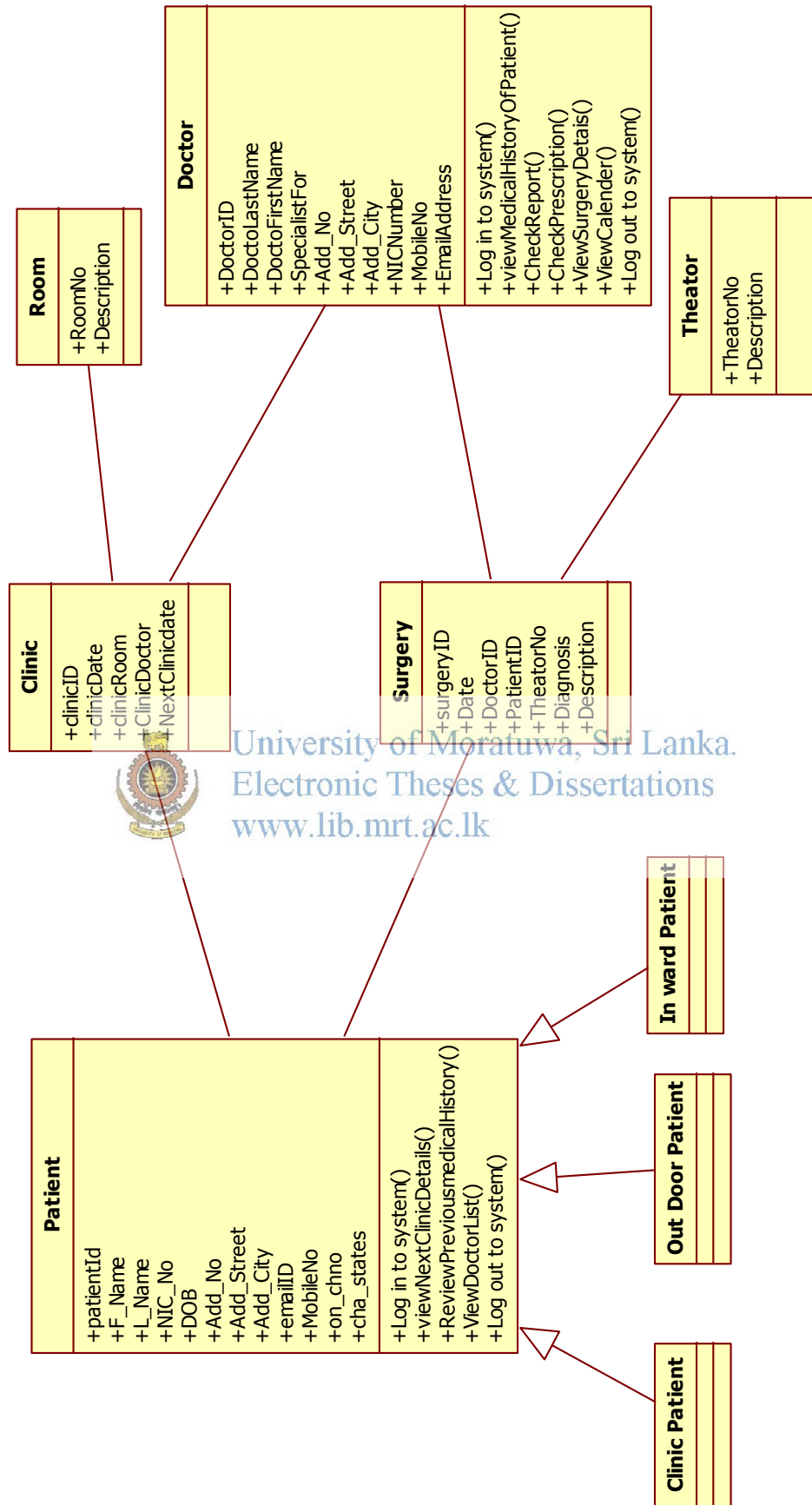


Figure 4.4: Class Diagram for the proposed system

#### 4.4.4 Sequence Diagram

For each activity diagram it can be designed activity diagrams to view the dynamic behaviour of the system. In order to minimize the complexity of the sequence diagrams, only the happy path is considered. Sequence diagram is a kind of interaction diagram that shows how processes operate with one another and in what order.

##### *Patient Registration*

The patient registration process is shown in the following sequence diagram. The administrator initiates the sequence first.

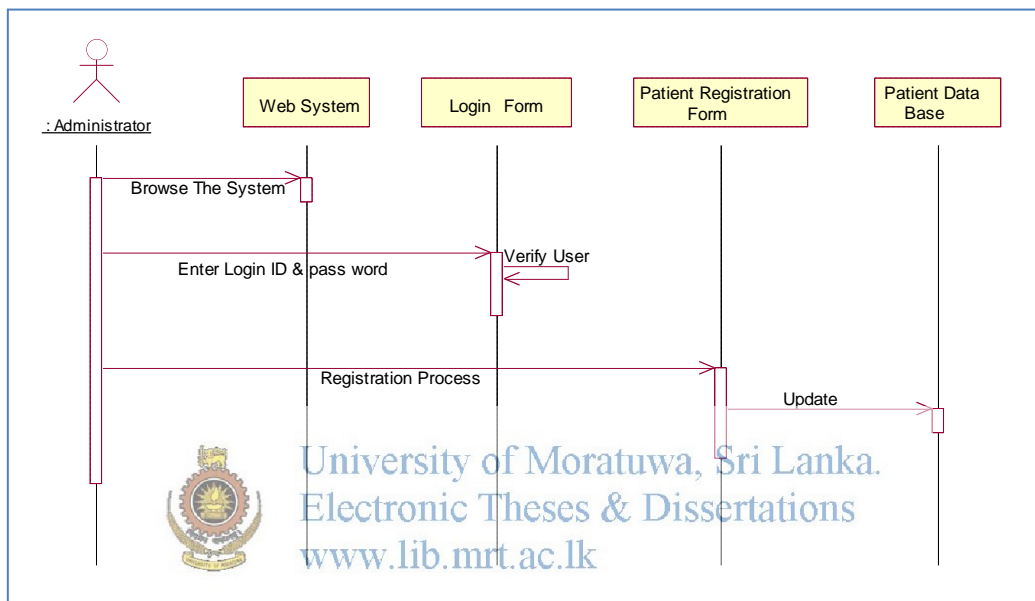


Figure: 4.5 Sequence Diagram for Patient registration

##### **Update Surgery Details**

Following sequence diagram shows how to update surgery details.

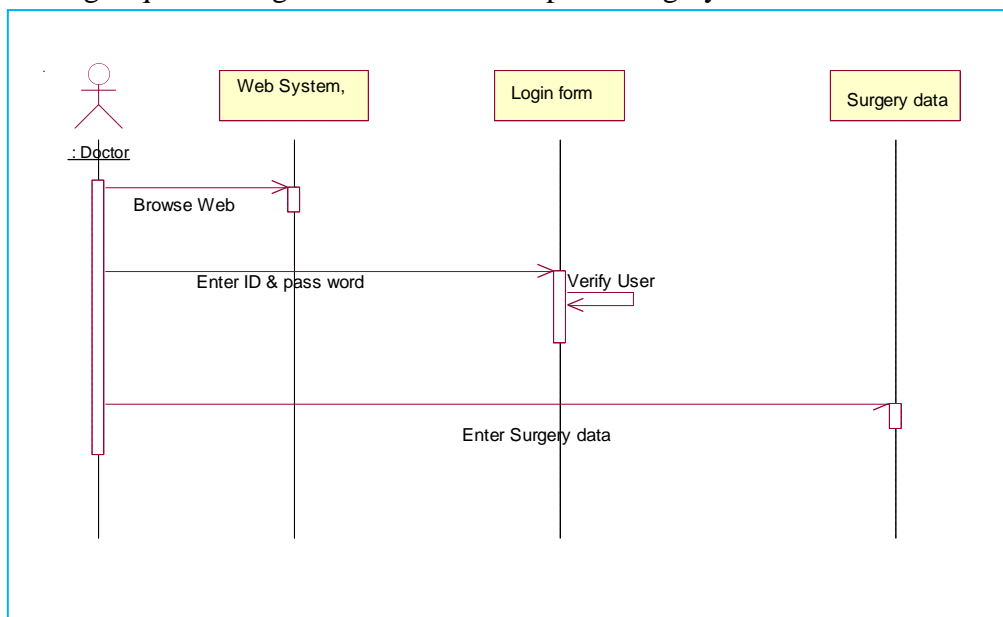


Figure 4.6: Sequence Diagram for Update Surgery Details

## 4.5 Interface Designing of PRMS

Interfaces are the users' interactions to the system in order to get the intended task done. Good User Interface Design can make a product easy to understand and use, which results in greater user acceptance.

Following figure views the login page of the system. Through this login, all registered patients can log on to the system to see their medical information with the help of their user names and passwords. And every registered doctor can log on to the system separately by using their user name & password. Director and the administrator of the hospital have separate accounts. But both of them have same authority. General public can do e channeling without logging on to the system.



The screenshot displays the login interface of the Sri Lanka National Eye Hospital's Patient's Record Management System. The header features a banner with the hospital's name in Sinhala, Tamil, and English, along with the University of Moratuwa logo and text. Below the banner, the system title 'PATIENT'S RECORD MANAGEMENT SYSTEM' and the website 'www.nib.mrt.ac.lk' are visible. The main login area is a green box containing a 'User Login' title, a padlock icon, and input fields for 'User Name', 'Password', and 'Language' (set to English). A 'Logging' button is at the bottom. To the left, a blue sidebar lists links: 'ABOUT THE HOSPITAL', 'NEWS', and 'ONLINE CHANNELING'. To the right, a blue box welcomes users to the system.

Figure 4.7: Interface of Login page

Figure 4.8 displays the “Register of New Patient” form of the Patient’s Record Management System for the Eye Hospital. In this page validation rules are used for the first name, last name, NIC number and email address. JQuery is used for the date of birth.

Figure 4.8: Interface of Register New Patient

#### 4.6 Summary

This chapter explained the design methodologies of the proposed system. It provided designing diagram of Class, sequence, activity. It also declared about the user interface designs. Especially the section outlined the system design architecture of the project. In the Implementation details of the system will be discussed in the next chapter.

# Chapter 5

## Implementation

---

### 5.1 Introduction

Implementation is the fruition of chain of the efforts starting with analysis and it is most important stage in every system. One of the main goals of the implementation is to minimize development time and improve quality by avoiding unnecessary rework.

During the implementation stage of the system, it has converted the detailed design into code in a programming language using PHP and MySQL database. The major product of the implementation stage, the source code, is the ultimate goal of the entire software development process. There is real sense of accomplishment when software reaches its deliverable form.

### 5.2 Implementation environment

Implementation is the stage where the theoretical design is turned into a working system. This is the most crucial stage in achieving a new successful system and giving confidence to users.

Implementation is the realization of an application or execution of a plan, idea, model, design, specification, standard, algorithm or policy. It is also the realization of a technical specification or algorithm as a program, software component or other computer system through programming and deployment.

### 5.3 Software Used

#### *WAMP Server*

WAMP Server has been used as the server for the system. It [28] is easy to install Apache, PHP and MySQL package.

#### **5.3.1 Database**

##### MySQL

MySQL [29] provides a strong data protection. Patients' all data of the PRMS can be stored on separate tables in MySQL database.

### **5.3.2 Development Tools**

#### ***PHP***

PHP is the main language of the proposed system. PHP codes of the PRMS have been used to gather, edit, view data of patients, doctors, surgeries & clinics. The availability of the theatres and doctors can be checked and login passwords of the database have been encrypted by using PHP.

#### ***HTML***

The proposed system has been used HTML considering its user friendliness and its supportiveness on almost every browsers.

#### ***Java Script***

The system has been written to change the way of JQuery. JavaScript has been comprised with JQuery in order to view data of Doctors, Patients, Clinics and Surgeries in the system.

#### ***CSS***

CSS has been designed to enable the separation of document content from document presentation, including elements such as the layout, colours, and fonts.



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### **5.3.3 Dreamweaver**

Dreamweaver has been used for page designing and code editing of the PRMS.

### **5.3.4 UML Designing Tools**

Star UML software is used for Sequence diagram, Class diagram, Use case diagram, and Visio is utilized for creating Activity diagram of this project dissertation. The reason behind using above software for drawing purpose is that they are considered as free & open source.

#### ***Star UML***

The StarUML is used to create class diagrams, sequence diagrams and to make case diagrams of the report.

#### ***Visio***

Visio is an intelligent diagramming program which was very helpful in drawing Activity diagrams of this project dissertation.

### 5.3.5 Reporting Tool

#### *JQuery*

The proposed system has been included jQuery plugins which are available on the web considering the fact that easy implementation in comparison to other applications. The system has created a jQuery plugin for auto complete function.

### 5.3.6 Operating System

The system needs computer with Microsoft Windows XP or latest. The PC should be able to install the WAMP server or XAMMP server for running the system.

### 5.3.7 Hardware Requirement

For an effective operation, the system can be implemented provided the PC with 2.0GHz or higher 32bit or 64bit processor is at least met.

## 5.4 Input/ Output Design Implementation

The input to the system comes from many forms. The system has been included many forms such as patient registration form, doctor form and surgery form, etc. Each of these forms has the functions of collecting specific data of the doctors and the patients based on the requirement.



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The first form is the patient registration form that the system enables administrative officers or front officer to fill required details of patients concerning registration of the hospital.

A screenshot of a web form titled "REGISTER NEW PAIENT" (sic). The form has a blue background and contains the following fields: "First Name:" with a dropdown menu showing "Mr" and a red asterisk; "Last Name:" with a red asterisk; "Name with Initials:" with a red asterisk; "NIC Number:"; "Address No:"; "Address Street:"; "Address City:"; "Date of Birth:"; "Mobile No:"; "Telephone No:"; and "E-mail Address:". A "Submit" button is located at the bottom right.

Figure 5.1: Patient Registration Form

The Patient registration form is an important prerequisite for patient diagnosis in the Hospital programme.

The screen output design is an important task in the development of the human computer interface. The success or failure of a system development effort rests on this element of the design. The output design should be flexible to provide for the adaptation of differing user requirements for display of data.

The following were taken into consideration when designing the screen outputs.

- What are the contents of the screen output?
- The navigation of a page
- How to present information

## 5.5 Database Implementation

MySQL was used for as a database of this system because of its simplicity, superior speed, reliability, and ease of use [30] and MySQL has become the preferred choice for Web. It also helps saving time and money. MySQL is most popular open-source database software.



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The database of the system has been included a collection of tables (patient, doctor, surgery, etc.) that contain many data and other objects.

←T→	sug_id	sug_idauto	sug_date	sug_doc	sug_pat	sug_the	sug_dia	sug_des	sug_adddatetime
<input type="checkbox"/>	5	sur02	2015-03-02	Dr.Charith	PushpaH	Ward 01	Cataract	Operation of eye	2015-01-20 00:00:00
<input type="checkbox"/>	6	sur03	2015-04-08	Dr.Kapila	ApsaraP	Ward 01	Cataract	Must operate the eye on time	2015-01-20 00:00:00
<input type="checkbox"/>	7	sur04	2015-04-15	Dr.Charith	AsankaK	Ward 03	Cataract		2015-01-20 00:00:00
<input type="checkbox"/>	8	sur05	2015-04-15	Dr.Charith	AthulaP	Ward 02	Repair Of Corneal		2015-01-20 00:00:00
<input type="checkbox"/>	9	sur06	2015-04-22	Dr.Manel	KumuduniM	Ward 02	TPPV		2015-01-20 00:00:00
<input type="checkbox"/>	10	sur07	2015-04-23	Dr.Charith	AnushaP	Ward 03	PKP		2015-01-20 00:00:00

Figure 5.2: Surgery Database Table

## 5.6 System Login and Main Modules

Patient's Records Management System for the National Eye Hospital was designed to cover a wide range of hospital patient management processes. It is integrated with patients, doctors, surgery and clinic management that provides relevant information across the hospital to support effective decision making for patient care in a seamless flow. This proposed System is a software product designed to improve the quality and management of clinical care in the areas of clinical process analysis.

The system can be used or logged as an Administrator, a Doctor, and a Registered Patient. Administrative authority of the system can be given to Director, admin or front officer of National Eye Hospital. Doctors and the patients have limitations to logging into the system. The following diagram describes the main functions and the flow of system operations of the proposed system.



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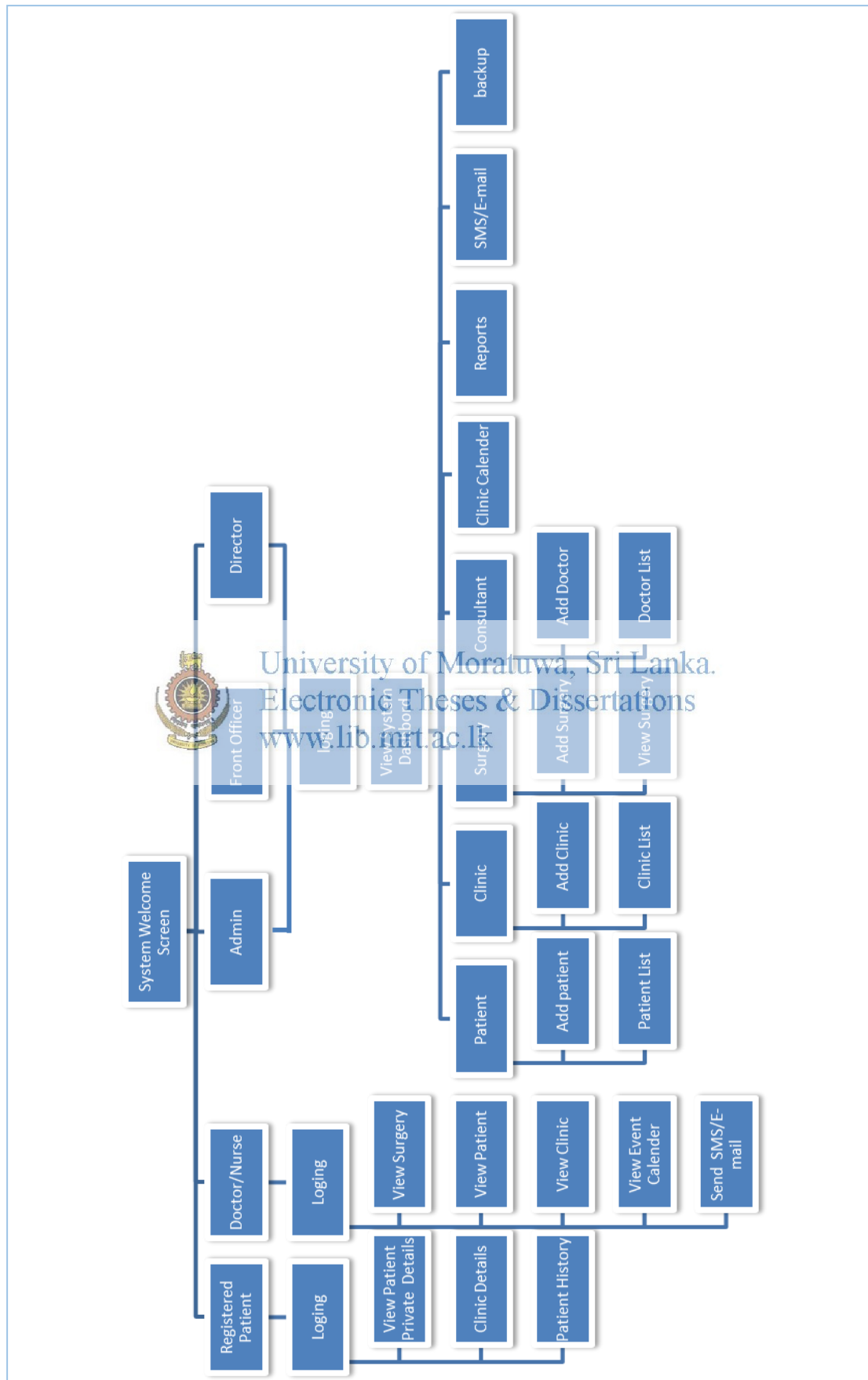


Figure 5.3: System Flow Diagram of Proposed system

Patient record management system is advanced, powerful, and flexible for the National Eye hospital. Main key features of the PRMS are as follows,

#### ***Patient:***

In patient module, patients can be registered as new patients. In patient registration, the system should be entered the basic information of patients and identified them by enabling validations and verifications. When filling in patient details, users are unable to skip some compulsorily required fields. ID number of a patient is validated to 11 characters. Although E-mail address field must be entered a valid e-mail address, it is not essentially required.

In this module, the system displays the patient list with special functionalities which enable users to search any patient by using date, name or patient Id. Functionalities refer to patient history, doctor prescription and disabling patients and edit patient are covered in this module.

#### ***Doctors:***

In this module, system facilitates doctor registration with their speciality. Similar to patient registration, some fields of the doctor registration have also been developed validation & verification. The system supports viewing the doctors list in this module.



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#### ***Online Appointments Scheduling:***

Online appointment scheduling enables patients to make online appointments for their preferred doctors. If a patient needs to make an appointment for a particular doctor, then he or she can search the availability of doctors by referring the drop down list. Once online registration form is completed and submitted then an appointment number will be shown in the system.

#### ***Clinic***

In this module, the system has been developed including two types of clinic management functionalities called add clinic data and view clinic list.

#### ***Surgery***

Surgery module facilitates users to add surgery details and view surgery list. The system was developed in such a way that the user can check for theatre availability in the hospital.

### ***E-mail/SMS***

This module is a separate module in the system. This module facilitates communicating messages for both doctors and patients. PRMS has the ability of sending an SMS or an email to both parties simultaneously. The system has been configured Gammu software for sending e-mails.

### ***Reports***

The system generates some important reports such as Doctor wise Patients, Clinic wise patients, Number of surgeries per month, Registered patient within a data range, Number of OPD/Clinic patients per month, Comparison of number of patient visits the hospital for a given time range etc.

Reports can be seen only by the doctor, director of the Hospital and the person who has admin authority of the system. Reports have been developed by using a jQuery plugin.

## **5.7 Summery**

This chapter mainly describes the development tools used during the process of the Patient's Records Management System. WAMP server has been used as the basic infrastructure for the system. The system has been written the codes in PHP, HTML and Javascript. *phpmyadmin* has been used in order to manage the MySQL database.

Main modules of the system were described in this chapter while highlighting techniques & tools used in developing those modules.

### **6.1 Introduction**

This chapter presents the evaluation of the project which is more important for the organization as well as the system developers. At this final stage it is necessary that the prototype is critically evaluated in order to decide whether the project is a success or a failure.

The system has been designed in such a way that enables users to store, retrieval and updating the diagnostic history of patients in an efficient and effective manner. Online channeling plus SMS/e-mail facilities are some other important functionalities of the system. As far as PRMS is concerned, the system provides expected benefits to its stakeholders.

The system design and development were carried out in a systematic manner and based on user requirements defined by the end users. The design objectives of creating an efficient system was further accomplished with the creation of add, enable/disable, search and edit functionalities in the developed system. All these functionalities possess a relatively high level of accuracy.



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### **6.2 Evaluation Criteria**

Evaluation was carried out to obtain remarks, opinions and suggestions about the product. Several evaluating techniques such as interviews, questionnaires and demonstrations were used in this purpose. Especially questionnaire was a very effective tool for collecting information from a large number of people. Since questionnaires are relatively inexpensive to developer in comparison to other method of gathering information, they were successfully utilized in collecting information refers to process evaluation or outcome evaluation (See appendix C for the questionnaire).

### **6.3 Testing the System**

The testing phase is an important part of software development. It is the computerized system will help in automate process of finding errors and missing operations and also a complete verification to determine whether the objectives are met and the user requirements are satisfied. Further testing has been identified as the processes intend to build confidence in the software and convince the system developers and the end users that the enhancement made to

the system is good enough for operational use [31]. Testing is a crucial element of software quality assurance and it presents an ultimate review of specifications, designs and coding. A good test case is one that has a high probability of finding undiscovered errors. A successful test is one that uncovers undiscovered errors.

Test plans and test data used to test the system differ with the particular levels and they are described in the table below. Black Box methodology was used to test the system. Test cases were generated covering all the modules. Following tables show login test case and E-mail/SMS test case of the system.

Other test cases can be viewed by referring the Appendix D.

Test case for login



Test Case ID	001
Procedure	Clicking the <i>login</i> button without providing user name or password
Input Data	Leave blanked
Expected Results	Red coloured text of displaying the error <div style="text-align: center;">  <p>University of Moratuwa, Sri Lanka.          Electronic Theses &amp; Dissertations          www.lib.mrt.ac.lk</p> </div>
Actual Results	Red coloured text of displaying the error <div style="text-align: center;">  <p>University of Moratuwa, Sri Lanka.          Electronic Theses &amp; Dissertations          www.lib.mrt.ac.lk</p> </div>
Tested By	Developer, Client

Table 6.1: Login Test Case (001)

Test case for sending E-mail/SMS

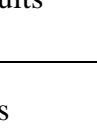
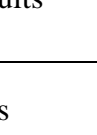
Test Case ID	002
Procedure	Clicking the area of “Add E-mails or Mobile Numbers” without selecting at least one E-mail or Mobile Number
Input Data	Not selecting checkbox
Expected Results	Displaying the error <div style="text-align: center;">  <p>University of Moratuwa, Sri Lanka.          Electronic Theses &amp; Dissertations          www.lib.mrt.ac.lk</p> </div> <ul style="list-style-type: none"> <li>▪ Please select at least one checkbox</li> </ul>
Actual Results	Displaying the error <div style="text-align: center;">  <p>University of Moratuwa, Sri Lanka.          Electronic Theses &amp; Dissertations          www.lib.mrt.ac.lk</p> </div> <ul style="list-style-type: none"> <li>▪ Please select at least one checkbox</li> </ul>
Tested By	Developer, Client

Table 6.2: E-mail/SMS Test case (002)

## **6.4 Unit testing**

A product limit is the smallest piece of code that can be independently tested. From an object oriented programming perspective, classes, properties, methods and events are all individual units. A unit should pass its unit test before it is checked in to the project for integration. A unit test might take sample data and calculate a result, and then compare that result against the expected result to check for accuracy.

## **6.5 Integration testing**

Integration testing really becomes just an extension of unit testing, though the focus is to check if the unit works together.

## **6.6 Summary**

This chapter described evaluation & the testing of the developed system. Testing builds confidence in the software and convinces the system developers and the end users that the enhancement made to the system is good enough for operational use. Black box testing methodology was used to test the system.



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### 7.1 Introduction

This chapter presents the conclusion of the project which is also more important for client and the system developer. Chapter has described project limitations, problems uncounted while developing the system and future improvements.

### 7.2 Limitations of the Project

The system has few shortcomings to overcome. One is that the patient need to enter a valid mobile number or e-mail address at the point of registering in order that the patient could receive an alert message from PRMS refers to his or her health concerns. SMS/e-mail part is a very important aspect of the system. And the patient must register for logging to the system with user ID and password to display their clinic data otherwise patient can't be logged to their data.

### 7.3 Problem Encountered

In attempting to design the system, the following problems were encountered.

Details of patients are sensitive data, because of that reason obtaining the real records from the eye hospital was a difficult task.

Medical processes and records are separated and independent from each and every departments, obtaining the overall process of the eye hospital was a complicated process. Because of that reason, defining the scope was complicated.

The knowledge required to develop such a system had to study in order to adopt it, because there was no prior healthcare System of the government hospitals in Sri Lanka. Feasibility study is little challenging to cope up with eye hospital's staff busy schedules.

Time management was a frequently faced obstacle. Even when finally succeeded in finishing both the system and the report before the deadline.

#### 7.4 Future Enhancements

In addition to limitations of the project presented, there is a scope for work to further improve the functionality and usefulness of this project. The researcher therefore makes following recommendations for future enhancements of the system.

Considering the fact of limited time, the project scope had to be limited only to clinics and surgeries performed in the eye hospital. Hence the scope can further be widened to include Pharmacy, Staff of the hospital to make a more integrated and comprehensive system which covers the entire hospital's records management.

A few other additional components can be included in the system in future. This may include the ability to compute calculations such as determining a patient's next appointment date. Payments gateway and Patient tickets generation functionalities are two crucial items which are expected to be included in the system for the future enhancements.

The system can also be further enhanced so that the patients themselves have access to more additional information of the hospital online in a secure manner (Eg: to select online clinic patient themselves).



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In Conclusion, after a proper analysis and assessment of the designed system, it can be safely concluded that the system is an efficient, usable and reliable records management system. It is working properly and adequately meets the minimum expectations that were set initially.

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# APPENDIX – A

## Project Charter

PROJECT CHARTER	
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Title of the Project	PATIENT'S RECORD MANAGEMENT SYSTEM FOR NATIONAL EYE HOSPITAL OF SRI LANKA
Supervisor	<p><b>Name</b> : Dr. G.D.S.Prasad Wimalaratne</p> <p><b>Organization</b> : University of Colombo School of Computing</p> <p><b>Designation</b> : Senior Lecturer</p> <p><b>Address</b> : University of Colombo School of Computing</p> <p>: UCSC Building Complex</p> <p>University of Moratuwa, Sri Lanka.</p> <p>35, Reid Avenue,</p> <p>Electronic Theses &amp; Dissertations</p> <p>Colombo 07</p> <p><a href="http://www.lib.mrt.ac.lk">www.lib.mrt.ac.lk</a></p> <p><b>Telephone</b> : 077-3832223</p> <p><b>E-mail</b> : pwimalaratne@gmail.com</p>
1	Introduction
2	Literature and Technology Review
3	Requirements Analysis
4	Designing
5	Implementation
6	Evaluation & Testing
7	Conclusion

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- Send sms/e-mail to patient
- Search patient
- Add next clinic date to patient
- View Calendar
- View reports

#### **5. Patient Logging**

- View patient history
- View next clinic date
- Got SMS/e-mails



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#### **6. General Public Functionalities**

- Online channelling
- Get details about the Eye Hospital
- News/New Activities of the hospital

## 1. Introduction

This user manual is designed to give user guidelines on how to use the system. This Patient's Records Management System includes three main loggings. Web based application to provide patient's functions, doctor's functions and administrator's functions. Patient, doctor and administrator have different authority levels.

## 2. Installation of the System

The information system has been used PHP, MySQL and Apache technologies. This platform can be implemented in two methods from the perspective of local hosting and online hosting.

### 1. Localhost Installation:

For the development and testing purposes, localhost installation can be used. First WAMP server must be installed into the computer which is going to be used to development and testing purposes of the information system. Then the developed software system must be copied into the WWW directory of the wamp folder. After that import the database of the system into the MySQL DBMS and set the parameters of the database.

### 2. Real time online system Installation:

In order to use the system in online it must be installed in the server. In order to do that following steps must be followed.

#### **Step 1:**

Get the web address or URL from the authorized body in order to use the system.

#### **Step 2:**

Purchase the web space of a server to store the system and the database. Get the username and password of the control panel of the server.

#### **Step 3:**

Upload the information system and the database by using appropriate software such as FileZilla

### 3. Administrator Login

- User logging



**PATIENT'S RECORD MANAGEMENT SYSTEM**

**User Login**

User Name :

Password :

Language : English ▾

ABOUT THE HOSPITAL  
NEWS  
ONLINE CHANNELING

Welcome to  
Patient's Record  
Management System of  
National Eye Hospital in Sri  
Lanka

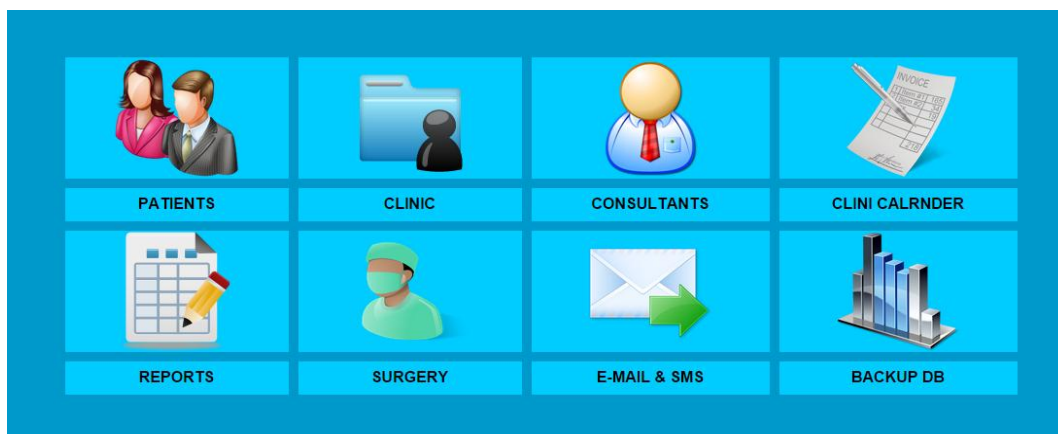
- Enter Username and Password
- Select the language (English/Sinhala/Tamil)
- Then click on Login button



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- View System Dashboard

*After clicked the logging button then view the system dashboard*



*Click on doctor icon in the dashboard or any other*

- Manage doctor functions
  - Add doctor details

The screenshot shows a web browser window with the URL `localhost/Eye/admin/add_doctors.php`. The page has a navigation bar with links: HOME, PATIENT, CLINIC, CONSULTANTS, SURGERY, EVENT CALENDER, REPORT, E-MAIL SMS, RESTORE, and LOGOUT. A dropdown menu for 'CONSULTANTS' is open, showing 'Add Doctors' and 'Doctors List'. The 'Add Doctors' form is titled 'ADD DOCTORS / CONSULTANTS' and contains the following fields: (Mr/Ms), Doctor's ID, Doctor's First Name, Doctor's Last Name, Specialist For, NIC Number, Address No., Address Street, Address City, Mobile No., Telephone No., and e-mail Address. A 'Submit' button is located at the bottom right of the form.

1. Select “CONSULTATIONS” on the menu
2. Then click “Add Doctor”

Enter doctor’s information

*Note: You must fill compulsory fields with an \* mark. If you don’t fill it, you won’t be able to submit the doctor’s details.*



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- View doctor’s details

The screenshot shows a web browser window with the URL `localhost/Eye/admin/view_doctors.php`. The page has the same navigation bar as the previous screenshot. Below the navigation bar, there is a search bar with fields for 'First Name' and 'Last Name', and a 'FIND' button. Below the search bar is a table of doctors.

Doctor ID	NIC No	Doctor Name	Telephone	Specialist For	Disable
Dr.Mangala	719562344V	Mangala Gamage	0777658456/0112564872	Ophthalmologist	Disable
Dr. Muditha	796421045V	Muditha Kulathunga	0759636522/0112896354	Ophthalmologist	Disable
Dr.Vasuki	695487564V	Vasuki Gurusamy	7184568752/0112458769	Ophthalmologist	Disable
Dr.Manel	758456872V	Manel Pasquel	0718654892/0112658475	Ophthalmologist	Disable
Dr.Anuradha	804578214V	Anuradha Dharmarathna	0726587458/0112455878	Ophthalmologist	Disable
Dr.Mangala	794587654V	Mangala Dhanapala	0718589966/0112548762	Vitreo-Retinal Surgeon	Disable
Dr.Kapila	764587564V	Kapila Banduthilaka	0777754875/0112548657	Vitreo-Retinal Surgeon	Disable
Dr.Dharshani	827895462V	Dharshani Wijewardana	0718678546/0112354875	Anaesthetists	Disable
Dr.Ranjith	694587564V	Ranjith Dissanayake	0715485623/0112546879	Anaesthetists	Disable
Dr.Sriyani	784586785V	Sriyani Nanayakara	0715846985/0112548756	Anaesthetists	Disable

1. Select consultation button on the menu

2. Then select doctor list

○ Disable doctor

1. Click consultation button on the menu

2. Then select doctor list

3. After click on disable button

○ Search doctor

1. Click consultation button on the menu

2. Then select doctor list

3. Then search doctor by entering “first name” or “last name” or registered date.

4. Click “FIND” Button

○ Edit doctor’s details

1. Click consultation button on the menu

2. Then select doctor list

3. Click on a doctor name for editing

Enter details that you want to edit and click submit button



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▪ Manage Patient Functions

○ Add patient

A screenshot of a web application titled "EYE HOSPITAL INFORMATION". The browser address bar shows "localhost/Eye/admin/add\_patient.php". The navigation menu includes: HOME, PATIENT (selected), CLINIC, CONSULTANTS, SURGERY, EVENT CALENDER, REPORT, E-MAIL SMS, RESTORE, and LOGOUT. On the left sidebar, there are two buttons: "Add Patient" (highlighted in blue) and "Patient List". The main content area is titled "REGISTER NEW PAIENT" and contains a form with the following fields: First Name (with a dropdown menu showing "Mr"), Last Name, Name with Initials, NIC Number, Address No, Address Street, Address City, Date of Birth, Mobile No, Telephone No, and E-mail Address. Each field has a red asterisk indicating it is required. A "Submit" button is located at the bottom right of the form.

1. Select “patient” on the menu and click “add patient”

2. Enter patient’s details

**Note:** You must fill compulsory fields with an \* mark. If you don't fill it, you won't be able to submit the patient's details.

- View patient details

Patient ID	Patient Name	Date of Birth	Patient History	Add Clinic Date	Disable
247		1982/01/21	HI		Disable
255		1971/02/05	HI		Disable
256		1982/3/5	HI		Disable
257	Sampath Kumara	1980/12/02	HI		Disable
258	Baby Shamika Supuni	2011/01/01	HI		Disable
259	Subashini Kanchanamala	1973/8/3	HI		Disable
260	Apsara Perera	1989/04/20	HI		Disable
261	Kumuduni Maliyadda	1968/11/05	HI		Disable
262	Saman Kodithuwakku	1971/06/25	HI		Disable
263	Athula Perera	1983/2/5	HI		Disable



- Disable patient
  1. Select patient button on the menu
  2. Then select patient list
  3. Click on disable button that you need to disable one
- Search patient
  1. Select patient button on the menu
  2. Then select patient list
  3. Search by entering patient Id or first name or last name or registered date
  4. Click "Find" Button
- Edit patient's details
  1. Select patient button on the menu
  2. Then select patient list
  3. Click on a patient name
  4. Then edit the details and click submit button

- Add patient's clinic details

1. Select “patient” button on the menu
2. Then select “patient list”
3. Click “add clinic date” of any patient
4. Then add clinic date that has appeared on the window

- View patient's clinic details

1. Select “patient” on the menu
2. Then select “patient list”

3. Click “patient history” of any patient
4. View clinic details of the patient

- Add doctor’s prescription

The screenshot shows a web application interface for an eye hospital. The top navigation bar includes links: HOME, PATIENT, CLINIC, CONSULTANTS, SURGERY, EVENT CALENDER, REPORT, E-MAIL SMS, RESTORE, and LOGOUT. The main content area is divided into two sections. The top section, titled 'PATIENT RECORDS', contains a table with the following data:

Date	Doctor Remarks	Next Clinic Date	Prescription
2015-01-21	Need to come next clinic date	2015-03-05	<a href="#">CLICK</a>
2015-01-22	Bring all reports	2015-03-27	<a href="#">CLICK</a>
2015-01-23	need to do a scan	2015-03-25	<a href="#">CLICK</a>

The bottom section, titled 'ADD CLINIC RECORD', contains a form with the following fields:

- Date: 2015-02-07
- Scan Images: Choose File (No file chosen)
- Reason: Glaucoma (dropdown menu)
- Doctor Remarks: (text input field)
- Next Clinic date: (text input field)
- Submit: (button)

1. Select “patient” on the menu
2. Then select “patient list”
3. Then click “patient history” in any patient
4. And click the link “ADD CLINIC RECODE”

5. Then fill date, scan image, reason mean disease, doctor remarks, and next clinic date.
6. Click “submit” button

- View doctor’s prescription

After submit above details viewed a table with Date, doctor remarks, next clinic date and prescription.

Then click on “prescription” link and appear the scanned image of doctor prescription.

#### ▪ Manage Surgery Functions

- Add surgery

1. Select surgery and click “add surgery details”

2. Enter the surgery details and click “submit” button

*Note: You must fill compulsory fields with an \* mark. If you don't fill it, you won't be able to submit the surgery details. Check the availability of the theatre.*

- View surgery details

Date	Surgery Id	Doctor Id	Patient Id	Ward No
2015-03-02	sur02	Dr.Charith	PushpaH	Ward 01
2015-04-08	sur03	Dr.Kapila	ApsaraP	Ward 01
2015-04-15	sur04	Dr.Charith	AsankaK	Ward 03
2015-04-15	sur05	Dr.Charith	AthulaP	Ward 02
2015-04-22	sur06	Dr.Manel	KumuduniM	Ward 02
2015-04-23	sur07	Dr.Charith	AnushaP	Ward 03

1. Select “SURGERY” on the menu

2. Then click “View Surgery Details”

- Edit surgery details
  1. Select “SURGERY” on the menu
  2. click “view surgery details”
  3. click on “surgery ID” and edit the values
  4. click on “Submit” button
  
- Disable surgery details
  1. Select “surgery” on the menu
  2. click “view surgery details”
  3. Then click “disable” in relevant field

▪ Manage Clinic Functions

- Add new clinic

The screenshot shows a web browser window with the URL `localhost/Eye/admin/add_clinic.php`. The page has a navigation bar with links: HOME, PATIENT, CLINIC, CONSULTANTS, SURGERY, EVENT CALENDER, REPORT, E-MAIL SMS, RESTORE, and LOGOUT. The main content area is titled 'ADD NEW CLINIC' and contains a form with the following fields:

- Type: Clinic (dropdown menu)
- Clinic Name: Glaucoma clinic
- Clinic No.: 05
- Date: 2015/03/13
- Room Number: 3
- Fee: 1.50 per day

A 'Submit' button is located at the bottom right of the form. A watermark for the University of Moratuwa, Sri Lanka, is visible across the center of the form.

1. Select “Clinic” on the menu
2. Click “add clinic”
3. Enter the clinic details and click submit button

**Note:** You must fill compulsory fields with an \* mark. If you don’t fill it, you won’t be able to submit the clinic details.

- View clinic details

Type	Clinic Day	Clinic Date	Clinic Time	Doctor	Room
Clinic	Monday	2015-03-02	01:00:00 - 12:00:00	Dr.ManeI	01
Clinic	Wednesday	2015-03-18	08:00:00 - 12:00:00	Dr.Charith	02
Clinic	Thursday	2015-03-26	01:00:00 - 04:00:00	Dr.Mangala	03
Clinic	Wednesday	2015-03-18	02:00:00 - 04:00:00	Dr. Muditha	01
Clinic	Friday	2015-03-27	01:00:00 - 04:00:00	Dr.ManeI	14
Clinic	Monday	2015-03-02	14:00:00 - 16:00:00	Dr.ManeI	2
Clinic	Thursday	2015-03-26	14:00:00 - 16:00:00	Dr. Muditha	14
Clinic	Tuesday	2015-03-31	15:00:00 - 17:00:00	Dr.Charith	3
Clinic	Thursday	2015-04-02	12:00:00 - 15:00:00	Dr.Mangala	4
Clinic	Monday	2015-04-06	10:00:00 - 12:00:00	Dr.Kapila	14

1. Select “CLINIC” on the menu
2. Then click “Clinic List” Details

- Edit clinic

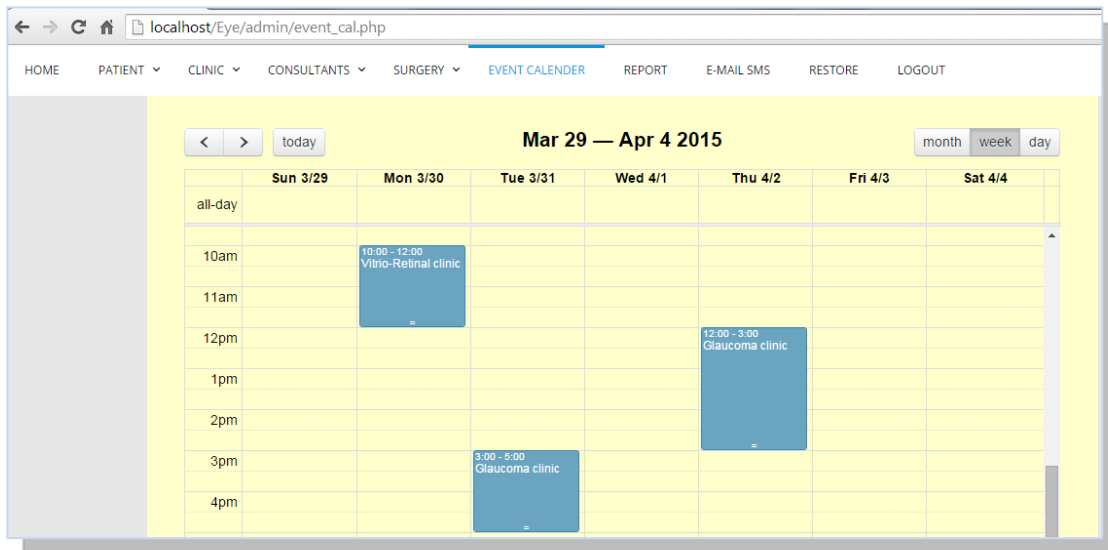
1. Select “CLINIC” on the menu



- Search clinic

1. Select “CLINIC” on the menu
2. Click “Clinic List”
3. Search by Day or Date you entered to the clinic
4. Click “Find” Button

## ▪ View Event Calendar

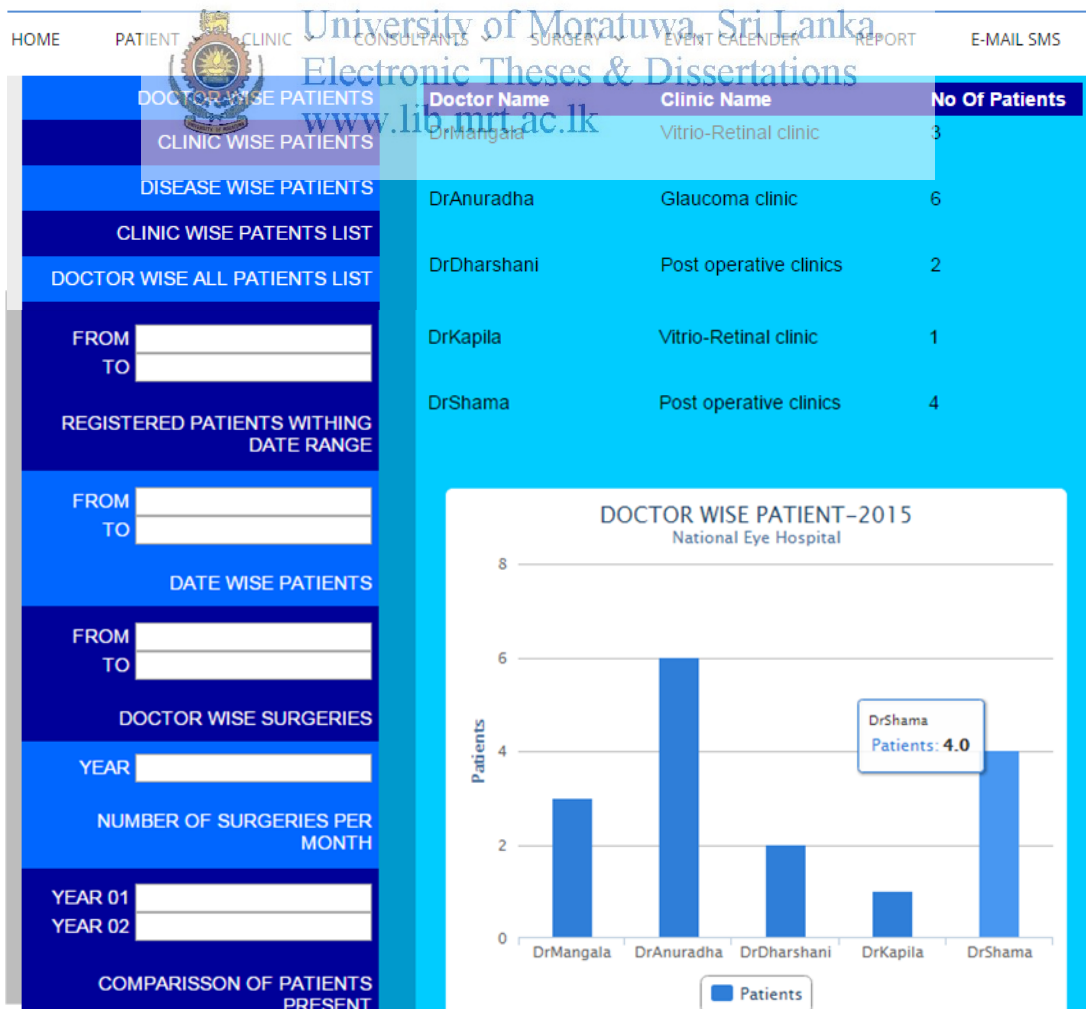


1. Click “EVENT CALANDER” on the menu

2. It shows clinic dates and times

**Note:** you can get it monthly wise or week wise or day wise

## ▪ View Report



1. Select “REPORT” on the menu
2. Click any report of ten on the left hand

▪ Get Printouts of The Reports

The screenshot shows a web browser window with the URL `localhost/PRMS_New/admin/do_v_pa_print.php`. The page is titled "DOCTOR WISE PATIENT REPORTS". On the left, there is a "Print" sidebar with the following options:

- Total: 1 sheet of paper
- Print button (blue)
- Cancel button (grey)
- Destination: Canon iR2420 UFRII LT (with a "Change..." button)
- Pages: ☒ All, ☐ e.g. 1-5, 8, 11-13
- Copies: 1 (with + and - buttons)
- Layout: Portrait (dropdown menu)
- + More settings
- Print using system dialog... (Ctrl+Shift+P)

The main content area displays a table of doctor-wise patient reports and a corresponding bar chart.

Doctor Name	Clinic Name	No Of Patient
DrMangala	Vitrio-Retinal clinic	3
DrAnuradha	Glaucoma clinic	6
DrDharsani	Post operative clinics	2
DrKapila	Vitrio-Retinal clinic	1
DrShama	Post operative clinics	4

Below the table is a bar chart titled "DOCTOR WISE PATIENT-2015 National Eye Hospital". The Y-axis is labeled "Patients" and ranges from 0 to 8. The X-axis lists the doctors: DrMangala, DrAnuradha, DrDharsani, DrKapila, and DrShama. The bars represent the number of patients for each doctor: DrMangala (3), DrAnuradha (6), DrDharsani (2), DrKapila (1), and DrShama (4).

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1. Select “REPORT” on the menu
2. Click any report on the left hand
3. Click “Print” button on the report
4. Then get a printout of the report as you wish

▪ Send SMS/E-Mail to Patients and Doctors

*Doctor Wise*

localhost/Eye%20Hospital/admin/email-sms.php


Babylon Search (1) cse.lk - Web Sear... JOHN KEELLS HOLD... CSE Babylon Search (1) cse.lk - Web

NT CLINIC CONSULTANT SURGERY EVENT CALENDER REPORT E-MAIL SMS

### E-MAIL/SMS DETAILS

Doctor ID Slect Clinic Name Slect

DOCTOR ID	E-mail	Mobile	Mobile	E-mail
DrFonseka			<input checked="" type="checkbox"/>	<input type="checkbox"/>
DrSriyani	sriyani@gmail.com	0777866454	<input type="checkbox"/>	<input type="checkbox"/>
DrShama	shama@gmail.com	0714586954	<input type="checkbox"/>	<input type="checkbox"/>
DrMuditha	mahinda.rajakaruna@gmail.com	0718547854	<input checked="" type="checkbox"/>	<input type="checkbox"/>
DrIshara	anupama.pathiraja@gmail.com	0777856954	<input type="checkbox"/>	<input type="checkbox"/>
DrRanjith	dissa@yahoo.com	0767854692	<input type="checkbox"/>	<input type="checkbox"/>
DrDharshani	dharshani@gmail.com	0777458699	<input type="checkbox"/>	<input type="checkbox"/>
DrKapila	kapila@gmail.com	0724586975	<input checked="" type="checkbox"/>	<input type="checkbox"/>
DrAnuradha	anupamapma@gmail.com	0777458764	<input type="checkbox"/>	<input type="checkbox"/>
DrManel	pathiraja.anu@gmail.com	0784589654	<input type="checkbox"/>	<input type="checkbox"/>
DrVasuki	guru@gmail.com	0777758695	<input type="checkbox"/>	<input type="checkbox"/>
DrPasad			<input type="checkbox"/>	<input type="checkbox"/>
DrDirector			<input type="checkbox"/>	<input type="checkbox"/>

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E-mail Or Mobile  
0718589966,0718547854;0724586975

Your Message  
National Eye Hospital

Send E-mail Send SMS

1. Select "E-MAIL/SMS" on the menu
2. Select the check box of the relevant doctors
3. Click on "Add E-mails or Mobile Number"
4. Type your message
5. Then click on E-mail or SMS button

**Note:** You can send sms/e-mail doctor wise here

## Patient wise

PATIENT ▾ CLINIC ▾ CONSULTANT ▾ SURGERY ▾ EVENT CALENDER REPORT E-MAIL SMS RESTORE

### E-MAIL/SMS DETAILS


Doctor ID ▾ DrShama ▾ Clinic Name ▾ Slect ▾

Doctor ID	Doctor's Name	E-mail	Mobile	Mobile	E-mail
DrShama	DrShama	nawagamuwa@gmail.com	0724568952	<input checked="" type="checkbox"/>	<input type="checkbox"/>
DrShama	DrShama	padmakumara@gmail.com	7145869523	<input checked="" type="checkbox"/>	<input type="checkbox"/>
DrShama	DrShama	sdha@hotmail.com	0777154869	<input checked="" type="checkbox"/>	<input type="checkbox"/>
DrShama	DrShama	anupamapma@gmail.com	0752365987	<input checked="" type="checkbox"/>	<input type="checkbox"/>

**Add E-mails or Mobile Numbers**

E-mail Or Mobile: 8952,7145869523,0777154869,0752365987

Your Message: National Eye Hospital

1. Select "E-MAIL/SMS" on the menu
2. Then click "doctor ID" and select a doctor  


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 You can see list of patients and their e-mail/phone numbers  
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3. Then select the check box of the relevant patients
4. Click on "Add E-mails or Mobile Number"
5. Type your message
6. Then click on E-mail or SMS button

- Enable doctor/patient records

localhost/Eye%20Hospital/admin/view\_patient\_backup.php

Sign in Babylon Search (1) cse.lk - Web Sear... JOHN KEELLS HOLD... CSE Babylon Search (1) cse.lk - Web Sear...

PATIENT ▾ CLINIC ▾ CONSULTANT ▾ SURGERY ▾ EVENT CALENDER REPORT E-MAIL SMS RESTORE

### PATIENTS

Patient ID	NIC No	Patient Name	Date of Birth	
1	<a href="#">815764099V</a>	<a href="#">Anupama Pathiraja</a>	<a href="#">1981/03/16</a>	Enable

### DOCTORS

Doctor ID	NIC No	Doctor Name	Telephone	Specialist For	
DrPasad	<a href="#">754586754V</a>	<a href="#">Prasad Wimalaratne</a>	<a href="#">0773832223/</a>	Ophthalmologist	Enable

### CLINIC

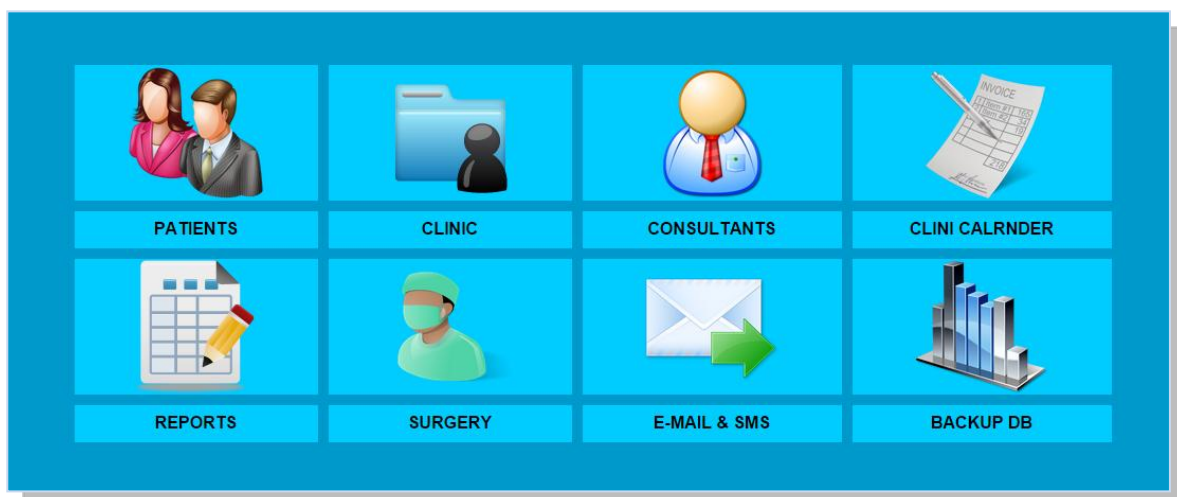
Type	Clinic Day	Clinic Date	Clinic Time	Doctor	Room	
Opd	Thursday	<a href="#">2015-05-07</a>	<a href="#">08:00:00 - 12:00:00</a>	<a href="#">DrAnuradha</a>	<a href="#">5</a>	Enable

### SURGERY

Date	Surgery Id	Doctor Id	Patient Id	Ward No	
2014-11-20	SRY03	DrMangala	Sandamali S	Theatre 03	Enable

1.  Select "RESTORE" on the menu
  2. Show the list doctor wise, patient wise, Clinic Wise, and Surgery wise list
  3. Then click "enable" of the relevant person
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- Get Backup of the Daily Records



- You can daily backup by clicking on the "BACKUP DB" on the dashboard

**Note for section 4, 5:** You can see same functions of the doctor logging and patient logging of the system. But they have limited authorization.

## 6. General Public Functionalities

- Online channelling

**ONLINE CHANNELLING SERVICES OF NATIONAL EYE HOSPITAL**

First Name: Mr ▼ Saman \*

Last Name: Kumara \*

Name with Initials: KumaraS \*

NIC Number: 856523698V

Mobile No: 0715263985


Doctor's Name: DrShama - Ophthalmologist ▼

OPD No:

OPD Name	Date	Availability
Post operative clinics	2015-05-05	47 <input checked="" type="radio"/>

**YOUR CLINIC ID : 3**  
**User Name : Saman**  
**Password : KumaraS**

<< Back

 **Note:** This facility has been provided to the general public for online channelling of doctors. Hence authorization is not required for you to log on to the system. Upon completion of the online channelling form, you will receive a user name and a password through the system.

1. Click the link of "ONLINE CHANNELLING" on the logging page
2. Enter the details and click "Submit Details " button  
*Note: You must fill out compulsory fields with an \* mark. If you don't fill out it, you won't be able to get an appointment.*
3. After submitting your details you just get the user ID and password then you will be able to view your details through online.

- Get details about the Eye Hospital



1. Click the link of “ABOUT HOSPITAL” on the logging page
2. Then logged to the public web site of the Eye hospital

- News/New Activities of the hospital

This link also developed on the logging page. This also can view general public to get an idea about new programmes of the eye hospital.



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### Evaluation Questionnaire

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#### Patient's Records Management System for the Eye Hospital Evaluation Questionnaire

The aim of this questionnaire is to build a quality, effective & efficient web based online patient record information system.

The applicability and usefulness of the proposed system will be assessed through the information that will be gathered through this questionnaire.

Therefore I welcome your feedback.



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Thanking you,

P.M.A.Pathiraja

MSc in IT

(University of Moratuwa)

E-mail: [pathiraja.anu@gmail.com](mailto:pathiraja.anu@gmail.com)

# Patient's Records Management System for the National Eye Hospital

## Evaluation Questionnaire

---

1. Name

Rev / Mr. / Mrs. / Miss.....

2. Age Group

☐ 16 - 20      ☐ 21 - 30      ☐ 31 - 50      ☐ Above 50

3. Occupation/ Profession

☐ Doctor      ☐ Nurse      ☐ Patient      ☐ Office staff      ☐ Other

.....

4. How would you rate your knowledge of computer literacy?

☐ An advanced user      ☐ Basic user

☐ An average user      ☐ Non-literate



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5. Have you use any computer system?

☐ Yes      ☐ No

6. If Yes, please mention what type of system you used?

☐ Hospital system      ☐ HR System      ☐ Inventory system      ☐ Other (pls mention below)

.....

7. Have you used any Patient's Records Management System before?

☐ Yes      ☐ No

8. If Yes, please specify the purpose?

.....

.....

9. Have you used any web based hospital software before?

☐ Yes      ☐ No

10. Prefer Patient's Records Management System for the eye hospital compared to existing manual method?

☐ Yes    ☐ No

11. Was the Graphical User Interface easy to use?

☐ Yes    ☐ No

12. Level of satisfaction?

☐ Very satisfied      ☐ Unsatisfied  
☐ Satisfied      ☐ Very Unsatisfied      ☐ Neither

Any comments

.....  
.....

13. Suitability of Patient's Records Management System for other hospital?

☐ Yes    ☐ Can be    ☐ Not Sure    ☐ No



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Any comments

.....  
.....

14. Further improvements / enhancements that you feel necessary to make this software more useful?

.....  
.....  
.....  
.....  
.....

## APPENDIX D

### Test Cases

#### 1. Test cases for Login

Test Case ID	003
Procedure	Clicking the <i>login</i> button invalid user name or password
Input Data	Some text
Expected Results	Red coloured text of displaying the error <ul style="list-style-type: none"><li>User name or password is not match</li></ul>
Actual Results	Red coloured text of displaying the error <ul style="list-style-type: none"><li>User name or password is not match</li></ul>
Tested By	Developer, Client

Table D.1: Login Test Case (003)

Test Case ID	004
Procedure	Clicking the <i>login</i> button valid user name and password
Input Data	Valid user name and password
Expected Results	Display the system dashboard
Actual Results	Display the system dashboard
Tested By	Developer, Client

Table D.2: Login Test Case (004)

#### 2. Test case for Patient Registration

Test Case ID	005
Procedure	Clicking the submit button without providing the first name
Input Data	Leave blanked
Expected Results	Red coloured text of displaying the error <ul style="list-style-type: none"><li>This field is required</li></ul>
Actual Results	Red coloured text of displaying the error <ul style="list-style-type: none"><li>This field is required</li></ul>
Tested By	Developer, Client

Table D.3: Test Cases for Patient Registration (005)

Test Case ID	006
Procedure	Clicking the submit button providing the duplicate NIC number
Input Data	Duplicate NIC Number
Expected Results	Red coloured text of displaying the error <ul style="list-style-type: none"> <li>▪ Duplicate NIC Number with patient's name</li> </ul>
Actual Results	Red coloured text of displaying the error <ul style="list-style-type: none"> <li>▪ Duplicate NIC Number with patient's name</li> </ul>
Tested By	Developer, Client

Table D.4: Test Cases for Patient Registration (006)

Test Case ID	007
Procedure	Clicking the <i>login</i> button invalid e-mail address
Input Data	Invalid e-mail address
Expected Results	Red coloured text of displaying the error <ul style="list-style-type: none"> <li>▪ Invalid e-mail address</li> </ul>
Actual Results	Red coloured text of displaying the error <ul style="list-style-type: none"> <li>▪ Invalid e-mail address</li> </ul>
Tested By	Developer, Client

Table D.5: Test Cases for Patient Registration (007)

### 3. Test case for selecting next clinic date

Test Case ID	008
Procedure	Select calendar with clinic date which was not scheduled
Input Data	Any date
Expected Results	Displaying the error <ul style="list-style-type: none"> <li>▪ Please enter scheduled clinic date</li> </ul>
Actual Results	Displaying the error <ul style="list-style-type: none"> <li>▪ Please enter scheduled clinic date</li> </ul>
Tested By	Developer, Client

Table D.6: Test Cases for selecting next clinic date (008)

#### 4. Test case for searching data

Test Case ID	009
Procedure	Clicking the button of “ <i>FIND</i> ” without entering any data
Input Data	Leave blank
Expected Results	Displaying the error <ul style="list-style-type: none"><li>▪ Please enter data to search</li></ul>
Actual Results	Displaying the error <ul style="list-style-type: none"><li>▪ Please enter data to search</li></ul>
Tested By	Developer, Client

Table D.7: Test Cases for searching data (009)



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