ADIGRAT UNIVERSTY

COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPATMENT OF INFORMATION TECHNOLOY

Project title: - patient record management system for Adigrat general hospital

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2016/2017, Adigrat University, Ethiopia

Declaration

We declare that the Project Document is our original work and has not been presented for a degree in any other university.

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ACKNOWLEDGEMENT

First of all we would like to express our heartful thanks to "The almighty GOD" for this opportunity, which he render to us and gives the physical strength and pleasant mind to complete our final documentation .

We thank our Advisor Gezahegn H/slassie for advice and supervision to complete our project proposal. And we thanks our co-advisor Tafere Aregawi also guide and advise us how to do each and every things in our documentation.

Also we thank Ato Alem to give the interesting information for the Adigrat general hospital patient record management system.

ABBREVIATION AND ACRONYMS

MRN: Master Registration Number

MPI: Master Patient Index

OPD: Outpatient diseases

IPD: Inpatient Diseases

SQL: Structured Query Language

ASP: Active Server Pages

CSS: Cascading style sheet

UC: use case

DB: Database

LAN: Local area network

OPERATIONAL DEFINITIONS

Hospital: is an institution that provides the medical services to the patient in questioned at a given period of time.

Patient record management system: It is a system that can manage multiple administrators and can have the track of the right assigned to them.

Patient: One who receives medical treatment attention care?

Medical records: it's any data, which is collected and use to diagnose or treat a patient's health problem.

Database: A collection of data arranged for ease and speedy search and retrieve.

Abstract

Hospital administrator often deal with information about a large number of patients and their visits to the hospital that need to be organized and kept up-to-date. The patient record management system for Adigrat general hospital is a web based application that would be designed and developed for hospital administrators and doctors to organize information and interact with the patients information through web. The system intends to facilitate several steps in the process from the patient registration and to the patient evaluation. During this process, there woud have many tasks that have to be handled by this system including maintaining complete information.

Chapter One

1. Introduction

1.1 Background information of the Organization

The Adigrat general hospital is located in the northern part of Ethiopia at 14020N and 30029 E at distance of 895kms towards north from Addis Ababa and 125 from Meklle city.

The hospital was esthablished in the year 1950s. Hospital are the essential part of our lives providing best medical facilities to people suffering from various ailments which may be due to change in climatic conditions increased worked load. It is necessary for the hospital to keep track of it day to day activities and records of its patients doctors, nurse and other staff persons that keep the hospital running smoothly and successfully but keeping track of all activities and their records on paper is very ambiguous and error prone. It also is very inefficient and a time consuming process observing the continuous increase in population and number of people visiting the hospital recording and maintain all these records is highly unrealizable, inefficient and error phone.

This keeping the working of the manual system as the basis of our project we have develop computerized version of the manual system named as hospital management system. The main aim of our project is to provide a paperless hospital up to 90%.

1.2 Statement of the problem

The reason that initiates us to do this project is that we understand the importance of using information communication technology in the computational business of hospitals, using the current most valuable tool of the information communication technology (i.e. LAN). Developing such system does not only benefit the hospital but proportionally it also benefits the patients which are the reason for the existence of the hospital.

Currently the hospital uses manual approach system to deal with patient information. So our main aim is, to develop system which makes many workloads of the hospital easy would regarding patient record or information.

- Since any information stored on paper manually it is difficult to :
  - Retrieve needed information
  - Update data and

- Modification

- Lack of security on the patients' information.
- High work burden for the employee
- There is no guarantee regard to stored information because; if storage paper damaged there is no way to backup of information.
- Lack of preparation of accurate reports
- Data redundancy
- Large storage medium (space) is required to store medical documents, cards, reports, and patient information.
- Circulation of patient information such as (lab report generated by lab technician, doctor prescription to pharmacy) is too late.
- Patient is not getting service according to their arrival and appointment

1.3 Objective of the project

1.3.1 General Objective

The general objective of this project to solve the problem arise in the manual system and improves efficiency of patient record management system for Adigrat general hospital.

1.3.2 Specific objective

Here are some specific objectives that would together help us to achieve the overall project:

- To provide quick information on the patient and its description
- To manage the patient information easily(i.e. update ,search, insert and delete)
- To decrease the data redundancy of the patient record
- To minimize time and efforts needed to perform the tasks in the hospital.
- To make data transfer and communication fast between different workers of the hospital.
- To provide accurate and prompt report
- To decrease the calculation error about the record amount to produce the monthly analysis report
- Implementing standard security that can keep the confidentiality of the patient data at rest.

1.4 Purpose of the project

The new patient record(information) management system is reliable, easy, fast and consistent and would play a crucial role for the hospital, hospital workers, and for the patients. The significance of the system includes:

- User friendness is provided in the application with various controls.
- To minimize time and efforts needed to perform tasks.
- To manage the patient information easily.
- Providing a well-organized and guaranteed record keeping system with minimum space and effort need.
- Readily upload the latest updates by a legitimate user.
- It provides high level of security with different level of authentication.
- To avoid data redundancy
- To increase the security
- To increase efficiency

1.5 Scope of the project

The scope of this project would develop patient record (information) management system for Adigrat general hospital. The coverage of this study include() :-

- Manage account i.e., create ,update account and change password
- Registration of patients
- View patient information
- Search and update of patient information
- Laboratory result and medicine order information
- View order drug
- Provide referral for patients
- Generate report
- Prescribe drug

1.5.1 Target beneficiaries of the system

The newly proposed system has a benefit for Developers and users

- Developers:-
- ✓ Obtain knowledge and experience from it.
- ✓ Use it for partial fulfilment of degree program.
- ✓ Gain income if it is complete.
- patients**:-** is any person that uses the hospital for treatment **.**So, after developing the new system
- ✓ Can get information about patient recorded data or information easily
- ✓ Save their time
- ✓ To easily retrieve information or data
- Organizations such as: hospitals
- ✓ Economically get benefit because man power will decrease and the money which is paid for workers will be saved.
- Administrators: such as hospital administrators
- ✓ To manage the data easily
- ✓ To update the information easily.

1.6 Limitation of the project

Defines what the proposed system is not going to perform or what is not including in the proposed system.

- This system would not include other service like Payment, etc.
- The proposed system is used only for outpatient diseases(OPD)
- The proposed system is not reserve the bed for patient

1.7 Methodology for the project

It is a system of methods follow in particular discipline. To be effective in our project gathering of data in smart way is the predecessor. This data collect focus issues like, what is expected

from the system? What are input of the system? What are outputs of the system? How are they processed? Who requires which data in what form?

1.7.1. Data Source

- Practical observation enables us to list out the existing system problems, since it is what we had seen or observed in reality.
- By discussing real problem of the existing system with our group
- Collecting information from different references, projects and web sites

1.7.2 Fact Finding Techniques

The methodologies employee in the study include observation, interview and document analysis method. We have interviewed record keeping stuff, plan and program directors and IPD case team coordinator .We gather documents of different forms that the organization is using to carry out its activities, which are of high importance in analyzing the current system as a foundation to develop the propose system.

Observation:-We went to the hospital and observe their daily as regards their current system and they are manually recording the patients records as specify by the receptionists. A follow up is make to determine the time it took to carry out the patient record management. We observe the system's weaknesses like it is vulnerable to errors.

Interviewing:-During data collection we use one of the fact finding methods which is interviewing. The administrator of the patient record management system Ato Aleme tell us find out what difficulties they Encounter with the existing system.

Document Analysis:- For more information about the existing system we refer relevant documents, others reading materials and some projects regarding to patient information management system.

1.7.3 Systems Analysis and Design

For our newly proposed system we use the object oriented software engineering (OOSE) approach, OOSE is a software engineering approach that models a system as a group of interacting objects that works together to accomplish a task. It is by using Unified Modelling Language (UML) .This is because it includes the overall features of OOSE. It is an approach which based on objects rather than data and process separately. Then we enforce to select this method due to the following benefits:

- ✓ Increasing code reusability because of inheritance, polymorphism and encapsulation.
- ✓ Reusability of objects, hence reduce the time and cost of writing software as well as incident of defects (error).

1.7.4 Development Tools

Software: - This project use the following system development tools for different activities.

Table 1: Development tools

Tools	Activities
CSS	For attractive layout
ASP.NET	Frontend
SQLServer	Backend (database)
Mozilla Firefox, IE, Google Chrome, Opera	Browsers

Hardware :-

We use the hardware tool specifications listed below to develop our proposed system and for taking a backup. The hardware tools we would use listed below:

- PC's processor speed is 2.4 GHZ.
- System type 64 bit, operating system x64 based processor.
- RAM of pc is 4.00 GB.
- Hard Disk is 465 GB.

1.7.5 Testing procedures

We would have start the test producer of our project in the code. Therefore, our propose system testing procedure depends on the manual system of the Adigrat general hospital. If the error is occurre when we must be write the code; we would try to debug it. Before we integrate the

system we would test each individual module. We test our propose system by using the following testing operations:

- **Unit testing: -** Unit testing is carry out on individual modules of the system to ensure that they are fully functional units. We do this by examining each unit, for example the Underwriter's page. It is check to ensure that it functions as required and that it adds patient's data and other details and also ensure that this data is sent to the database. The success of each individual unit gave us the go ahead to carryout
- **Integration testing**. We will be carry out integration testing after different modules have put together to make a complete system. Integration is aim at ensuring that modules are compatible and they can be integrate to form a complete working system. For example we test to ensure that when a user is login he/she is link to the appropriate page, and also can access the database.
- **System Testing:** Testing will be do after the system is put in place. This is do in two ways namely Unit Testing and integration testing.

1.8 Feasibility Analysis

Assessing feasibility for our project answering questions relating to the utility and viability of the system that is going to would develop. This means answering the following questions:

Is it really cost-beneficial to develop the proposed system?

Is it possible to develop the proposed system?

In order to answer these questions we would conduct various kinds of feasibility analyses list below.

- Economic feasibility
- Technical feasibility
- Operational feasibility
- Schedule feasibility

1.8.1 Economic feasibility

- To develop any system/project first it must be economically feasible.

- To overcome the problem in the existing system of Adigrat general hospital which is manual patient record management system, we would need to develop web based patient record management system with low ***cost.***
- For our system the benefit that we would get after the proposed system is completed is greater than the cost that we expend to develop this project so that our project is **economically feasible** and it is possible to develop it.

Tangible benefits

Since this project is going to a web based system, there is reduction cost for material that used for manual operation, save time and make comfortable working environment for the users. In case of our proposed system we divided the tangible benefit in to two ways as follows.

One-time cost

- The cost paid for system designers and system analysts
- The cost of Software to be acquired to build and run the system
- The cost to buy server.

Recurring cost

- The cost to maintain computers, database and server if there is problem with them.
- Salary of system administrator
- The cost to give training for employees how to use the system.

Intangible benefits

Intangible benefits are the benefits to the organization but which cannot easily be measured in monetary terms.

- Improving the moral of the organization's employees
- Knowledge gain by project developer.
- Increasing the competitiveness of the individual.
- Faster decision making in organization.
- Facilitating information processing of organization system

1.8.2 Technical feasibility

The technical issue of our project raise during the feasibility stage of the investigation includes the following:

- Does the necessary technology exist to do what is suggest?

The entire group members are expect the system to be technically feasible. The system is going to be develope by technological development technique such as C# language with the SQLserver database to store files, Microsoft word for writing document, java script and CSS.

The system that we would develop is familiar with new technologies and also easy to understand by the system users. Our system would provide an easy access to the users. The work for the project is do with the current equipment and existing software technology. Necessary bandwidth exists for providing a fast feedback to the users irrespective of the number of users using the system.

1.8.3 Operational feasibility

Propose projects are beneficial only if they can be turn out into information system. That would meet the organization's operating requirements. Operational feasibility aspects of the project are to take as an important part of the project implementation. Some of the important issues raise are to test the operational feasibility of a project includes the following: -

- Is there sufficient support for the management from the users?
- Will the system be used and work properly if it is being developed and implemented?
- Will there be any resistance from the user that will undermine the possible application benefits?

This system is target to be in accordance with the above-mentioned issues. Beforehand, the management issues and user requirements have been taken into consideration. So there is no question of resistance from the users that can undermine the possible application benefits.

We, the project team members, would propose the system which are operationally feasible and the project would:-

-More efficient

-User friendly

-Reduce information redundancy which is a major problem in existed system

1.8.4 Schedule feasibility

Since schedule feasibility is a process of assigning the degree to which the potential time and computation date for all major activity which in a project meet organizational deadlines. So, our project would profitable within a months. Therefore, our project satisfies schedule feasible.

1.9 project schedule

ID	Task Name	Start	Finish	Duration
1	Select the topic and proposed the system	10/10/2016	10/19/2016	1.6w
2	Over view of the existing and the new system	10/24/2016	11/18/2016	4w
3	System modeling	11/21/2016	12/9/2016	3w
4	System designing	12/12/2016	12/23/2016	2w
5	The last date submission of project one	12/26/2016	12/30/2016	1w

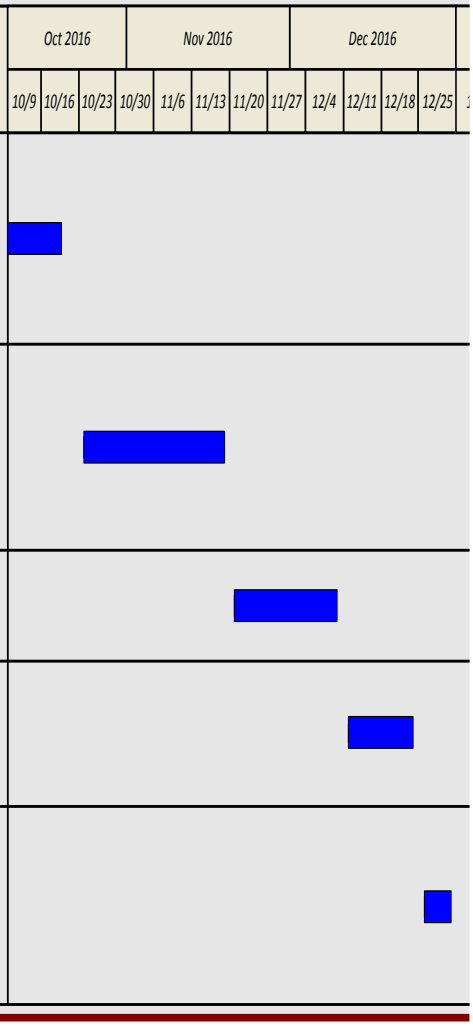


Figure 1 project schedule

1.10 cost break down

No	Materials required	Amount	Price per unit In birr	Total Cost
1	Toshiba computer	1	12000	12000
2	Pen	5	5	25
3	A4 size paper	1 Desta	120	120
4	Print	100	1	100
5	Flash	2(8GB)	120	240
6	CD-ROM	2	8	16
Total			12476	

Table 2 cost break down

1.11 Team organization

Involves organization of the team and communication among each member of the team. There are three (3) types of team organization:-

centralized – control team organization: standard management technique in well understood discipline worker report to supervisor who directly controls and is responsible for their performance

De-centralized – control team organization:- is ring-like management because of lack of hierarchy . The team member are at the same level , and then can review each other's work and responsible as a group

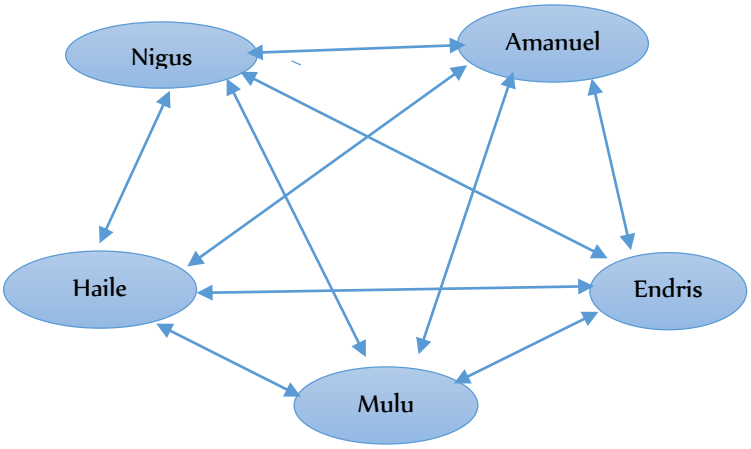
Mixed – control team organization: combines the benefits of centralized and de- centralized organization by minimizing or avoiding disadvantages

Among these three control team organization our project team chooses decentralized – control team organization.

Reason of choice:

- our team members are on the same level and we can review each other's work
- Higher moral among team member

- Job satisfaction
- Higher quality of the product
- Encourage to share
- Feel more ownership and responsible



1.12 organization of the document

In our document we have included the system details through all the chapters.

In chapter one we have include introduction, background, general objective, specific objective, scope of the project, the methodology we have used.

In chapter two we describe about system features such as; existed system description, proposed system description, functional requirement, non-functional requirement, and analysis models.

In chapter three we describe about system modeling such as actor specification, use case diagram, use case, use case description, sequence diagram and class diagram.

In chapter four we describe about the system design such as design goal, system decomposition, system architecture, deployment diagram, persistence data management, access control and security and user interface.

In chapter five and six we describe about the system implantation and conclusion about the system

CHAPTER TWO

2. Requirement Analysis Description

2.1 Overview of the existing system

2.1.1 Activities of the system

A. patient registration procedures

- When the patient arrives at registration, the clerk should ask the patient's name (first, father's first name and grandfather's name) and then look for an existing MRN in the paper-based MPI (i.e., set of index cards) . This should be done whether the patient reports that he/she has been to the hospital before or not.
- If there is an existing MRN for that patient, the registration clerk should facilitate the retrieval of the existing MR stored in the record room. A runner/transistor should retrieve the patient's MR and then take the MR to the area where the patient is to be treated.
- If no previous MPI card or MRN can be found, the registration clerk should generate a new MRN.
- New MRNs should be issued in straight numeric sequence, without skipping any numbers
- Each MRN should be assigned to one and only one patient. Reissuing a MRN to another patient should never occur. Registration staff should both create an index card for the paper-based MPI
- All patients– regardless of which service they would access–should be registered at one central registration site.

B. procedures for retrieving existing medical record for returning patient

- Use the MRN to find the MR. If the patient knows his/her MR number or brings his Service Card, then the MR number can be used to find the patient's MR.
- Retrieving a MR by name: If the patient does not remember their MRN or does not have their service card, then MPI should be used to search for the patient information.

C. Storage of medical records

- All active MRs should be filed in a single, centralized file room i.e. Medical Records Department or Card Room.
- MRs should be filed numerically according to MRN.
- Audit of medical record files should be made quarterly by medical record department head
- All patient files should be stored together, using one MPI, including those from specialized clinics.

2.1.2 Problem of existing system

There are problems of the existing system. This problem can be evaluated using the following frameworks. It is the useful framework for classifying problems, opportunities and directives.

2.1.2.1 Performance (Response time)

The existing system does not provide fast response time because it is difficult to access data from the document and misallocation of patient information in the shelf to retrieve the patient' s status information.

2.1.2.2 Security and controls

The existing system has less security and there is no data backup when the users profile lost or damaged.

- Lose of vital documents as the filing system is manual.
- Damage of document due to fire or rain incident..
- Take a lot of time to retrieve a patients information

2.1.2.3 Efficiency

Due to the manual operation most of the activities are easy to wastage of resources like manpower, time etc. to produce the corresponding outputs. This makes the current system inefficient while utilizing resources.

2.1.3 Business rule

Business rules are rules that are used as guide to perform all tasks according to the rules and regulation.

The following are some of the business rules of Adigrat General Hospital in the current time.

- One patient should have one master registration number (MRN)
- Patients must be come to the hospital for lab test and for first registration
- All information of patient should be kept in one record office
- Patients should not take their medical card to their home by any means
- Only the concerned body can see the medical card
- Drug could not be sold without prescription
- Lab test could not be taken unless there is an order from the Doctor.

2.2 overview of the proposed system

The proposed system is a web based application that automates the patient records management system in Adigrat general hospital. The proposed system has server, database and client. The server used to fetch data from the database and store data in to the database according to the instruction of the user. So decrease the calculation error about the record amount to produce the monthly analysis report.

The new system is designed to solve problems affecting the manual system in use. It is design to be used web based there by relieving both the patients and the hospital workers from much stress as experienced in the manual system.

2.2.1 Functional requirement

The functional requirement of this Project is defines a function of our System and its components. So our proposed system is aimed to solve the problems in current system by creating web based system that helps the hospital to manage the patient information. Generally the functional requirements of the system are:-

- System should register new patients of the hospital.
- The system should update patient record
- The system should manage accounts i.e. it can create, and change accounts.
- The system should accept patient MRN and view patient information.
- The system should retrieve patient record
- The system should generate report

- The system should search patient information.
- View laboratory test result
- Provide appointment for patient.
- Provide refer for patients

2.2.2 Non-functional requirement

A non-functional requirement of our project also referred to as technical requirement pertains to the technical aspects the system must fulfil such as performance related issues, reliability issues, and availability issues**,** Non-Functional Requirements are those requirements that have nothing to do with the functionality of the system but they determine the performance of the whole system. Generally Non-functional requirement are Describe restriction on a system that limit the choices for its construction as solution to a given problem.

Performance:-

- The system is fast since it is web based.
- The software shall support use of multiple users at a time.
- It works very well with short response time, high availability.
- Reduce costs and time waste by providing access to system in available place and time where Internet connection is available.

Security and access permission: - The new system provides security to prevent and protect unauthorized modification of data, the new database must have a security to control the activities that can be performed by the users and determine which information can be viewed and modified.

- Password and user name must be put to the system for responsible user.
- Unauthorized people cannot access the system due to security.

Resources, usability and availability: - the system consumes resource that required high processer speed both for server and client and machine having more memory space as a server. The system is available to the user through the server. An authorized user can access the system easily and the system is available to user at any given time.

Input related requirement: - The proposed system can take input from the authorized user and check the validation of the input. It also needs correct input to display correct output to end user.

Output related requirement: - The system takes in an input to perform or to process some function in order to produce an output based on the given input.

Storage related requirement: - The proposed system can store any data inserted in to the system in appropriate manner. The stored data can be kept in database permanently and can be retrieving easily when the user accesses it from database.

2.2.3 System requirement

This section we describes the hardware components and the software requirement needed effective and efficient running of the system.

Hardware requirement

Hardware	System requirement
Processor	2.4 GHZ processor speed
Memory	4GB RAM
Disk space	80GB(including the database management system)

Table 3: Hardware requirement

The above table shows the hardware components of the machine that allow the system to function as required for using the patient record management system.

Software requirement:-

Software	System requirement
Operating system	Windows XPs and later
Database management system	SQL Server
Runtime	Browser

Table 4: Software requirement

The above the table shows software requirements recommended to enable the system to run as required for using patient record management system.

2.2.4 Constraints

Our proposed system can't handle if the power is lost during the user register to the system, managing in the system, view any information from the system.

2.2.5 Assumptions

In order to use our system, we assume that every user must have basic skill to use computer and some knowledge on how to use or access on internet to do some task. To access the system in Adigrat hospital should have full network access and fast.

Chapter Three

3. System modeling

The analysis of the system is the basic thing in our system development which helps the system designer (we) to find the purpose of the system .In case of the new system we develop the purpose is in order to make providing computerized information handling system. in this chapter we use **sequence diagram** (shows how processes operate with one another and in what order), **use case diagram** (to represent the interaction of user with system) and **class diagram** (to describe the structure of a the system by showing the system's class their attributes, operations (or methods) and the relationships among objects).

3.1 use case model

Use case classes in our project are used to model and represent units of functionality or services provided by a system (or parts of a system: subsystems or classes) to users. It captures the goal of the users and the responsibility the system to its users. It is the functionality of the system or the service provided by the system.

3.1.1 Actor Specification

- **Doctor**- who order lab test, prescribe drug, refer patient, make appointment, and view patient history.
- **Lab technician**: who view lab order and produce lab result.
- **Pharmacist**: view drug order, add drug and generate report.
- **Clerk**: who register patient, update patient and search patient.
- **Administrator**: The person whose responsibility is create Account, generate monthly, annually report and update account.
- **Patient**: A person who get treatment from the hospital. View drug, view refer, view appointment and receive drug prescription.

3.1.2 Use case diagram

Figure 2 use case diagram

3.1.3 Use case description

Table 5 login use case description

Number	UC-1
Use case name	Login
Actor	Admin, Clerk, Doctor, Lab technician and Pharmacist
Description	System allows users to login using his/her user name and Password
Precondition	Actors open website and wants to login
Post condition	The actors login to their privileged page
Event flow	1. Users are on the homepage and wants login to the system and press login button. 2. The system displays the login form. 3. Users enter user name and password. 4. The user click login button. 5. The system checks the validity and if it is valid logged in successfully.
Alternative event flow	5.1 If the user name and password is not valid go to event flow 3.

Table 6 register patient use case description

Number	UC-02
Use case name	Register patient
Actor	Clerk
Description	Clerk registers the patient.
Precondition	Patient wants to register
Post condition	The Patient is registered.
Event flow	1. Actors click register patient link. 2. The system will display a Patient registration form. 3. Actors fill the form. 4. Actors click register button 5. The system checks all the form fields have filled correctly and if it is correct stores in to database and display registered sucessfully message.
Alternative flow of event	5.1 If it is invalid input the system shows error message and redirects to step 3

Table 7 : search patient use case description

Number	UC-03
Use case name	Search patient
Actor	Clerk and doctor
Description	Search patient use case enable clerk to search for particular patient information from the data base
Pre-condition	The patient must be register
Event flow	1. clerk or doctor browse by clicking on search bottom 2. The system displays search form 3. Clerk or doctor enter related information about patient to be searched 4. system displays patient information
Post condition	The required patient information will be successfully searched and found
Alternative flow of event	If the patient being searched is not in the database the system will display message like ”no patient found that match the information you provide, please try again enter the correct information” and direct to 3.

Table 8 update patient information use case description

Number	UC-04
Use case name	Update patient information
Actor	Doctor
Description	Enable doctors to update or modify the patient information stored in the database
Precondition	Patient should be register
Event flow	1. doctor click on update button 2. system displays update the form 3. doctor enter patient information and search for a particular patient 4. system search and display patient's information 5. doctor enters new information and click update button 6. the system updates and save on the on the database 7. The system acknowledge as successfully updated
Post condition	Patient's information will be updated or new information added
Alternative flow of event	IF search result is false, the system displays error message as "no data found please enter correct patient information"

Table 9 create account use case description

Number	UC-5
Use case Name	Create account
Actor	Admin
Description	System allows Admin to create account for the users.
Precondition	The Admin is authenticated and login to the system.
Post condition	The Administrator creates the account for the user.
Event flow	1.Admin click the Create Account link. 2. The system displays the form. 3. The Admin Inserts the necessary data of the user to the system. 4. the admin click create account button. 5.The system checks the validity and if it is valid logged in successfully. 6. System Admin get the confirmation.
Alternative flow of event	5.1 if the input is invalid it shows error messages and redirects to step 3.

Table 10 : order lab

Number	UC-6
Name of use case	Order lab
Actor	Doctor
Description	Informing the lab technician to test the investigation
Precondition	The disease must require laboratory examination.
Post condition	The patient's information sends to the lab technician for examination.
Event flow	1. A doctor click on order laboratory form. 2. The system displays order lab form. 3. A doctor fill the form and click submit button. 4. the system check if the input data are coorrect; if correct store to database.
Alternative flow of event	4.1 If the input data are invalid it shows error message and redirects to step3.

Table 11: order drug

Name	UC-7
Use case name	Order drug
Actor	Doctor
Description	Order the drug to pharmacist
Precondition	The doctor wants to order drug.
Post condition	The pharmacist gives the drug to the patients.
Event flow	1. The doctor login to the system. 2. The doctor open order drug page. 3. The system display order form. 4. The doctor fill the form. 5. the doctort click submit button 6. The system checks the validity and if it is valid store in the database
Alternative flow of event	6.1 If the doctor not filled out the form correctly back to event flow 4.

Table 12: view drug order use case description

Number	UC-08
Use case name	View drug order
Actor	Pharmacist
Description	The pharmacist view the type of medicine ordered from the doctor
Pre-condition	The pharmacist needs to views the ordered drug.
Event flow	1. The pharmacist login to the system. 2. The pharmacist open view order page. 3. The system display the Order which is from the doctor

Table 13: Delete patient information

Number	UC-09
Use case name	Delete patient information
Actor	Admin
Description	Enable the authenticated actors of the system delete unexpected or expired or impossible patient accounts or patient information
Event flow	1. manager open the home page 2. log in the page **3.** search particular patient information to be deleted 4. click on the delete button
Precondition	The information of patient to be deleted should be properly verified
Postcondition	Unwanted patient information will be deleted from the database

Table 14: view lab result

Number	UC-10
Use case name	View lab result
Actor	Doctor
Description	The doctor views the patient's status or result of patient that added from the lab technician ordered from the doctor.
Precondition	The disease must require laboratory examination.
post condition	The doctor views the investigated result
Event flow	1. Doctor open view result page. 2. Doctor enter patients registration number. 3. The system receives patients ID and name. 4. system display disease type or investigated test 5. Doctor views the added result

Table 15: generate report

Number	UC-11
Use case name	Generate report
Actor	Admin ,doctor and pharmacist
Description	Users generates report about activates done in the hospital during time.
Precondition	Need to generate report according to the time.
post condition	actors successfully generate report about the choose actor activity and other things.
Event flow	1. Admin open generate report page 2. . Users click generate report button. 3. The system displays generate report page. 4. The actor fill the reported data and click generate report button 5. The system store the report in to database if valid data is filled
Alternative flow of event	5.1 If the input is invalid it shows error message redirects to step 4.

Table 16: Add drug

Number	UC-12
Use case name	Add drug
Actor	Pharmacist
Description	pharmacist Add Drug to database
Pre-condition	The drug must available and pharmacist log in to the system.
Post condition	The drug is stored in database
Event flow	1. Pharmacist open add drug page and click add Drug button. 2. The system will display the form. 3. . Pharmacist Fills the form and click Add button. 4. The system checks the validity of the input and if it is valid stores the drug in to the system.
Alternative flow of event	4.1 If the input data is not correct it redirects to 3.

Table 17: make appointment

Number	UC-13
Use case name	Make appointment
Actor	Doctor
Description	Helps a doctor to assign appointment for the patient for the next additional treatment
Precondition	The patient should have had treatment
Event flow	1. The doctor click the assign appointment button 2. The system display the appointment form 3. The doctor fill the necessary information and save 4. The system save the appointment in database
Post condition	Patient appointment will be assigned effectively so patient in contact can access it

Table 18: refer patient

Number	UC-14
Use case name	Refer patient
Actor	Doctor
Description	The doctor refer the patient
Precondition	The patient should treat with the doctor
Event flow	1. The doctor click the refer button 2. The system display the form 3. The doctor fill the form and save 4. The system the refer in the database
Post condition	Patient refer will be refer effectively and contact referred center.

3.2 Sequence Diagram

The sequence diagram in this project is used primarily to show the interactions between objects in the sequential order that those interactions occur. During the requirements phase of a project, analysts can take use cases to the next level by providing a more formal level of refinement. When that occurs, use cases are often refined into one or more sequence diagrams.

The main purpose of a sequence diagram is to define event sequences that result in some desired outcome. The focus is less on messages themselves and more on the order in which messages occur; nevertheless, most sequence diagrams will communicate what messages are sent between a system's objects as well as the order in which they occur.

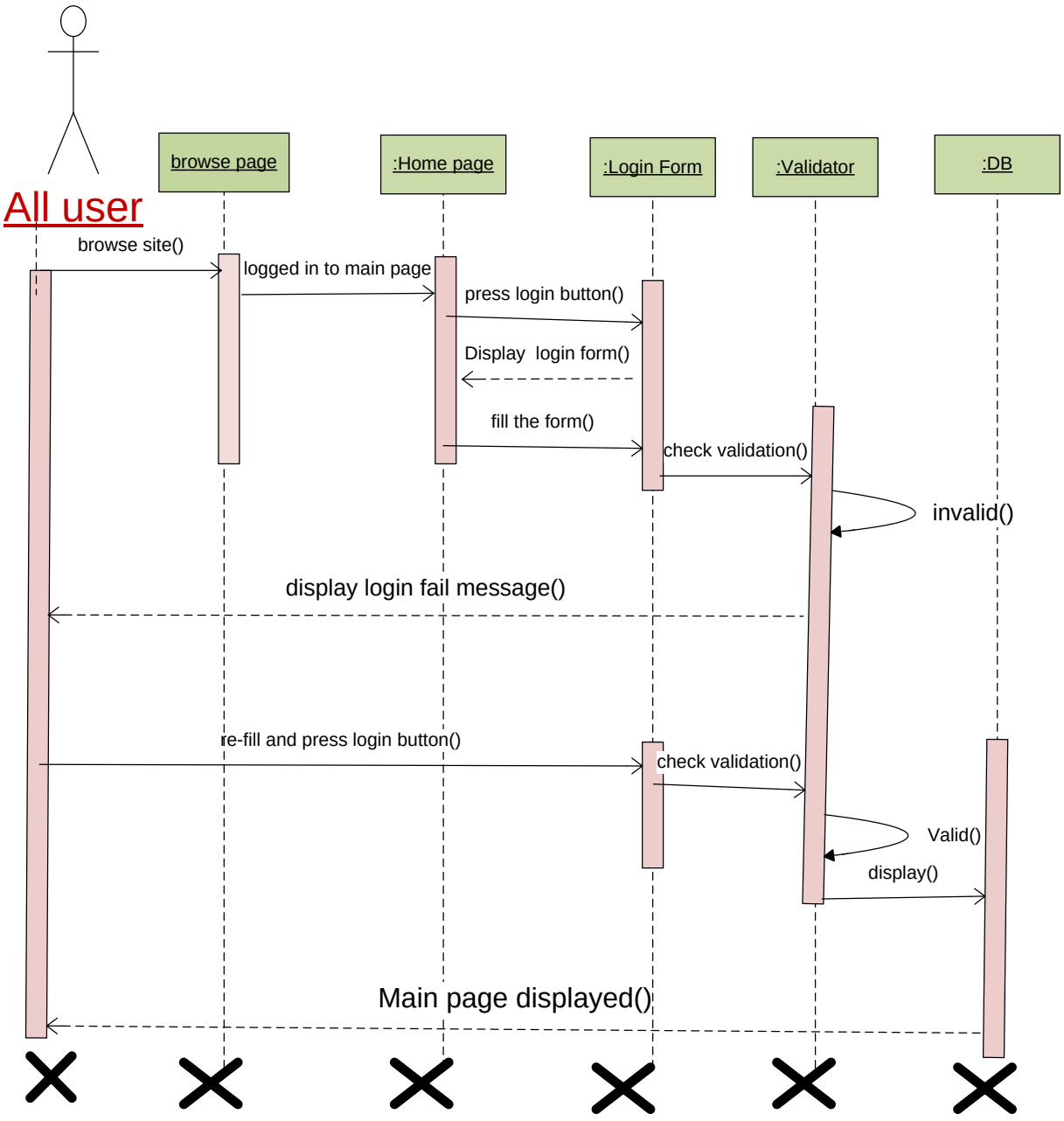


Figure 3 sequence diagram for login use case

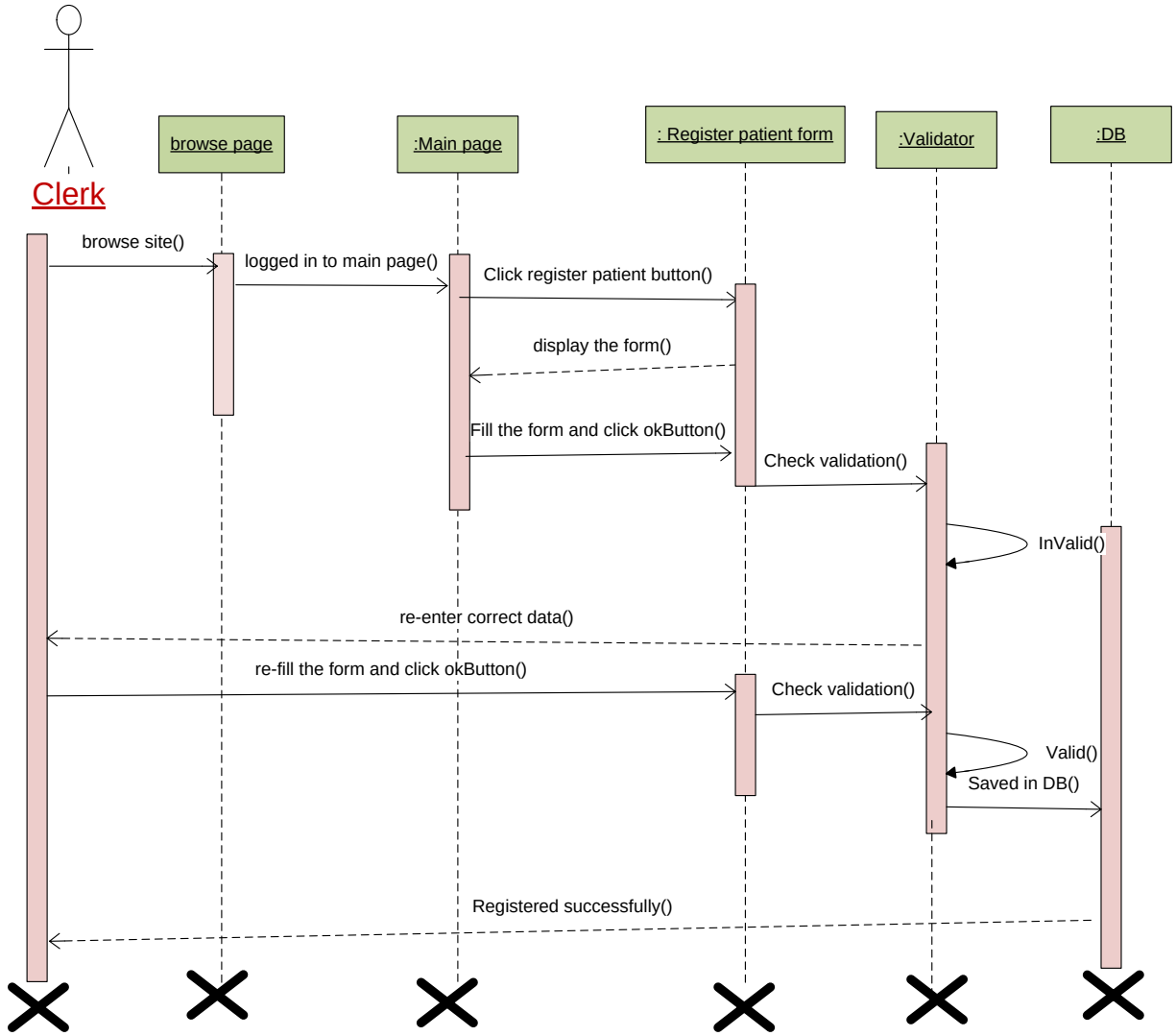


Figure 4 sequence diagram for patient registration use case

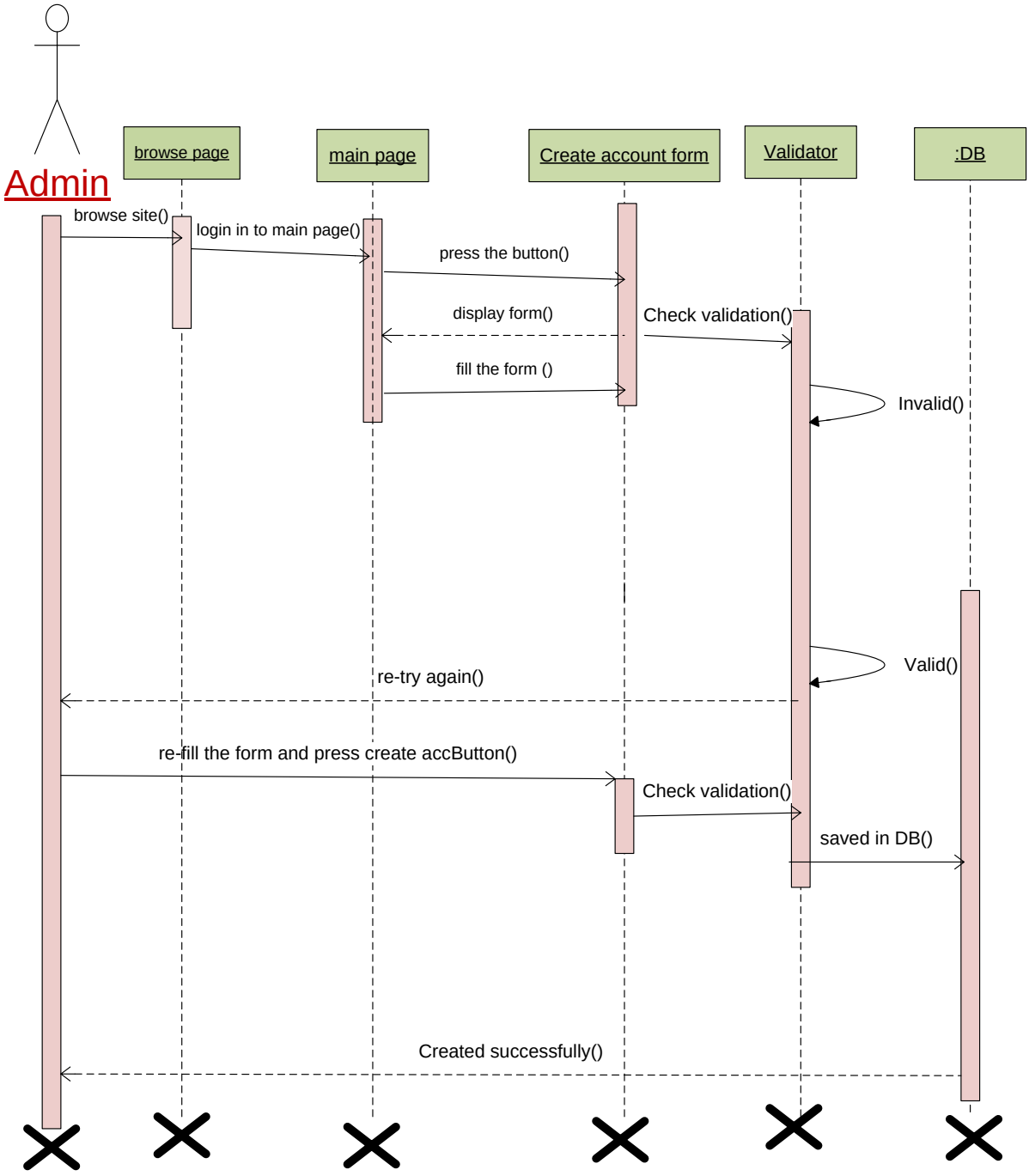


Figure 5 sequence diagram for create account use case

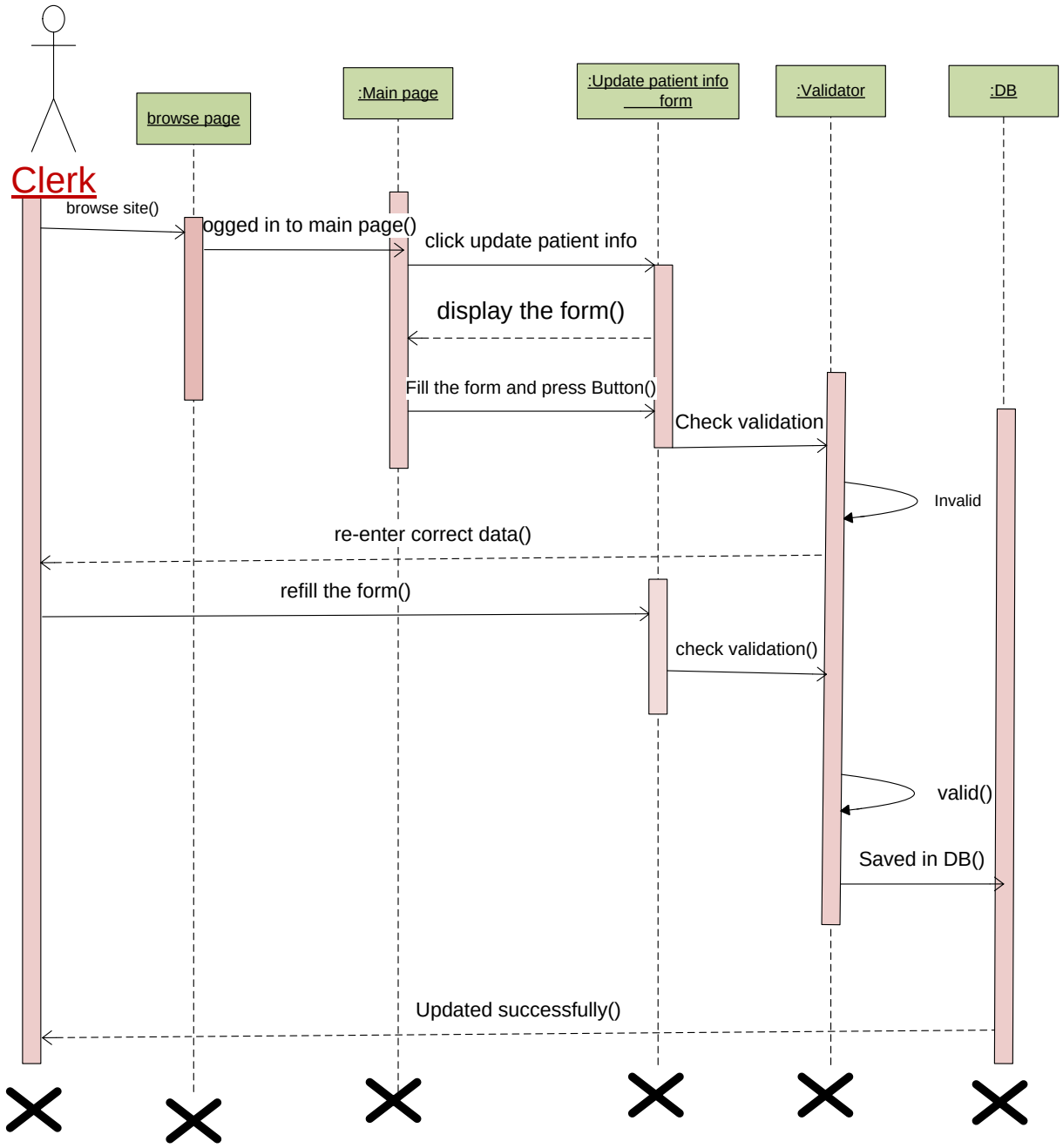


Figure 6 sequence diagram for update patient information

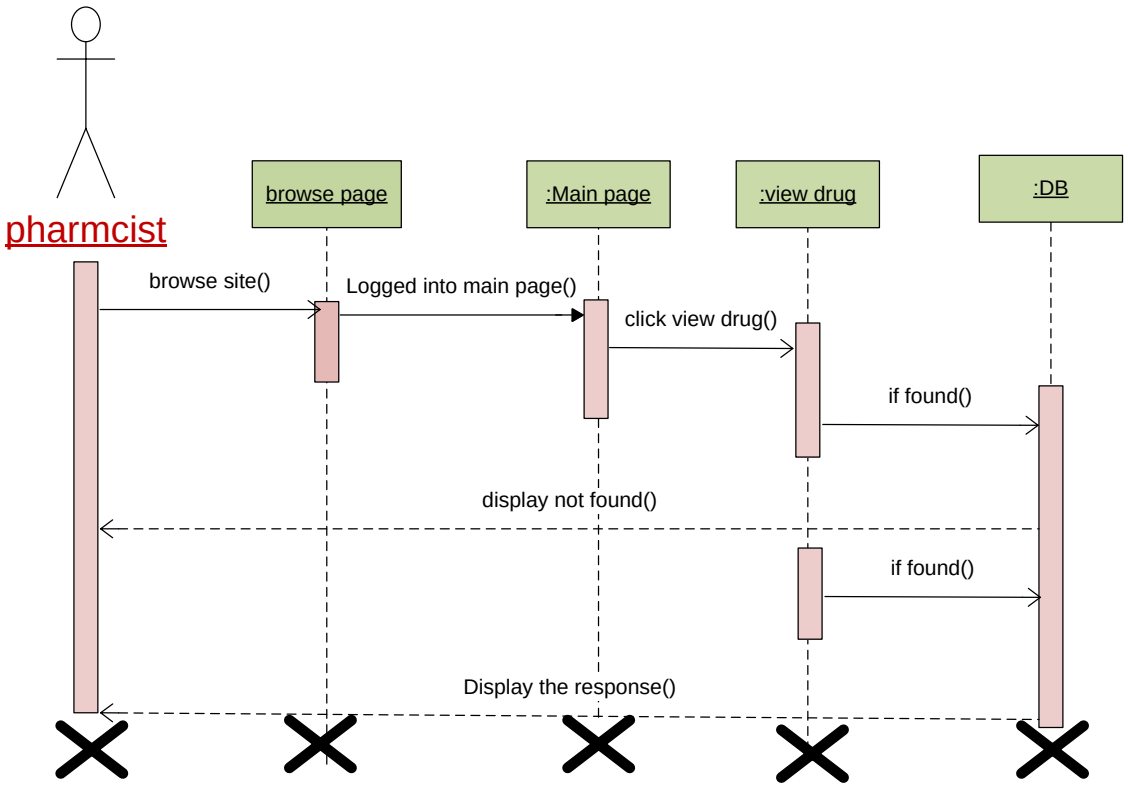


Figure 7 sequence diagram for view drug use case

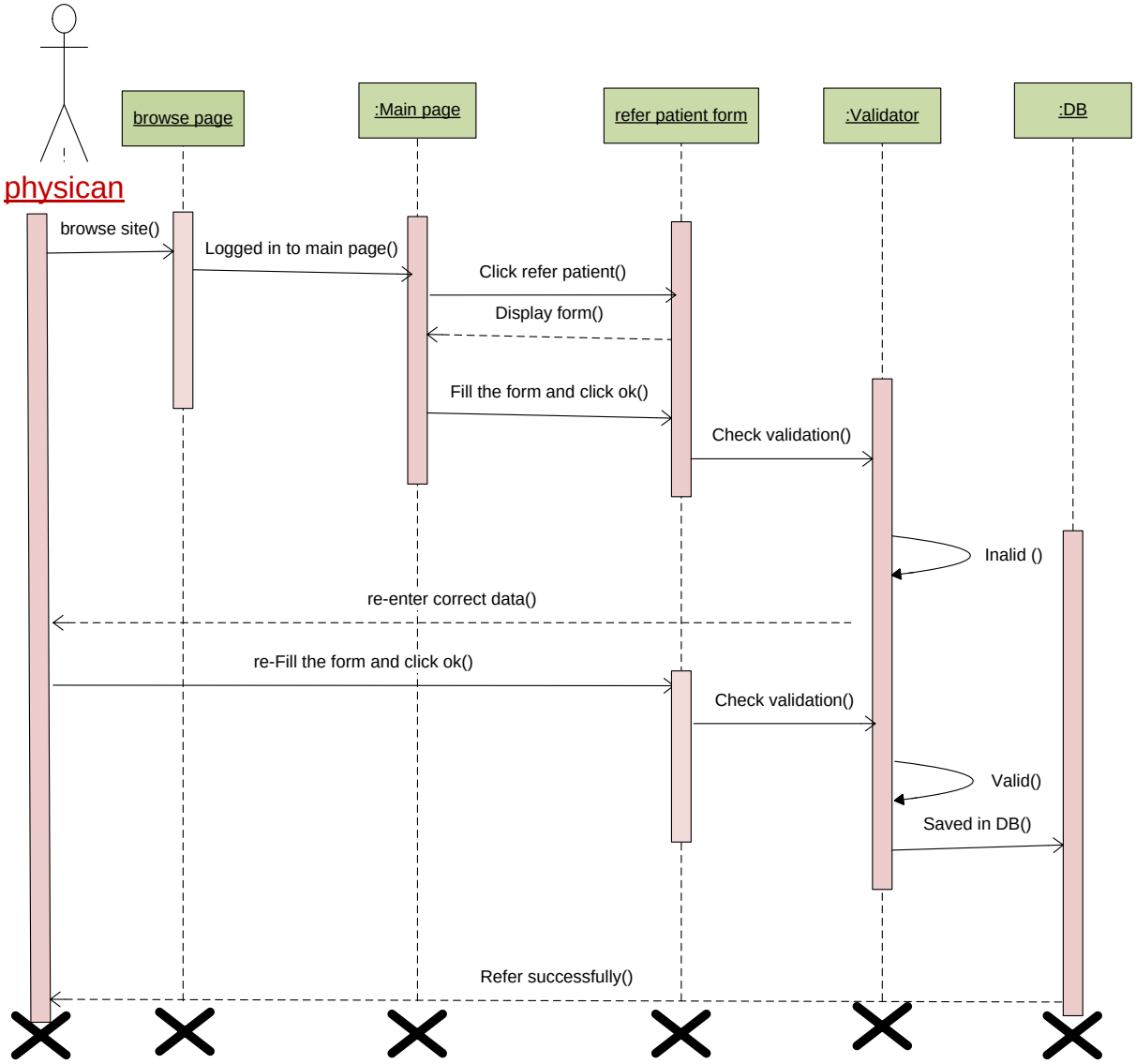


Figure 8 sequence diagram for refer patient use case

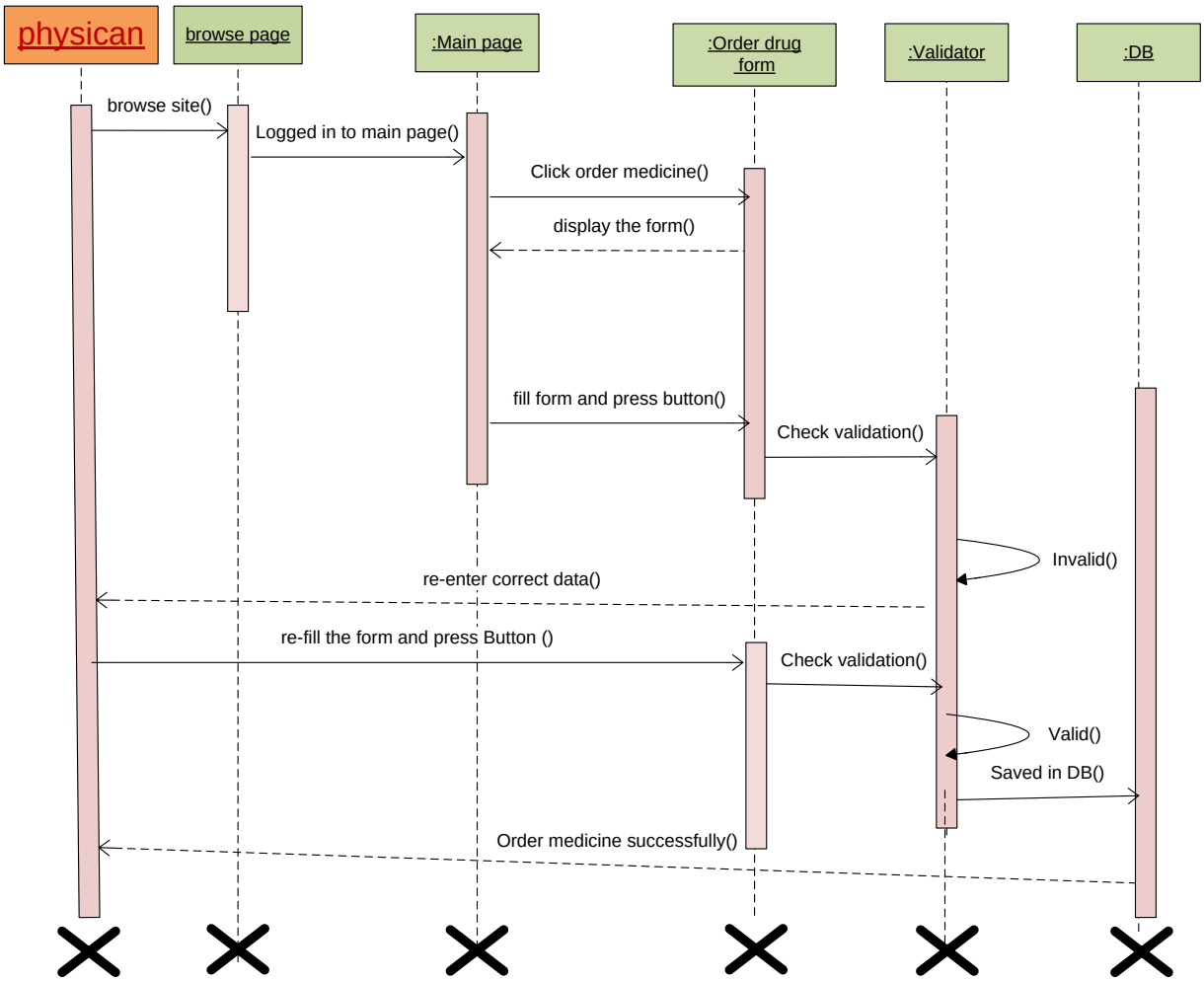


Figure 9 sequence diagram for order drug use case

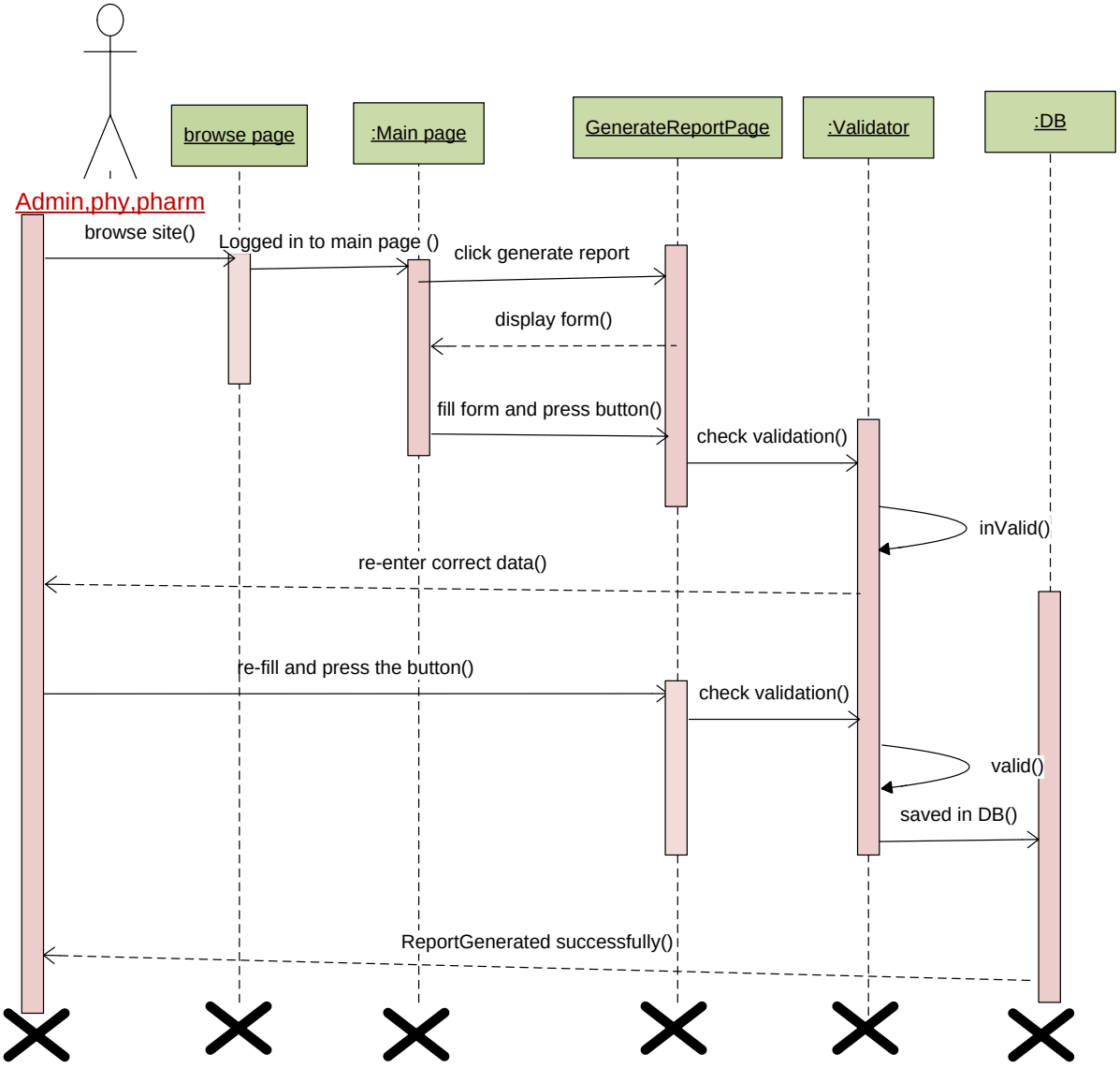


Figure 10 sequence diagram for generate report use case

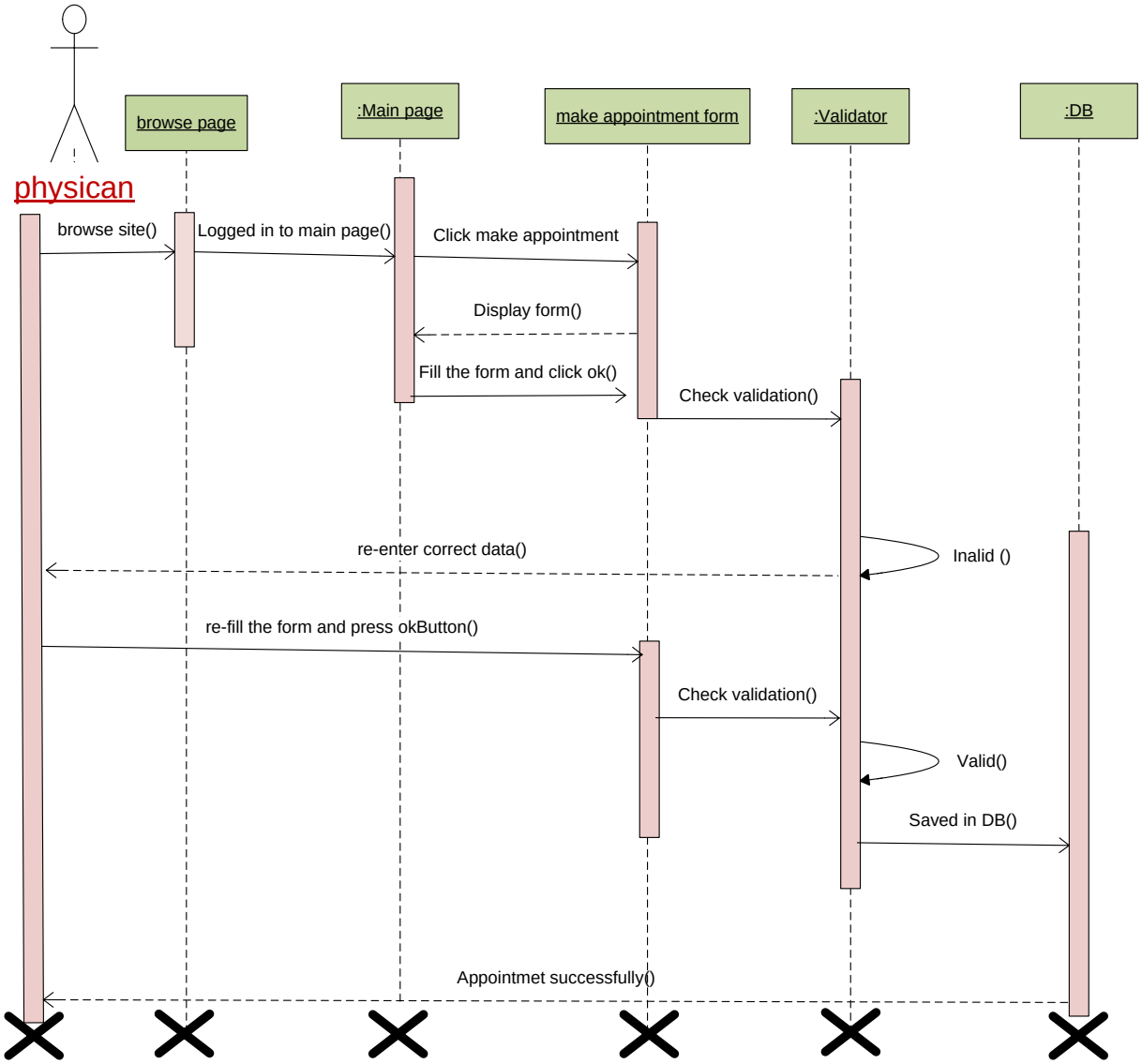


Figure 11 sequence diagram of make appointment

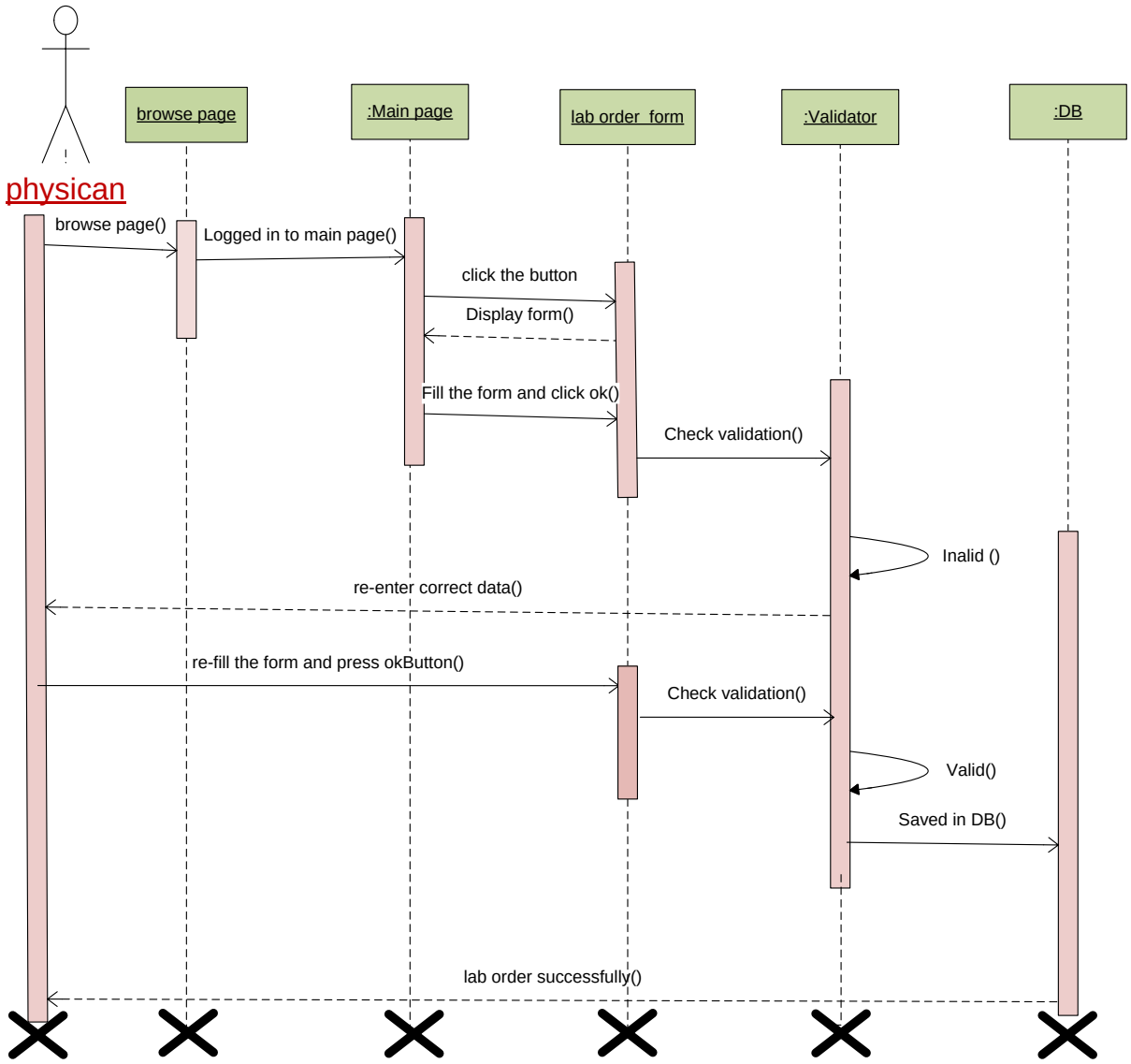


Figure 12 sequence diagram of lab order

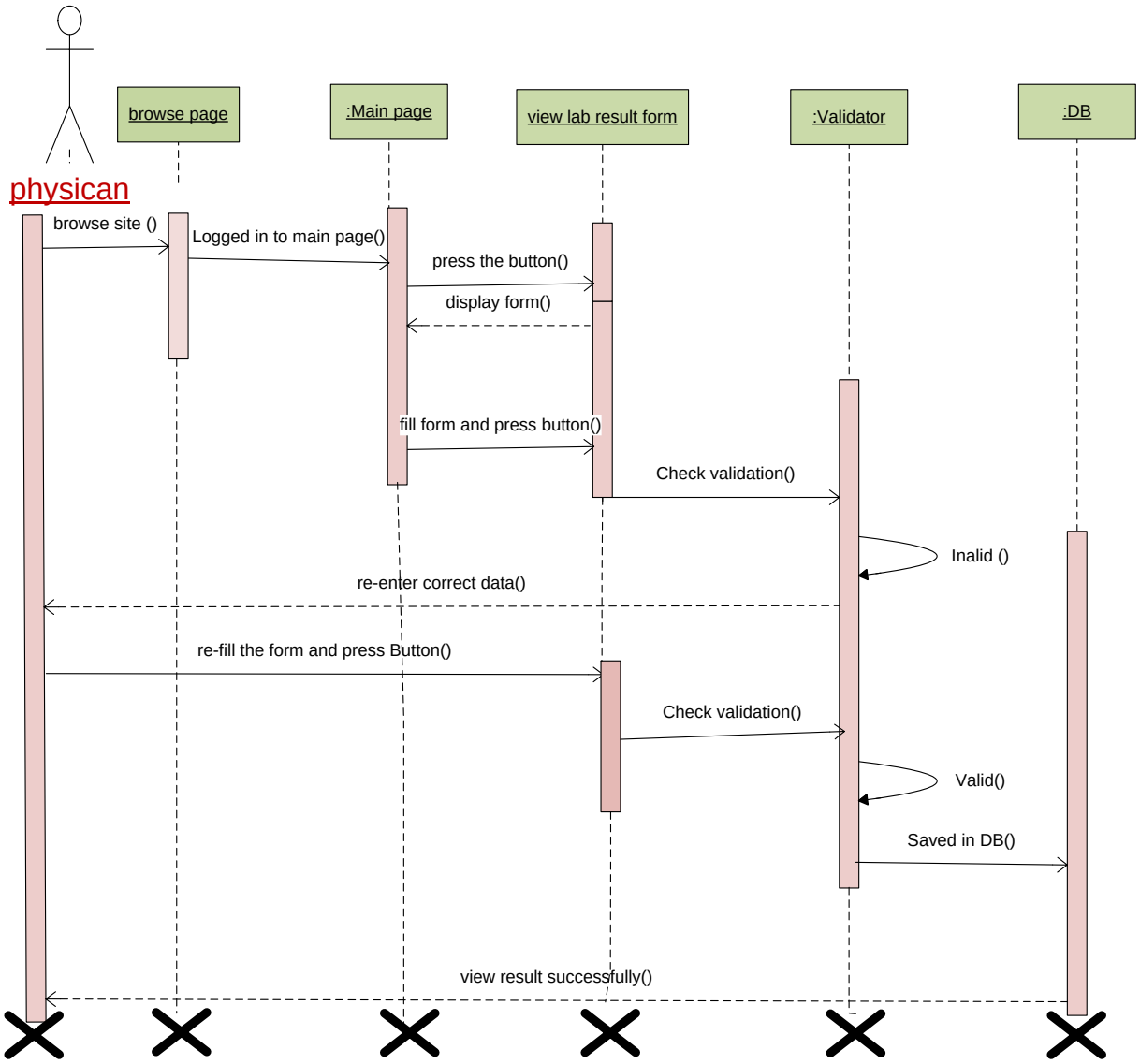


Figure 13 sequence diagram of view lab result

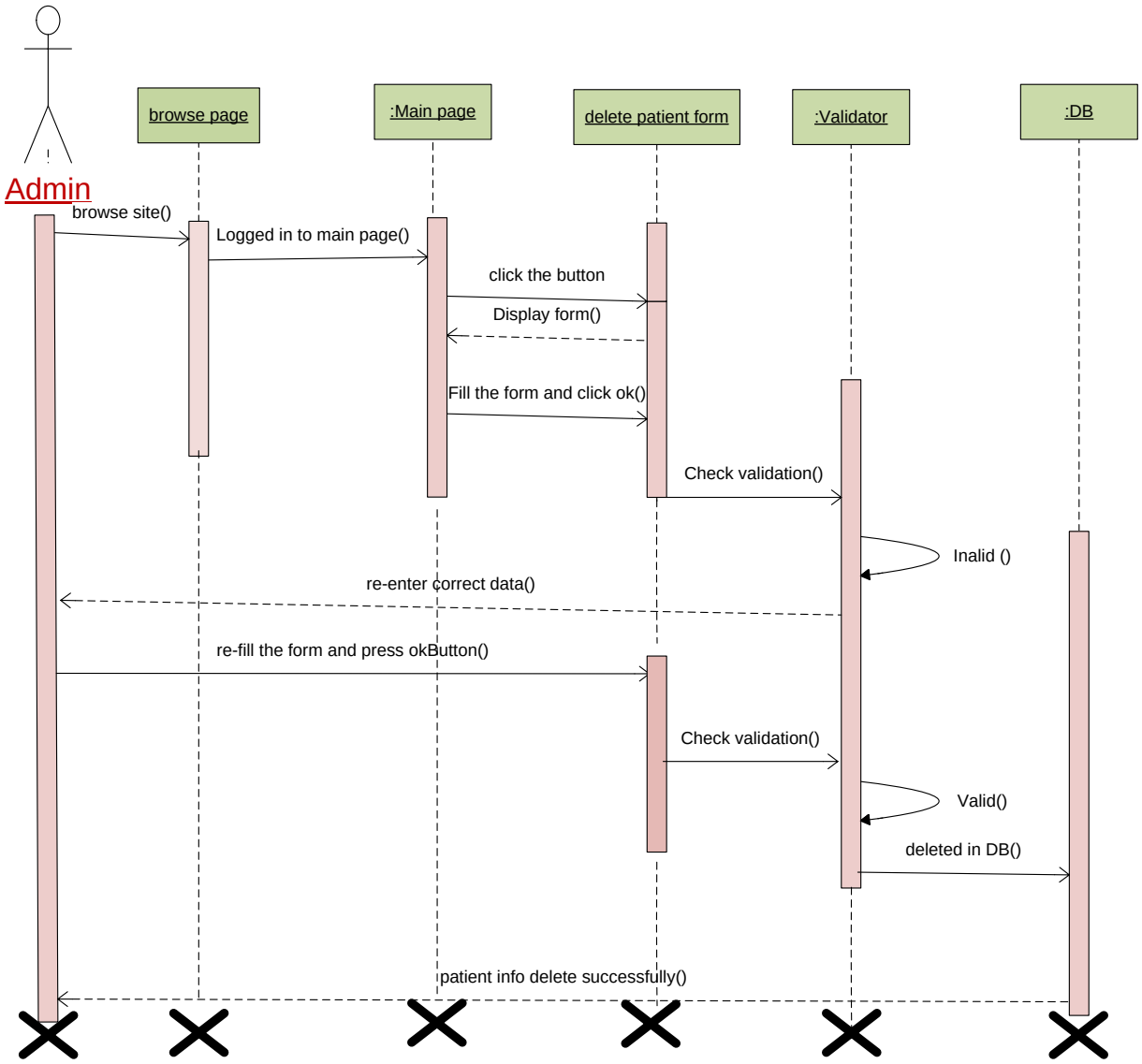


Figure 14 sequence diagram of delete patient information

3.3 **Class Diagram**

C**lass in this project** is a description of a set of objects that share the same attributes, operations, relationships, and semantics. Graphically, a **class diagram** is drawn as a rectangle with three compartments holding the class name, attributes, and operation.

Class Names: Every class must have a name that distinguishes it from other classes. A *name* is a textual string. That name alone is known as a *simple name*; a *qualified name* is the class name prefixed by the name of the package in which that class lives.

Attributes: An attribute is a named property of a class that describes a range of values that instances of the property may hold. A class may have any number of attributes or no attributes at all. An attribute represents some property of the thing you are modeling that is shared by all objects of that class.

Operations: An operation is the implementation of a service that can be requested from any object of the class to affect behaviour. In other words, an operation is an abstraction of something you can do to an object that is shared by all objects of that class. A class may have any number of operations or no operations at all.

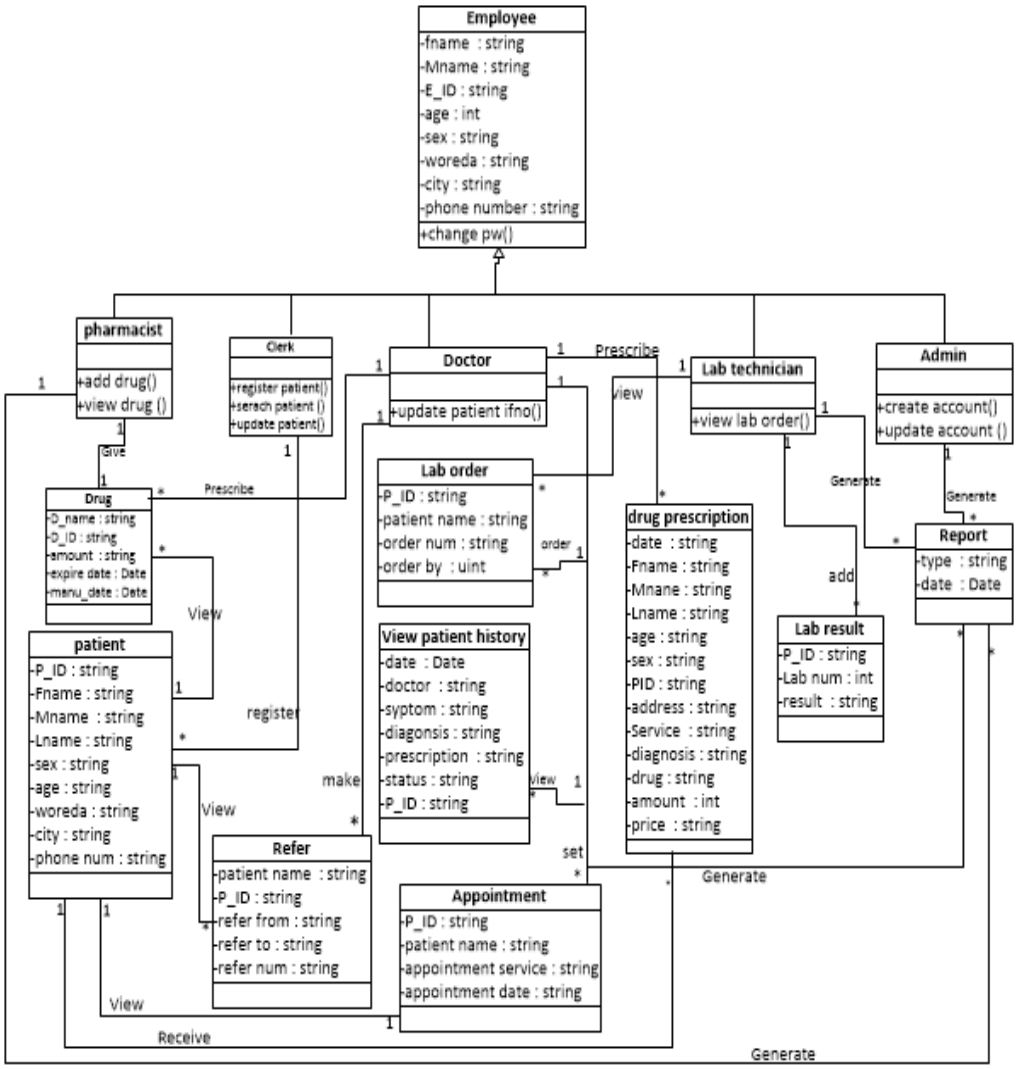


Figure 15 class diagram

Chapter 4

4. System design

4.1 Design Goal

This project is designed in a manner that solves the problems of the organization by minimizing the work load that appears on the employees because of the existing manual system. It provides more efficient, reliable and time saving system. In this project design the team will try to show:

- How the project is designed
- What are tasks done under the whole project
- The different modules and their way of functioning are described here

The goal of system design according to the proposed project is to manage complexity by dividing the system into smaller, manageable pieces and to increase the system:-

- Efficiency: the system doing something well and thoroughly without waste of money and time.
- Flexibility : the system able to change to suite new condition or situation
- Security: the system should be secured, i.e. not allow unauthorized users to access the system.
- Reliability: the system should be reliable.

4.2 System Decomposition

In our project we decompose the whole patient management system into smaller components are more easily understood when broken down into pieces using functional decomposition

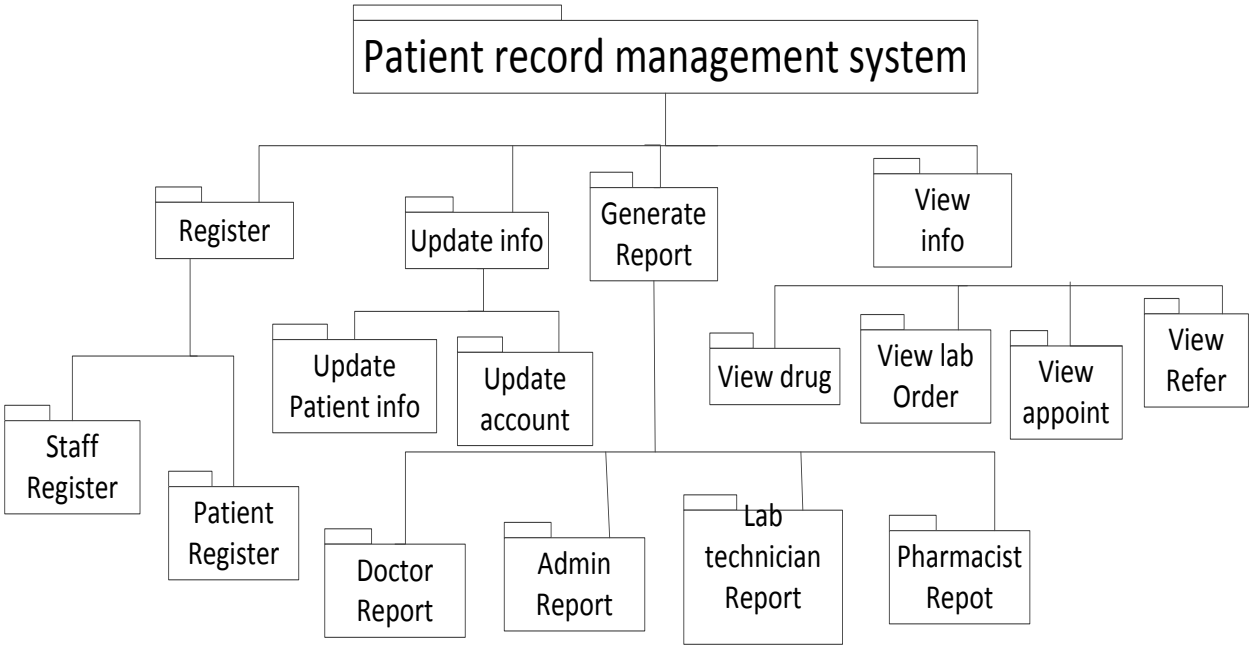


Figure 16 system decomposition

4.3 System Architecture

This gives a high level view of the new system with the main components of the system and the services they provide and how they communicate.

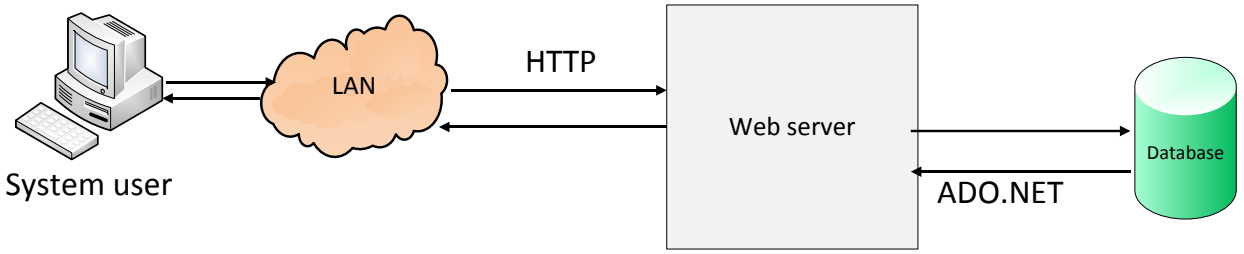


Figure 17: system architecture

4.4 **Deployment diagram**

The deployment diagram in this project shows how the software components, processes, and objects are deployed into the physical architecture of the system.

It shows the configuration of the hardware units (e.g. Computers, communication devices, etc) and how the software components are distributed across the units. Deployment diagrams are used to visualize the topology of the physical components of a system where the software components are deployed.

So, deployment diagrams are used to describe the static deployment view of a system. Deployment diagrams consist of nodes and their relationships. Deployment diagrams are used for describing the hardware components where software components are deployed. Deployment diagrams are mainly used by system engineers. These diagrams are used to describe the physical components (hardware), their distribution and association. To clarify it in details we can visualize deployment diagrams as the hardware components/nodes on which software components reside.

So the usage of deployment diagrams can be described as follows:

- To model the hardware topology of a system.
- To model hardware details for a client/server system.
- To design the hardware components efficiently

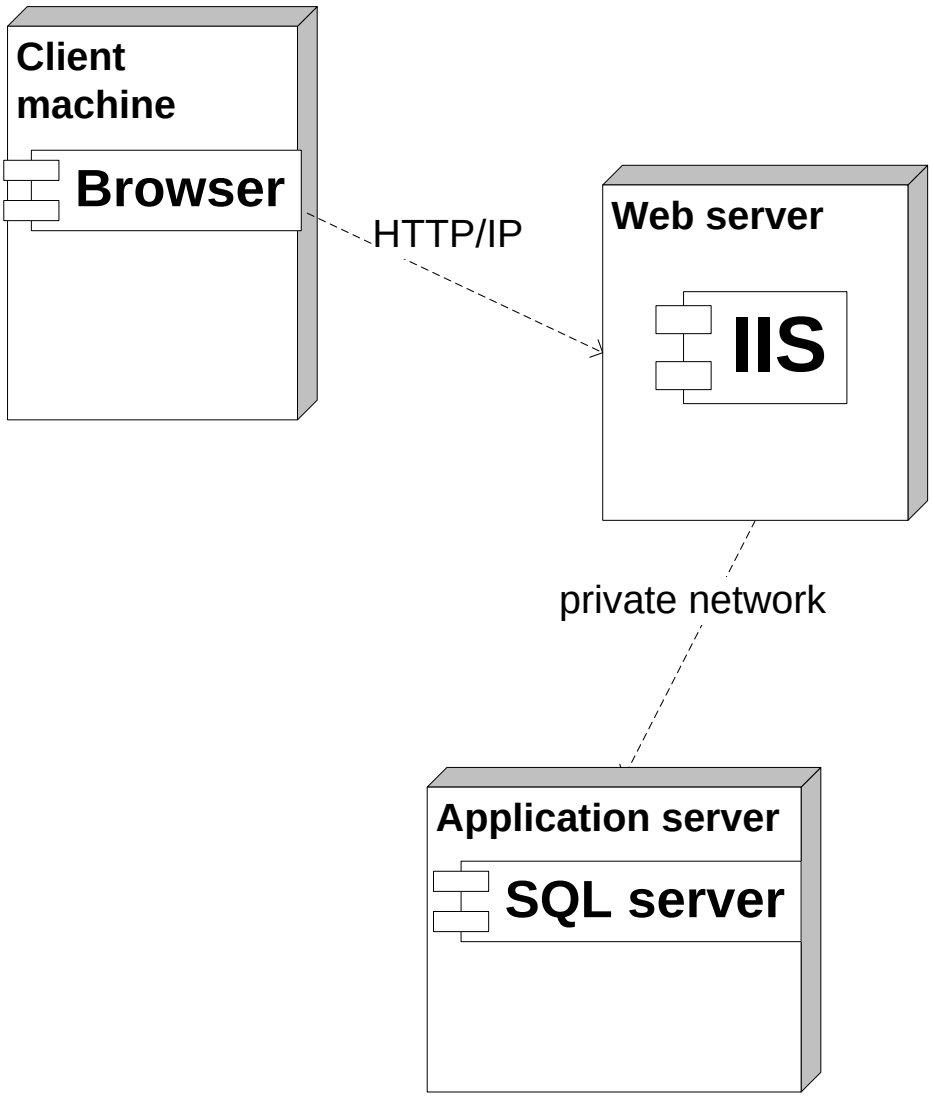


Figure 18 deployment diagram

4.5 Persistence data management

Persistence of our object can be achieved by relational database since it used as machine to make object persistent. It describes the persistent data aspect of software system. Our system includes the basic table that handles the data of system implemented using SQL server.

Mapping class and relational table

Mapping refers how objects and their relationship are stored in relational database.

The mapping of the data to be persisted in our system is given as follows:

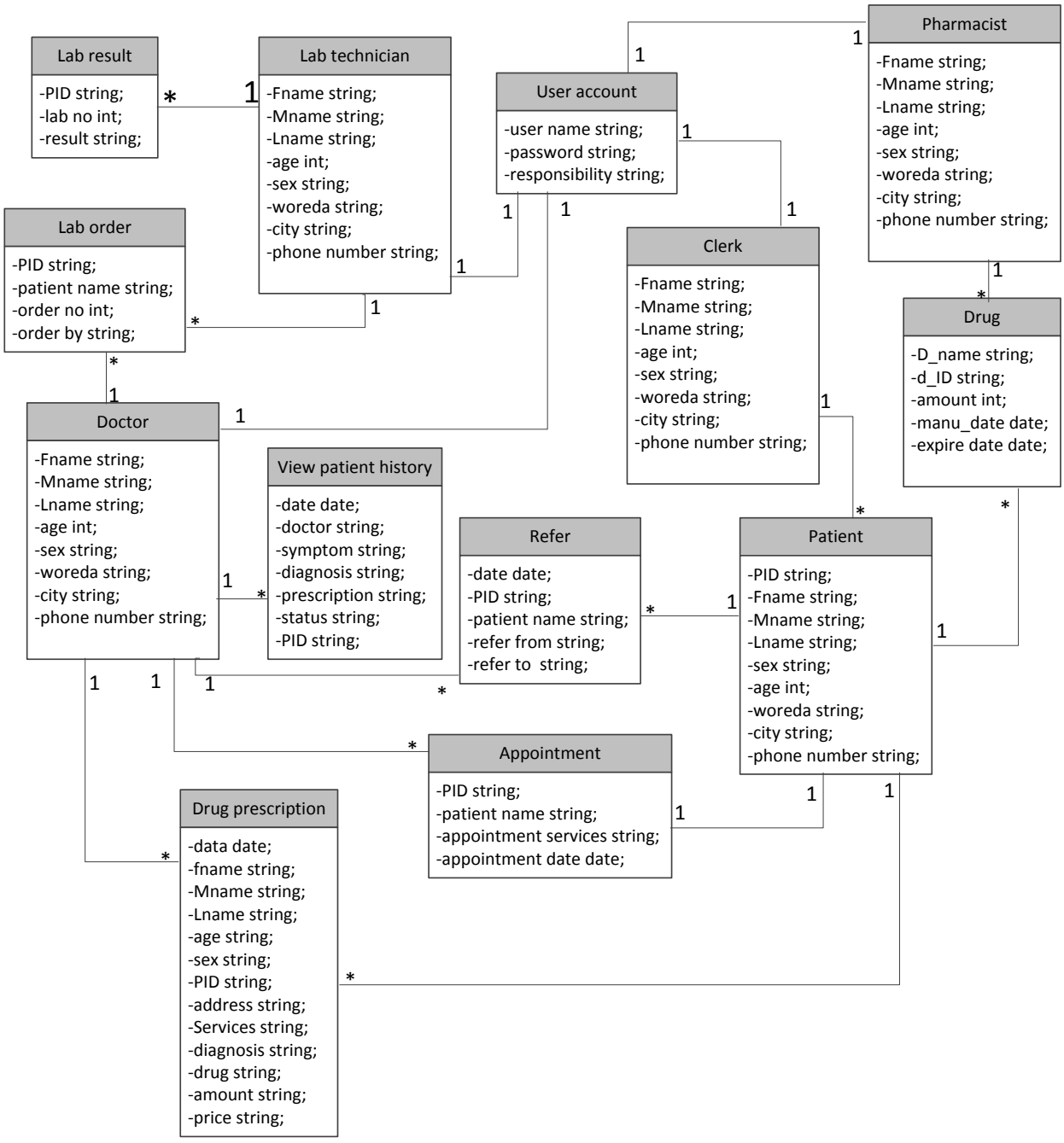


Figure 19 persistence diagram

4.6 **Access control and security**

In our system, different actors have access to different functionality and data. The system has different users as Administrator, doctor , lab technical , clerk , patient assistance and pharmacist.

Admin: Is an authenticate user .It is used by login subsystem .He or She is responsible for Create user account, Update account, delete patient and generate report.

Doctor : Is an authenticate user .It is used by login subsystem. Responsible for order lab test,refer patient, make appointment ,view patient history and order drug.

Clerk: Is an authenticate user. It is used by login sub system. Responsible to register patient , update patient , search patient.

Lab technician: Is an authenticate user. It is used by login subsystem. Responsible to view lab order, generate lab result.

Pharmacist: Is an authenticate user. It is used by login sub system. Responsible to add drug, view drug,

4.7 User interface design

Figure 20 login user interface

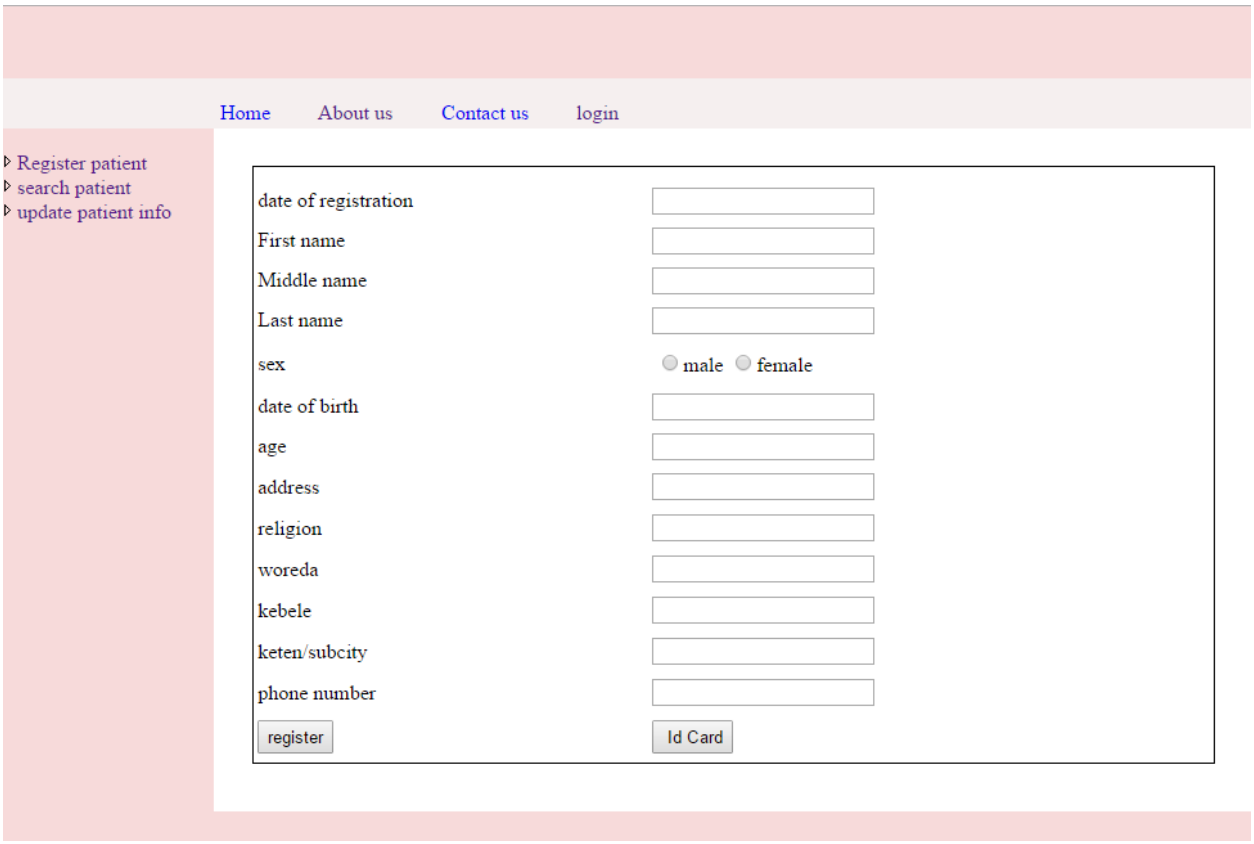


Figure 21 patient registration main form

Chapter five

5. Implementation

System description:-

Our system is the web based patient record system. So that every user to access this system based on their specific user account i.e. user name and password. Those user are the Administrator, doctor, lab technical, clerk, patient assistance and pharmacist. So that those user to use the system the administrator create account for the other user. At this time every user as well as the admin only access our system based their own accounts.

System development:-

To develop our system we use different editor and markup and scripting languages are:-

- CSS
- Visual studio 2010
- Ajax Control toolkit

Libraries:-

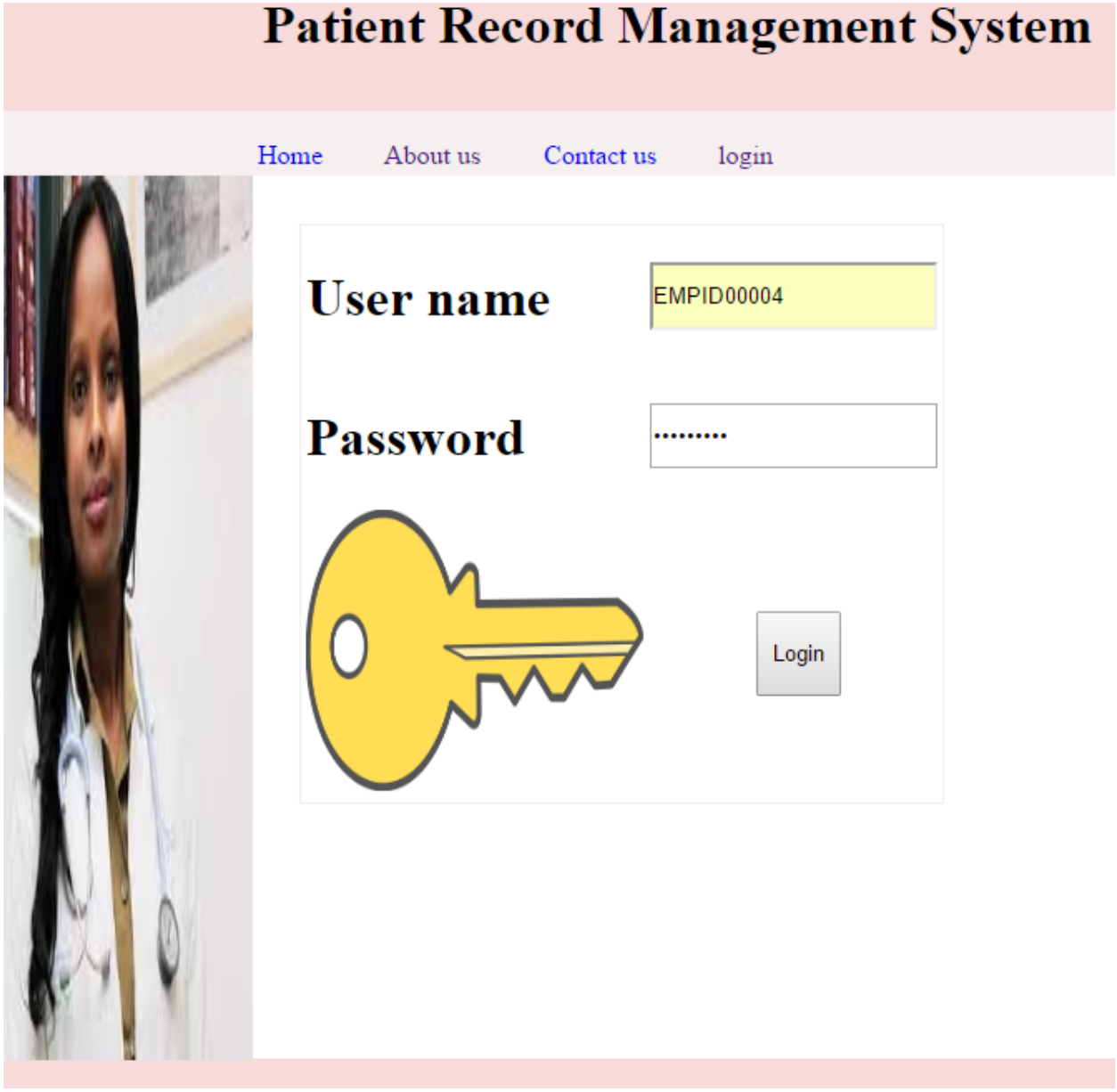
```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Web;
using System.Web.UI;
using System.Web.UI.WebControls;
using System.Data;
using System.Data.SqlClient;
using System.Configuration;
using System.IO;
using CrystalDecisions.CrystalReports.Engine;
```

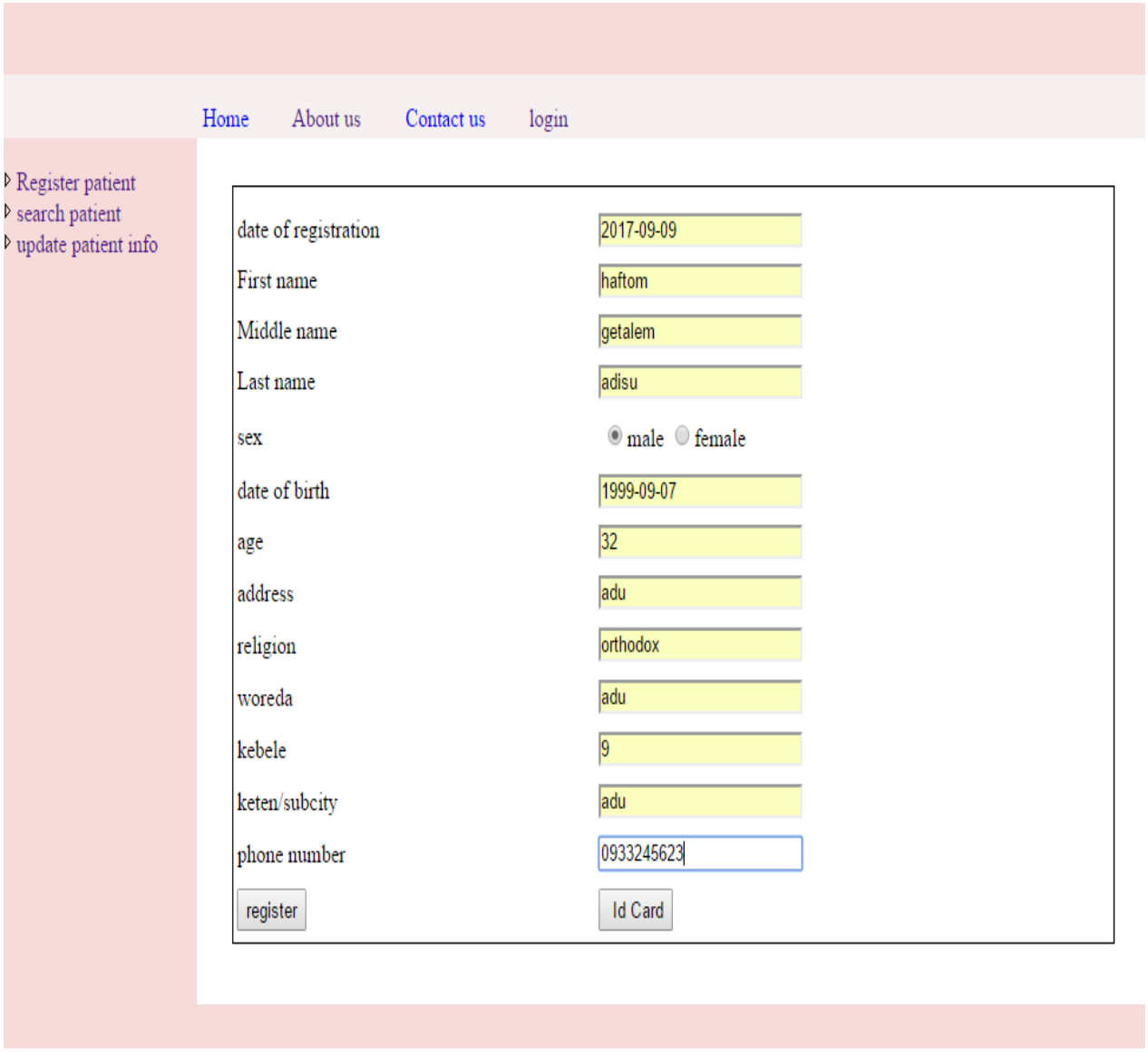
System implementation:-

This describes the tools used to implement the graphical user interface and the database. SQLServer was used to create and connect relational tables to the database. Asp.net was used to develop the GUI. ADO.net was used to connect the database with the interfaces

Prototype:-

The Prototype of our project shows how the users of this system can use and accesses information from the website and the database legally.




Home
About us
Contact us
login
Register patient
search patient
update patient info
date of registration
2017-09-09
First name
haftom
Middle name
getalem
Last name
adisu
sex
male
female
date of birth
1999-09-07
age
32
address
adu
religion
orthodox
woreda
adu
kebele
9
keten/subcity
adu
phone number
0933245623
register
Id Card

5.1. Code review and testing

The following section shows part of the code from Authentication class for the login

```
public partial class login : System.Web.UI.Page
    {
        SqlConnection con = new
SqlConnection("Data Source=INFOTECH;Initial
Catalog=PRMS;Integrated Security=True");

        protected void Page_Load(object sender,
EventArgs e)
        {

        }

        protected void button_Click(object
sender, EventArgs e)
        {
            SqlConnection con = new
SqlConnection(ConfigurationManager.ConnectionSt
rings["ApplicationServices"].ConnectionString);
            con.Open();
            SqlCommand cmd = new
SqlCommand("Select role from Employee where
EMPID='" + name.Text + "' and password ='" +
password.Text+ "'", con);
            SqlDataAdapter da = new
SqlDataAdapter(cmd);
            DataTable dt = new DataTable();
            da.Fill(dt);
            if (dt.Rows.Count > 0)
```

```
            {
                string type =
(dt.Rows[0]["role"]).ToString();

                if (type == "Admin")
                {
                    Session["EMPID"] =
name.Text;

Response.Redirect("Admin.aspx");
                }
                if (type == "labTechnican")
                {
                    Session["EMPID"] =
name.Text;

Response.Redirect("labTechnican.aspx");
                }

                if (type == "doctor")
                {
                    Session["EMPID"] =
name.Text;

Response.Redirect("Doctor.aspx");

                }
                if (type == "clerk")
                {
```

```
                    Session["EMPID"] =
name.Text;

Response.Redirect("Clerk.aspx");

                }
                if (type ==
"patientAssistence")
                {
                    Session["EMPID"] =
name.Text;

Response.Redirect("patientAssistence.aspx");

                }
            }
        }
```

5.1.1 Unit testing

Unit testing is carry out on individual modules of the system to ensure that they are fully functional units. We do this by examining each unit, for example the Underwriter's page. It is check to ensure that it functions as required and that it adds patient's data and other details and also ensure that this data is sent to the database. The success of each individual unit gave us the go ahead to carryout.

Test Case1			
Test Case Name: Login			
Purpose: To identify the user			
Input	**Expected Result**	**Output**	Pass/Fail
Valid user name and Password combination	The system successfully accept the user and display the profile page	The system successfully accept the user and display the profile page	Pass
Valid user name and invalid password	The system display “invalid user name/password”	The system display “incorrect user name/password”	pass
Incorrect user name and correct password	The system display “invalid user name/password”	The system display “incorrect user name/password”	pass
Incorrect user name and Incorrect password	The system display “invalid user name/password”	The system display “incorrect user name/password”	pass
Null user name and password	The system displays “pleas fill user name”	The system displays “pleas fill user name”	pass
user name and null password	The system display “pleas fill password”	The system display “pleas fill password”	Pass

5.1.2 Integration testing

We would carry out integration testing after different modules have put together to make a complete system. Integration is aim at ensuring that modules are compatible and they can be integrate to form a complete working system. For example we test to ensure that when a user is login he/she is link to the appropriate page, and also can access the database.

Chapter six

6.1 Conclusion

It is known that developing a system for an organization is not easy. But the team have tried its best and developed interesting web patient record management system for Adigrat general hospital. It is flexible, accurate and attractive with easy GUI approach. Generally, the team confidently can say that the software is completed successfully with negligible errors. Finally the team expects the software will change the general patient record management system of the hospital and makes it more reliable and efficient than the previous manual system.

6.2 Recommendation

According to scope of our project the team develops web based application .Because of the time constraint we cannot do beyond to our scopes, but in the future the team believes that this system can be fully operational by having enough time and full information.
So now all the group members strongly recommend the department that for the coming students, it has to provide them with better service than the present in better hard ware, guaranteed software's, giving orientations how to proceed, offering guest to provide them with more experienced work, support morally, manually.

References

1. Bruegge, B. and Allen Dutoit. 1999. Object Oriented Software Engineering: Conquering Complex and Changing Systems. Prentice hall PTR
2. A.Hoffer. (2007). Modern Systems Analysis and Design (5th Edition).
3. Ambler, S.W.2001. The Object Primer, 2nd edition. The application Developer's Guide to Object Oriented and the UML. Cambridge: Cambridge University Press
4. Cris Kobryn, Grady Booch, Ivar Jacobson and Jim Rumgaug. 1997. UML Distributed 3rd edition.
5. http://www.microsoft visio.com/product/vpuml/features/behavioralmodeling.jsp
6. http://creately.com/diagram-type/article/simple-guidelines-drawing-uml-class-diagrams