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Clinical Decision Support System

Bachelor of Science in Information Technology

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Certificate

We accept the work contained in the report titled “Virtual Car Restoration/Modification With 3D Model”, written by Mr. Hashir Manzoor and Ms. Kainaat Shah as a confirmation to the required standard for the partial fulfillment of the degree of Bachelor of Science in Computer Science.

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Abstract

Clinical Decision Support System for Hospital provides the benefits of streamlined operations, enhanced administration and control, superior patient care, strict cost control and improved profitability. It is a powerful, flexible, and easy to use and is designed and developed to deliver real conceivable benefits to hospitals. More importantly it is backed by reliable and dependable support.

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*“We think someone else, someone smarter than us,
someone more capable, someone with more resources will solve that problem.
But there isn’t anyone else.”*

Regina Dugan

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Chapter 1

Introduction

Clinical Decision Support System is a technique to develop large software systems have many integrated modules to make core business processes possible. Hospitals need to upgrade their system and move from manual processes to automated processes. Hospitals maintains much complex processes and activities using documentations and patients are mostly not in direct contact with hospital and their doctors. Patients have to maintain their files manually. To deal with these all situations we have created an automated system which can automate many processes in hospitals like getting Online Appointment, managing hospital Employees data and getting patients disease prediction. It will also help patients to see their routines and prescription history. It will give the disease outbreak predictions. This system will help hospitals move into the new world of automation and make things easier and faster. As it was a large system, so we completed its modules in iterations.

1.1 Project Background

In the previous couple of decades, technology has made a profound impact on the lives of people. Technology has influenced human practices to a considerably more prominent degree. Some people continue discovering approaches to do their work in a convenient way. They are becoming lazy and seek ease in every aspect of life. People are constantly looking for new services that would enable them to do their work efficiently in order to save their time. Also the Hospitals in Pakistan are full with the manual errors are frequent, doctors and nurses are confounded with slow paper-based information retrieval, and misplaced patient histories lead to poor diagnosis, which can lead to bad (life or death) decisions. Patient has to bring their records to the doctor and if something is lost then doctor sometime finds difficult to prescribe. There is no facility to view patient records. All the records are maintained by receptionist, all patient details, doctor details and general staff details

as well. Some of the hospitals have been using management systems which provide the basic functionalities needed to be handled in a hospital management environment. So we have created web application for hospital which will Integrate almost all the Services provided in the Hospital System and also this system will also automate these operations of the Hospital. Clinical Decision Support System is a technique to develop large software systems have many integrated modules to make core business processes possible. Hospitals need to upgrade their system and move from manual processes to automated processes. Hospitals maintains much complex processes and activities using documentations and patients are mostly not in direct contact with hospital and their doctors. Patients have to maintain their files manually.

1.2 Problem Description

In Hospitals of Pakistan, the manual errors are frequent, doctors and nurses are confounded with slow paper-based information retrieval, and misplaced patient histories lead to poor diagnosis, which can lead to bad (life or death) decisions. Patient has to bring their records to the doctor and if something is lost then doctor sometime finds difficult to prescribe. There is no facility to view patient records. All the records are maintained by receptionist, all patient details, doctor details and general staff details as well. Some of the hospitals have been using management systems which provide the basic functionalities needed to be handled in a hospital management environment. The way we are going to make this project will aid in learning because we are automating the manual system in an intelligent way and adding data mining technique as well. We will learn Clinical Decision Support System from this project, including that we can put our hand on AngularJS and MVC framework as well. We will learn how to put a complex business on automation by applying complex business rules. Our project management skills will also get better.

1.3 Project Objective

Primary objectives of this project are:

- To provide patients a platform for catering issues related to the problem they face in case of emergency
- To solve doctor and patient consultancy problem
- To notify the patient about doctor appointment and intake medicine

1.4 Motivation and Challenges

The aim of this project is to develop a patient and doctors oriented system which is specifically helpful for the patients as well as doctors and solve their problems. Hospital plays a very important role in our society to save human life. Individual (patient) can't maintain their medical history because size increase after every checkup and information are scatted in different hospitals. The biggest challenge for developing our system is to first understand the terms, standard level, different medical terms and vaccinations and the concepts of the medical field before to build up our system.

1.5 Project Scope

CDSS is a health information system that combines health observations / diagnostics options that affect health improvement with knowledge-based predictions Healthcare. The system will advise based on several factors involved in the patient will diagnose procedure and give specific advice to physician or physician.

A typical procedure will involve:

This project will make hospital able to manage things in an easy and intelligent way. This software mainly revolves around admin, doctor, receptionist and patient. When patient visit a hospital as a visitor, he/she will be given UHID and all his records will be maintained against this ID. Patient will be given username and password so that he/she can access portal, where patient can see all the history regarding to the treatments by different doctors and their prescriptions, appointments and payments. Appointments can be taken from website as well without UHID. On the other hand, there are doctors who will have their own portal and they can treat their patient using this decision support system. Patient will give his/her UHID and all records regarding that patient with this particular doctor will appear, no need of bringing heavy files for patients anymore. Doctors can see their appointments and daily schedule from there as well. Now here comes the receptionist for some important jobs, he/she will add/update/delete patients record, make and view appointments and all history regarding payments, prescriptions, treatments, doctor details, tariff details and search patient details using advance search as well. Our major focus is on Heart Disease Patient.

Chapter 2

Literature Review

It is important to understand and explore knowledge about existing systems to provide a solution. This is helpful to trace a gap between already existing system and the system will be created to get more deep understanding about the problems and helps us in providing a good solution and compare our product quality to existing solutions

2.0.1 Literature Review

In context of literature review, in our life in many ways we observed great issues in manual hospitals systems like:

1. Human Errors
2. Time Consuming process
3. Misinterpretation

And also there are some online hospital management system which lag different features.

2.0.2 Analysis from Literature Review

The analysis from the related systems provides the functionalities that are not present in these systems. Moreover, there are some improvements in the current systems that need to be cooperated in the developing system. The major issue among all the systems is that they are not providing online Appointments and medical record fetching for patients. Doctors can see their appointments and daily schedule from there as well. Now here comes the receptionist for some important jobs, he/she will add/update/delete patients, make and view appointments and all history regarding payments, prescriptions, treatments, doctor details, tariff details and search patient details using advance search as well. At the end

there is admin who can add doctors. Admin will set the schedule of doctor and he/she will be given privilege to give username and passwords to doctors.

2.0.3 Related System Analysis/Literature Review

Application Name	Weakness	Proposed Project Solution
Insta HMS	<ol style="list-style-type: none"> 1. No patient feed-backs. 2. Late reply on query. 	<ol style="list-style-type: none"> 1. Patient feedback about different departments and doctor treatments will be taken. 2. There will be live chat in which customer queries will be watched by admin and queries will be forwarded to respective department. Then sender will be satisfied asap.
SoftClinic	<ol style="list-style-type: none"> 1. Not able to type in a specific advice for the patient at the end of the prescription. 2. Lack of popups. 	<ol style="list-style-type: none"> 1. Doctor can update patient health status and can add an advice as well. 2. We will prefer popups after some sensitive actions like deleting records.
Medstar HIS	<ol style="list-style-type: none"> 1. Patient is not able to download files from portal. 	<ol style="list-style-type: none"> 1. Patient will be able to down files

Chapter 3

Requirement Analysis

This chapter contains the requirements for the system “Clinical Decision Support System” . It includes the problem scenarios, functional and non-functional requirement of the system.

Functional requirements of the system are following.

3.0.0.1 Use Case 1

Functional Requirement

3.1 Functional Requirements

Some of the functional requirements that need to be performed in the web application are:

3.1.1 Admin’s Portal

3.1.1.1 Functional Requirement 1

Identifier	FR-01
Title	View all appointments and their status.
Requirement	Admin will be able to view all appointments and their status with respect to doctors and patients.
Rationale	Check that doctor is dealing with appointments regularly.
Business Rule (if required)	Admin cannot make any changes in the appointments.
Dependencies	
Priority	High/Medium/Low

Table 3.1: Privilege to view appointment and their status

3.1.1.2 Functional Requirement 2

Identifier	FR-02
Title	Make Schedule
Requirement	Admin will be able to make schedule for doctor, medical staff and general staff. Admin can update that schedule as well
Source	
Rationale	Make schedule for faculty and run processes in a regularized way
Business Rule (if required)	Schedule should revolve within duty time.
Dependencies	FR-32
Priority	High

Table 3.2: Doctor schedule

3.1.1.3 Functional Requirement 3

Identifier	FR-03
Title	Send Notifications
Requirement	System will ask to send notification via SMS and email to patients about the new schedule
Source	Any uncertain change in doctor schedule
Rationale	Patient will be updated about the new schedule timely
Business Rule (if required)	If admin doesn't allow to send notification then messages will not be sent
Dependencies	N/A
Priority	High

Table 3.3: Privilege to send notification by Email and SMS

3.1.1.4 Functional Requirement 4

Identifier	FR-04
Title	Respond to Live chat
Requirement	Admin will be able to respond live chat
Source	When a message will be thrown from somewhere by someone
Rationale	Customer care
Business Rule (if required)	Response should be sent within an hour, when the time exceeds admin will be notified with red color
Dependencies	N/A
Priority	High

Table 3.4: Respond to live chat

3.1.1.5 Functional Requirement 5

Identifier	FR-05
Title	See patient feedback
Requirement	Admin can see the patient feedback about the doctor and hospital management
Source	When patient send feedback
Rationale	Analyze weaknesses and strengths
Business Rule (if required)	Response should be sent within an hour, when the time exceeds admin will be notified with red color
Dependencies	N/A
Priority	High

Table 3.5: Able to see the patient feedback

3.1.1.6 Functional Requirement 6

Identifier	FR-06
Title	Give doctor access to portal
Requirement	Admin can give doctor access to portal
Source	Doctor requires portal
Rationale	Make better medical decisions
Business Rule (if required)	Random username and password will be generated by system
Dependencies	N/A
Priority	High

Table 3.6: Privilege to give access to portal

3.1.1.7 Functional Requirement 7

Identifier	FR-07
Title	Add Employee
Requirement	Admin add employee as a doctor, medical staff and general staff
Source	When new employee is required
Rationale	Fulfill the need of manpower
Business Rule (if required)	Employee will be given a unique ID and important particular cannot be left blank
Dependencies	FR-06
Priority	High

Table 3.7: Privilege to add a new employee

3.1.2 Front Desk

3.1.2.1 Functional Requirement 8

Identifier	FR-09
Title	Enter patient
Requirement	Receptionist will take detailed information of patients and this information will be saved in database
Source	When patient record doesn't exist already.
Rationale	Patient registry
Business Rule (if required)	If patient record already exists then new record cannot be entered.
Dependencies	FR-10, FR-13 and FR-15
Priority	High

Table 3.8: Add/Edit information of patients

3.1.2.2 Functional Requirement 9

Identifier	FR-9
Title	Generate Unique Health Identification Number (UHID)
Requirement	System will generate UHID of patients.
Source	Patient registry
Rationale	Patient unique identity
Business Rule (if required)	UHID will be specific for each registered patient
Dependencies	FR-11
Priority	High

Table 3.9: Generates Unique Health Identification Number (UHID)

3.1.2.3 Functional Requirement 10

Identifier	FR-10
Title	Admit Patient
Requirement	Receptionist can admit a patient using UHID of the patient by adding the required data.
Source	Patient is emergency case or recommended by doctor.
Rationale	Patient will be looked after by hospital staff.
Business Rule (if required)	To admit a patient UHID is required.
Dependencies	N/A
Priority	High

Table 3.10: Check Doctor Availability

3.1.2.4 Functional Requirement 11

Identifier	FR-11
Title	Check Doctor Availability
Requirement	Receptionist will provide information to the patients about the doctor like whether the doctor is available or not.
Source	When patient needs appointment.
Rationale	Patient can match his/her schedule with doctor and take the appointment on the time patient wants.
Business Rule (if required)	Patient will be told only the doctor timings.
Dependencies	N/A
Priority	Medium

Table 3.11: Provide Doctor Information

3.1.2.5 Functional Requirement 12

Identifier	FR-12
Title	Advance search for patients
Requirement	Receptionist can search patient by name, contact and CNIC.
Source	When patient doesn't remember UHID number.
Rationale	Let patient know his/her UHID.
Business Rule (if required)	N/A
Dependencies	N/A
Priority	High

Table 3.12: Advanced search for registered patients

3.1.2.6 Functional Requirement 13

Identifier	FR-13
Title	Room Allocation
Requirement	System will automatically allocate the room to the patient who wants to get admitted.
Source	When patient wants to get admitted
Rationale	Motivation behind the requirement
Business Rule (if required)	Receptionist will enter the department and room type first then room will be allocated.
Dependencies	N/A
Priority	High

Table 3.13: Room allocation

3.1.2.7 Functional Requirement 14

Identifier	FR-14
Title	Give patient access to portal
Requirement	System will give access to the portal.
Source	When patient wants to get access to the portal
Rationale	Patient can use the facilities and see all his/her history.
Business Rule (if required)	System will generate username and password.
Dependencies	N/A
Priority	High

Table 3.14: Generate Login Information for Patients

3.1.2.8 Functional Requirement 15

Identifier	FR-15
Title	Add appointments manually
Requirement	Receptionist will add appointments manually
Source	When patient didn't make appointment online.
Rationale	Using this appointment number patient can enquire about the appointments.
Business Rule (if required)	System will give appointment number for this appointment.
Dependencies	N/A
Priority	High

Table 3.15: Add appointments manually

3.1.2.9 Functional Requirement 16

Identifier	FR-16
Title	Confirm Online Appointments
Requirement	Receptionist will confirm the appointments that have been registered online.
Source	When patient has arrived on the appointment date.
Rationale	Confirmed appointments will be added to the List of Current Appointments.
Business Rule (if required)	If patient doesn't arrive on the appointment date then online appointment will be discarded.
Dependencies	N/A
Priority	High

Table 3.16: View Online Appointments

3.1.2.10 Functional Requirement 17

Identifier	FR-17
Title	Tariff information and estimates
Requirement	Receptionist will be able to see tariff information and calculate total tariff estimates.
Source	When patient ask about tariff.
Rationale	Patient doesn't need to wait for such calculations.
Business Rule (if required)	Front Desk cannot change Tariff Estimates.
Dependencies	N/A
Priority	Medium

Table 3.17: Tariff information and estimates

3.1.2.11 Functional Requirement 18

Identifier	FR-18
Title	Discharge Patient
Requirement	Receptionist will discharge the patient.
Source	When doctor acknowledge to discharge that patient.
Rationale	Patient requires no more treatment and free the bed.
Business Rule (if re- quired)	When all dues are clear.
Dependencies	FR-30
Priority	High

Table 3.18: Discharge patient

3.1.3 Patient Portal**3.1.3.1 Functional Requirement 19**

Identifier	FR-19
Title	View History
Requirement	Patient will be able to see appointment history and payment history.
Source	When patient wants to recall something about his/her routine from the past.
Rationale	View his routine in hospital with different doctors.
Business Rule (if re- quired)	N/A
Dependencies	N/A
Priority	Medium

Table 3.19: History

3.1.3.2 Functional Requirement 20

Identifier	FR-20
Title	View Prescriptions
Requirement	Patient will be able to see his/her all previous prescriptions and medicine dosages.
Source	When patient wants to see previous prescriptions.
Rationale	Patient can view his all record and discuss it with other doctors.
Business Rule (if required)	N/A
Dependencies	N/A
Priority	High

Table 3.20: View prescription and medicine dosage

3.1.3.3 Functional Requirement 21

Identifier	FR-21
Title	Edit Profile
Requirement	Patient will be able to edit his profile (e.g. contact and email).
Source	When patient got new contact and want to update it in profile.
Rationale	Notifications will be sent on right contact number and email.
Business Rule (if required)	Patient cannot change sensitive data (e.g. UHID, name, CNIC etc.).
Dependencies	FR-23
Priority	High

Table 3.21: Edit profile

3.1.3.4 Functional Requirement 22

Identifier	FR-22
Title	Notification by email and SMS
Requirement	Patient will get notifications about appointments from hospital management via email and SMS.
Source	Change in doctor schedule
Rationale	Patient knows about the new schedule
Business Rule (if required)	Only those patients having appointment with a particular doctor, will be updated if there is some change in that particular doctor schedule.
Dependencies	FR-3
Priority	Medium

Table 3.22: Notification by email and SMS

3.1.3.5 Functional Requirement 23

Identifier	FR-23
Title	Send Feedback
Requirement	Patient will give feedback about how was he treated by doctor and hospital staff.
Source	When patients want to give remarks on their experience
Rationale	Help hospital management to understand their weaknesses and strengths.
Business Rule (if required)	Popup will appear when feedback is submitted.
Dependencies	FR-6
Priority	High

Table 3.23: Send Feedback

3.1.3.6 Functional Requirement 24

Identifier	FR-24
Title	Take appointment
Requirement	Patient will be able to take appointment from that portal.
Source	When patients want to visit a doctor.
Rationale	Patient will get appointment without calling.
Business Rule (if required)	Appointment will be made against patient's UHID.
Dependencies	FR-17 and FR-27
Priority	High

Table 3.24: Take appointment

3.1.3.7 Functional Requirement 25

Identifier	FR-25
Title	Live chat with hospital
Requirement	Registered patients and other people will be able to ask about any query to the hospital management through live chat.
Source	When patients and other people have any query to ask.
Rationale	Patient will get answer very soon.
Business Rule (if required)	<ol style="list-style-type: none"> 1. Patient will be shown a popup when feedback is submitted. 2. Admin will be notified that new message has come.
Dependencies	FR-04
Priority	Medium

Table 3.25: Live chat with hospital

3.1.4 Doctor portal

3.1.4.1 Functional Requirement 26

Identifier	FR-26
Title	View daily appointments
Requirement	Doctor will view daily appointments that have been made online or manually by the receptionist.
Source	When doctor want to check appointments.
Rationale	According to the number of appointments doctor can manage time.
Business Rule (if required)	After patient doctor meetup system will change appointment status from pending to done.
Dependencies	N/A
Priority	High

Table 3.26: View daily appointments

3.1.4.2 Functional Requirement 27

Identifier	FR-27
Title	Update patient health status
Requirement	The doctor will be able to update the health status of patients (admitted and visitors).
Source	When patient wants to update patient health status.
Rationale	Patient can see their health status on their portal.
Business Rule (if required)	The doctor will update the health status of patients in that way [bad->Out of danger->satisfactory->good].
Dependencies	N/A
Priority	High

Table 3.27: Update patient health status

3.1.4.3 Functional Requirement 28

Identifier	FR-28
Title	Treatment and Prescription
Requirement	Doctor will see patient's previous prescriptions and comments then doctor will easily prescribe the new medicines and add some comments.
Source	When patient has come for treatment.
Rationale	Better health decision and record keeping
Business Rule (if required)	<ol style="list-style-type: none"> 1. Doctor will give UHID of particular patient and system will retrieve patient data. 2. All prescriptions, comments and advises will be stored in database.
Dependencies	FR-21
Priority	High

Table 3.28: Treatment and Prescription

3.1.4.4 Functional Requirement 29

Identifier	FR-29
Title	Watch Schedule
Requirement	Doctor will be able to see his/her schedule on this portal.
Source	When doctor wants to see his/her schedule.
Rationale	Doctor can regularize his/her routine.
Business Rule (if required)	Doctor cannot change the schedule if change is wanted then doctor can request admin.
Dependencies	FR-27
Priority	High

Table 3.29: Watch Schedule

3.1.4.5 Functional Requirement 30

Identifier	FR-30
Title	Reporting
Requirement	The system will generate reports of appointments, treatments, births and death records. Including that system will generate these reports for individuals as well.
Source	When admin requires report.
Rationale	Record keeping
Business Rule (if required)	Weekly/Monthly/Yearly reports will be generated on admin demand.
Dependencies	N/A
Priority	High

Table 3.30: Reporting

3.1.5 Cashier**3.1.5.1 Functional Requirement 31**

Identifier	FR-31
Title	Charges Details
Requirement	Cashier will be able to add and update the charges of each facility.
Source	When patient requires information about charges.
Rationale	Patients will get to know about the charges.
Business Rule (if required)	Except cashier no one will be able to update that data.
Dependencies	FR-18
Priority	High

Table 3.31: Charges Details

3.1.5.2 Functional Requirement 32

Identifier	FR-32
Title	Patient Billing
Requirement	Cashier will be shown all the facilities patient has taken including daily charges and extensions. Then system will help cashier to calculate the bill for the admitted patient.
Source	When patient is ready to discharge
Rationale	Bills clearance
Business Rule (if required)	Patient will not be discharged unless cashier acknowledges.
Dependencies	FR-19
Priority	High

Table 3.32: Patient Billing

3.1.6 Non-Functional Requirements

Non-Functional requirements of this system are following:

1. Usability

USA-1: The system will be easy to understand, UI will be kept simple and sound.

USA-2: System will also save session and view state.

2. Performance

PER-1: The system load time for user interface screens shall take no longer than five seconds, if user is having connection of 8 MBPS or more. PER-2: Login verification and other processes should not take more than five seconds, if user is having connection of 8 MBPS or more.

3. Integrity

INT-1: The system will not make any changes to the data saved, data will be preserved in their original form. INT-2: Data will be accessible and easy to understand.

4. Security

SEC-1: Authorized employees can only access the webpages.

Chapter 4

Design

4.1 Introduction

A software architecture comprising software components determines the functional architecture such as Database Management System, connectivity software and workflow engine.

4.2 Modules

4.2.1 Hospital Main

Hospital main section will contain:

- Hospital name
- Hospital profile
- Pictures
- Address
- Contact details
- Diseases cured/covered
- Payment options
- Doctor names, pictures and profiles
- Doctor availability and schedule
- Approximate treatment fee

- Consultation charges
- Live chat with hospital
- Notifications

4.2.2 Users

4.2.2.1 Admin Portal

Salient Features Include:

- Privilege to view appointment
- Doctor schedule
- View bed allotments
- General Information
- Privilege to send notifications by Email
- Respond to live chat
- Privilege to add new employee

4.2.2.2 Patient Portal

Salient Features Include:

- Appointment history
- Payment history
- Privilege to view previous prescriptions
- Edit profile
- Receive notifications
- Feedback
- Live chat with hospital

4.2.2.3 Doctor Portal

Salient Features Include:

- View daily appointments
- Update patient health status
- Treatment and prescriptions
- Patient discharge
- Privilege to allow extensions to the admitted patients
- View schedule
- Add/change medicines

4.2.2.4 Front Desk

Salient Features Include:

- Add/Edit patient information
- Provides Unique Health Identification Number (UHID) to patient
- Admit a patient
- Provide doctor information
- Room allocations
- Advanced search for registration patient
- Generates username and password for patients
- Add appointments manually
- View online appointments
- Patient discharge

4.2.2.5 Cashier

Salient Features Include:

- Add/Edit patient information
- Patient billing details

- Cash collection dashboards
- Reporting
- Weekly/ Monthly/ Yearly Reports of:
 - Appointments
 - Treatments done
 - Individual Appointment History
 - Individual Treatment History

4.3 System Architecture

The proposed system makes use of the Model View Controller or MVC architecture. MVC stands for Model, View and Controller. MVC separates application into three components - Model, View and Controller.

Model: Model represents shape of the data and business logic. It maintains the data of the application. Model objects retrieve and store model state in a database. Model is a data and business logic.

View: View is a user interface. View display data using model to the user and also enables them to modify the data. View is a User Interface.

Controller: Controller handles the user request. Typically, user interact with View, which in-turn raises appropriate URL request, this request will be handled by a controller. The controller renders the appropriate view with the model data as a response. Controller is a request handler.

4.4 Use Case Diagram

The requirements of the customers will be kept under consideration while designing the web application so that it should be user-friendly, responsiveness and design should be made to use which will be providing all the features and functionalities of the website without any flaws. The design of the web application shall be simple from the front end so that any user can easily access and use the website to view a modified version of a car.

4.4.1 Use Case 1

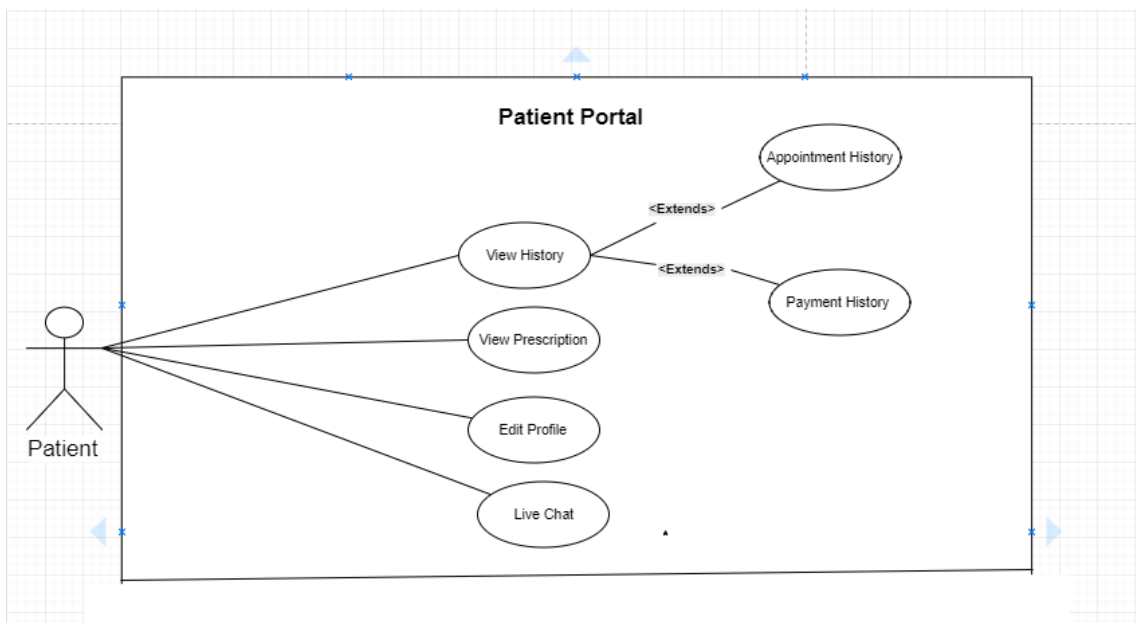


Figure 4.1: Patient Portal

4.4.2 Use Case 2

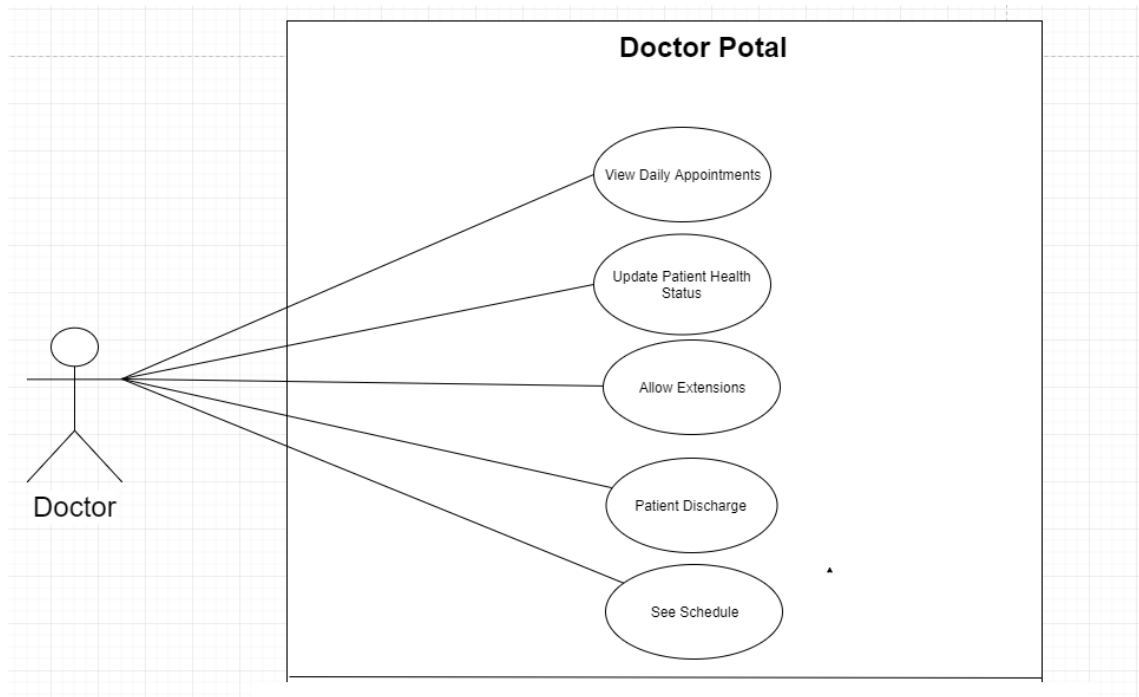


Figure 4.2: Doctor Portal

4.4.3 Use Case 3

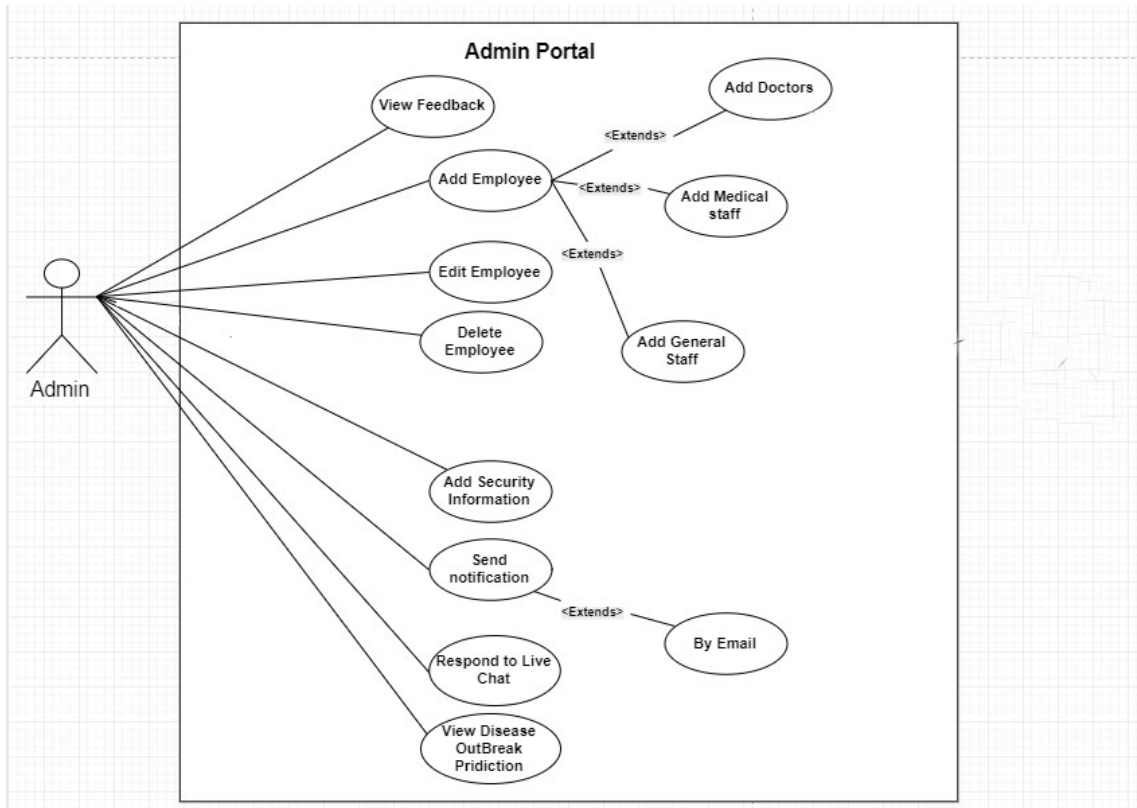


Figure 4.3: Admin Portal

4.4.4 Use Case 4

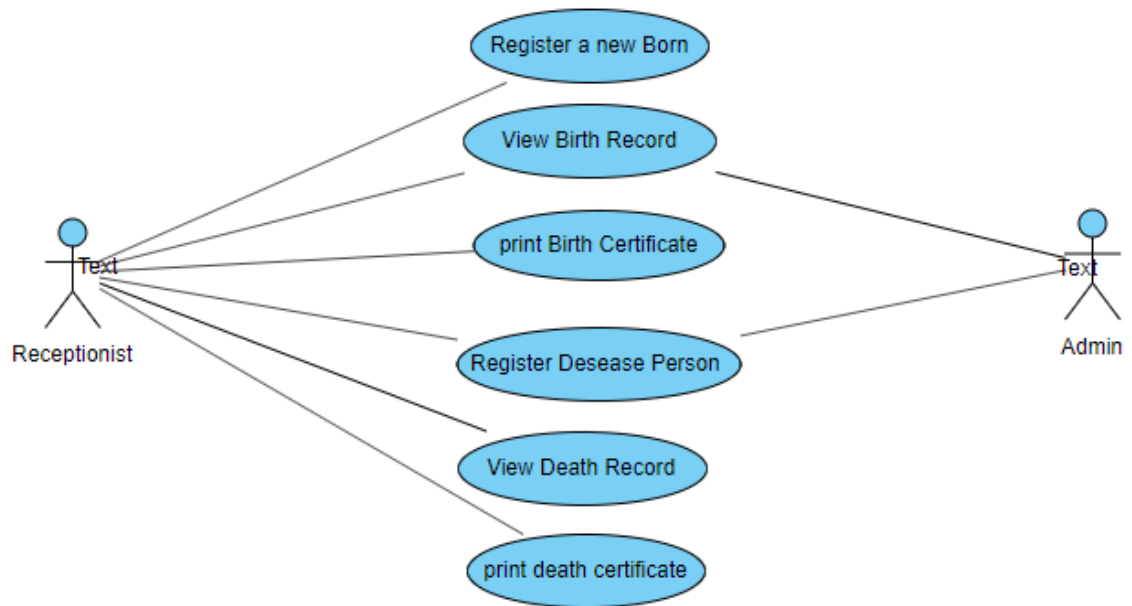


Figure 4.4: Front Desk Portal

4.5 Activity Diagram

4.5.1 Activity Diagram 1

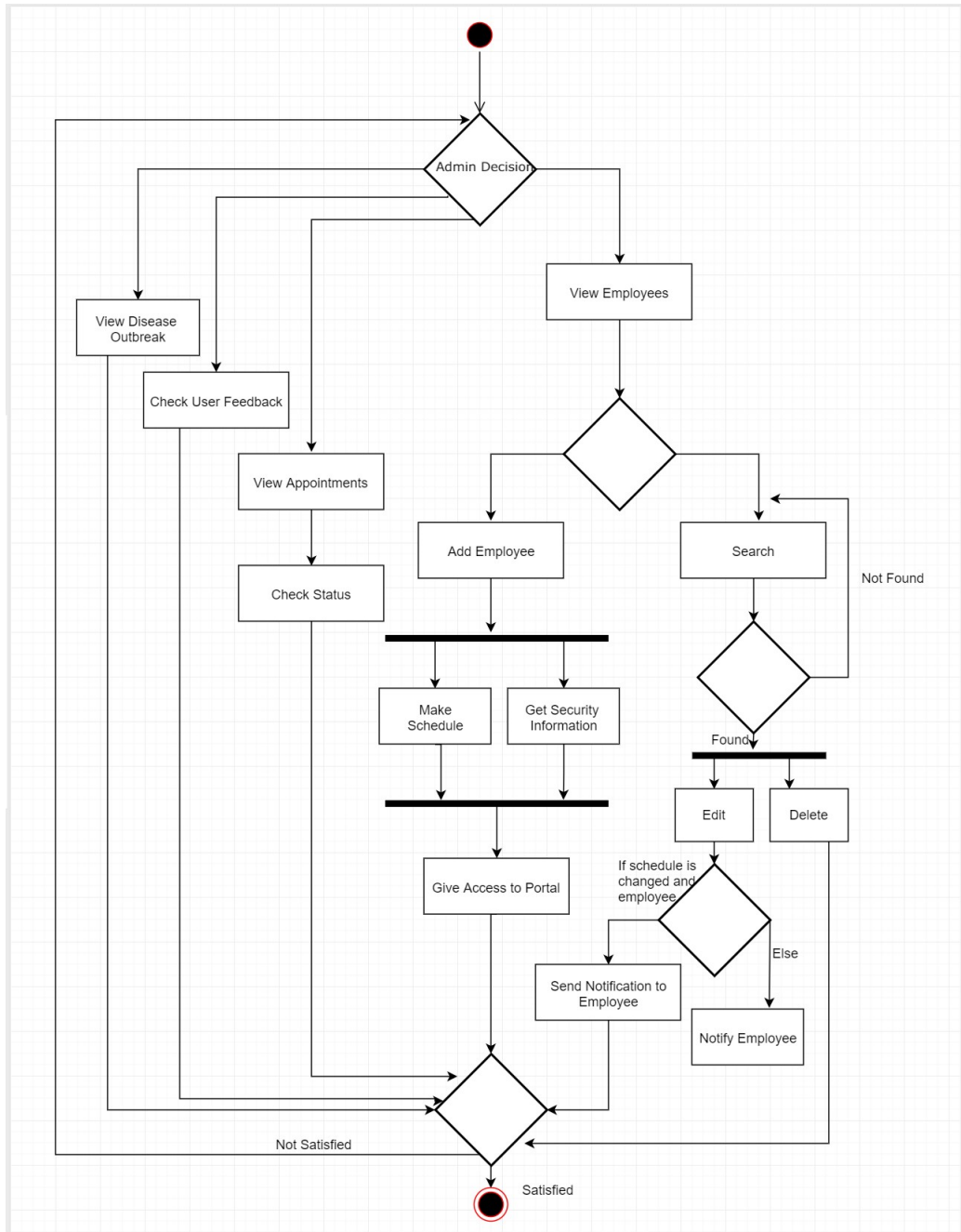


Figure 4.5: Activity Diagram (Admin)

4.5.2 Activity Diagram 2

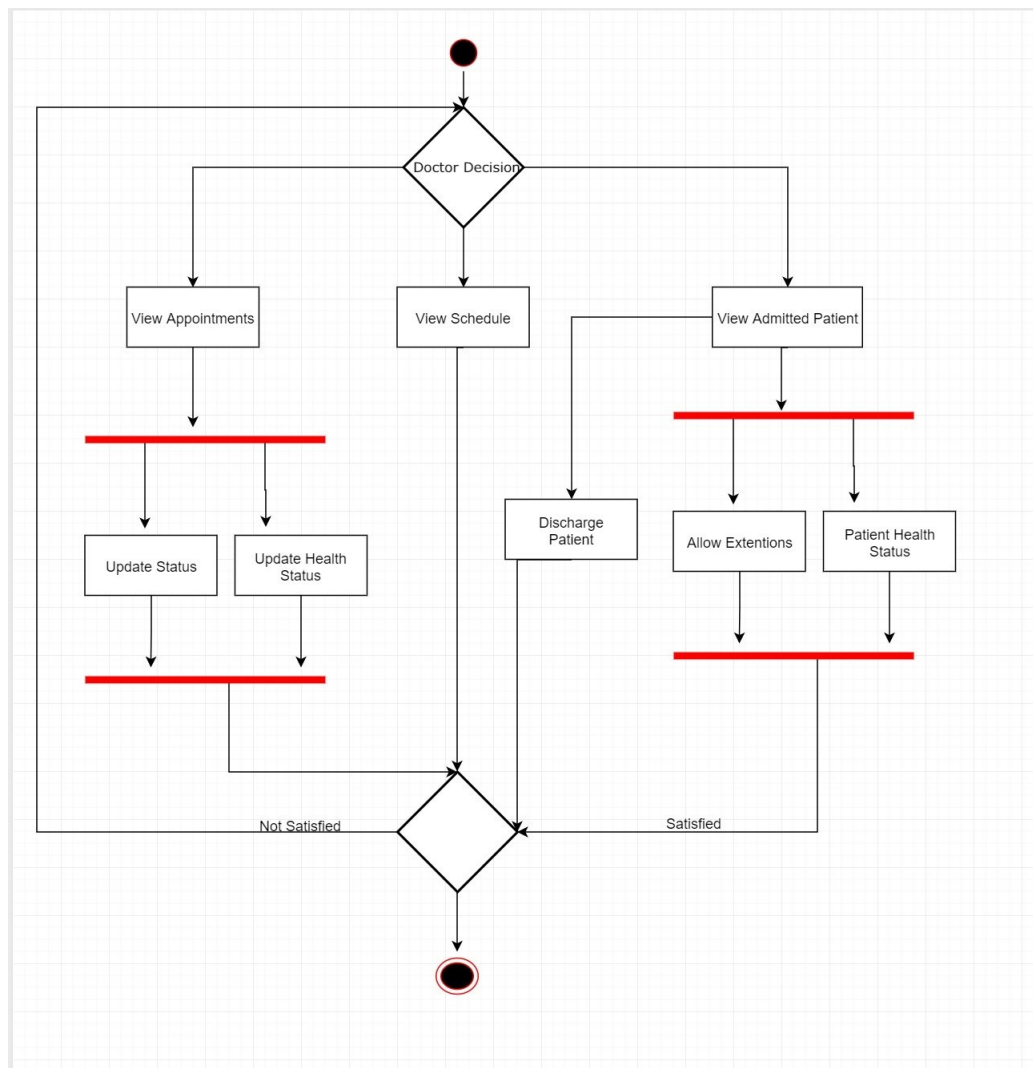


Figure 4.6: Activity Diagram (Doctor)

4.5.3 Activity Diagram 3

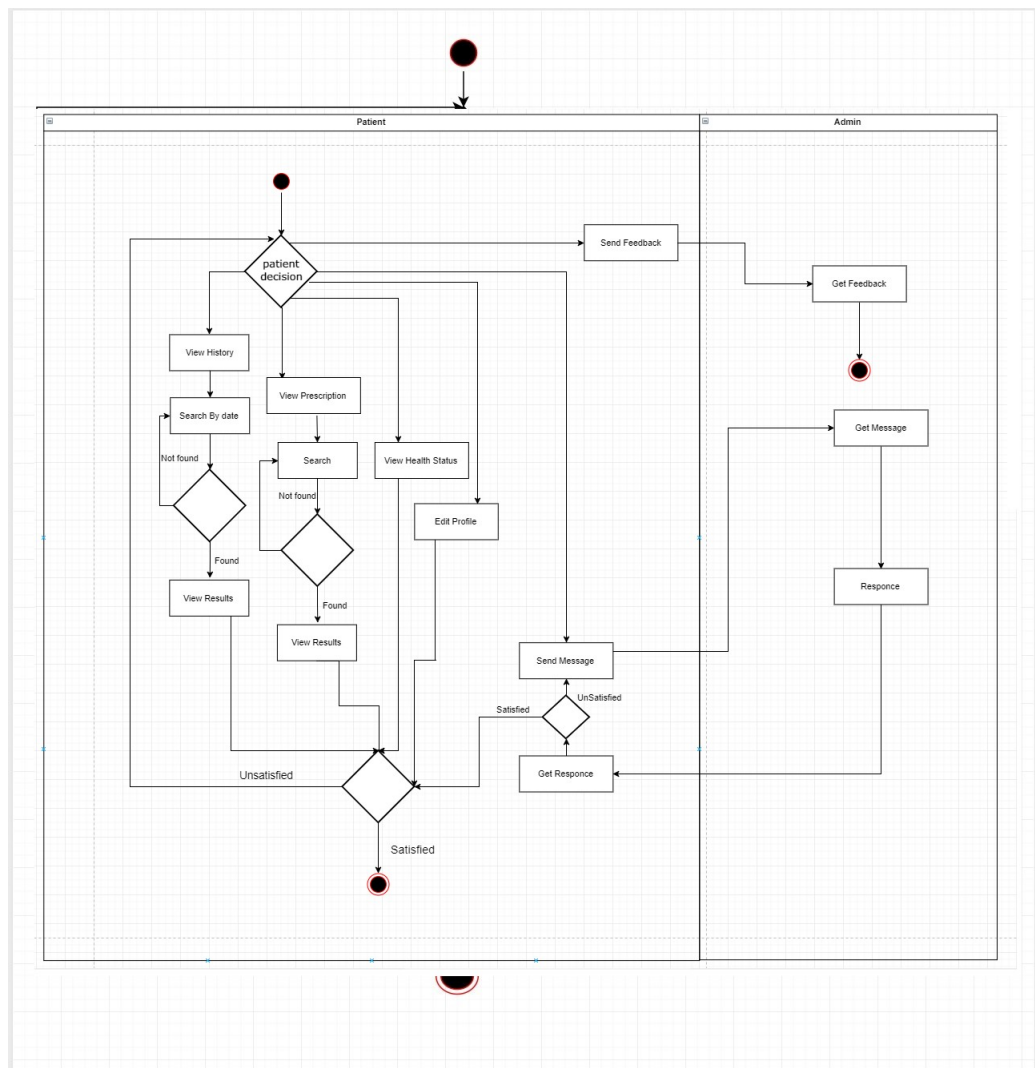


Figure 4.7: Activity Diagram (Patient)

4.6 Sequence Diagram

4.6.1 Sequence Diagram 1

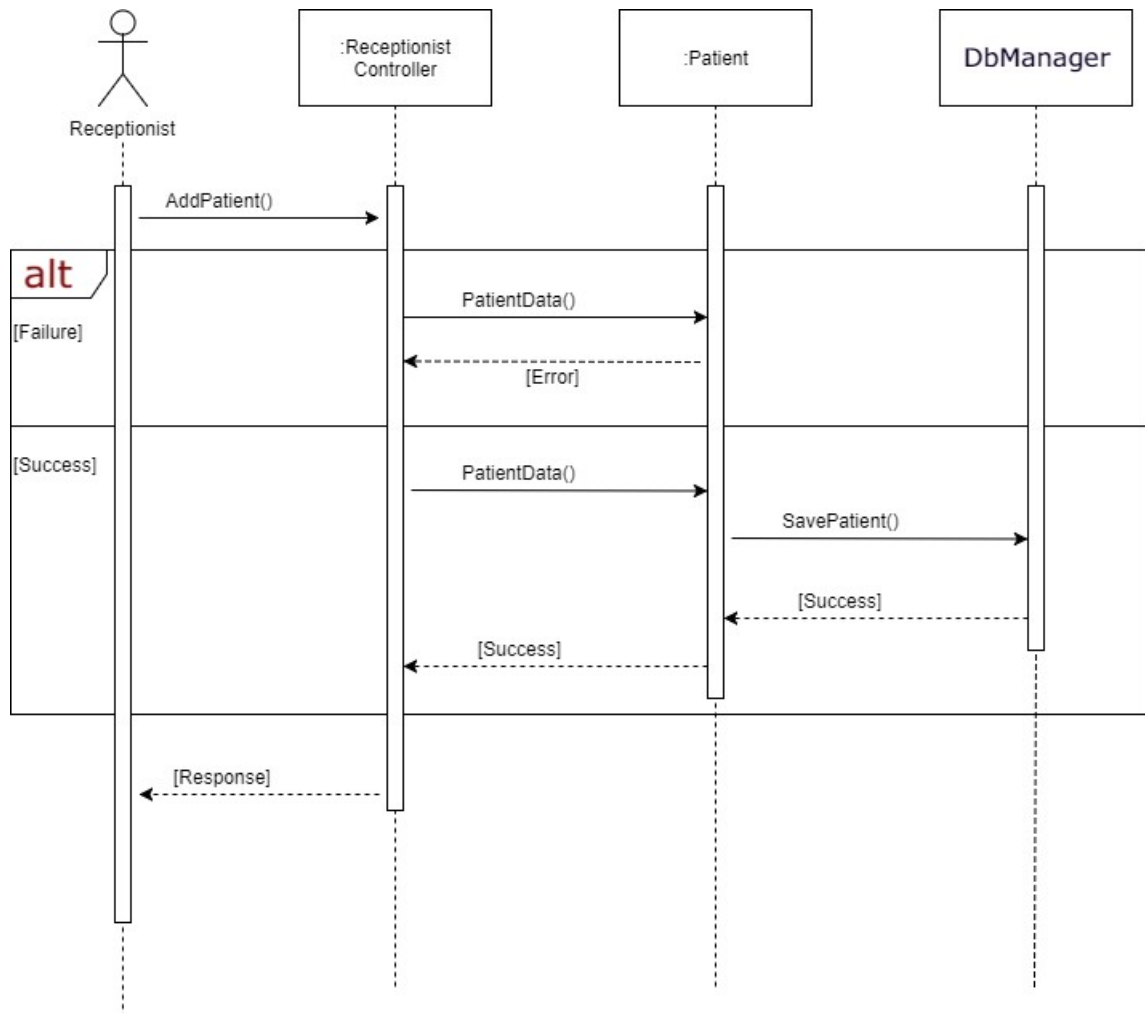


Figure 4.8: Sequence Diagram (Add Patient)

4.6.2 Sequence Diagram 2

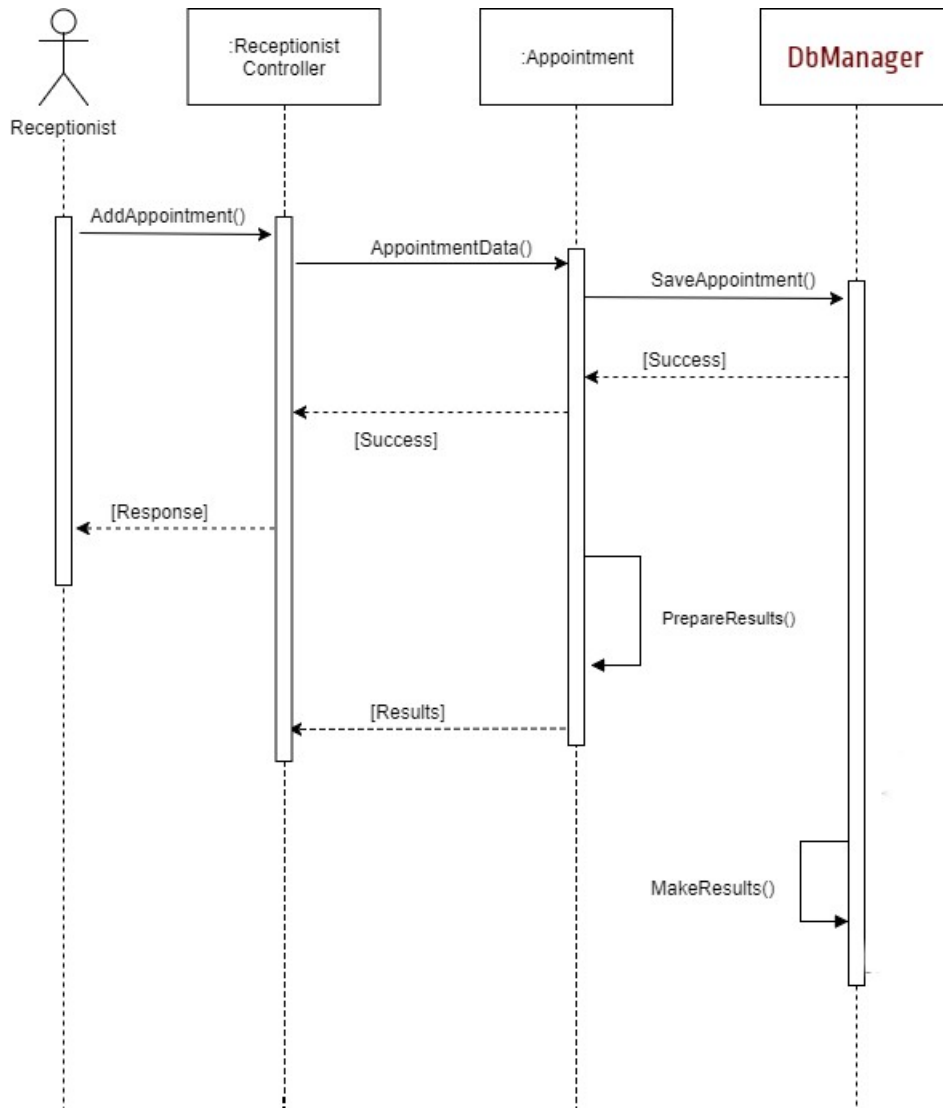
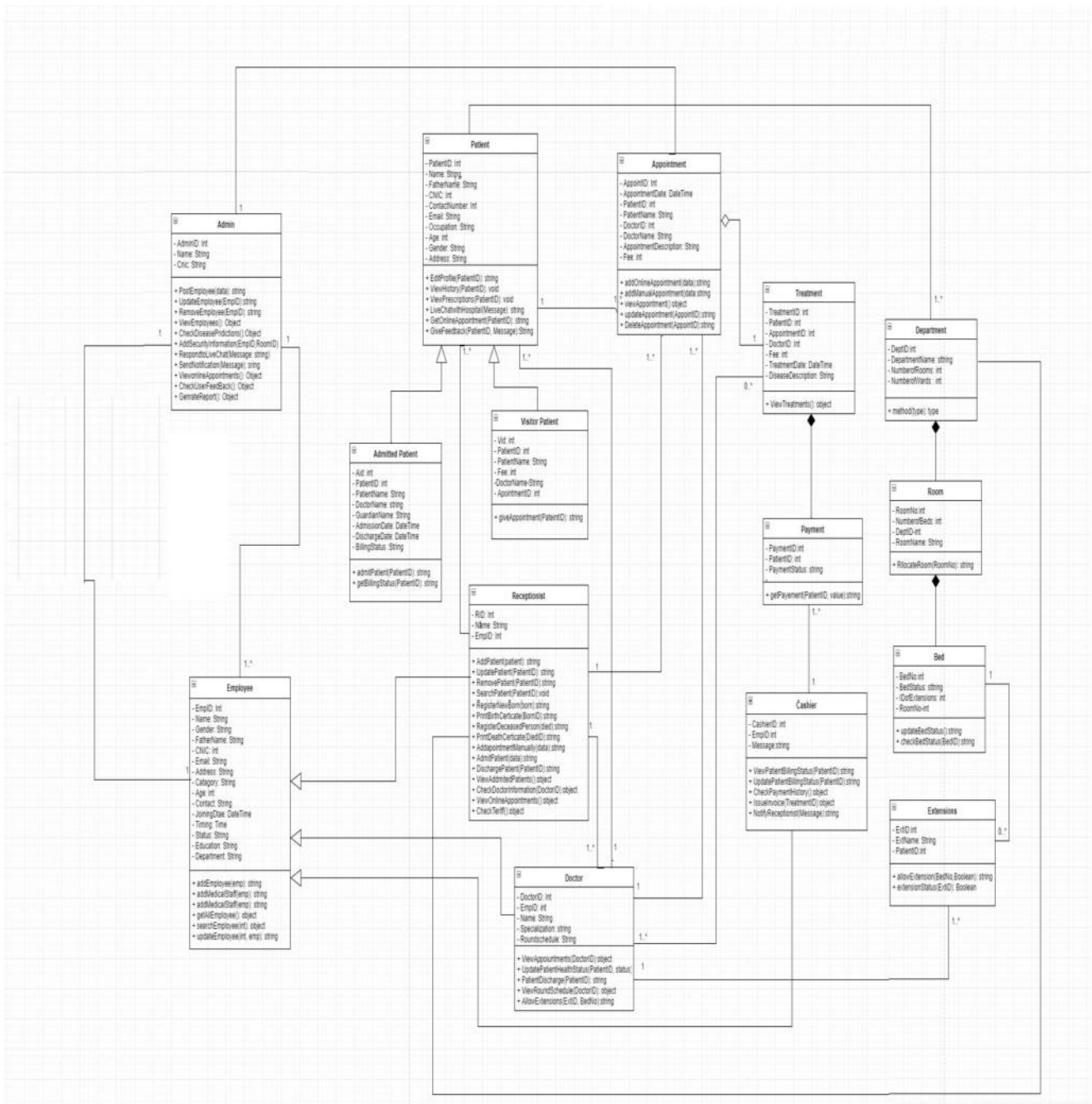


Figure 4.9: Sequence Diagram (Make Appointment)

4.6.3. CLASS DIAGRAM



4.7 Data Dictionary

This section contains the data dictionary of the main entities of the ERD

4.7.1 Admitted Patients

Field Name	Data type	Constraint	Description
AdminID	Int	Primary Key	Admin Id, Auto Generated
Cnic	varchar(15)	Not Null	Cnic of Admin
Name	20	Not Null	Name of Admin

Table 4.1: Admitted Patients

4.7.2 Appointment

Field Name	Data type	Constraint	Description
Aid	Int	Primary Key	Admit Id, Auto Generated
AdmissionDate	Datetime	Not Null	Date of admit
BillingStatus	Int	Not Null	Billing status of patient
DischargeDate	Datetime	Not Null	Date of discharge
DoctorName	varchar(20)	Not Null	Name of the doctor
GuardianName	varchar(20)	Null	Name of Guardian
PatientID	Int	Not Null	Patient id
PatientName	varchar(20)	Not Null	Name of Patient

Table 4.2: Appointment

4.7.3 Bed

Field Name	Data type	Constraint	Description
BedNo	Int	Primary Key	Bed Id, Auto Generated
BedStatus	varchar(15)	Null	Status of Bed
IDofExtensions	varchar(200)	Not Null	ID of extensions
RoomNo	Int	Not Null	Room number

Table 4.3: Bed

4.7.4 Cashier

Field Name	Data type	Constraint	Description
CashierName	Varchar(20)	Not Null	Cashier Name
EmpID	Int	Primary Key	Employee id ,Auto Generated

Table 4.4: Cashier

4.7.5 Department

Field Name	Data type	Constraint	Description
DeptID	Int	Primary Key	Department Id, Auto Generated
DepartmentName	varchar(20)	Not Null	Name of department
NumberofRooms	Int	Not Null	Number of rooms in deparment
NumberofWards	Int	Not Null	Number of wards in deparment

Table 4.5: Department

4.7.6 Doctor

Field Name	Data type	Constraint	Description
DoctorID	Int	Primary Key	Doctor ID, Auto Generated
EmpID	Int	Not Null	Employee id of doctor
Name	varchar(20)	Not Null	Name of Doctor
Roundschedule	varchar(60)	Null	Round Schedule of Doctor
Specialization	varchar(20)	Null	Specialization of Doctor

Table 4.6: Doctor

4.7.7 Employee

Field Name	Data type	Constraint	Description
Age	Int	Not Null	Age of Employee
Address	varchar(50)	Not Null	Address of Employee
Contact	Int	Not Null	Contact number of Employee
Category	varchar(20)	Null	Category of Employee
Cnic	varchar(15)	Not Null	Cnic of Employee
Department	varchar(20)	Null	Department of Employee
EmpID	Int	Primary Key	Employee ID, Auto Generated
Email	varchar(20)	Null	Email of Employee
Education	varchar(20)	Not Null	Education of Employee
FatherName	varchar(20)	Not Null	Father Name of Employee
Gender	varchar(6)	Not Null	Gender of Employee
JoiningDate	Datetime	Not Null	Joining Date of Employee
Name	varchar(20)	Not Null	Name of Employee
Status	varchar(20)	Not Null	Status of Employee
Timing	Time(7)	Not Null	Timing of Employee

Table 4.7: Employee

4.7.8 Extensions

Field Name	Data type	Constraint	Description
ExtID	int	Primary Key	Extension Id, Auto Generated
ExtName	varchar(20)	Not Null	Name of Extension
PatientID	int	Not Null	Patient id

Table 4.8: Extensions

4.7.9 General Staff

Field Name	Data type	Constraint	Description
Department	varchar(20)	Not Null	Department of Employee
EmpID	Int	Primary Key	Employee id ,Auto Generated
Name	varchar(20)	Not Null	Name of general Staff
Sub Category	varchar(20)	Not Null	Sub Category

Table 4.9: General Staff

4.7.10 Medical Staff

Field Name	Data type	Constraint	Description
AvailabilityDays	varchar(100)	Not Null	Availability days of Employee
Department	varchar(20)	Not Null	Department of Employee
EmpID	Int	Primary Key	Employee id ,Auto Generated
Name	varchar(20)	Not Null	Name of medical Staff
Sub Category	varchar(20)	Not Null	Sub Category

Table 4.10: Medical Staff

4.7.11 Patient

Field Name	Data type	Constraint	Description
Age	Int	Not Null	Age of patient
Address	varchar(50)	Null	Address of patient
ContactNumber	Int	Null	Contact Number of patient
Cnic	varchar(15)	Not Null	Cnic of patient
Email	varchar(20)	Null	Email of patient
FatherName	varchar(20)	Not Null	Father Name of patient
Gender	varchar(6)	Not Null	Gender of patient
Name	varchar(20)	Not Null	Name of patient
Occupation	varchar(20)	Null	Occupation of patient
PatientID	Int	Primary Key	Patient ID, Auto Generated

Table 4.11: Patient

4.7.12 Payment

Field Name	Data type	Constraint	Description
PaymentID	int	Primary Key	Payment Id, Auto Generated
PaymentStatus	varchar(20)	Not Null	Payment status
PatientID	int	Not Null	Patient id

Table 4.12: Payment

4.7.13 Receptionist

Field Name	Data type	Constraint	Description
RID	int	Primary Key	Receptionist Id, Auto Generated
Name	varchar(20)	Not Null	Name of Receptionist
EmpID	int	Not Null	Employee id

Table 4.13: Receptionist

4.7.14 Room

Field Name	Data type	Constraint	Description
DeptID	int	Not Null	Id of department of the room
NumberofBeds	int	Not Null	Number of beds in room
RoomNo	int	Primary Key	Room number, Auto Generated
RoomName	varchar(20)	NotNull	Name of room

Table 4.14: Room

4.7.15 Security

Field Name	Data type	Constraint	Description
EmpID	Int	Not Null	Employee id
EmpName	varchar(20)	Not Null	Name of employee
RoomID	int	Not Null	Id of room
SID	int	Primary Key	Security id ,Auto Generated

Table 4.15: Security

4.7.16 Treatment

Field Name	Data type	Constraint	Description
AppointmentID	int	Not Null	Appointment ID
DoctorID	int	Not Null	ID of Doctor
DiseaseDescription	varchar(50)	Not Null	Description of the disease
Fee	int	Not Null	Fee of the treatment
PatientID	int	Not Null	Patient ID
TreatmentID	int	Primary Key	Treatment ID, Auto Generated
TreatmentDate	datetime	Not Null	Treatment Date

Table 4.16: Treatment

4.7.17 Visitor Patients

Field Name	Data type	Constraint	Description
AppointmentID	int	Not Null	Appointment ID
DoctorName	varchar(20)	Not Null	Name of the doctor
Fee	int	Not Null	Fee of OPD
PatientID	int	Not Null	Patient id
PatientName	varchar(20)	Not Null	Name of Patient
Vid	int	Primary Key	Admit Id, Auto Generated

Table 4.17: Visitor Patients

Chapter 5

System Implementation

5.1 Tools and Technologies:

Following are the tools and technologies used in our project.

5.1.1 Angular 4:

We have use angular 4 for the front-end of our application.

5.1.2 CSS:

We have use CSS (Cascading Style Sheets) for styling and designing the front-end of the application.

5.1.3 HTML:

HTML is used in our project for the basic static contents.

5.1.4 Bootstrap:

We used Bootstrap to make our application faster and easier to be used on different platforms i-e Mobile phones, Tablets and PC's to be used along with CSS and HTML.

5.1.5 JavaScript:

We used JavaScript for client side scripting to cater different user requests and events in response to them and to allow dynamic content to get executed on webpages.

5.1.6 JQuery:

We used JQuery library to simplify the interaction between JavaScript code and HTML elements.

5.1.7 Python:

We have use python for predicting disease outbreak prediction.

5.1.8 Visual Studio Code:

We developed and designed our application on visual studio code as it is considered to be the best designing and development tool to visualize the application while coding.

5.1.9 MySQL:

We used MySQL to access the contents in our database and to process or manage the contents according to our needs.

5.3 Implementation Strategy

For developing our web application, it involved knowledge of web and database designing and development techniques. The whole designing and development was done on WINDOWS 10 operating system. We used MySQL as its database system. The Scripting language on the client side is HTML with angular whereas dot net is used on the server side.

Our application comprises five user groups i.e.

- Admin
- Doctor
- Patient
- Receptionist
- Cashier