A PROJECT REPORT

ON

Mobile Application for Medical Report

By

(K-21254014 Mouza Ahmed Al Shamsi)

Guided by

(Dr. Ghassan Alnajjar)

A Project report submitted in partial fulfillment of the requirements for the award of

Bachelor Degree in Information Technology

AL KHAWARIZMI INTERNATIONAL COLLEGE
Abu Dhabi, United Arab Emirates
January, 2017

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DECLARATION

I, "**Mouza Ahmed Al Shamsi**", hereby declare that the work presented herein is genuine and has not been copied in part or in whole from any other source except where duly acknowledged. As such, all use of previously published work (from books, journals, magazines, internet, etc.) has been acknowledged within the main report to an item in the references or bibliography lists.

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APPROVAL FORM

The project report entitled **Mobile Application for Medical Report** submitted by **(ID. NO. K-21254014) Mouza Ahmed Al Shamsi** is approved in partial fulfillment of the requirements for Bachelor degree in Information Technology.

_____

Supervisor

Dr. Ghassan Alnajjar

IT Department

Date:

_____

Examiner

Full name

Department

Date:

_____

ACKNOWLEDGMENT

First of all, I would like to thank God, the Almighty, for giving me the strength and perseverance to accomplish this work.

Secondly, I thank my supervisor, Dr. Ghassan, for his guidance during my project plan and study. Many thanks to all faculty members in Al Khawarizmi International College, for their supports throughout my study.

Last but not the least, many thanks to my family, my Husband and all of the people I have met in the college for their support because without their support I will not be successful or be able to complete my bachelor degree in IT.

ABSTRACT

Al Ain Hospital has problem in Health Information Management (HIM). This department is the important one in hospital because all patient's data and conditions with them. The problem is requiring solving to insure the patients comfort because there are chronic diseases and some of patient traveling from country to other and they will need their reports ready.

Also, that will facilitate the process of communication between patients and medical reports section, using contemporary techniques to access Medical Reports (for example X-rays, Lab test results and physical diagnoses).

Currently, if customers wish to obtain a Medical Report, they have to go to Al Ain Hospital to fill in an application form and physically go back to Al Ain Hospital after two weeks to collect the report.

My project is to build a Mobile Application to help patients fill an Application Form from any place and choose to receive the Medical Report by email, fax or visit the Hospital to collect it. Requestors will need to scan their Emirates ID (EID) in order to prove their identity.

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Chapter 1: Introduction

1.1 Overview of Project Case

Al Ain Hospital consists of more than 35 specialist departments with a total of more than 300 doctors. It is a 402-bed acute care and emergency hospital, serving Al Ain community and its region. With more than 20,000 inpatients, and 320,000 patients in outpatient clinics on an annual basis, it is a key healthcare provider for multidisciplinary ambulatory diagnostics and treatment.

At Al Ain Hospital, Patients come first and it is committed to providing high-quality healthcare in a safe, caring, confidential environment in line with international standards. [1]

1.1.1 VISION

Leading integrated healthcare services with the highest international quality and safety standards.

1.1.2 MISSION

Transform healthcare system services to the highest medical quality and customer care international standards.

1.1.3 VALUES

- Ihsan
- Innovation
- Transparency
- Sustainability
- Quality
- Culturally Sensitive [2]

1.1.4 Al Ain Hospital Chart

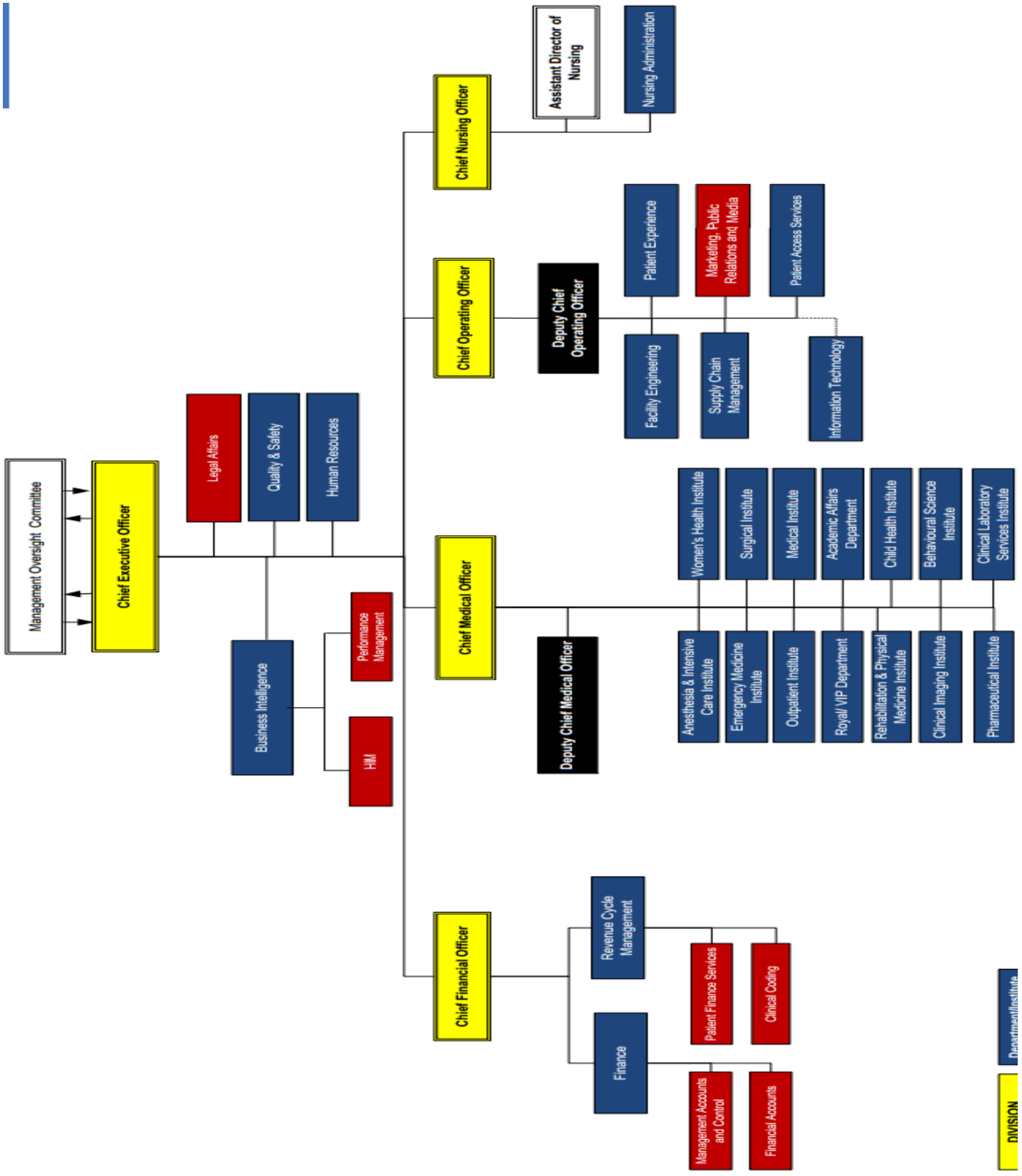


Figure 1: Al Ain Hospital Chart

1.1.5 HIM Section

Health Information Management (HIM) Section is dedicated to supporting quality in management of health information that will benefit both patients and providers.

To achieve this mission, emphasis on teamwork and collaboration between healthcare teams is important to achieve excellence in quality of patient care.

The health information professional maintains the overall knowledge and skills required for managing patient records and providing Medical Reports as required by the patients.

1.2 Problem Definition

To obtain a Medical Report patients have to go to Al Ain Hospital to fill out an application form and return after two weeks when the report is ready to collect it.

After the application is filled, a request is sent to the doctor to make the report. Once the report is completed, it is then translated in the system and an email is sent to the doctor to sign in order to complete the report. If the patient wants the report to SEHA then they will need two signatures, first from the doctor and second from the head of department. Finally, after finishing the report the patient can then collect the report from the hospital after providing ID or if the patient has given permission to someone else then s/he has to bring their ID to compare with the details provided by the patient.

This is an onerous process, particularly when people may live or work in other cities. Further, patients are limited by opening hours of the Hospital. To make it easier and more accessible I will build a Mobile Application to help the patient to fill an Application Form from any place and receive the Medical Report by email, fax or pick up from the Hospital if they wish. The patient can scan their proof of identity to verify they are the patient of the Medical Report.

The organizations increase its distributed information systems, it become more vulnerable to security breaches. There are a number of techniques, such as encryption and electronic signatures to protect data. This Mobile Application will adopt these techniques to ensure data confidentiality; integrity, and availability. [3]

1.3 Project Scope

1.3.1 Project Name: Mobile Application for Medical Report

1.3.2 Project Goal: Facilitate the process of communication between patients and medical reports section, using contemporary techniques to improve accessibility to Medical Reports (eg. X-ray report, lab test results and physical diagnoses).

1.3.3 Aim:

Create Mobile Application to change process from manual to online process and that will simplify a process between customer and hospital. Also, that will make the process easy and will make the follow up clear for staff.

1.3.4 Technical Requirements:

1.3.4.1 Platform

- Determine which hardware and operating system the application will run on.

- Define requirements for quality management (size and formats, OS versions and basic device characteristics).

1.3.4.2 Security

- Authentication and authorization of data.
- Protection of the file systems, options, and hardware and network resources.
- Confirm the security policies to protect the data

1.3.4.3 Usability

- Maintaining User Interface

1.3.5 Deliverable:

Chapter1: Finished Overview of Project Case, Problem Definition, and Project Scope.

Chapter2: Finished Literature Review and Feasibility Analysis.

Chapter3: Finished Methodology, Project Plan, Requirement Analysis, and Initial Design.

1.3.6 Milestone:

1. Chapter 1
2. Chapter 2
3. Chapter 3

1.3.7 Functions:

1. Send Notifications

   Send messages to the patients when they finish filling the application as confirmation and messages when the report is ready.
2. Location Map

   To locate the Medical Report Section if they wish to collect their Medical Reports.
3. One Click Contacting

   One click button to make a direct call if the patients wish to discuss his/her reports.
4. Indoor Scanner (attachment)

   To allow the patient to view attached application to confirm details.
5. Pass code

   For security, to ensure no one can access your information.

1.3.8 Features:

1. Usability: The interface should be usable
2. Customize: font size, coloring and setting clear for customer?
3. Keep it simple: Make the interface simple.

1.3.9 Risk Management

I found many challenges to do this project study because it's hard to get information from the section which has a problem. There is internal risk which is using many functions to keep data/medical reports safe from lose or from other people. Also, External risk is possibility of facing a challenge when the project application to convince people using the new application especially from overage.

Chapter 2: Literature Review & Feasibility Analysis

2.1 Literature Review

Health care access, quality and affordability are common problems which people face. There are differences to health care access due to income and geography; the high cost related to healthcare present affordability challenges for thousands of people. Mobile application provides a solution to assist with these challenges. Mobile based application allows patients as well as providers to have easy and quick access to reference materials, laboratory test reports and medical records. [4]

There are many hospitals in world making mobile applications for the purpose of displaying lab results for easy access. Smart phones are commonly used by everyone including the physician and the mobile application can assist with uploading the medical reports which in turn, can be easily accessed by the patient. It will also assist the physicians to access their patient's medical record. Use of such mobile applications helps in improving the health record of patients. [5]

In the past, access to Medical Reports was more difficult because there was often one copy of the medical record for each patient but with technology, patients can have quick access to their reports via a medical report mobile app. When patient can get easy access to his/her medical reports it can improve doctor-patient relationship by enhancing their communication; it also allows correct flow of information as well as reduces probability of quality errors. [6]

There are a lot of benefits associated with use of mobile app that give access to patient's medical reports, however, one problem associated with it is that many people may not have access to the internet, is illiterate or lack skills to use the mobile application. Therefore it is important to educate people on how to use mobile app to get access to reports online and highlight the benefits of using such apps. [7]

According to Patel et al., 2014, patient's accessibility to their online medical record can enhance patient engagement and improve their health outcomes. When

patients can get online access to their medical report they can use it for various purposes such as to monitor their health and to share it with others. [8]

There are about 9,000 medical and health related app solely offered by Apple, 4,290 medical apps offered by Google Android and 12 apps offered by Nokia. From this finding, it is clear that although an app can be deployed by a healthcare organization, it should be used in a way that it does not become a source of error and/or inefficiencies. Therefore, hospitals should consider creating coherent and practical policies for introducing good quality medical apps that can be useful. [9]

Medical report when accessed online via website or app saves time because patients no longer need to go to the hospital and show receipt to collect his/her report; the login process to get access to report can be very secure, if a person is travelling he/she can get easy access to his/her medical report. [10]

Since 2010, Apple and iPhone are the leading source of providing efficient and high quality medical apps. Such apps can be used by different types of people to access their medical records, for example, people with long term diseases such as diabetes and blood pressure who visit hospital regularly, people who travel a lot from one place to another and have no time to collect their medical record from relevant hospital, parents of a child who remain busy with their daily life routine. [11]

Most medical apps used worldwide are technically simple which meet the instant needs of people and offer benefits that directly incentivize the user. Apps for medical reports contribute largely to increased efficiency in the healthcare system. Technology of sending online reports via websites or app is increasing day by day which provide quick and easy access as well as improve data quality, security, and authenticity. [12]

Researchers has found that use of mobile and wireless technologies largely support the achievement of healthcare objectives therefore for the planning, development and evaluation of medical app will greatly help to enhance its impact and increase the productivity of healthcare organization. [13]

2.2 Feasibility Analysis:

2.2.1 SWOT analysis:

SWOT analysis of developing medical report mobile app is set out below:

2.2.1.1 Strengths:

Strengths associated with this project include:

- Ease of development
- Give faster and quicker access to reports
- Publication of smart phones
- Provide electronic payment
- Reduce front office work for employee
- Easy and helpful for people

2.2.1.2 Weakness:

Various weaknesses associated with this project include:

- No internet access
- No skills and knowledge for using such app
- Data security issues
- Lack of financial resources for app development

2.2.1.3 Opportunities:

Various opportunities associated with this project include:

- Demand for new app increases day by day
- Speeding in loading and accessing medical reports
- New and unique ways to retain app users visit

2.2.1.4 Threats:

Various threats associated with this project include:

- Fierce competition with other mobile app used for other medical purposes with unique feature
- Barriers in creating app.
- Financial issues
- Medication errors
- Patient trust issues
- Matchless app's functions

2.2.2 Business objective:

To develop a mobile app through which patients can get easy access to their medical reports. Which help to increase patient-doctor communication, and increase the hospital productivity.

2.2.3 Technical feasibility:

The development of medical report mobile app tends to be smaller and involve less integration. It includes choosing platform, process, technology, skills, and feature, for the development of medical report mobile app for the hospital. All these technical requirements impact the chance of app success. It is also useful to present the result, response for each option with an overall score of technical feasibility analysis for development of medical report mobile app.

2.2.4 Cost benefits analysis:

The mobile app development does not cost much to the hospital and it can help increase the productivity of the hospital. This analysis evaluates the critical cost benefit analysis related to the development of mobile app. It includes an estimation of

apps life cycle cost, net benefit, app maintenance cost, development cost and the value of services provide by the app.

2.2.5 Operational feasibility:

The app has no cultural, cost related or ethical issue to be considered by hospital. The app ensures no customer or hospital privacy concern, is easily acceptable by hospital management and staff, can be easily implemented and managed by staff. The app has no data protection issue or legal issue.

2.2.6 Ethical feasibility:

The reports which the patient can request must be obtained by the correct method because doctors collect all data for the patient through doing a laboratory tests and x-rays if necessary. During physical examination, doctors are access these data in order for them to write the requested report. This process is dependent on trust between the patient and the physician.

Chapter 3: Methodology

3.1 Methodology

The Mobile Application will facilitate the process of communication between patients and medical report section of Al Ain hospital using contemporary techniques to provide their needs from medical report. There are various software development methodologies that can be used to structure, plan and control the whole process of developing software or other information system. Some common software development methodologies include:

- **Agile software development methodology:**

  It is the conceptual framework for doing various software engineering projects. It develops software in short time boxes known as iterations lasting from one to four weeks. Its different types include crystal method, scrum and dynamic system.

- **Spiral methodology:**

  This methodology is the lifecycle model that largely focuses on early identification and reduction of risks associated with the project. The steps of this methodology are very lengthy and detailed.

- **System development life cycle methodology:**

  This methodology is the conceptual model which describes stages involved in the process of information system development starting from initial feasibility study, maintenance to the completed application.

- **Waterfall methodology:**

  This is the most popular version of software development lifecycle. This methodology is usually considered the classic approach toward the software development lifecycle method that is linear and rigid.

Methodology selected for the study:

3.1.1 Waterfall methodology:

This methodology is also known as traditional or linear sequential lifecycle software development model. It is the sequential software design process in which development progress can be seen by flowing steadily downward like a waterfall by passing through different steps of conception, initiation, analysis, design, construction, testing, production, implementation, and at the end maintenance. The output of one stage in this model act as input of next one sequentially. Out of all software development methodologies, waterfall methodology is the most dominant process model with large ratio of software developers in world still using this model.[14]

The diagrammatic representation of stages involve in this methodology is given below:

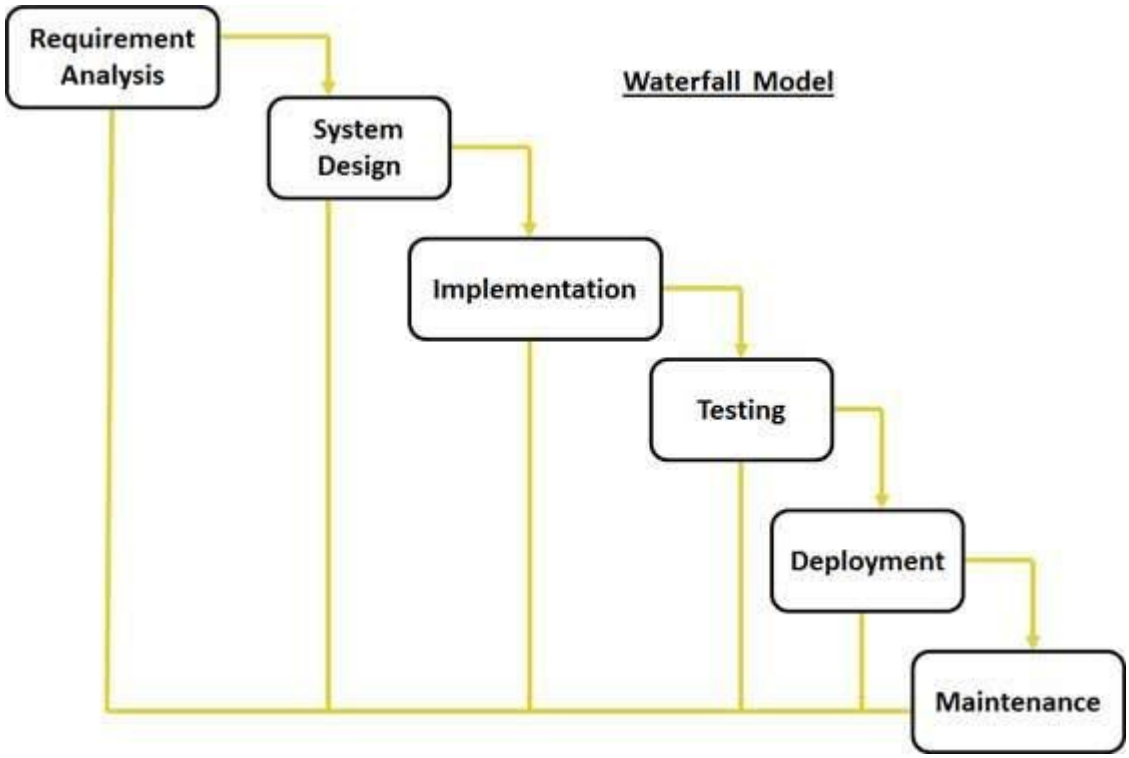


Figure 2: Showing stages of waterfall methodology [14]

The Waterfall Methodology is usually considered the classic approach toward the software development. Waterfall is low in risk.

Waterfall method is a sequential step of software process development, it is also referred as linear sequential life cycle model. It is simple to understand and very easy to implement. In waterfall model, it is necessary to complete one phase before moving to another. It is a sequential process, that one step is done cannot be tracked back. If something gets missed or added, the whole process must be repeated.

3.1.2 Steps of Waterfall:

3.1.2.1 **Requirement analysis:** requirement analysis is done by the requirement engineer; he collects all the information/ requirement from the stakeholders and users. He confirms everything from the client and makes a requirement document and gets it signed from the client to make sure the set of agreed requirements.

Output: requirement Document

3.1.2.2 **System design:** this step includes project designers, they make prototype and show it to the client, and get it approved before moving ahead.

Output: Project Design

3.1.2.3 **Implementation:** this step includes programmers, they code the project in software and make sure that the requirements must meet with the requirement document;

Output: Software project

3.1.2.4 **Testing:** this phase includes the testing of the project, it has certain types of testing to ensure that everything function is working fine. It includes black box, white box, unit testing etc.

Output: testing plan and test cases.

3.1.2.5 **Deployment:** this phase includes installation and set up at the client's location

Output: software installed

3.1.2.6 **Maintenance:** This step includes the after implementation facility, it deals with the errors and problem that user faces after deployment.

3.1.3 Reasons for choosing Waterfall methodology:

Several reasons due to which waterfall methodology is selected for this study are given below:

- It is simple and very easy to use and understand.
- It is cost effective.
- The requirements of this methodology are very clear, fixed and well documented.
- Product definition is stable.
- Its technology can be easily understood.
- There are no ambiguous requirements associated with this methodology.
- The project can be completed within short time span very easily by choosing this method.
- Each stage of this methodology can be easily managed.
- Task of all stages can be arranged very easily.
- The process and result of methodology is also very easy to document.
- The whole development process is very sequential as a result there is less chance left for rework.

3.2 Project Plan

3.2.1 Work Breakdown Structure

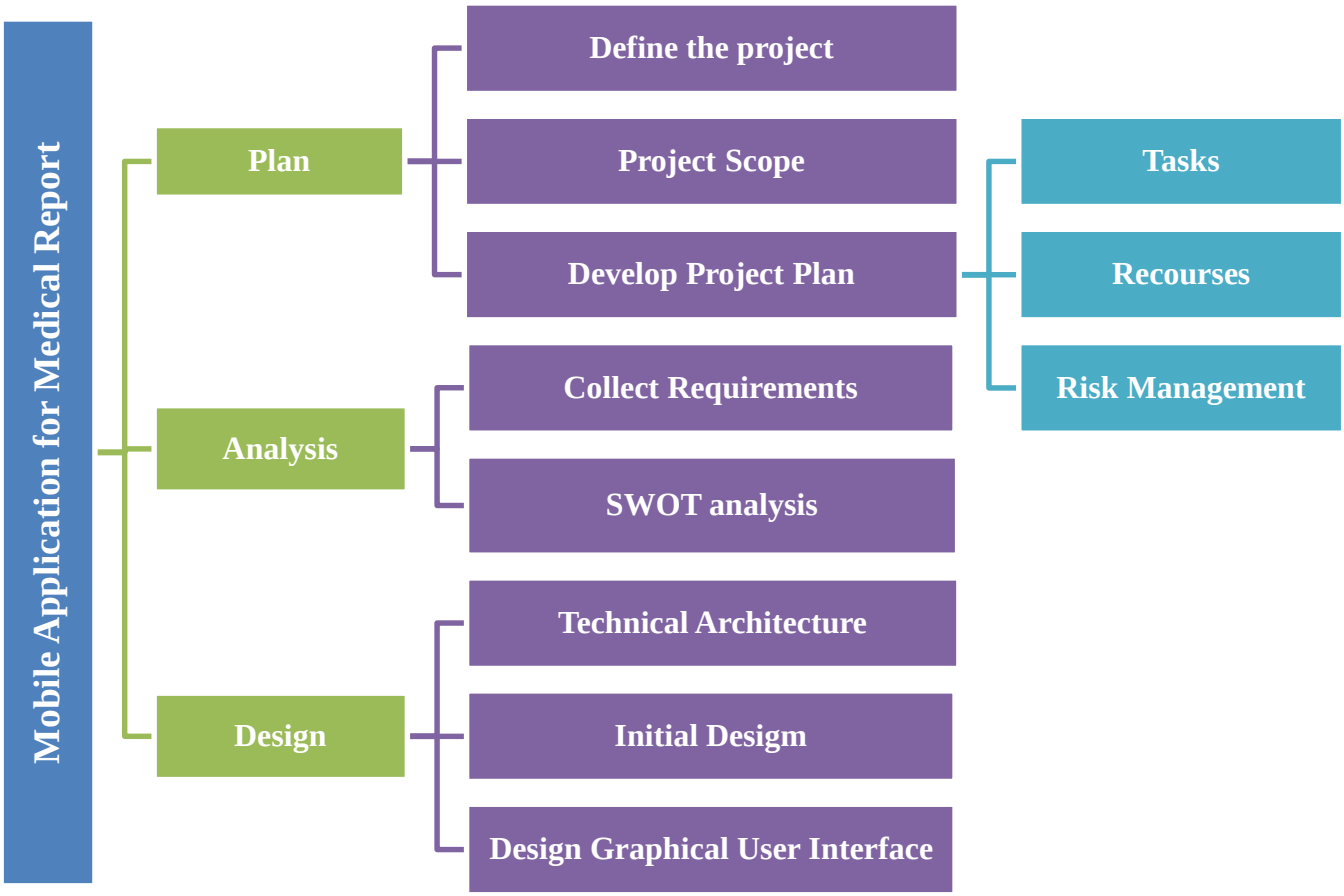


Figure 3: Work Breakdown Structure

3.2.2 Critical Path

Mobile Application for Medical Report Activities

	Task Name	Duration	Predecessors
1	Mobile Application for Medical Report	57 days	
2	Plan	24 days	1
3	Define the project	7 days	2
4	Project Scope	10 days	3
5	Develop project plan	7 days	4
6	Tasks	3 days	4
7	Recourses	2 days	6
8	Risk Management	2 days	7
9	Analysis	15 days	5
10	Collecting requirements	8 days	7
11	SWOT analysis	7 days	8
12	Design	18 days	9
13	Technical Architecture	7 days	11,12
14	Initial Design	6 days	13
15	Design Graphical User Interface	5 days	14

Figure 4: Mobile Application for Medical Report Activities

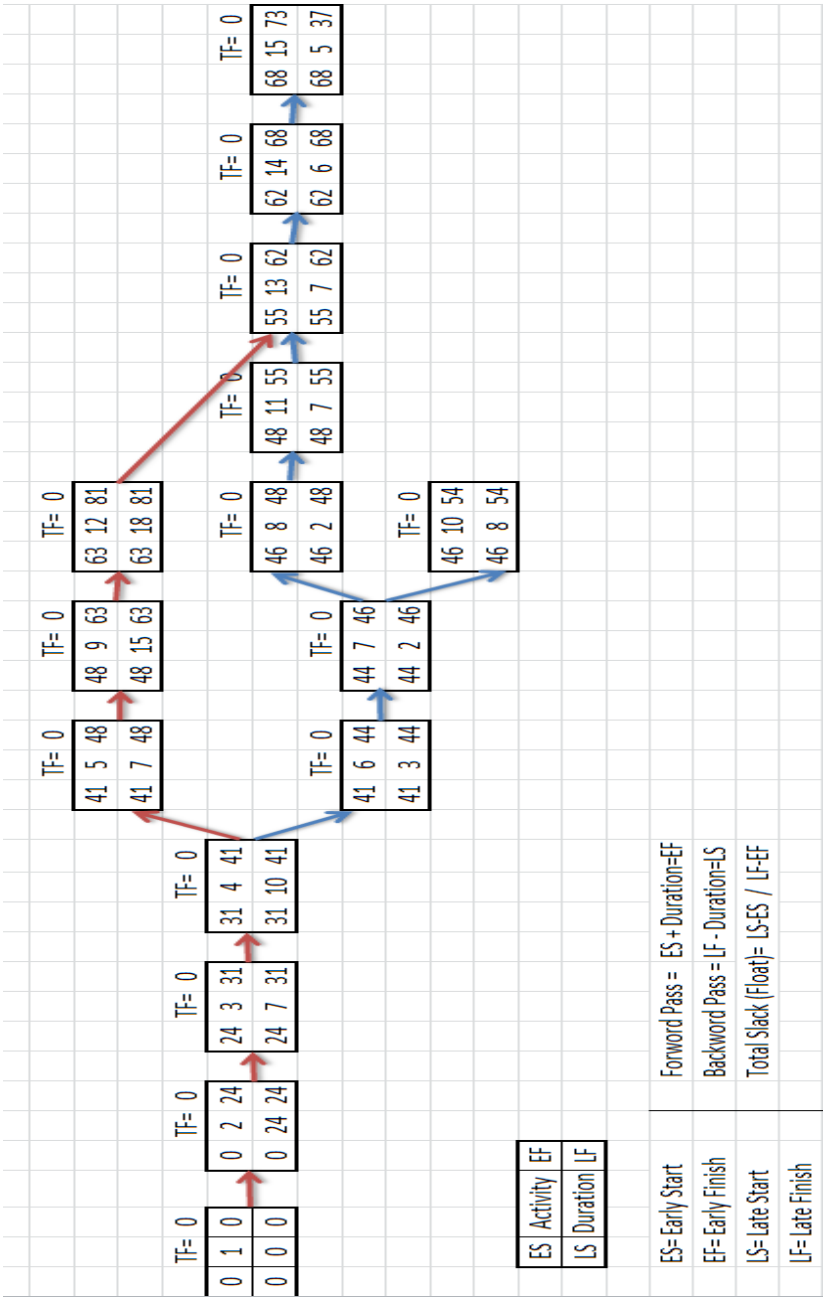


Figure 5: Critical Path with ES, EF, LS, LF, and Slacks

Will find the Critical Paths:

Path1: 1/0+2/24+3/7+4/10+5/7+9/15+12/18+13/7+14/6+15/5= 99 days

Path2: 1/0+2/24+3/7+4/10+6/3+7/2+8/2+11/7+13/7+14/6+15/5= 73 days

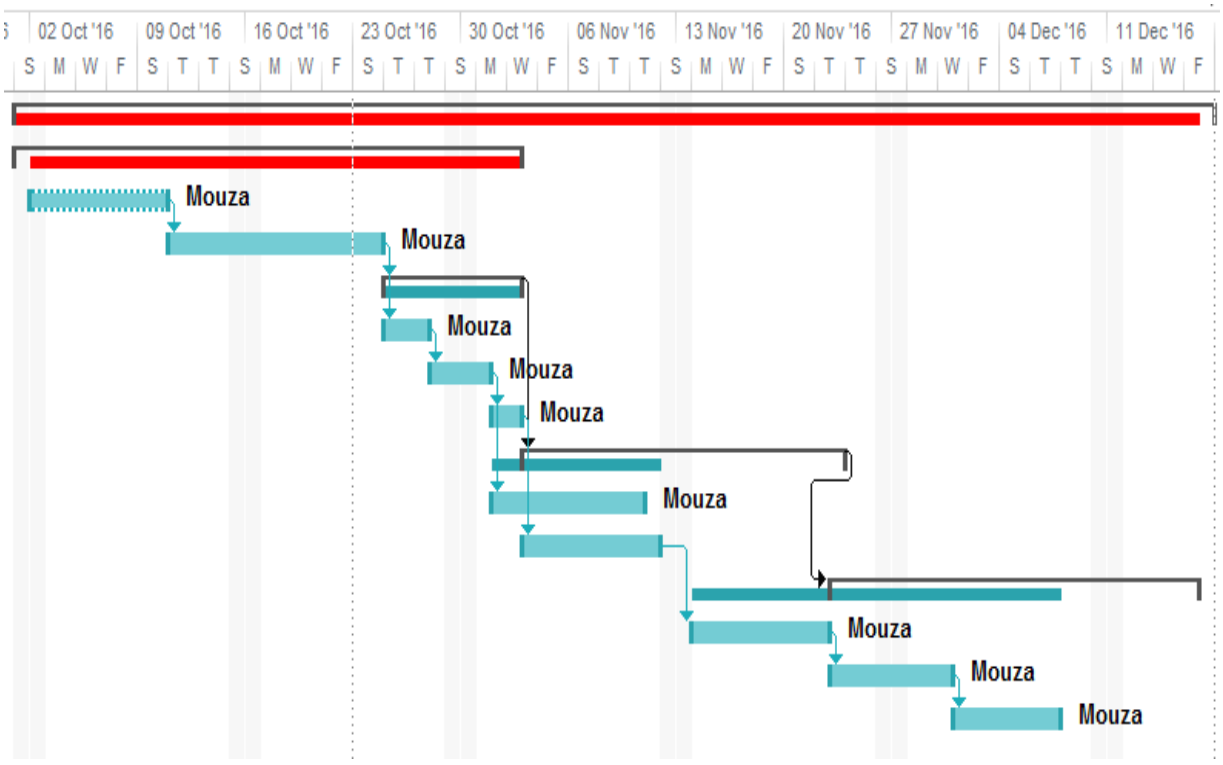
Path3: 1/0+2/24+3/7+4/10+6/3+7/2+10/8= 54 days

The Critical Path is Path1 because is the longest path. Also, the Slack = 0

3.2.3 Gantt Chart

GANTT CHART

	Tas Mod	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1		**Mobile Application for Medical Report**	**57 days**	**Sat 01-10-16**	**Sat 17-12-16**		**Mouza**
2		**Plan**	**24 days**	**Sat 01-10-16**	**Wed 02-11-16**		**Mouza**
3		Define the project	7 days	Sun 02-10-16	Mon 10-10-16		Mouza
4		Project Scope	10 days	Tue 11-10-16	Mon 24-10-16	3	Mouza
5		**Develop project plan**	**7 days**	**Tue 25-10-16**	**Wed 02-11-16**	**4**	**Mouza**
6		Tasks	3 days	Tue 25-10-16	Thu 27-10-16	4	Mouza
7		Recourses	2 days	Fri 28-10-16	Mon 31-10-16	6	Mouza
8		Risk Manegment	2 days	Tue 01-11-16	Wed 02-11-16	7	Mouza
9		**Analysis**	**15 days**	**Thu 03-11-16**	**Wed 23-11-16**	**5**	**Mouza**
10		Collecting requirements	8 days	Tue 01-11-16	Thu 10-11-16	7	Mouza
11		SWOT analysis	7 days	Thu 03-11-16	Fri 11-11-16	8	
12		**Design**	**18 days**	**Wed 23-11-16**	**Fri 16-12-16**	**9**	**Mouza**
13		Technical Architecture	7 days	Mon 14-11-16	Tue 22-11-16	11	Mouza
14		Initial Design	6 days	Wed 23-11-16	Wed 30-11-16	13	Mouza
15		Design Graphical User Interface	5 days	Thu 01-12-16	Wed 07-12-16	14	Mouza



3.3 Requirement Analysis

3.3.1 How data was collected?

The data was collected by interviewing patients, employees and doctors.

Requirement analysis User requirement we collected the user rudiments as follows:

1) The system must respond quickly
2) Reports can be viewed easily from anywhere
3) Patients can download or print the report.
4) There will be no long queues for medical reports.

3.3.2 Functional Requirements

1) Accepts the request of patient reports view from authorized/registered patients.
2) The system must verify all user input
3) All reports must be uploaded after the verification process is done by the laboratory.
4) Send Notifications to the patients when they finish filling the application as confirmation and then send messages when the report is completed.
5) Location Map for the customer to locate the Medical Report Section if they wish to collect their Medical Reports.
6) Indoor Scanner (attachment) to allow the patients to attach documents to their application.
7) Pass code for security to be sure that only authorized persons can access your information.

3.3.3 Non-Functional Requirements

1) The system must be responsive
2) The system should be user friendly as all patients are not a computer literate.
3) Simple interface must be used.
4) Online registration process should be simple
5) System scalability is possible
6) Strong error handling must be done

3.4 Initial Design

3.4.1 Context Diagram

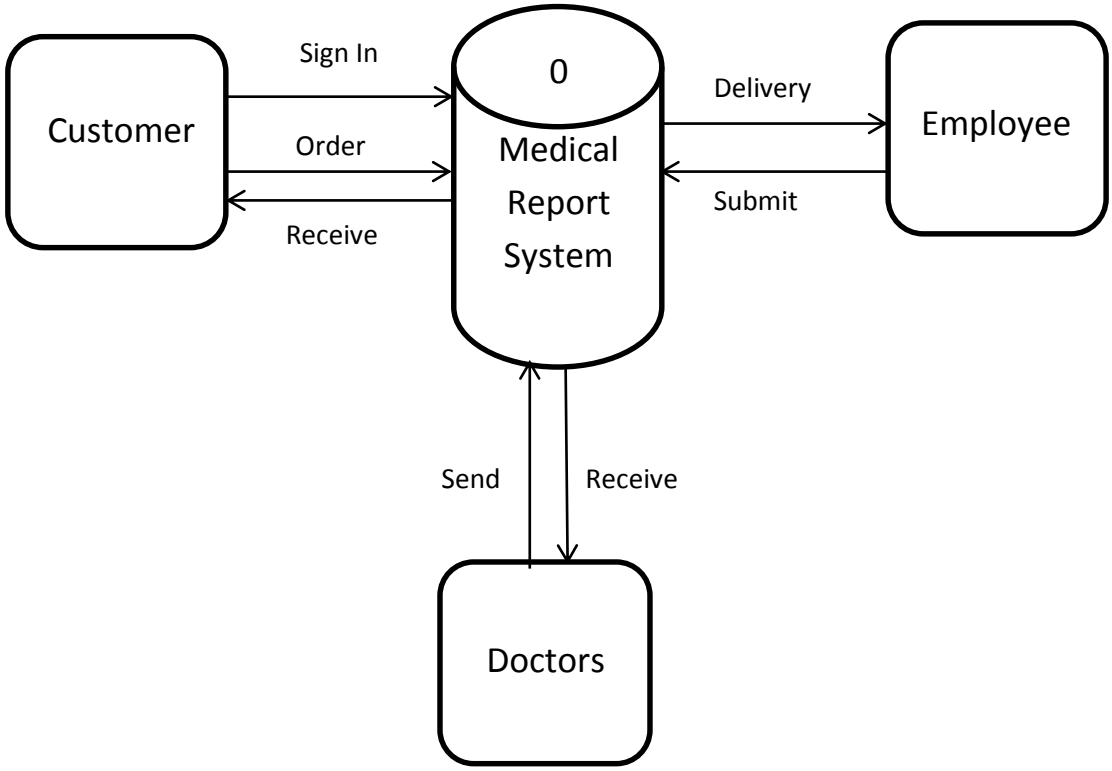


Figure 6: Context Diagram

3.4.2 Data Flow Diagram

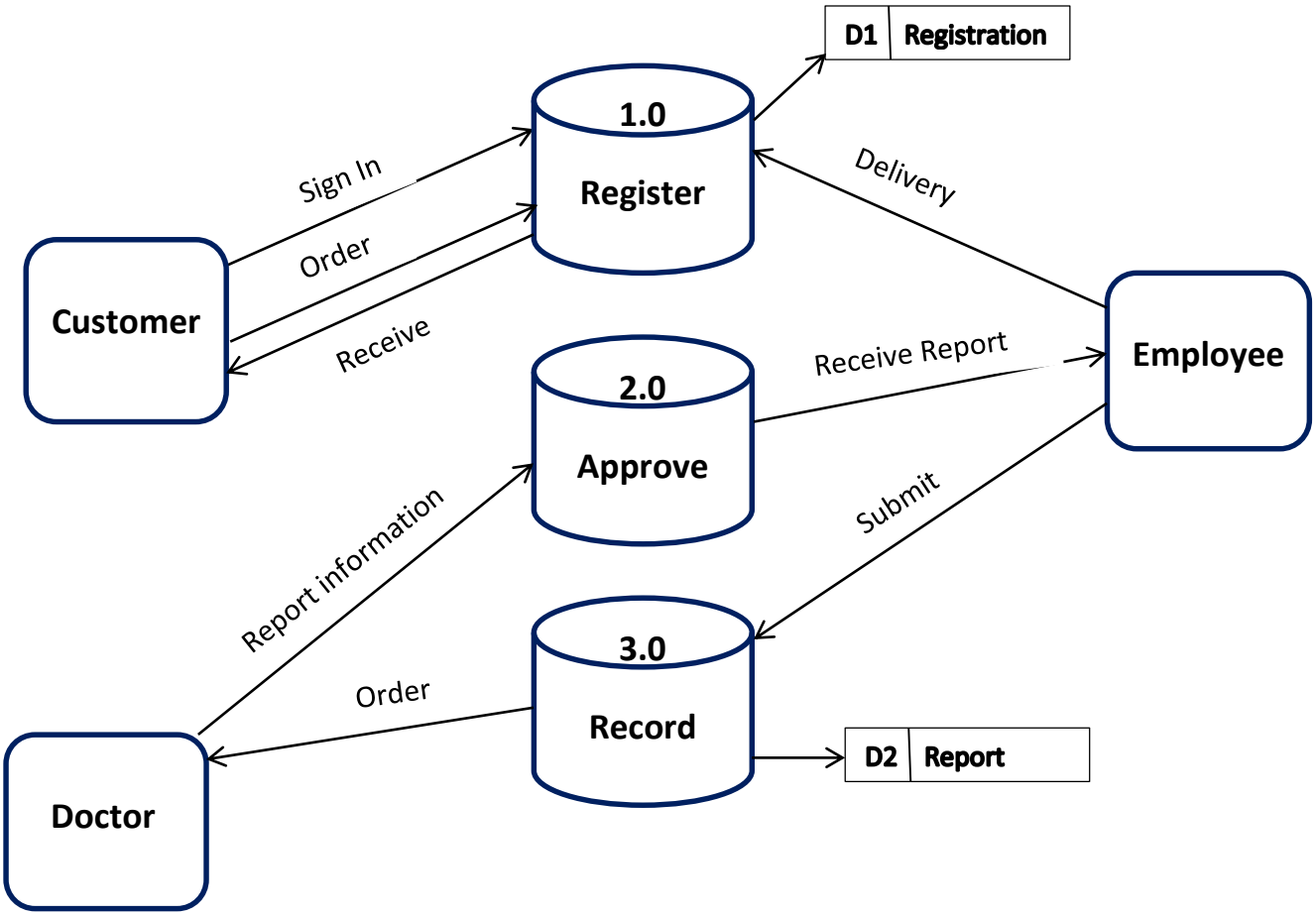


Figure 7: Data Flow Diagram

This diagram shows the process of Medical Report System. First, the customer will register in system. Then he has to do order of report. The customer login information will store in the database. The employee will submit the order to doctor and when doctor receive report order will start to do report and after ready will send report information for approved. All report will store in report database for need. The employee will find the complete report then will delivered it to customer.

3.4.3 Use case

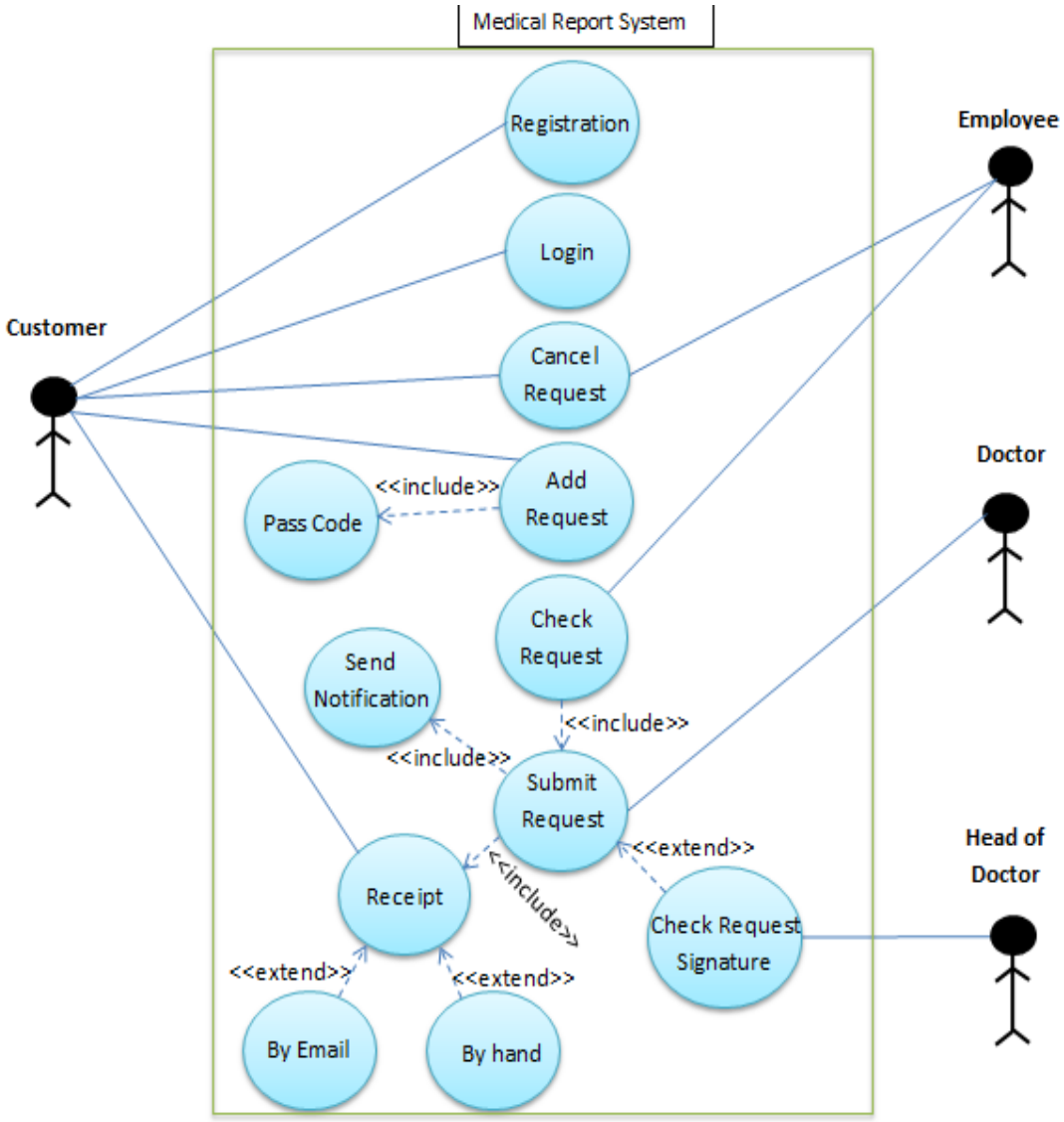


Figure 8: Use Case Diagram

This Diagram show the process of submits and receive the Medical report from system. After customer do order of report, the employee will send the request to doctor. Then doctor will add details to complete report. After that employee will find the details of report and will submit it to can customer receive it? Also there is including process which can't complete process without that step. And there is extend process which can do process with choice.

3.4.4 Activity Diagram

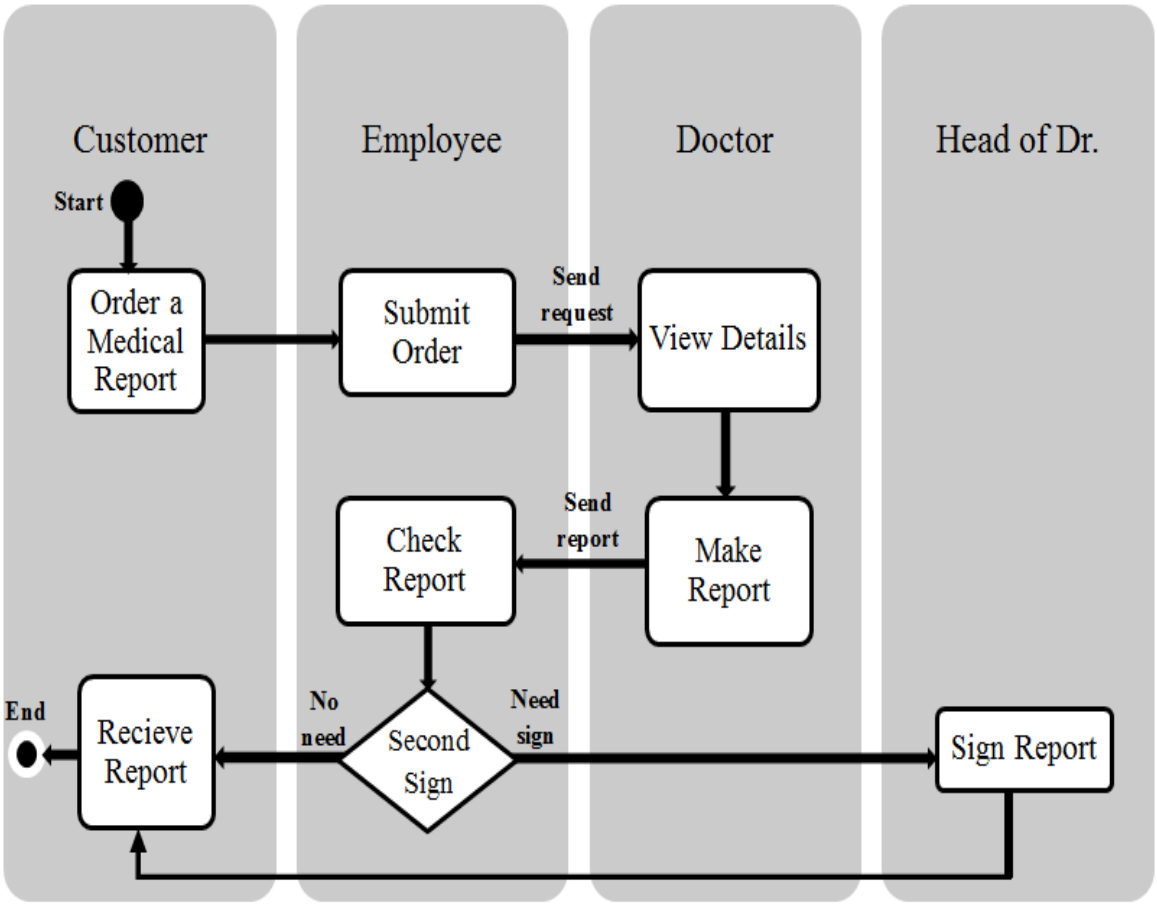


Figure 9: Activity Diagram

This diagram shows the process of medical report from beginning to end. Customer will start by order a medical report. Then employee will submit order and the request will send to doctor. The doctor will view customer details and will start to make a report. After report ready will return to employee to check report if will need second sign will send it to head of doctors to sign the report and will return to system to be ready for collecting but if not need will be ready for collecting by customer.

3.4.5 Sequence Diagram

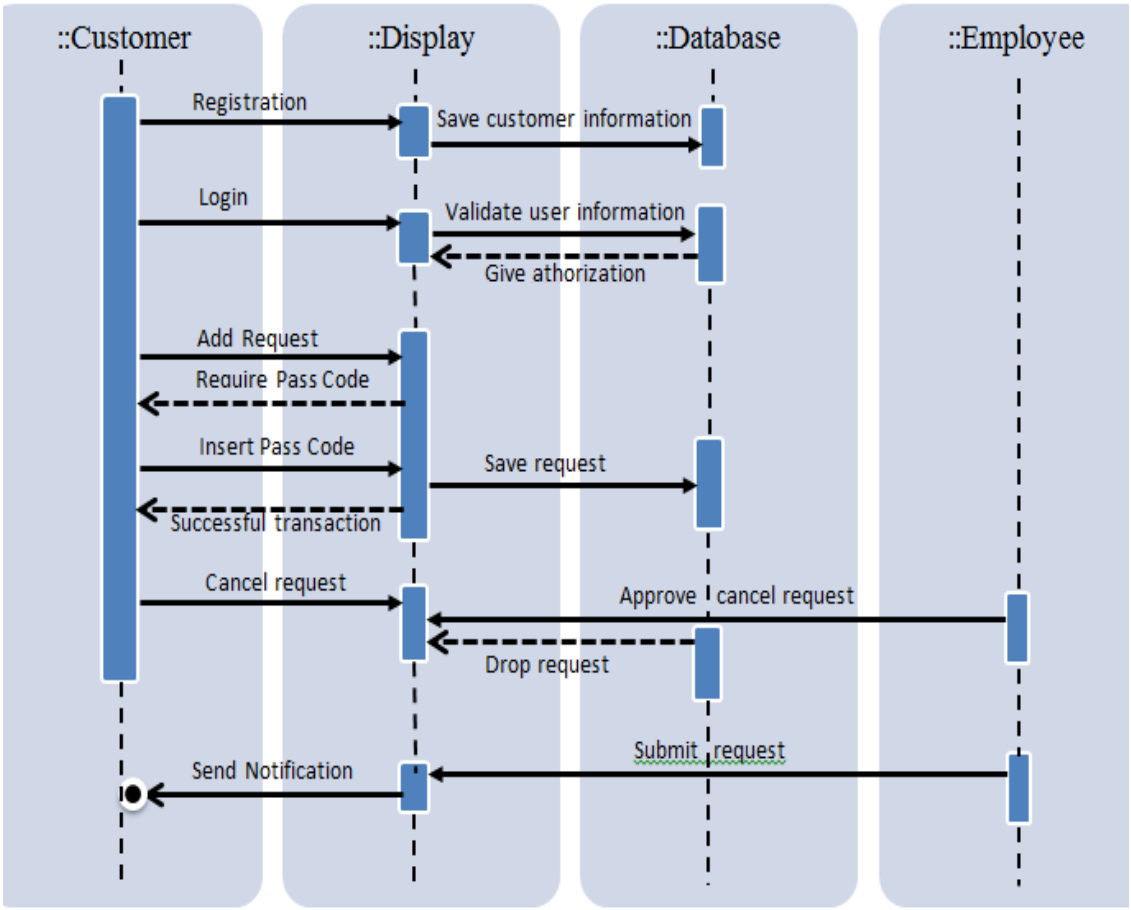


Figure 10: Sequence Diagram process between Customer, System and Employee

This diagram show process in Medical Report System between Customer, System and Employee and that is the first steps with the system. This arrow ⟶ is for calling and this arrow ⟵ is for return massage. Also, this arrow ●⟵ is for send massage for actor.

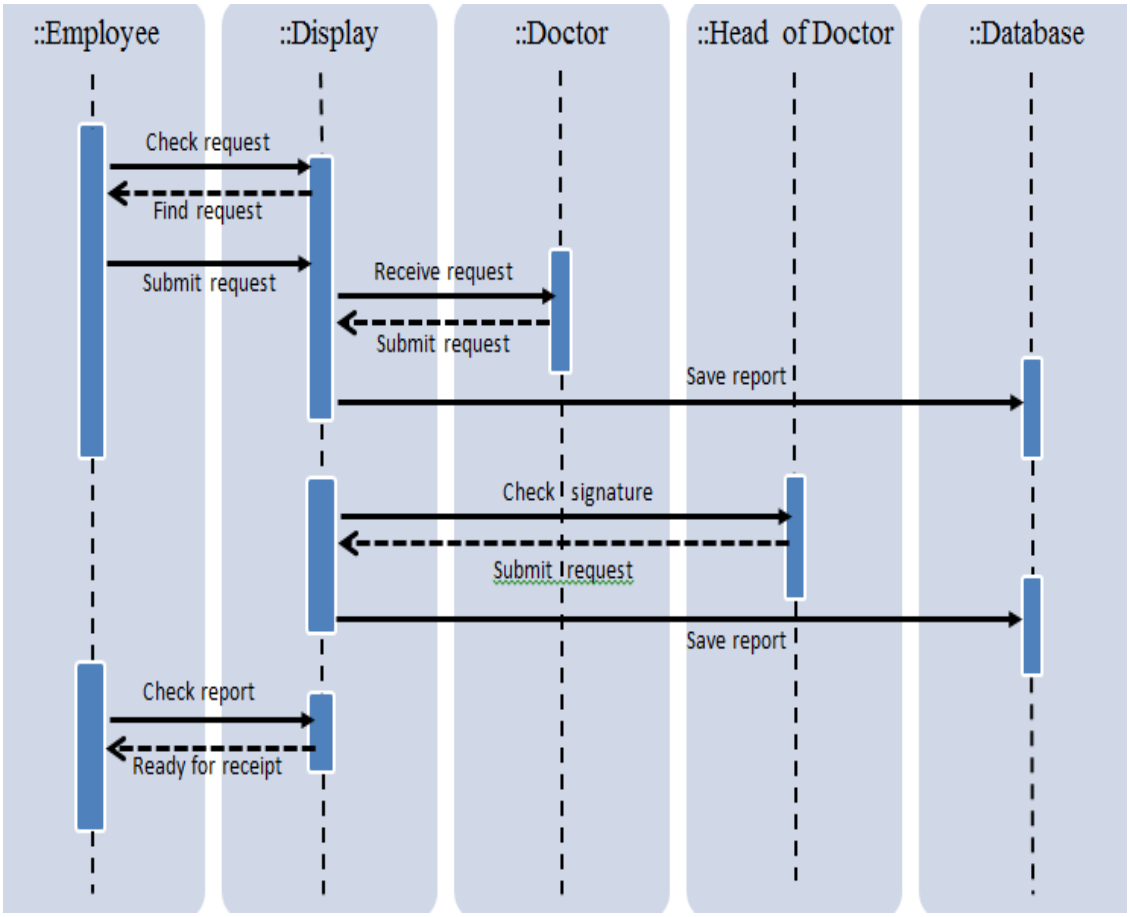


Figure 21: Sequence Diagram process between Employee and Doctors

This diagram continues process in Medical Report System between Employee and Doctors.

3.4.6 Class Diagram

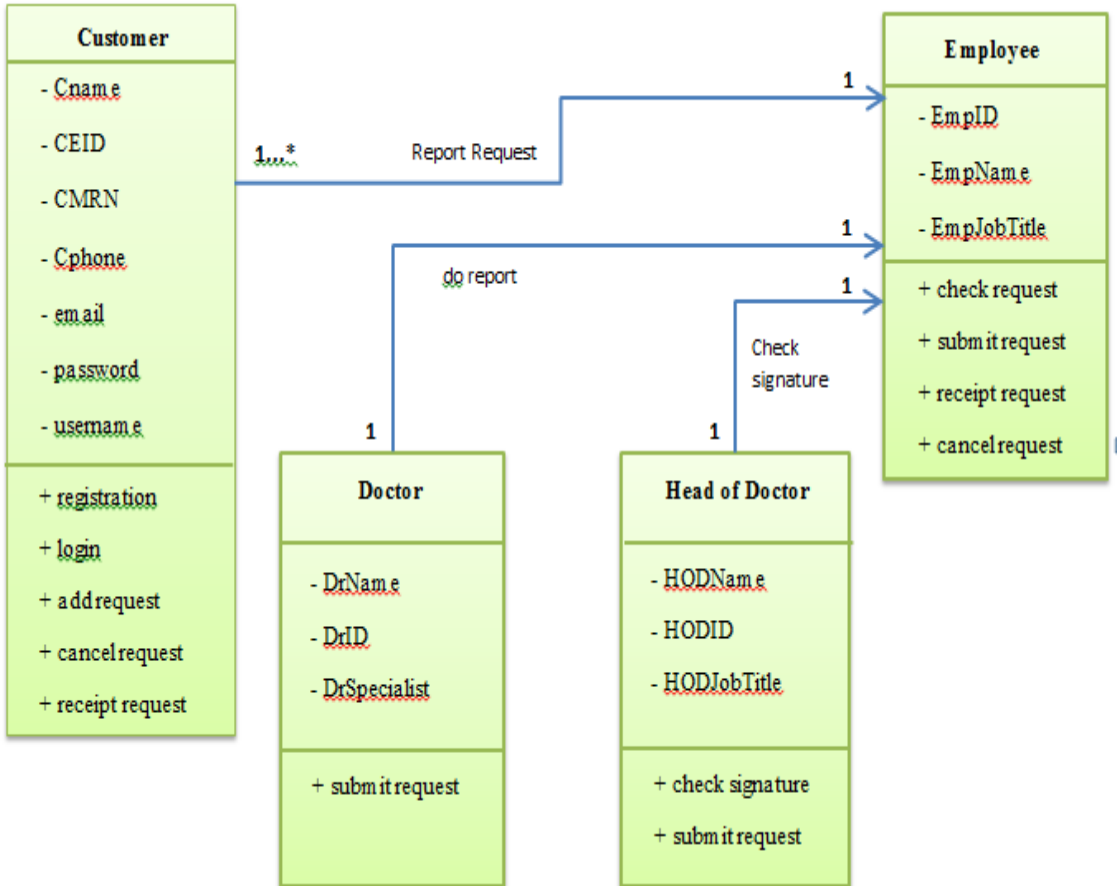


Figure 12: Class Diagram

This diagram shows the classes of Medical Report System. Each class has association with Employee Class. Also one association which is from customer to employee it's from one or many customers to one employee. And other association is from one to one. In addition there are primary key in each class (Customer Class has CEID), (Employee Class has EmpID), (Doctor Class DrID), and (Head of Doctor has HODID).

3.4.7 Entity Relationship Diagrams

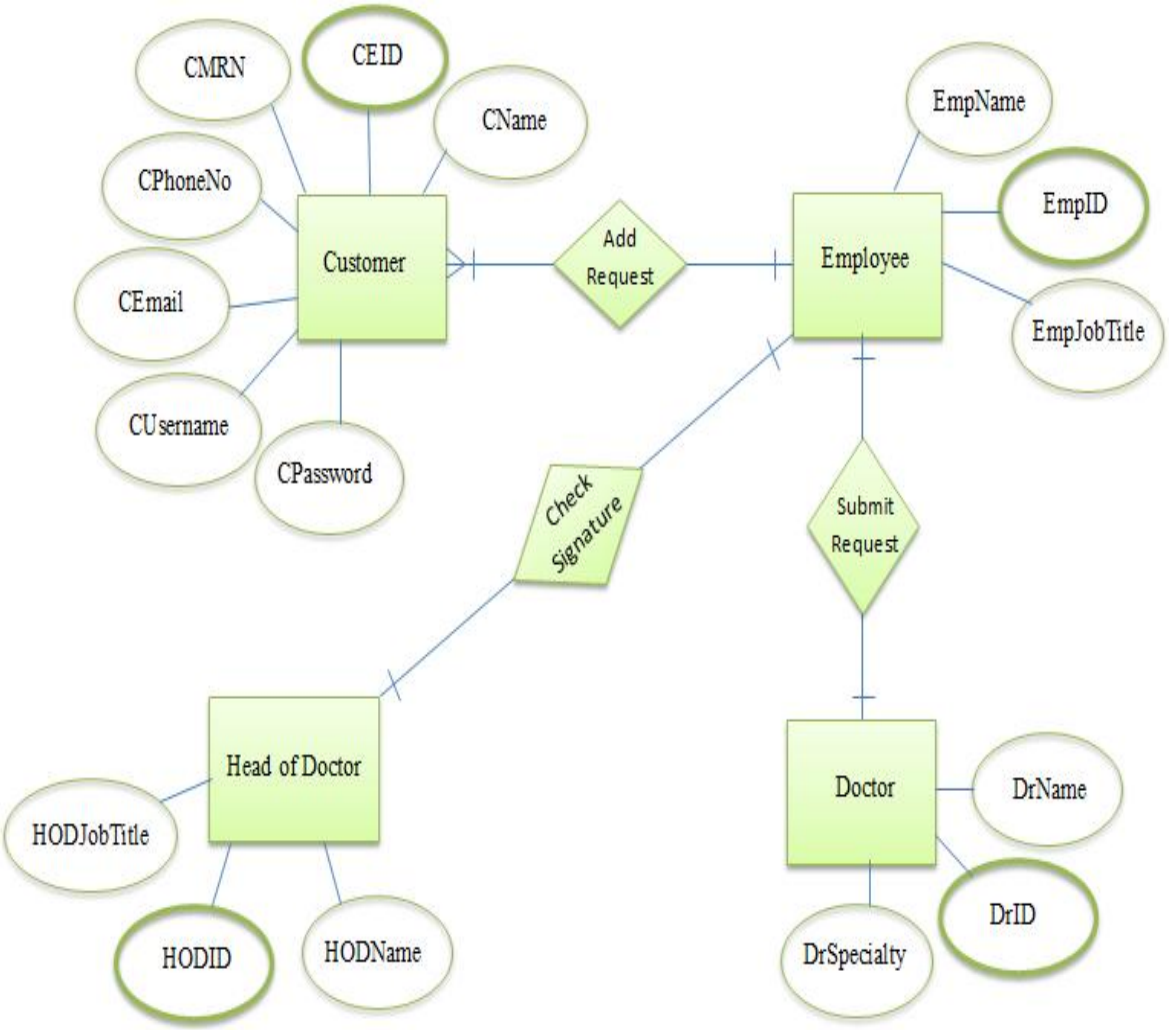


Figure 13: Entity Relationship Diagrams

This diagram shows Entities, Attributes and Entities of Medical Report System. There are 4 entities (Customer, Employee, Doctor, and Head of Doctor). Also, each entity has attributes and there is relation between each entity. The relation between Customer and Employee is from one and more to one. All other relation is from one to one.

References

[1] https://www.seha.ae/alain/English/aboutus/Pages/welcome-message.aspx

[2] https://www.seha.ae/alain/English/aboutus/Pages/mission-vision-and-values-.aspx

[3] http://ieeexplore.ieee.org/document/1416861/

[4] West, D.M. 2013. Improving healthcare through mobile medical devices and sensors: *Centre for Technology Innovation at Brookings*, 6:1-13. (https://www.brookings.edu/wp-content/uploads/2016/06/West_Mobile-Medical-Devices_v06.pdf)

[5] Nicholson, D., Andry, F., and Wan, L. 2011. A mobile application accessing patient's health record through a Rest API: *International conference on Health informatics*, pp: 27-32. (http://www.fandry.net/pub/ANDRY_ET_AL_HealthINF11.pdf)

[6] Cardoso, A.B., Lima, A.F., Pereira, A.F., Silva, A.F., and Corte, A.F. 2006. The access to medical record a systematic review*: Department of Biostatistics and Medical Informatics Introdução à Medicina*, 2: 1-20. (http://medicina.med.up.pt/im/trabalhos05_06/sites/Turma2/files/final.pdf)

[7] Luo J.2008. Mobile computing in healthcare the dreams and wishes of clinicians m: *In HealthNet 08 Proceedings of the 2nd International Workshop on Systems and Networking Support for Health Care and Assisted Living Environments*.

[8] Patel, V., Barker, W., Siminerio, E. 2014. Individuals' Access and Use of their Online Medical Record Nationwide: *The office of National Corporation for Health Information Technology*,20:1-12. (https://www.healthit.gov/sites/default/files/consumeraccessdatabrief_9_10_14.pdf)

[9] Gill, P.S., Kamath, A., and Gill, T.S. 2012. Distraction an assessment of smart phone app usage in healthcare work setting: *US National library of Medicine and National institute of health*, 5:105-114. (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3437811/)

[10] Khan, J. S. 2012. How smart phones are changing health care for consumers and providers: *California Healthcare Foundation*, 4:1-19. (http://www.chcf.org/~/media/MEDIA%20LIBRARY%20Files/PDF/PDF%20H/PDF%20HowSmartphonesChangingHealthCare.pdf)

[11] Ozdalga, E., Ozdalga, A., and Ahuja, N. 2012. The Smartphone apps in Medicine: *Journal of Medical Internet Research*, 14: 23-40.

[12] Dolan, B. 2011. Mobile Communications for Medical Care a study of current and future healthcare and health promotion applications, and their use in China and elsewhere: *University of Cambridge*, pp: 1-120.

[13] WHO. 2011. MHealth New horizons for health through mobile technologies: *World health Organization*, 3:1-112. (http://www.who.int/ehealth/mhealth_summit.pdf)

[14] https://www.tutorialspoint.com/sdlc/sdlc_waterfall_model.htm