

TABLE OF CONTENTS

1. Introduction

2. System Analysis

2.1 System Analysis

2.2 Identification

2.3 Preliminary Investigation

2.4 Feasibility Study

2.4.1 Technical Feasibility

2.4.2 Operational Feasibility

2.4.3 Economical Feasibility

2.4.4 Social Feasibility

3. Software Engineering

3.1 Waterfall Model

4. Software Requirement Specification

4.1 Software Requirement Specification

4.1.1 Introduction

4.1.2 Purpose of Development

4.1.3 Scope of development

4.1.4 Functional requirement

4.1.5 Overview

4.1.6 Description of S.R.S

4.1.7 Hardware Interface Requirement

4.1.8 Performance Requirement

5. Design of System

5.1 Design Objective

5.2 Design Concepts

5.2.1 Top-Down Design

5.2.2 Bottom-Up Design

5.3 Architectural Design

5.3.1 E R Diagram

5.3.2 Data Flow Diagram

5.3.3 Context Diagram

5.3.4 Use case diagram

5.3.5 Data Dictionary

6. Implementation

7. Testing

7.1 Test objective

7.2 Test Case & Test Case criteria

7.3 Black box testing

7.4 White box testing

7.5 Boundary value analysis

7.6 Functional testing

7.7 Structural testing

7.8 Levels of testing

7.8.1 Unit testing

7.8.2 Integrated testing

7.8.3 Regression testing

7.8.4 System and Acceptance testing

8. Conclusion

9. Future Scope

INTRODUCTION

In the era of high end Industrial growth and globalization, local institutions/organizations/industries/companies/hospitals are facing a stiff competition in the financial/ economical/ industrial market. New Standards have to be adapted, devised and followed in order to meet the requirements and to keep in pace with the ever increasing work and competition. The goals have shifted mainly from performing the corporate work to performing corporate work in an efficient and faster way.

As a part of this, organizations today are more techno savvy and are investing large amount of time and money in automation and computerization of the their work. As the need for computerization increase, computers have become the internal part of increasing the growth rate of company's progress due to the efficiency and speed with which they perform the task.

The management currently uses the conventional method of string the records in the registers. Lots of paper work is to be done which is very time consuming and is often prone to errors.

For example: Whenever a Patient comes to Hospital for the registration, he/she must fill the form filling all the details regarding them i.e. their name, guardians' name, bed type etc. along with the residence proof. After the verification of the data filled by the patient or the relative, it is passed to next stage where the request is transferred to a staff for allotting the registration number, after that the registration is provided to the patients. This is a real time consuming system.

Modification of records is also not so easy in the present system. Editing in the hand written records makes it look untidy and causes misunderstanding.

In order to make the system more convenient and pacify the drawbacks, the system was computerized through a window-based application serving the purpose for exclusive.

DEFINING THE PROBLEM

AIMS AND OBJECTIVES

Main aims designated of the project are as follows:

1. Automation of all the activities of the Charitable Hospital to make them happen faster.
2. It permits to add a new patient record.
3. Generates the annual patient number automatically.
4. Also allows searching of some particular records of the patients on the basis of their names, or the guardian's name or date of admission.
5. If the patient tends to change the bed type in between its treatment schedule, the changes are made accordingly. Our system supports the same.
6. Whenever a new patient is admitted to the charitable hospital, then the ratio of the number of beds vacant to the number of beds occupied is updated.
7. Stores personal Information and contact addresses with phone numbers of the doctors engaged with the charitable hospital
8. Also helps in searching the details about a particular doctor based on their names and specialization.
9. An appointment for the operation can be made prior to the date but before a month.
10. It permits the person on desk to edit the records for the patients

ADVANTAGES OF PROPOSED SYSTEM

The advantages of this Hospital Management System are given below:

1. It will reduce the burden of all the files, as data can now be stored in the database.
2. It can reduce the work of the Staff that just has to work on software now.
3. The staff just has to enter a query to search the records and they can have the results in no time.
4. Queries can be sorted out easily and quickly.
5. Result determination is done hand to hand.
6. The System is developed keeping in mind the benefits of the patients.
7. Timely access to Patient information.
8. Easy Updating of records

As, in current System the records are maintained manually. It takes a lot of time and the process is very lengthy. So to increase our work capacity we need to computerize our Hospital Management System (HMS). The HMS covers all the aims and objectives of the charitable hospital which were kept in mind earlier.

ADDITIONAL FEATURES

Apart from the features mentioned above, our system also provides the full-fledged solution to all the problems of security, such as:

- a) **Secured:** Our system is not just a walk through. Only the person who is authorized or has the password is allowed to access the system.
- b) **Limited access:** Since a charitable hospital consists of a number of employees, all of them can't be granted complete access. Keeping this thing in mind system is designed as such so that only a few authorized or very important people (like: Supervisor) are granted complete access to the system with the help of password
- c) **Easy to handle:** Use of menu options and other point and click functions make our application more accessible and easy to use even for the people with little knowledge of computers.
- d) **Limited –edit features:** Allows editing only a part of Patient's information.
- e) **Automatic generation of the discharge reports:** Discharge report is automatically generated as well as printed that contains the case history patient's information, reason of discharge etc. etc. with the total payable and non-payable(already paid) accounts ,at the time when the patient discharges. All the records are automatically deleted from the databases except for the patient history and general information.
- f) If some money in advanced is deposited on behalf of the patient's treatment, the information (regarding the advance money deposited) can be easily tracked.

SYSTEM ANALYSIS

System analysis is related with the information gathering i.e. analyzing the system, deciding which information is to be stored in the database, and in which manner. Here we had analyzed the Hospital Information System. In analyzing the system, we have to decide the entities about which we have to store the information, the attribute of these entities and relation between these entities.

The system consists of the following entities:

1. PATIENT
2. REGISTRATION
3. ADMISSION
4. WARD
5. DOCTOR
6. TEST RESULT
7. INVOICE

SYSTEM DEVELOPMENT LIFE CYCLE MODEL

SDLC model is a structured sequence of phases, for implementing an information System. It contains a set of activities that a designer has to carry for System development. The life cycle model is not a procedure that deals with the hardware and software. Life cycle begins with the recognition of the user needs. It provides a basis for categorizing and controlling the various activities required to develop and maintain a software System. The key stages of the life cycle are evaluation of the present System, analysis, design, and implementation of the System.

1. **System Analysis** – In this phase the analyst carry out a detailed study of the user's requirement. They then, arrive at the proposed System to be built. The model of the System is used to freeze all requirements before the next phase begins.
2. **Design** – A set of graphical tools are used to represent a logical System model to formalization the user with System characteristics and interrelationships before implementation. The tools are – Data Flow Diagram (DFD), Data Dictionary. The purpose of the design phase is to specify a particular software System that will meet the state requirements.
3. **Coding** – This phase produces the actual code that will be delivered to the customer as the running System. Individual modules developed in this phase are tested before being delivered to the next phase.
4. **Testing** – All the modules that have been developed before are integrated or put together in this phase, and tested as a complete System.
5. **Implementation & Maintenance** – Implementation means converting a new System design into operation. This involves creating computer – compatible files, training the operating Staff, installing hardware.

IDENTIFYING THE LIFE CYCLE MODEL

For the development of any System, we should have to follow the well-scheduled path, which is known as model. Although there are many life cycle models nowadays, but according to our project and user convenience waterfall Model has been selected.

Justification — Using Waterfall Model

At every phase there is provision of verification & validation, correction of errors and inconsistencies.

1. All requirements are gathered once as we have done in this Hospital Management System (HMS).
2. Every stage begins when previous phase is finished. According to this model we have prepared all stages as analysis, designing, coding, and then finally development.
3. This project consists of a linear set of distinct phases.
4. Every phase has well defined entry and exit criteria, which is available in our HMS.
5. Easy to understand and cheap.
6. It provides proper feedback, to minimize the work again.
7. This is achieved through the process of review and documentation.
8. It is simple, old and most widely used process model for software development.
9. Easy to explain to the users
10. Stages and activities are well defined
11. Verification at each stages ensures early detection of errors/misunderstandings

Thus to solve the actual problem in an institution settings or System settings a software engineer must incorporate a development strategy that encompasses the process, methods, and tool layers. This strategy is often referred to as a process model i.e., why we have selected Waterfall Model, which is very helpful to carry out this HMS project.

IDENTIFICATION OF NEED

Before requirements can be analyzed, modeled, or specified they are gathered through an elicitation process.

Context free questions were asked to the management people belonging to different large departments regarding how they would characterize a good output that would generate a successful solution, what kind of problems will this solution address, how they describe the environment in which the solution will be used, and will special performance issues or constraints affect the way the solution is approached. Thus the information about the problem that is how the patient details were stored without the presence of the software is gathered. In the current Hospital Management System the person at the desk needs to keep a register to record the details of each patient while admitting it in the hospital

PRELIMINARY INVESTIGATION

The initial investigation HMS has the objective of ‘determining the validity of the user request for a computerized System and whether it is feasible, studies should be conducted’. It handles a user request to change, improve or enhance an existing System.

First stage is the preliminary investigation. The main aim of preliminary investigation is to identify the problem. In this phase of System Development we study the existing System, collects various information about the record maintenance and how data are fed up in the files. Basically we need to know exactly what our System actually wants and what we should do our best to provide with a System that can be implemented.

The process of registration is summarized below:

Whenever a Patient comes to Hospital for the registration, he/she must fill the form filling all the details regarding them i.e. their name, guardians’ name, bed type etc. along with the residence proof. After the verification of the data filled by the patient or the relative, it is passed to next stage where the request is transferred to a staff for allotting the annual registration number. After which the registration is provided to the Patients.

REQUIREMENT ANALYSIS

The heart of the Systems analysis is aimed at acquiring a detailed understanding of all the important questions of the patients and doctors have, we made of all-important areas under investigation. Analysts working closely with employees and managers must study the business process to answer the questions.

Its purpose is to create an overall picture or explanation of organizational data, not the design for a particular database. It describes the scope of data maintained by the organization.

This preliminary survey involves the study of the inside of Patient i.e. how the hospital provide various services to its Patient.

According to above mentioned need, we find the information by queries:

1. Patient query:
 - 1 By name
 - 2 By guardian's name
 - 3 By bed type

2. Doctor query:
 - 1 By name
 - 2 By specialization

3. Bed query:
 - 1 By bed type
 - 2 By empty bed
 - 3 By occupied bed

Then the problems occurring in the manual system were being questioned and noted. The various problems were related to the physical effort in maintaining, deleting and updating the register. Also searching technique of any patient was very poor as manual linear search was being used. Another problem was that the admitting of patient was not according to any group or subgroup categorization as no such details were there with the person at the desk. The admitting of patients was just admitting them in the respective rooms without any logic, thus patients having similar diseases were being admitted in different rooms. Expectations and the need of the person at desk and other staff using the patient details were being asked.

FEASIBILITY STUDY

The objective of a feasibility study is not to solve the problem but To predict (on the basis of system analysis & problem definition) that if it does the kind Of work expected on it, in a reasonable period of elapsed time, & consistent with the financial and processing objective and needs of the organization. During this study, data is being gathered to obtain sufficient information about existing system to make compression with possible computer systems. Here the system “Hospital Information System” is manual. It is not possible for this application to store such a huge database of hospital account.

Feasibility analysis is done in respect of the following:

1. Technical feasibility
2. Economical feasibility
3. Operational feasibility
4. Social feasibility

1. Technical feasibility

A study of resource availability that may affect the ability to achieve an acceptable system. This evaluation determines whether the technology needed for the proposed system is available or not.

- Can the work for the project be done with current equipment existing software technology & available personal?
- Can the system be upgraded if developed?
- If new technology is needed then what can be developed?

This is concerned with specifying equipment and software that will successfully satisfy the user requirement. The technical needs of the system may include:

Front-end and back-end selection

An important issue for the development of a project is the selection of suitable front-end and back-end. When we decided to develop the project we went through an extensive study to determine the most suitable platform that suits the needs of the organization as well as helps in development of the project. The aspects of our study included the following factors.

Front-end selection:

1. It must have a graphical user interface that assists employees that are not from IT background.
 2. Scalability and extensibility
 3. Flexibility.
 4. Robustness.
 5. According to the organization requirement and the culture.
 6. Must provide excellent reporting features with good printing support.
 7. Platform independent.
 8. Easy to debug and maintain.
 9. Event driven programming facility.
 10. Front end must support some popular back end like Ms Access.
- According to the above stated features we selected VB6.0 as the front-end for developing our project.

Back-end Selection:

1. Multiple user support.
2. Efficient data handling.
3. Provide inherent features for security.
4. Efficient data retrieval and maintenance.
5. Stored procedures.
6. Popularity.
7. Operating System compatible.
8. Easy to install.
9. Various drivers must be available.
10. Easy to implant with the Front-end.

According to above stated features we selected Ms-Access as the backend. The technical feasibility is frequently the most difficult area encountered at this stage. It is essential that the process of analysis and definition be conducted in parallel with an assessment to technical feasibility. It centers on the existing computer system (hardware, software etc.) and to what extent it can support the proposed system.

Operational feasibility:

The assessment made if the System will be used or not once it is developed. According to the project, the Hospital Management System will use the operational feasibility if the System is developed and implemented to measure how well is our project solution will work in the organization. And how the people feel about the System. Since, the System is highly user friendly, it is acceptable to the organization and other users as well. So we can say it is operationally feasible.

Economic Feasibility:

Economic analysis is the most frequently used method for evaluating the effectiveness of a proposed System. In this feasibility, we decide the proposed System as on the basis of cost/benefit analysis. Whether the proposed System is feasible according to the economic factors i.e. cost or money wise.

Economic analysis is the most frequently used method for evaluating the effectiveness of the System. The benefits that this System has, are many including the enhancing the working speed of the System, queries are sorted in a fast manner, the data are stored in the database that can be used whenever required. And the cost of new computerized System will not be much in view of its advantages. The benefits outweigh the costs, and then the decision is made to design the System. This HMS for management of Life Line Charitable Hospital is a simple project and requires the software's like Visual Basic and SQL. It is simple software and does not require any extra costs other than the cost of the software used for development and the charges of the developer. So we can say that it is economically feasible.

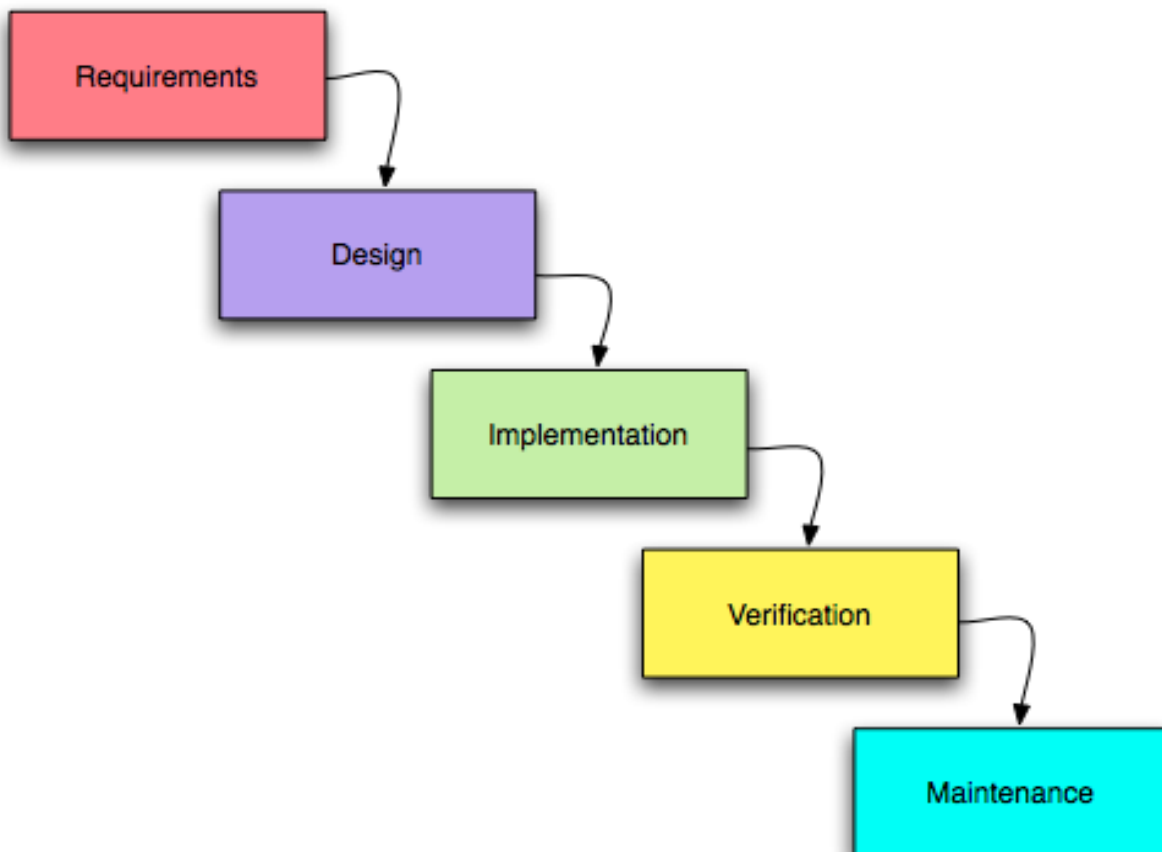
Social feasibility:

Social feasibility is the determination of whether the proposed model will be accepted by the public or not. The determination typically examines the probability of the project being accepted by the group directly affected by the proposed system change.

SOFTWARE ENGINEERING**Waterfall model:**

Waterfall approach was first Process Model to be introduced and followed widely in Software Engineering to ensure success of the project. In "The Waterfall" approach, the whole process of software development is divided into separate process phases.

The phases in Waterfall model are: Requirement Specifications phase, Software Design, Implementation and Testing & Maintenance. All these phases are cascaded to each other so that second phase is started as and when defined set of goals are achieved for first phase and it is signed off, so the name "Waterfall Model". All the methods and processes undertaken in Waterfall Model are more visible.



Requirements :

This is an informal specification of what we as hospital administrators want from the company designing a system to help us manage our hospital efficiently and effectively.

General Problem Statement

Due to budget cutbacks and general concern for providing the best service possible to the public, we as a hospital would like to ensure that we are using our scarce hospital resources in the most efficient manner possible. With this in mind we would like you to design a system which will help us manage our hospital in an efficient, effective manner. Specifically the system should help us schedule and monitor the various resources that we have at the hospital. This includes keeping track of available beds, waiting lists for patients, patients expected length of stay, scheduling of surgeries, patient notification and billing, scheduling of nurses and doctors.

DATA

The system must store the following information:

- For hospital (physical building):
 - No of wards
- For each ward:
 - type of ward
 - no of beds
- For each bed
 - ward it's in
 - whether or not it's occupied
 - patient who's in it
 - Date patient started occupying bed.

Scheduling of hospital staff must take the following information into account. Each floor requires a supervising nurse and 5 regular nurses during the day and 1 supervising and 2 Regular nurse in the evenings. Obstetrics, Cardiology, Intensive care and Operating all require nurses with that specialty. Two doctors with the appropriate specialty are required during the day and one in the evening for each floor. two doctors and two nurses are required for each operation.

For hospital staff:

- Name (Last Name, First Name)
- Address (Full Address, including city, province/state, country)
- Position (Doctor or Nurse)
- Level (Supervising, Regular)
- Specialty (Cardiology, Pediatrics...)
- Schedule to work:(which consists of the following entries)
- Date to work. (Month/Day/Year)
- Hour to start working (In military format e.g. 24:00)
- Hour to end working (In military format)
- Ward in which to work.

For doctors the following additional information:

- Operating schedule
- (all stuff from schedule above)
- type of operation
- patient to operate on

The system should also be able to keep track of certain patient information. The system should generate a notification letter 2 week before a patient is admitted to the hospital as well as lists of patients being admitted and discharged on the next day. Finally the system should generate an invoice for the patients stay.

For patients:

- Name (Last Name, First Name)
- Address (Full Address, including city, province/state, country)
- Insurance number (SIN, whatever it is in the states)
- Type of treatment required.
- For patients on waiting list:
- Position on waiting list
- Priority
- Date (first on waiting list)
- For patients in bed:
- bed info
- The system should also:
- Keep track of past info.

E.g. Old schedule, patients who were there, whether or not operation was successful.

ACTIVITIES:

The system must be able to perform the following actions. (JUST EXAMPLES!)

1. Must schedule hospital staff according to the following rules:
 - Staff must not work too many consecutive shifts.
 - Staff cannot be off work for too many consecutive shifts.
 - The number of staff working must be as large as possible at all times.
 - Doctors cannot be scheduled to work a ward and operate at the same time.
2. Manage the waiting list:
 - Must be able to add patients to the waiting list
 - Must be able to take patients off the waiting list:
 - For those who got spontaneously better just remove from list.
 - For those who got a bed, transfer patient info to bed.
 - As patients removed from waiting list, positions must be updated according to SOME rules. e.g. patients of higher priority move up list faster.
3. Add and remove hospital staff:
 - Note this may mean altering the schedule for every other staff member who is working.

SOFTWARE REQUIREMENT SPECIFICATION

4.1 Introduction:

To Provide an integrated Solution for the Hospital, which

- Helps in Efficient Management of the Hospital.
- Enhance Patient Care.
- Improve work efficiency.
- Enable the Growth of the Hospital.

4.1.1 Purpose of Development:

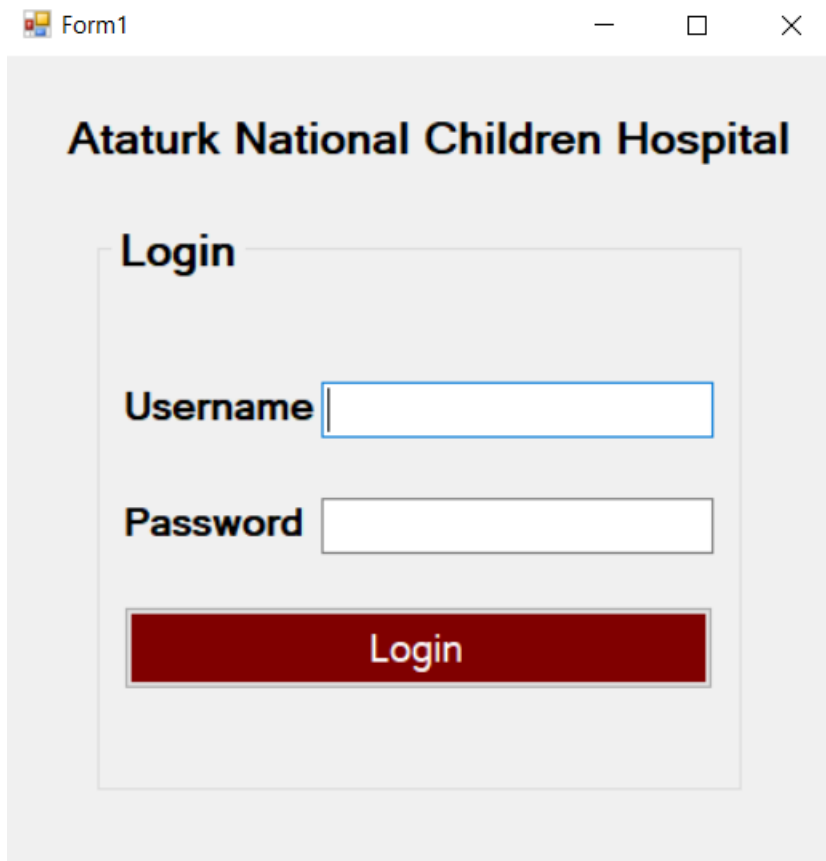
The purpose of this SRS document is to provide a detailed overview of our software product “Hospital Management System”, its parameters and goals. This document describes the project's target audience and its user interface, hardware and software requirements. It defines how our client, team and audience see the product and its functionality.

4.1.2 Scope of development:

It authenticates the user by matching the User ID and the access code (which in turn may be generated using some cryptographic algorithm) against the values stored in the database. It enables in creating new Users in the system i.e. it provides a registration form which makes the user to enter the new user's details. It provides separate billing method for indoor and outdoor patients, corporate and individual patients.

Home page:

Login page:



Form1

Ataturk National Children Hospital

Login

Username

Password

Login

Functional Requirement

There are 15 major modules

The various modules are:

- Reception Management
- Patient Registration (OPD & Indoor)
- Out Patient Management
- OPD Billing
- Investigations Reporting (Pathology & Imaging)
- Indoor Patient Management
- Indoor Billing
- Store
- Pharmacy
- Financial Accounting
- Payroll
- MRD Management
- Online Diagnostic Reporting
- HR Management

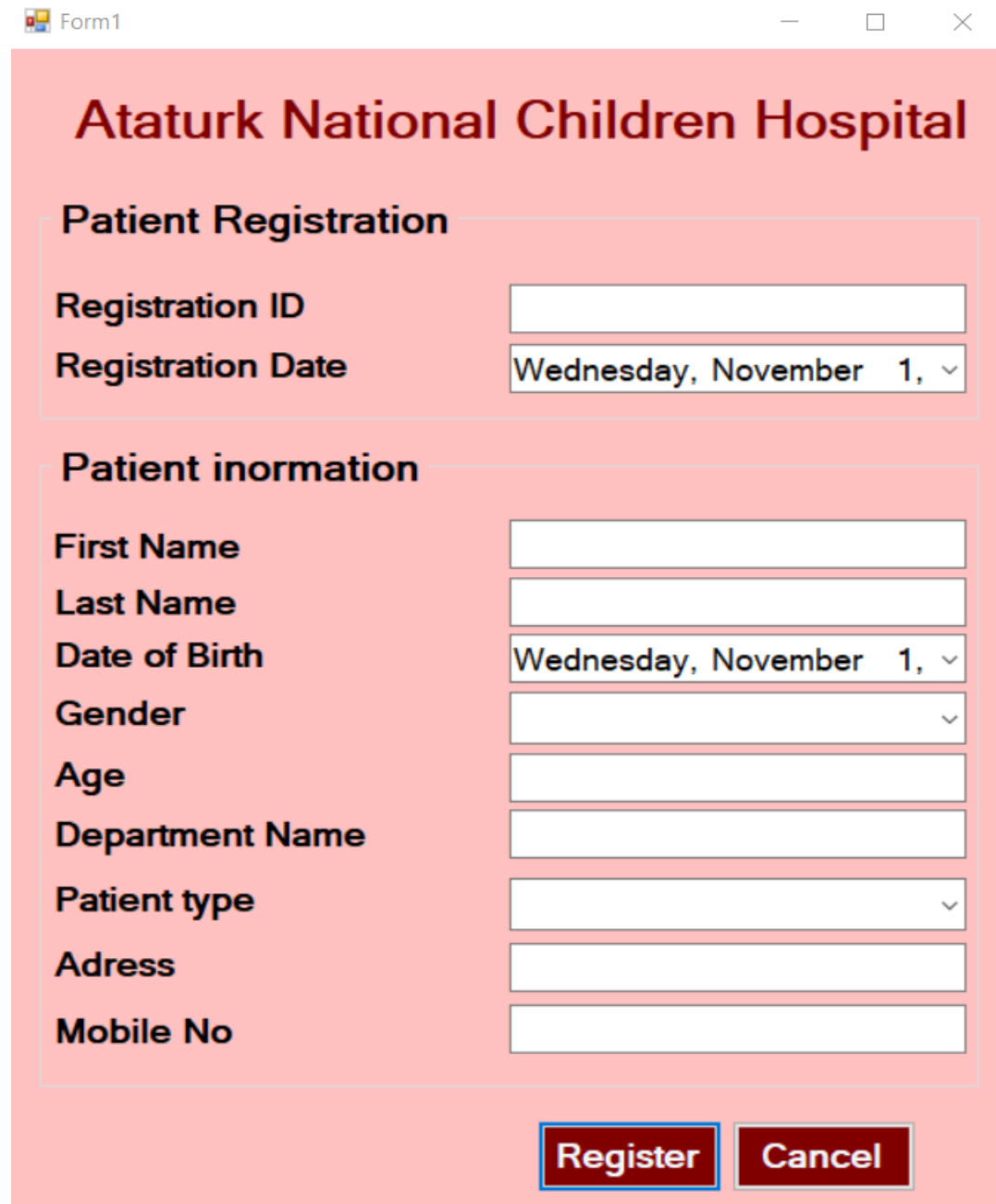
Reception Management:

Reception is the first point of interaction for anybody coming to the Hospital. It has all the information of the patients, doctors, departments and activities of the Hospital. All enquiries and appointments are scheduled through this module.

- Patient Related Enquires:
 - Bed Allotment
 - Admission Details
 - Payment Details
 - Discharge Details
- Doctor Related Enquires:
 - Availability Details
 - Appointment Schedules
 - Operation Schedules

Patient Registration:

All information available here are in real time and any enquiry about the patient status, Room Status, Doctors availability or tariff's for various services is on actual status since the data is constantly updated



The screenshot shows a web application window titled 'Form1'. The main heading is 'Ataturk National Children Hospital' in a large, bold, dark red font. Below this, the section 'Patient Registration' is highlighted with a light red background. It contains two fields: 'Registration ID' (a text input) and 'Registration Date' (a date picker showing 'Wednesday, November 1,'). Below this, the 'Patient information' section is also highlighted with a light red background. It contains several fields: 'First Name' (text input), 'Last Name' (text input), 'Date of Birth' (date picker showing 'Wednesday, November 1,'), 'Gender' (dropdown menu), 'Age' (text input), 'Department Name' (text input), 'Patient type' (dropdown menu), 'Adress' (text input), and 'Mobile No' (text input). At the bottom right of the form, there are two buttons: 'Register' (highlighted with a blue border) and 'Cancel' (highlighted with a dark red background).

Form1

Ataturk National Children Hospital

Patient Registration

Registration ID

Registration Date

Patient information

First Name

Last Name

Date of Birth

Gender

Age

Department Name

Patient type

Adress

Mobile No

This module comprises of the following components:

Patient Enquiry:

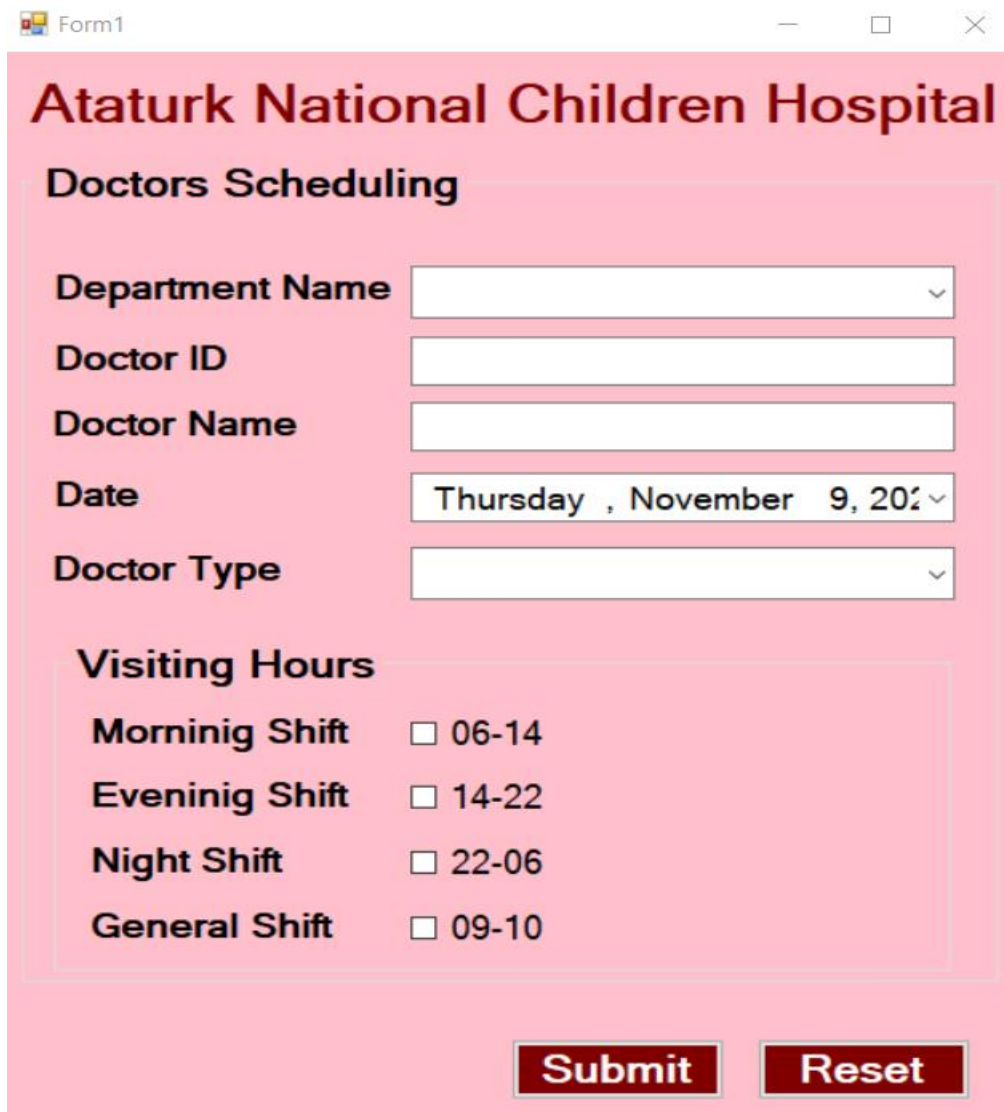
This will provide information of any patient like: Patient status, Name, Address or any other demographic detail.

Consultants Enquiry:

Any Information regarding a visiting Consultant can be obtained like consultant's availability, days & time of availability, Department, specialization or any other.

Doctor Scheduling:

User selects dept-name and doctor id from drop down list ; doctor's name display and user selects date from date picker and enters doctor type, selects visiting hours and click on submit button. Information saves in database.



The screenshot shows a web form titled "Ataturk National Children Hospital" with a subtitle "Doctors Scheduling". The form is set against a light pink background. It contains several input fields: "Department Name" (a dropdown menu), "Doctor ID" (a text box), "Doctor Name" (a text box), "Date" (a date picker showing "Thursday , November 9, 202"), and "Doctor Type" (a dropdown menu). Below these fields is a section titled "Visiting Hours" which contains four rows, each with a shift name and a checkbox followed by a time range: "Morninig Shift" with checkbox and "06-14", "Eveninig Shift" with checkbox and "14-22", "Night Shift" with checkbox and "22-06", and "General Shift" with checkbox and "09-10". At the bottom of the form are two buttons: "Submit" and "Reset".

Form1

Ataturk National Children Hospital

Doctors Scheduling

Department Name

Doctor ID

Doctor Name

Date

Doctor Type

Visiting Hours

Morninig Shift ☐ 06-14

Eveninig Shift ☐ 14-22

Night Shift ☐ 22-06

General Shift ☐ 09-10

The following information is required for the registration of OPD Patient--:

- Patient Details like Name, Age, Sex, Address, Contact number, Nationality, etc.
- Referring Source and Sponsorship / Penal Details
- Department & Consultant to be visited.

In Patient:

For Inpatient the additional information requirements are:

- ❖ Room / bed requirement.
- ❖ Consultant In charge
- ❖ Treatment required
- ❖ Authorization from Sponsor/Penal if required

After registration an OPD Card is printed for the OPD patients, which list all his registration information. This card is used for the prescription writing by the consultant. An Admission form is printed with all the registration details for Indoor patients, which serves as the cover page of the patient file.

Form1


Ataturk National Children Hospital

InPatient Entry

Admission ID	<input type="text"/>	Date	Friday , Novemb ▾
Registration ID	<input type="text"/>	Reg. Date Time	<input type="text"/>
First Name	<input type="text"/>	Last Name	<input type="text"/>
Date of Birth	Friday , Novemb ▾	Gender	<input type="text"/>
Age	<input type="text"/>	Doctor Name	<input type="text"/>
Department Name	<input type="text"/>	Prescription	<input type="text"/>
Referral Doctor	<input type="text"/>		

In Patient Daily Report:

User selects registration-id from drop down list and click on submit button; then Inpatient Daily report generates.

 Form1

Ataturk National Children Hospital

InPatient Daily Report

Admission ID

Registration ID

First Name

Date of Birth

Friday , November ▾

Age

Doctor Name

Ward Type

Request for Discharge

☒ Yes ☐ No

Visit Date

Friday , November ▾

Visit Time

Last Name

Gender

▾

Doctor Name

Prescription

Submit

Reset

Out Patient Management:

After the registration the patient comes to the consultation chamber, where the consultant records his history, diagnose and prescribe medicines & investigation.

The Consultant note down the following details on Patients OPD Card:

- Complaints
- History
- Diagnosis
- Investigation
- Medicines
- Advice
- Next Visit

This information is then entered into the patient data by the consultant or the operator at the OPD Counter. It serves the purpose of tracing patient's visit history and also as a feedback for research & analysis. The prescription can also be scanned and saved. The scanned data can be entered later into various fields by the operator.

4. OPD Billing:

For billing of any OPD service like Pathology Tests, or any imaging investigation, the patient moves to OPD billing counter. Here the services are charged as per the rates already defined for various categories/ penal/ time etc to the patient with his Patient ID. The Payment is collected for the service provided and a receipt is generated.

This module works as an interface with the diagnostic modules. All services will be automatically entered into the respective modules wherever required like lab & Imaging reporting. The Salient features of this module are:

- ⇒ Record Charges to be taken from the patient.
Record details of the concession & concession authority
- ⇒ Consultant charges are automatically picked according to general or emergency charges.
- ⇒ The charges for the services are automatically picked according to the category or panel of the patient.
- ⇒ The charges are also dependent on time when the service is being given to patient.
- ⇒ When patient revisits his information will be automatically picked using his identification number.
- ⇒ Patient can be defined under Cash & Credit OPD.
- ⇒ All relevant information is transferred to the Investigation departments.

5. Investigations Reporting (Pathology & Imaging):

In the routine functioning of a hospital, various types of investigations are carried out. Carrying out number of tests and making the results available promptly is very crucial for assessing the patient's medical status and deciding on the further course of action.

The investigation requisition can be auto-generated (through OPD billing or IPD) or can also be generated here, depending on the system followed in the hospital. The tests parameters are pre defined with the interpretations & formulae wherever applicable. The test results are entered into the software manually or with equipment integration and a descriptive smart report is printed after verification and validation.

The Salient features of this module are:

- ⇒ Online investigation requisition can be raised from OPD or IPD or Labs
- ⇒ Provision for entering results for diverse tests in multiple reporting formats.
- ⇒ Five options for each test parameter, along with interpretations & explanation.
- ⇒ Age wise & Sex wise Reference range for Pathology tests.
- ⇒ Warnings & Auto-highlighting of abnormal values.
- ⇒ Auto calculation and validation of test results with formulae
- ⇒ All the Reports will be validated before finally ready for printing after verifying its correctness.
- ⇒ Role Based Security. Different access password for each department & User.
- ⇒ Comparative analysis of Test result with last visits reports.
- ⇒ Integration with diagnostic equipments to fetch actual result values directly.

6. Patient Management:

The Indoor patient module commences when the patient is being registered and allotted a bed in the ward. It deals with the complete treatment and services provided to the patient during his stay in the hospital.

This module works at the nursing station. During his stay in the hospital, every patient is provided various services in terms of consultant's visits, investigations, procedures, medicines & consumable, room services, diet, etc. All these services are entered online to the patient record through nursing station. It also interacts with the Investigation module, Store, Pharmacy and sends the requisitions to these departments. This data serves as major input for the IPD billing.

Salient Features:

- ⇒ Bed Allocation and Transfer.
- ⇒ Consultants visit entry.
- ⇒ Recording Patient's Clinical Data
- ⇒ Requisition of Investigations required
- ⇒ Requisition to Store & Pharmacy for Medicines & Consumables.
- ⇒ OT Billing & Management.

7. Billing:

Indoor billing module has a supervisory role. The entries for billing are automatically transferred to the patient bill by the respective departments, which provide the service. The services are charged as per the category/panel/package applicable. Here the bill is compiled and the payment collected from time to time. Provisional and Final bills are generated which provides complete information about the Services availed, its Charges, Advance collected, appropriate Receipts, Refunds, Credit notes, Concession allowed, etc.

Salient Features:

- ⇒ Collection of Payment by Cash/Credit Card/ DD or Cheque.
- ⇒ Receipts, refunds, Credit Note Generation.
- ⇒ Provisional & Final Bills.
- ⇒ Department wise services availed.
- ⇒ Scrutinizing the Deposit Exhaust list and sending requisition for deposit.
- ⇒ Automatic scrutiny of the credit limit available to the patient.
- ⇒ Provision to bill a patient against another account (LIC account/company account/Donors account etc.)
- ⇒ Additional payment for Ambulance/attendants at discharge if required.

8. Central Store:

This module deals with the inventory of all Hospital Equipments, Materials, Consumables, and Medicines, Implants & Asset items indifferent departments of the hospital along with their purchase and supplier details. Requisitions for different items/equipment are sent to this store from different departments and accordingly the Central Store issues items/equipment to various departments and generate purchase orders for purchases. This also maintains records of purchases, stock, and supplier list, item/equipment/material master tables. The Store module ensures that there is a round the clock availability of a sufficient quantity of drugs and consumable material for the patients in a mode that neither hinders efficient clinical work, nor it becomes a threat to the survival of the Store.

Salient Features of this Module are:

- ⇒ Maintains the details of all items, its suppliers and purchase details.
- ⇒ Items can be categorized under different groups.
- ⇒ Items can be defined for the store i.e. a particular will be able to view only those items which comes under it.
- ⇒ Generate Purchase order linked with patient indents.
- ⇒ Maintain Separate Stock of Central Store & Multiple Sub Stores.
- ⇒ A particular store can indent items from all other stores.
- ⇒ Maintain vendor details from whom Items are being purchased.
- ⇒ Central Store can acknowledge return of purchased item.

- ⇒ Various area stores can return items that are not required by them back to the Central Store.
- ⇒ Different store can issue Items to other Stores, Department.
- ⇒ Strict Check on the Expiry Date of Medicines & Consumables.
- ⇒ Items can be issued according to FIFO & LIFO check
- ⇒ Maintain Reorder Level of Items and warn accordingly

The following reports can be generated as part of this module:

- ⇒ Report of all items according to their group.
- ⇒ Stock in Hand Report (Group & Batch Wise) Stock Valuation on Purchase Rate & M.R.P.
- ⇒ Report on Stock Movement as when & from where Item was issued and to whom it was issued.
- ⇒ Items Expiry list & warning
- ⇒ Reorder Level of Items.
- ⇒ Purchase & Issue Registers.

9. Pharmacy:

The Pharmacy Module deal with the Retail Sale of medicines to OPD patients and Issue of medicines to the In-patients in the hospital. Its function includes, online drug prescription, inventory management and billing of drugs, consumables and sutures. This module is closely linked to the Billing Module and In-patient Module. All the drugs required by the patient can be indented from the various sub stores.

Salient Features:

- ⇒ This module enables complete control on pharmacy including Purchase & Issue of medicine to IPD or OPD Patient.
- ⇒ Medicines can be classified under different categories as per the salt or appearance.
- ⇒ Total amount of the bill for IPD Patient will automatically get added in his bill.
- ⇒ The Pharmacy can acknowledge the return of items and issue Credit notes
- ⇒ Items can not be issued after the expiry date.
- ⇒ Items can be issued according to FIFO & LIFO check.
- ⇒ Details of all vendors are kept in accordance with their transactions.
- ⇒ Maintain Reorder Level of Item.

The following reports can be generated as part of this module:

- ⇒ Stock in Hand Report (Group wise, Batch wise)
- ⇒ Expired medicines list. List of all the items according to their group
- ⇒ classification.(Batch wise, or without Batch wise)
- ⇒ Report on Stock Valuation on Purchase Rate, Sale Rate & M.R.P.
- ⇒ Report on Stock Movement as when medicine was issued and to whom it was issued.
- ⇒ Purchase, Sale & Issue Register.

10. Financial Accounting:

A Financial accounting module is linked with hospital billing module. You get online accounting of all revenue generated along with expenses incurred. There is no need to enter the revenue entries as they are already fetched from the billing module. All relevant information for the staff salary/wages, consultant share, etc is available.

Salient Features of this module are:

- ⇒ All revenue entries are transferred automatically from billing module.
- ⇒ Just enter the expense vouchers and the accounts are complete up to balance sheet.
- ⇒ Consultant Share and other relevant Information already available.
- ⇒ User defined ledger Groups & Accounts.
- ⇒ User definition of Cost Centre.
- ⇒ Department wise income detail.
- ⇒ Cheque Printing.
- ⇒ Graph with Key Reports

Key Reports of this module are:

- Party Ledger
- Ledger Analysis.
- Day Book
- Cash Book
- Bank Book
- Sale Book
- Trial Balance as on date.
- Group wise Trial Balance.
- Profit & Loss Report.
- Balance Sheet

11. Payroll:

Keep track of all staff member's attendance; there leave record and deductions.

Generate salary slip and other related reports.

Salary Master:

User clicks on master salary option; master salary page opens. User selects Emp-Code from drop down list then all salary related information display.

Salient Features of this Module are:

- ⇒ Maintains complete record of all employees including the Employee Code,
- ⇒ name, Demographic data, Salary in different heads, Department, Designation, PF account, ESI Account, etc.
- ⇒ Definition of Salary head as per formula or straight away.

- ⇒ Leave's as per defined by user.
- ⇒ Salary settings as per monthly basis, or on wages basis.
- ⇒ Daily/ Monthly attendance record.
- ⇒ Short Term & Long Term Loans.
- ⇒ Record of employee's in time, out time, lunch hours, over time.
- ⇒ Application of salary increment formula.
- ⇒ Supports all types of Smart Cards, Bar Cards, etc.

Key Reports under this module are:

- ⇒ Salary Register.
- ⇒ Leave Register.
- ⇒ Pay Slips.
- ⇒ Employee List with their complete details.
- ⇒ Over time report.
- ⇒ Overall PF Report.
- ⇒ Report of Leaving and new join employees.

12. Medical Record data (MRD) Management:

Patient's Medical record data is critical for the analysis and research purposes. This data includes patient history, observation, diagnosis and therapeutic conclusions along with the tests details and serves as a source of information foray analysis and research. The purpose for this module is to utilize the patient's medical information and use it for analysis thereby improving patient care.

Salient Features of this Module are:

- ⇒ Statistical reports based on diagnosis, age, sex, geographical areas and other parameters.
- ⇒ Discharge Summary with details of test reports.
- ⇒ Reports on departments, consultants, etc.
- ⇒ Birth & Death Records with full details.

HR Management:

Department: User enters dept name, location, current man power,

Authorized man power and user will click on save button; information saves in database. When user clicks on reset option; all fields are cleared.

Employee Information:

When user clicks on employee information option; employee information page opens. And user enters EMP- name, emp-type, user will select date from date picker, enter department, designation, qualification, select blood group, gender, status from drop down list and user enters family information and address information and click on save button; popup message display and information saves in database.

Employee Information:

Form1

Ataturk National Children Hospital

***Employee Information**

General Information

Employee Code	<input type="text"/>
First Name	<input type="text"/>
Last Name	<input type="text"/>
Father Name	<input type="text"/>
Date of Birth	Friday , November 10
Gender	<input type="text"/>
Department Name	<input type="text"/>
Employee Category	<input type="radio"/> Doctor <input type="radio"/> Nurse <input type="radio"/> Staff
Employee Type	<input type="text"/>

Address Information

Adress 1	<input type="text"/>
Address 2	<input type="text"/>
City	<input type="text"/>
Country	<input type="text"/>
Distract	<input type="text"/>
Zip Code	<input type="text"/>
Mobile No	<input type="text"/>
Whatsapp No	<input type="text"/>
Email Address	<input type="text"/>

Submit

Reset

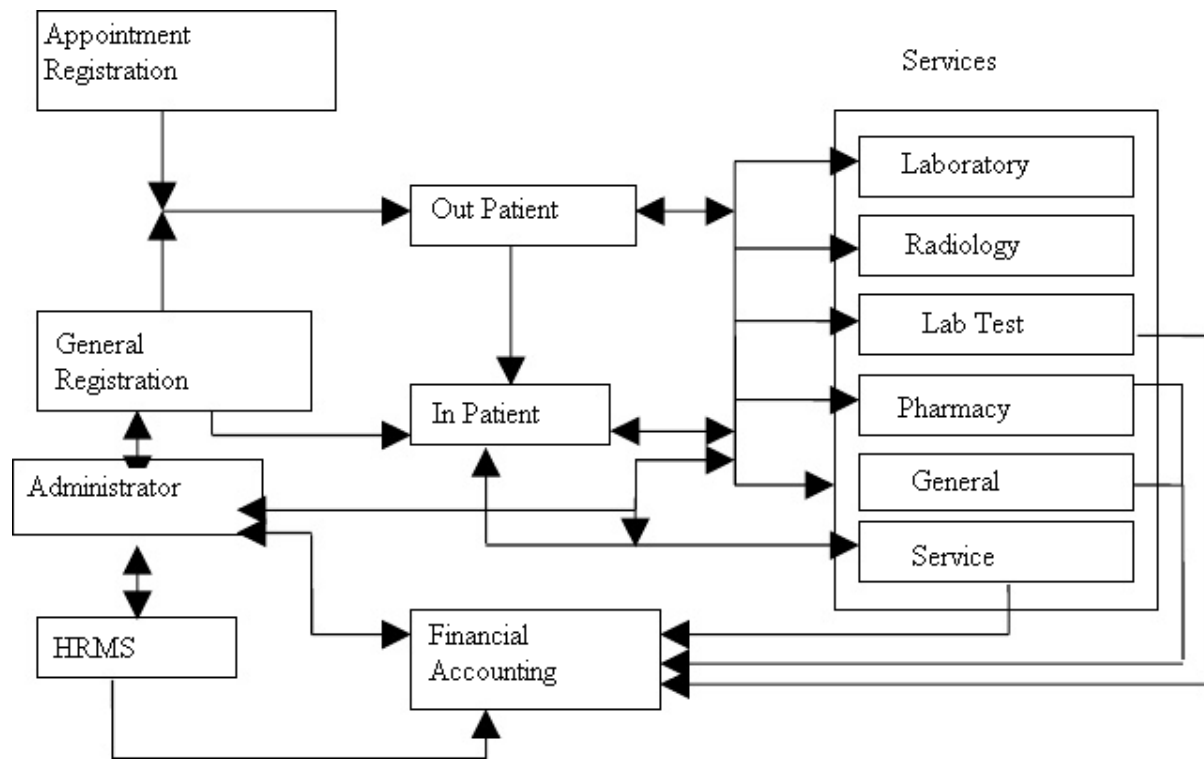
Overview:

This Software Requirements Specification (SRS) is the [requirements work product](#) that formally specifies Hospital Management System (HMS). It includes the results of both business analysis and systems analysis efforts. Various techniques were used to elicit the requirements and we have identified your needs, analyzed and refined them. The objective of this document therefore is to formally describe the system's high level requirements including functional requirements, non-functional requirements and business rules and constraints. The detail structure of this document is organized as follows:

Section 2 of this document provides an overview of the business domain that the proposed Hospital Management System (HMS) will support. These include a general description of the product, user characteristics, general constraints, and any assumptions for this system. This model demonstrates the development team's understanding of the business domain and serves to maximize the team's ability to build a system that truly does support the business.

Section 3 presents the detail requirements, which comprise the domain model. Picture 1 shows an overview of the Hospital Management System and the relationships between requirements.

Description of S.R.S:



What does HMS integrate?

- Database
- Applications
- Interfaces
- Tool

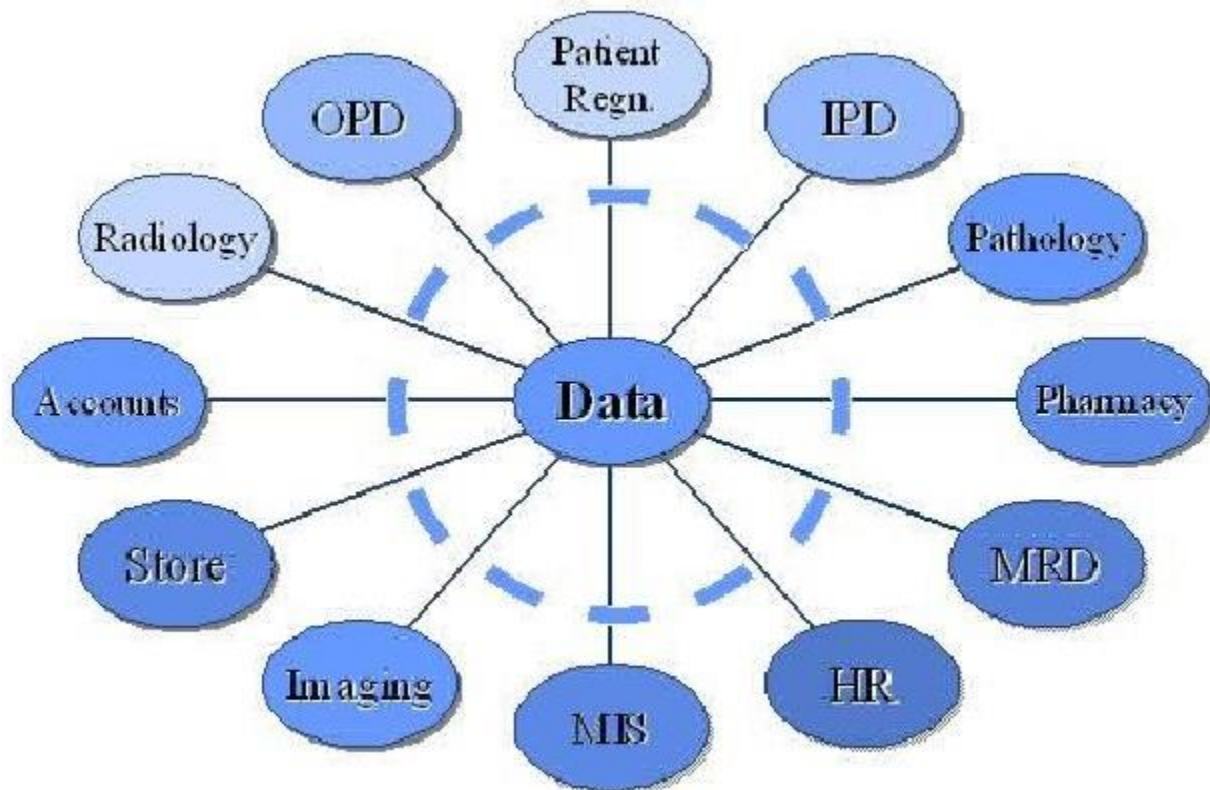
Terms, definitions and abbreviations:

- QA - Quality Assurance
- DATABASEA - place where permanent data is stored
- BRS - Business Requirement Specification
- SRS- Software Requirement Specification
- FRS- Functional Requirement Specification
- HMS- Hospital Management System

Application description:

The user will enter all the billing information for a particular patient. This will include the type of the patient (inpatient/out patient and corporate/individual), type of billing (for inpatient the mode of bill payment may be post-paid but for outpatient it should be prepaid). The user will also have to select the laboratory tests done by the patient, the date of discharge of the patient and the amount of discount if there is any.

Interface description: The user will have to be familiar with the billing module. If needed, the user should be trained up to use this module. The user may be an administrator, nurse or cashier. It depends upon the particular hospital.



External interfaces:

Input from the user will be via keyboard input and mouse point and click. The user will navigate through the software by clicking on icons and links. The icons will give appropriate responses to the given input.

Technology Used:

Visual Studio2008 and SQL server2005

Software and Hardware requirements:**Software Requirements:**

Operating System: Windows-10
Development Language: C and C++
Back End (RDBMS): Microsoft SQL server or Oracle

Minimum Hardware Requirements:

Processor: Core i7
RAM: 16GB
SSD: 500GB
Motherboard: Any compatible
Mouse: Optical Scroll Mouse
Keyboard: General or with Hot Keys/QWERTY.
Monitor: SVGA Monitor
UPS: 0.5 KVA Hardware and Software Requirements:

Performance Requirement:

The performance of our product is at its best if stored locally, as the response time will be much faster. If the product accessed via Internet, the performance is limited by the connection speed. The only foreseen limitation is that of web-server response. The performance of our software is at its best when the following are regularly done:

Normal Requirements:

1. Graphical displays:
 - a) Fully Menu driven.
Intuitive key assignments and user interactive screen.
 - b) User friendly and easy to use menus.
2. Feature to Add, delete and store data of the patient, beds and doctors.
3. Feature to fill patient details, bed details or doctor details on a single click and easily access them.
4. Search Facilities.
5. Updation facility with easy scrolling through records of patients, beds or doctors.

Expected Requirements:

1. Indexing.
2. Ease of human/machine interaction.
3. Reliability and operational correctness.
4. Ease of software installation.
5. Single point data storage for each data element.
6. 24x 7 support (any time).
7. The system should be secured.
8. Should be upgradeable to incorporate new features.
9. Should be expandable.
10. Should have fastest possible response while processing queries.

Security requirements:

The following security requirements are considered in this project.

1. Patient/employee Level Authentication.
2. Restricted Menu access.
3. Password protected software.
4. Only person at desk should be able to see and go through the records.

SYSTEM DESIGN

Design Objective:

This is the most creative and challenging phase of the System life cycle is System Designing. The term design describes a final System and the process by which it is developed. The first step is “to determine how the output is to be produced and in what format”.

The design of an information System produces the detail that clearly describes how a System will meet its requirements identified during the System analysis. System analyst begins the design process by identifying the reports and other outputs the System will produce. The System design also describes the data to be input, calculated or stored. The detailed information is passed on to the programming Staff for the purpose of software development.

A design document states the details of how to meet the System requirements identified during the System analysis.

Design Concepts:

Top-Down design:

Begin with the behavior description of the faculty and work towards the description of its components and their interconnections.

Bottom-Up design:

Begin with the set of components and see if they can be arranged to meet the behavior description of the faculty.

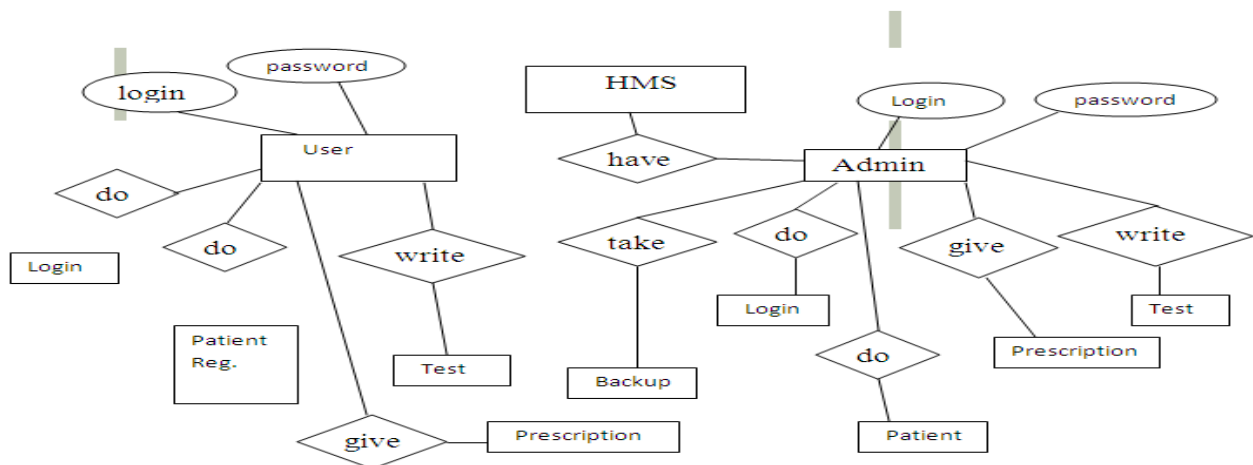
ARCHITECTURAL DESIGN

Entity Relationship-Diagram:

Entity relationship diagram is a diagram to show the different entities, its attributes and the relation between them. The entities are the tables in the database. Here we have 3 entities:

1. Bed,
2. Patient, and
3. Doctor

In an Entity Relationship Diagram we show entities in rectangular boxes, their attributes in circles and the connection between entity and attribute with a straight line between the two. The relationships between the two entities are shown in diamond boxes, and the connections between the entities and relationships are shown with the help of arrows. The above mentioned Entity Relationship Diagram (ERD) shows the relationship between different entities of Life Line Hospital Database. It also shows the different attributes of the entities of the Life Line Hospital Database



Entity Relationship diagram

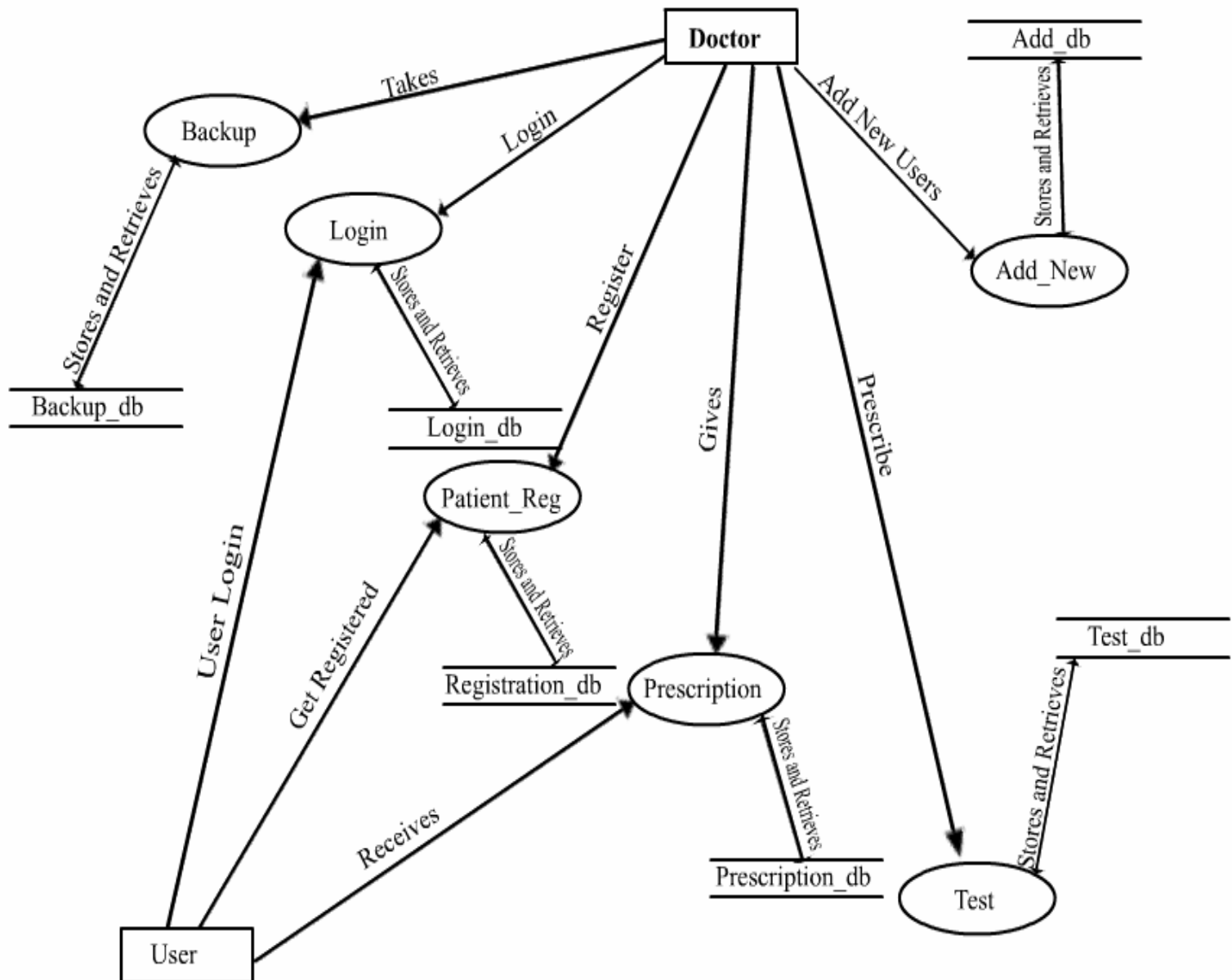
Data Flow Diagrams:

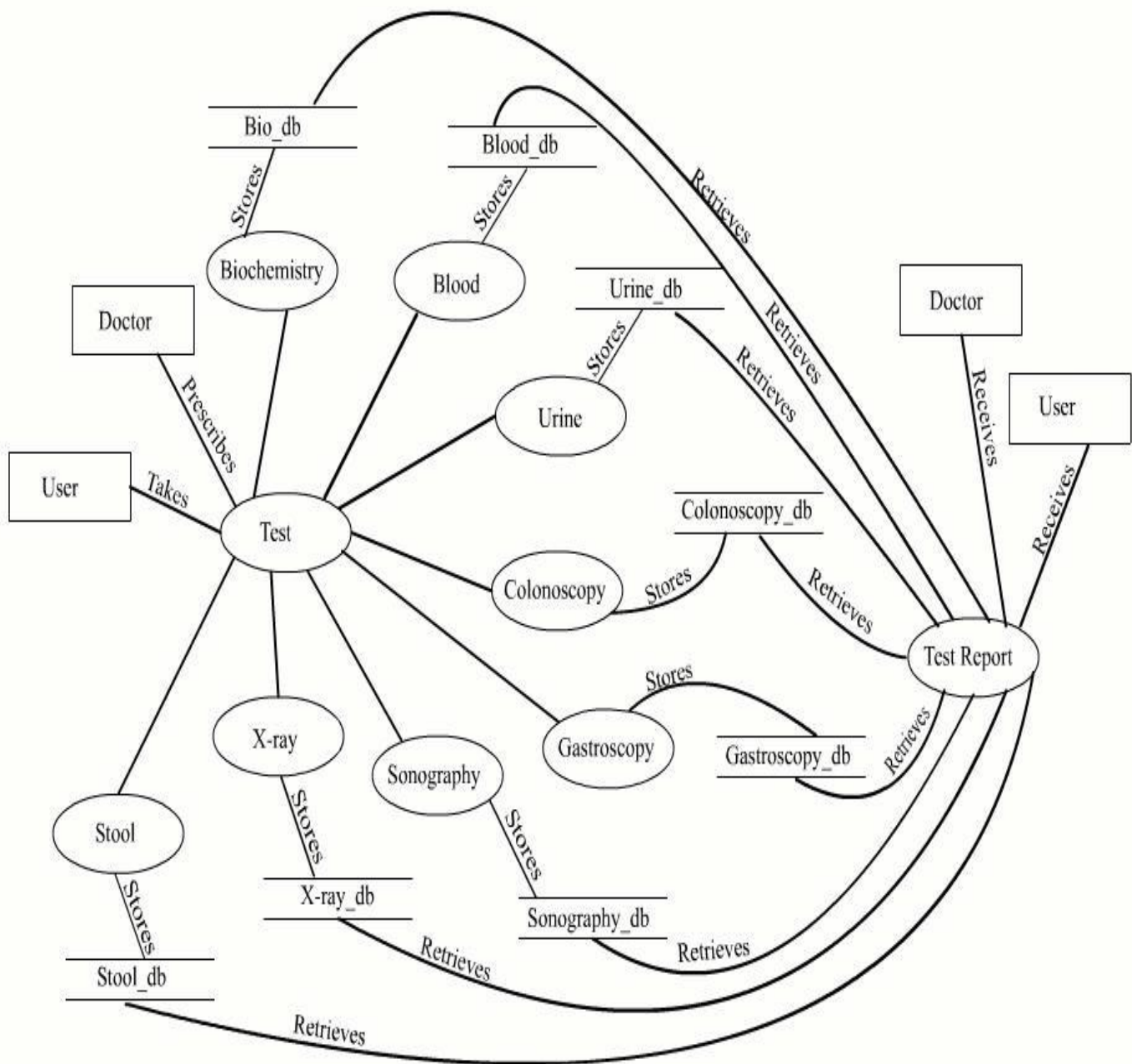
All the above requirements are fulfilled by the Detailed Design Specifications in the form of DFDs. DFDs are the best way for explaining the concept in brief & understandable manner.

DFD also known as “bubble chart” has the purpose of classifying System requirements & identifying major transformations that will become programs in System Design. A DFD consists of a series of bubbles joined by lines. The bubbles represent the transformations & the lines represent the flow of data in the System. Its symbols are as following:

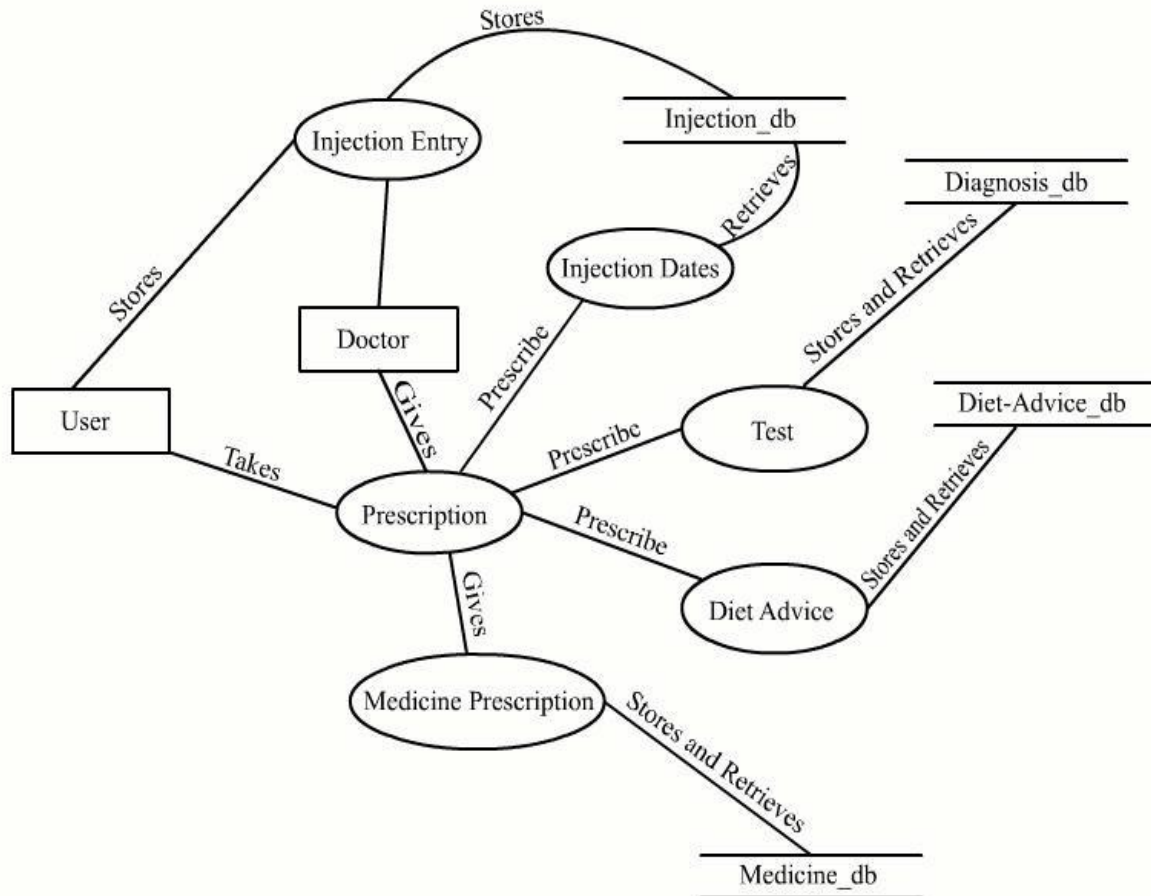
- 1 A square defines source or destination of System data.
- 2 An arrow identifies data flow.
- 3 A circle or bubble represents a process.
- 4 An open rectangle is a data store – data at store.

All the above components are used to design the DFD as a whole DFD in a complete & descriptive manner.

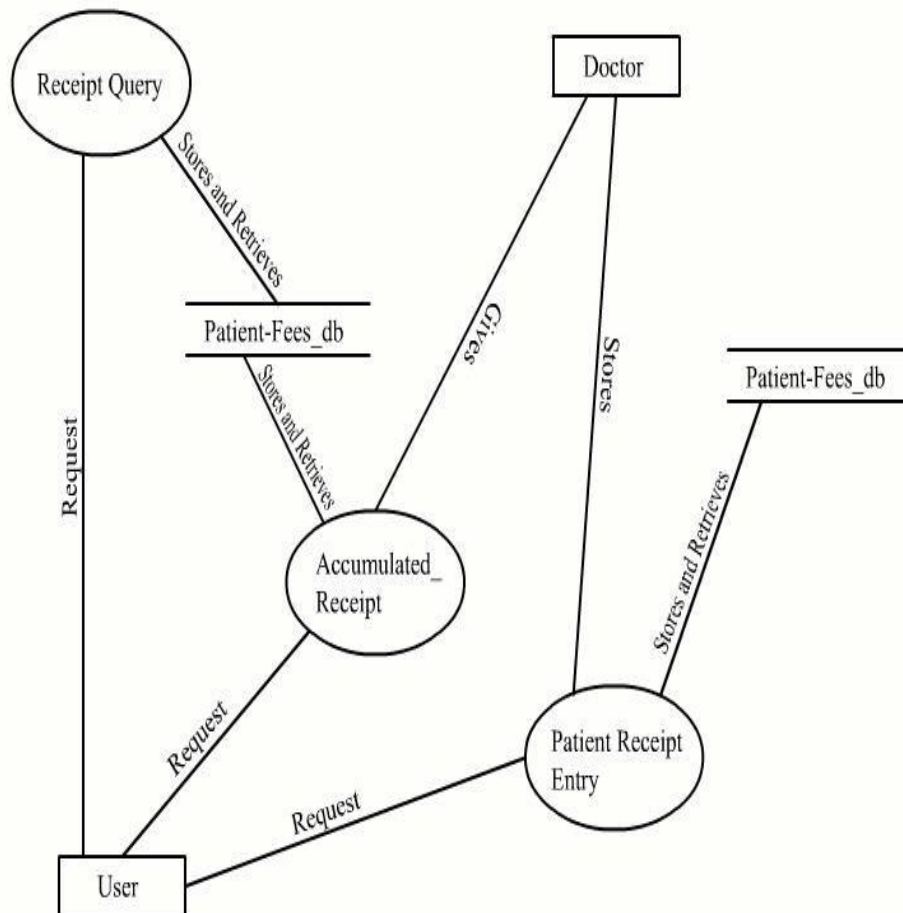
**0-level DFD**



1-level DFD

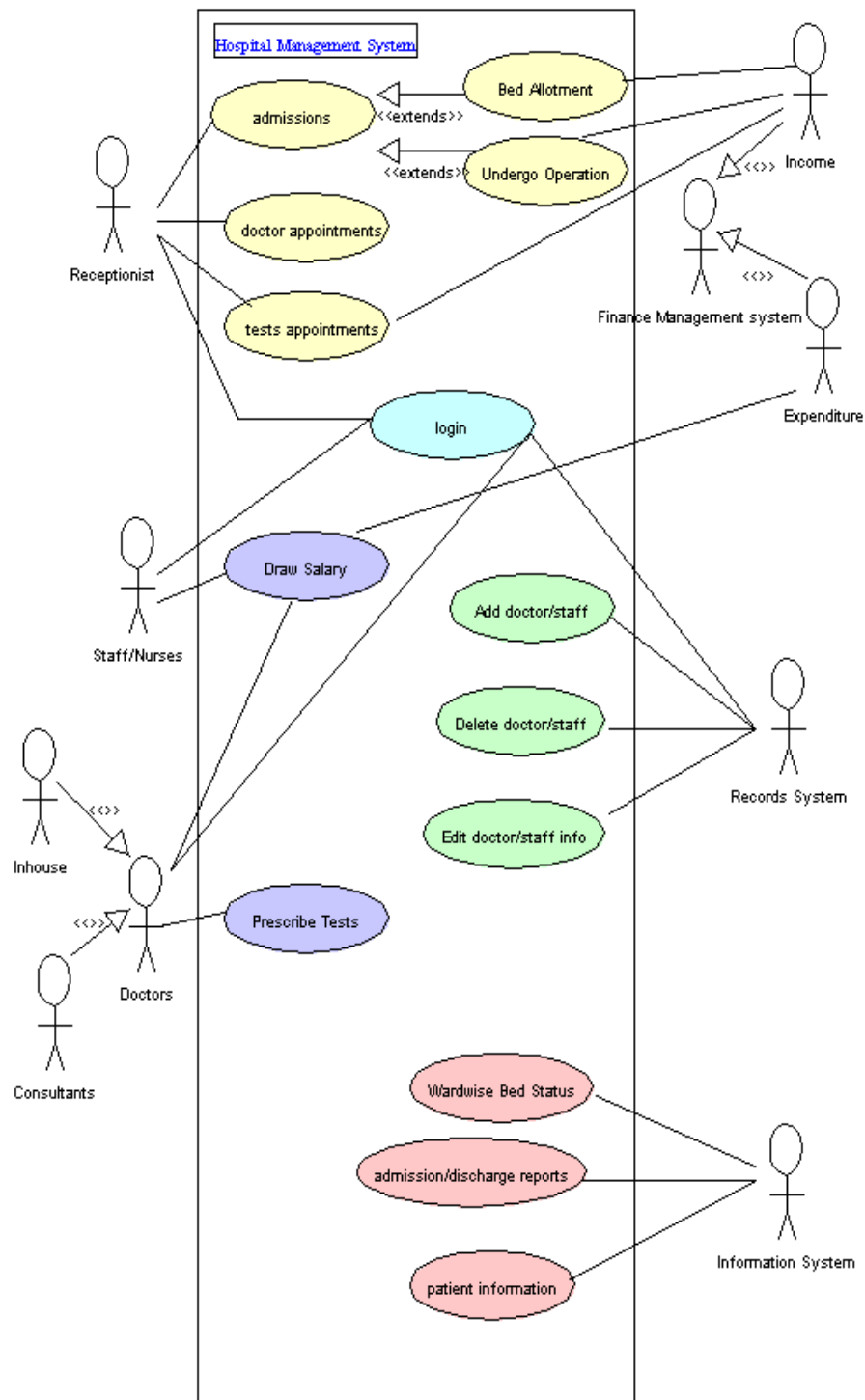


2-level DFD



3-level DFD

Use-case Diagram:



Data Dictionary

A data dictionary is a structured repository of data about data. It is a set of rigorous definitions of all DFD data elements and data structures.

A data dictionary has many advantages:

1. It helps in giving the user a complete information about the various terms used in the project.
2. it helps in better understanding of the project

During implementation, it serves as a common base against which programmers who are working on the System compare their data descriptions. Also control information maintained for each data element is cross- referenced in the data dictionary.

Data Dictionary of the columns in the LifeLine Database

Attribute Name	Data Type	Description
patient : Stores the information about the patients in the hospital		
Pno	Autonumber	Used as primary key which is unique for patients & Code for the registration that will uniquely identify them
Bty	Number	Patient bed type
Name	Text	Name of the patient
Sex	Text	Sex
Add	Text	Address of the patient
Age	Number	Patient's age
P_ph	Number	Patient's phone number
G_add	text	Guardian's address
G_ph	Number	Guardian's phone number
G_rel	Text	Relation of the guardian and the patient
Doa	Date	Date on which patient was admitted to the Hospital

Doc	Text	Doctor for the patient
Dia	Text	diagnosis
doctor: Stores the information about the doctors		
Doc_name	Text	Name of the Doctor
specialization	Text	Doctor's specialization
Doc_add	Text	Doctor's address
Doc_ph	Number	Phone number
Doc_mob	Number	Doctor's mobile number

Bed : Stores the information about the bed type		
Btyp	Text	Bed type
Bno	Number	Number of beds of the kind
Cpd	Number	Charges per day for a particular kind of bed
Desp	Text	Description of the facilities provided

TESTING

Testing is a process of executing a program with intent of finding an error. A goal test case is one that has a probability of finding an as yet undiscovered error. All test should be traceable to customers requirement. Test should be planned long before testing begins. The testing should begin in the small and programs towards testing in the large. Exhaustive testing is not possible. The most efficient, testing should be conducted by an independent third party.

Characteristics of Good Testing

- * A good testing has a high probability of finding errors.
- * A good test is not redundant.
- * A good test should be of breed.
- * A good test should be neither too simple nor too complicated.

Types of Testing

There are two basic approaches to testing functional and structural. Functional testing is also called Black Box Testing. In Black Box Testing the structure of the program is not considered structural testing is called **white Box testing**.

BLACK BOX TESTING :- Black box testing to be applied during lateral of testing Black box Testing enables the software engineer.

- Black box testing enables the software engineer.
- To derive sets input condition kill tall exercise the functional requirement of a program.
- Black box testing enables to find error in the following categories.
- Incorrect or missing functions.
- Interface Errors.
- Errors in data structure or external database access.
- Performance errors
- Initialization and termination errors.

The Black box testing procedure is exhaustive testing. One criterion for generating test cases is to generate them randomly. There are no formal rules for designing test cases for functional testing. However there are a

Number of method that can be used to select test cases they are:

1. Equivalence class partitioning.
2. Boundary value Analysis.
3. Case-Effect Graphing.

By applying Black Box testing a set of test cases that satisfy the following criteria:

Test cases that reduce, by a count that is greater than one, the number of additional test case must be designed to achieve reasonable testing.

Test case that tells as something about the presence associated only with the specific test at hand.

WHITE BOX TESTING:-

Structural Testing or white Box testing: - To test the structural testing or white box testing is used. This test is preformatted weekly in the testing process. This testing also called Glass box testing can drive test cases that.

1. Grantee that all the independent paths within the module have been expressed at least once.
2. Exercise all logical designs on their true and fake sides.
3. Execute all loops at their boundaries and within their validity.
4. Exercise internal data stricter to ensure their validity.

These are three different approaches to structural testing they are:-

1. Control flow based testing.
2. Data flow Based testing.
3. Mutation testing.

LEVELS OF TESTING:-

Testing is used to detect faults introduced during specifying and different levels of testing process. The basic levels of testing are:

- **Unit testing**
- **Integration testing**
- **system testing**
- **Acceptance testing**
-

UNIT TESTING

- Unit testing is for verification of the code produced during the code phase that is goal of testing is to the internal logic at the modules. As focus of this testing level is testing the code structure testing is best suited for this level

INTEGRATION TESTING

- The goal of this testing level is to see if the modules can be integrated properly. In other words the emphasis on testing the interfaces between the modules. This testing activity can be considered testing the design.

SYSTEM TESTING

- In this testing entire software is tested. The goal is to see if the software meets its requirements.

ACCEPTANCE TESTING

- Acceptance testing is preformatted using real data of the client to demonstrate that software is working satisfactorily. Testing focuses on the external behavior by the system. Intense the final testing is performance at this level.

VALIDATION CHECKS

- Validation refers to different set of activities that insure that the software that has been built is traceable that customer requirement. Validation is the check that “the product made is what was required or not”
- Validation testing provides final assurance performance requirement. Black on testing technique are used exclusively during validation.
- After each validation test cues has been conducted, one or two passable and condition exists. The function or performance characteristics conform to specification and are accepts.
- A deviation from specification is uncovered and a defiance list is created. Deviation or error discovered at this stage in a project can rarely be corrected prior to scheduled completion. It is often necessary for resolving deviancies.

CONCLUSION

Working on the project was an excellent experience. It helped us to understand the importance of planning, designing and implementation so far we have learnt in our theory books. It helped us unleashing our creativity while working in a team. It also realized the importance of team working, communication as apart of this project.

The project was successfully completed after a lot of efforts and work hours. This project underwent number of compiling, debugging, removing errors, making it bug free, adding more facilities in Hospital Management System and interactivity making it more reliable and useful.

This project focused that scheduling a project and adhering to that schedule creates a hard sense of time- management. It has also let us known that co-operative teamwork always produce effective results.

FUTURE SCOPE

Since the business environment keeps changing with time, our system easily adapts to that.

- a) Although the charitable hospital is small with a small number of rooms and thus patient capacity, but in future it may look forward to expansion. The number of rooms and facilities may increase. Keeping this thing in mind, our system is designed so that it may adhere to the changing circumstances.
New type of rooms could be added, facilities of the current room can be changed and the number as well.
- b) If future some more people can be granted access to the system, so our application also supports the creation of the new user accounts (but two users of the same name do not exist).
- c) Considering security, passwords of the users already existent can be changed.