

WEB-BASED HOSPITAL MANAGEMENT INFORMATION SYSTEM A CASE STUDY OF IBRAHIM BADAMASI BABANGIDA UNIVERSITY HEALTH CARE CENTRE, LAPAI, NIGER STATE

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ABSTRACT

Hospitals are the essential part of our lives, providing best medical facilities to people suffering from various ailments, which may be due to change in climatic conditions, increased work-load, emotional trauma stress. It is necessary for the hospitals to keep track of its daily activities and records of its patients, doctors, nurses, and other staff personals that keep the hospital running smoothly and successfully. But keeping track of all the activities and their records on paper is very tedious and prone to error. Also, it is very inefficient and a time-consuming process. Observing the continuous increase in population and number of people visiting the hospital. Recording and maintaining all these records is highly unreliable, inefficient and prone to error. It has also been observed that patient records tend to be duplicated and sometimes unavailable at critical time when it is required for emergencies. It is also not economically and technically feasible to maintain these records on paper, this paper proposed the use of **Web-based Hospital Management Information System** in automation of the Ibrahim Badamasi Babangida University Lapai Health care Centre.

Keywords: Web-based, Management Information System, Health Care, Health Records, Automation.

1.0 INTRODUCTION

A Hospital is a place where patients visit to for medical checkup or diagnosis and treatment. Hospitals provide facilities like: - Consultation and diagnoses of diseases by doctors, Provision of treatment facilities, Facility for admitting Patients (providing beds, nursing, medicines etc.) Immunization of patients/children. Various operational works are done in a hospital; all these works are done manually using papers as follows: Recording information about the patients that visit a hospital for treatment, generating bills, recording information related to diagnosis given to patients, keeping record of the immunization provided to children/patients, keeping information about various diseases and medicines available to cure them. These are the various jobs that are done in a hospital by the operational staff and doctors; information about patients is recorded manually by just writing the patients name, age and gender.

According to the study by Malhotra (2009) Hospital is an organization that mobilizes the skills and efforts of a widely divergent group of professionals, semi-professionals, professional's personnel, to provide highly personalized personnel services to patients. World health Organization (WHO) has defined hospital as an integral part of social and medical organization that provides the complete curative and preventive health care and treatment to people. Hospitals are the focal points of education for the health professionals and clinical research necessary for advancement of medicine. Thus, the hospital is one of the most complexes of all administrative organizations. The main purpose of the hospital is to provide adequate care and treatment to the people. Various operational works that are done in a hospital include: recording information about the Patients, generating bill, recording information related to diagnosis given to Patients, keeping record of the Immunization provided to patient, keeping information about various diseases and medicines available to cure them etc (Mansi Chitkara, 2010). All these works are done in most hospitals on papers. The need for proper management of the health sector leads to the creation of an electronic means of keeping records, administering discharge, querying of data, prescription helper and also good accountability. Information technology in general enables intra organizational networking that facilitates effective information flow within the various units of a firm (Benson, 2011).

The subsequent section of the paper is organized as follows: Section II gives a review of electronic health records; Section III is the detail methodology of the IBB health care center system and lastly section IV is the conclusion.

2.0 LITERATURE REVIEW

In a study of Blekinge Region Healthcare by MA (2010) Information security has significant role in Healthcare organizations. The Electronic Health Record (EHR) with patient's information is considered as very sensitive in Healthcare organization. Sensitive information of patients in healthcare has to be managed such that it is safe and secure from unauthorized access. The high-level quality care to patients is possible if healthcare management system is able to provide right information in right time to right place. Availability and accessibility are significant aspects of information security, where applicable information needs to be available and accessible for user within the healthcare organization as well as across organizational borders. At the same time, it is essentials to protect the patient security from unauthorized access and maintain the appropriate level in health care regarding information security. The aim of this thesis is to explore current management of information security in terms of Electronic Health Records (EHR) and how these are protected from possible security threats and risks in healthcare, when the sensitive information has to be communicated among different actors in healthcare as well as across borders. The Blekinge health care system was investigated through case study with conduction of several interviews to discover possible issues, concerning security threats to management of healthcare. The theoretical work was the framework and support for possible solutions of identified security risks and threats in Blekinge healthcare. At the end after mapping, the whole process possible guidelines and suggestions were recommended for healthcare in order to prevent the sensitive information from unauthorized access and maintain information security. The management of technical and administrative bodies was explored for security problems. It has main role to healthcare and in general, whole business is the responsibility of this management to manage the sensitive information of patients. Consequently, Blekinge healthcare

was investigated for possible issues and some possible guidelines and suggestions in order to improve the current information security with prevention of necessary risks to healthcare sensitive information (MA, 2010)

Base on a report by Damirel (2017), Information systems play an important role in the production, sharing, storage and transmission of information in various fields. Hospital information management systems used in the health sector actively meet the needs of physicians, administrators, and patients in institutional processes. Hospital information management systems ensure that data are collected in a correct, complete and interdependent manner. Hospital information management systems started to be used in the 1960s. These systems can be classified as integrated and modular systems. Integrated information systems are divided into hospital general information system, clinical information systems, management information system, and a database management system. In another classification, hospital management information systems are seen to include resource utilization and programming, financial management, materials and facility management and staff management systems. Hospital management information systems have purposes such as providing patient satisfaction, strengthening internal communication networks, reducing costs, and reliably storing data in a digital environment. The development of hospital information management systems in Turkey is based on the Health Information Systems Project, which was supported by the World Bank in 1990 and conducted by the Ministry of Health. The use of hospital information systems in health institutions has become increasingly widespread with the studies conducted under the leadership and coordination of the Ministry of Health after 2000 years. The purpose of this study is to evaluate the development and functions of the hospital information management systems in the health sector by acting from the Turkish case. The study first examined the development and types of hospital information management systems. The purposes of the usage and benefits of these systems have been referred to the study. In the second part of the study, the development and components of hospital management information systems in Turkey are evaluated (Demirel, 2017)

Based on as study by Sarab (2020) Hospital Management System provides the benefits of streamlined operations, enhanced administration, control, superior patient care, strict cost control and improved profitability. HMS is powerful, flexible, and easy to use and is designed and developed to deliver real conceivable benefits to hospitals. More importantly it is backed by reliable and dependable support. The project 'Hospital Management System' is based on the database, object oriented and networking techniques. As there are many areas where we keep the records in database for which we are using MY SQL software which is one of the best and the easiest software to keep our information. This project uses JAVA as the front-end software which is an Object-Oriented Programming and has connectivity with MY SQL. Hospital Management System is custom built to meet the specific requirement of the mid and large size hospitals across the globe. All the required modules and features have been particularly built to just fit in to your requirement. This package has been widely accepted by the clients in India and overseas. Not stopping only to this but they are highly satisfied and appreciating. Entire application is web based and built on 3 tier architecture using the latest technologies. The sound database of the application makes it more users friendly and expandable. The package is highly customizable and can be modified as per the needs and requirements of our clients. Prolonged study of the functionalities of the hospital and its specific requirement has given it a wonderful

shape both technically and usability wise. It covers all the required modules right from Patient Registration, Medicine details, Doctor, Wards, , Admin, Store, Patient appointment, bill payment, record modification, discharge details etc. Human Body is a very complex and sophisticated structure and comprises of millions of functions. All these complicated functions have been understood by man, part-by-part their research and experiments. As science and technology progressed, medicine became an integral part of the research. Gradually, medical science became an entirely new branch of science. As of today, the Health Sector comprises of Medical institutions i.e. Hospitals, research and development institutions and medical colleges. Thus the Health sector aims at providing the best medical facilities to the common man.

Based on a study by Joaquin (2010) who is one of the World health organization members, defined E-health as the use of information and communications technologies (ICT) in favor of health and health-related fields, containing health-care services, health supervision, health literature, and health self-management education , knowledge and research and stated that E-health has the potential to greatly improve health service efficiency, it should expand or extend treatment delivery to more than thousands of patients in developing countries, and also improve patient results. The Effective management of hospitals and health care facilities is based on the knowledge of the available resources (e.g. staff, beds, services). Furthermore, during emergencies, a reliable exchange information system is a crucial factor in providing a timely response. In their work they describe the Hospital Availability Management System (HAMS), a software developed in the framework of the EU-funded SAFECARE project. The main goal of HAMS is to provide the current status of a hospital (or health-care facility) to the internal staff, but also to first responders (paramedics, firefighters, civil protection, etc.) in order to manage the flow of patients correctly. Beyond the data coming from the normal operations of a hospital, the HAMS is able to integrate inputs from incident detection systems deployed in the hospital, to automatically update availability data after cyber and/or physical incidents, also taking into account the propagation of impacts among interconnected assets. Finally, HAMS implements the OASIS EDXL-HAVE standard, to allow the exchange of information in a open and interoperable format. To be used efficiently, all computer software needs certain hardware components or the other software resources to be present on a computer. These pre-requisites are known as (computer) system requirements and are often used as a guide line as opposed to an absolute rule. Most software defines two sets of system requirements: minimum and recommended. With increasing demand for higher processing power and resources in newer versions of software, system requirements tend to increase overtime. Industry analysts suggest that his trend plays a bigger part in driving upgrades to existing computer systems than technological advancements.

3.0 METHODOLOGY

In this work we used the Iterative and Incremental Development model (IID). This development approach is also referred to as Iterative Waterfall Development approach. Iterative and Incremental Development is a software development process developed in response to the more traditional waterfall model. This model is designed to take care of a large project and the IBB Health Care Centre is large project. The large and complicate project chiefly demand better development and testing procedure. The waterfall model is well known for its repeated testing process. Hence the waterfall model was use for developing the software.

Use Case Diagram:

A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a use-case analysis. The use case diagram shows the graphical overview of the functionality provided by the system in the IBB Health Care Centre in terms of actors, their goals (represented as use cases), and any dependencies between the use cases.

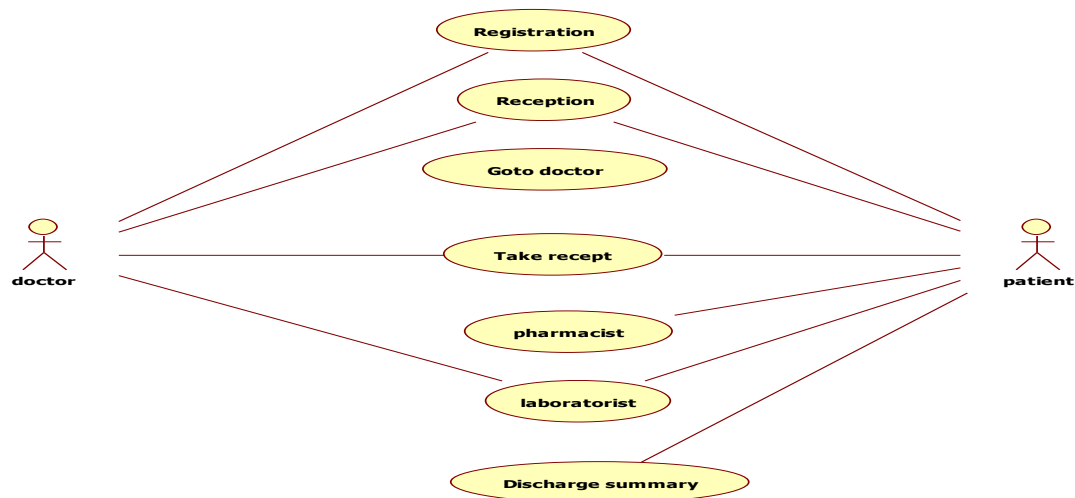
Use case diagram of IBB HEALTH CARE CENTRE:

Figure 3.3: Use case diagram

Class Diagram of IBB Health Care Centre:

The class diagram of IBB Health Care Centre shows the category or group of things that has similar attributes and common behavior in the clinic. A Rectangle is the icon that represents the class, it is divided into three areas. The upper most area contains the name, the middle; area contains the attributes and the lowest areas show the operations.

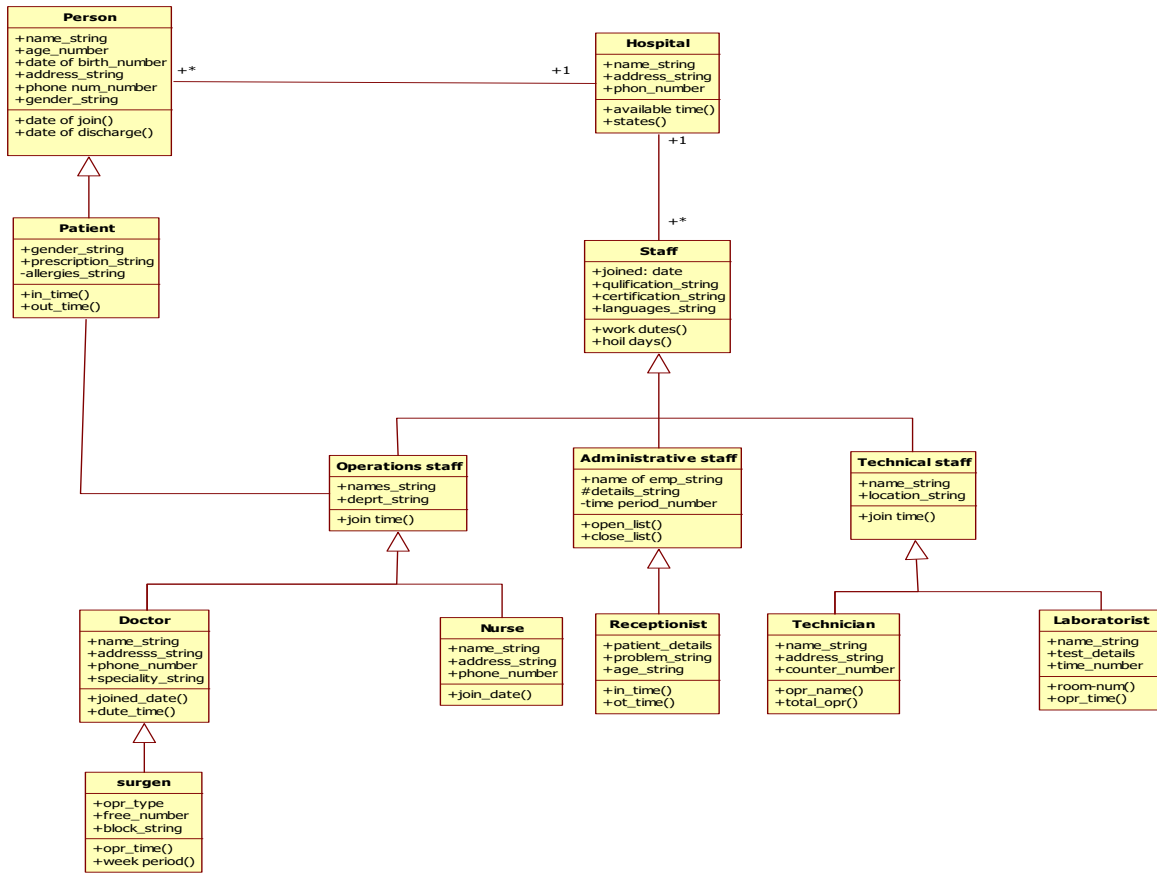


Figure 1: Class Diagram of IBB Health Care Centre

Sequence diagram of IBB Health Care Centre:

The Sequence Diagram shows the interaction and emphasis the time ordering of messages; a collaboration diagram is an interaction diagram that emphasizes the structural organization of the objects that send and receive messages.

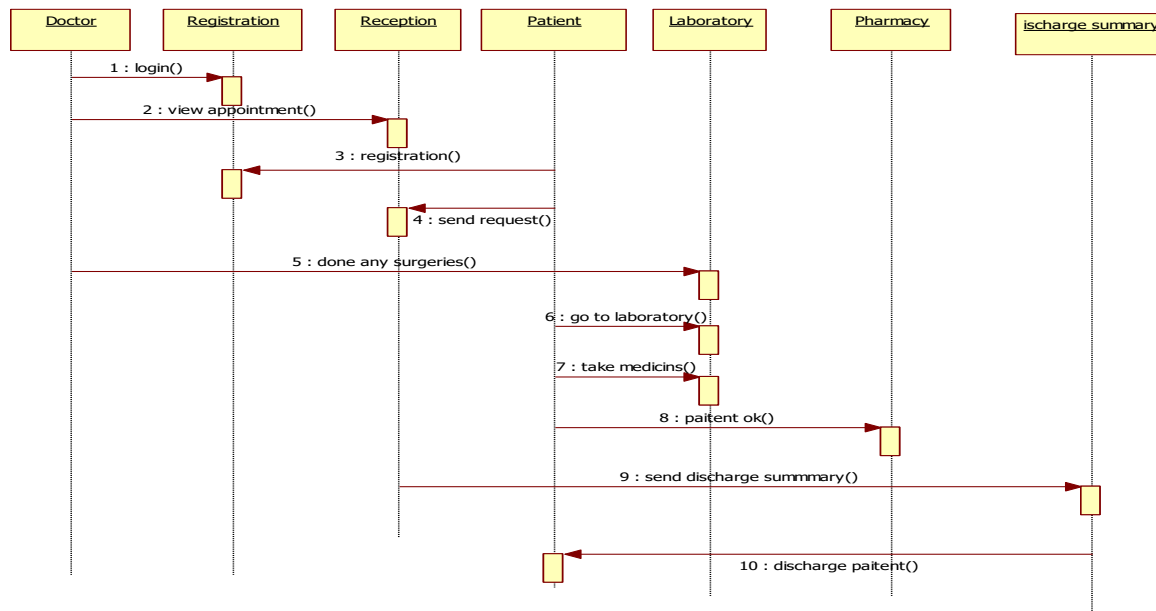


Figure 2: Sequence Diagram of IBB Health Care Centre

Database Design

Database design is the process of producing a detailed data model of database. This data model contains all the need logical and physical design choices and physical storage parameters needed to generate a design in a data definition language, which can then be used to create a database. A fully attributed data model contains detailed attributes for each entity. A database management, or DBMS, gives the user access to their data and helps them transform the data into information. Such database management systems include dBase, paradox, IMS, SQL Server and SQL Server. These systems allow users to create, update and extract information from their database.

Database schema of IBB Health Care Centre Hospital Management System

The database schema is the skeleton structure that represents the logical view of the entire database. It defines how the data is organized and how the relations among them are associated. It formulates all the constraints that are to be applied on the data.

The IBB Health Care Centre database schema is divided into two categories – Physical Database Schema: This schema pertains to the actual storage of data and its form of storage like files, indices. It defines how the data will be stored in a secondary storage. Logical Database Schema: This schema defines all the logical constraints that need to be applied on the data stored. It defines tables, views, and integrity constraints.

List of Database table in the IBB Health Care Centre:

1. Admin
2. Users /Patients
4. user details
5. Appointment
6. Doctors
7. Complaint

8. Doctor specialization

Admin Details**Name-Admin Details**

Name	Type	Size	Description
ID	Integer	25	ID of the Admin
Name	Varchar	50	Name of the Admin
Address	Varchar	150	Address of the Admin
Phone Number	Varchar	90	Contact number of the Admin
Gender	Varchar	30	Gender of the Admin
Image	Img		Picture of Admin
Login	Varchar	30	Login name of Admin
Password	integer		Password of Admin

Table No.3.1
Doctor Details

Name-Doctor Details

Name	Type	Size	Description
ID	Integer		ID of the Doctor
Name	nvarchar	50	Name of the Doctor
Address	nvarchar	150	Address of the Doctor
Phone Number	nvarchar	90	Contact number of the Doctor
Gender	nvarchar	10	Gender of the Doctor
Image	Img		Picture of Doctor
Specialization	Varchar		Specialization of Doctor
Login	Varchar	30	Login name of Doctor
Password	nvarchar		Password of Doctor

Patient Details.**Name- patient Details**

Name	Type	Size	Description
Patient_no	Integer	20	ID of the Patient
Name	Varchar	60	Name of the patient
Gender	Varchar	30	Gender of the Patient
Address	Varchar	90	Address of the Patient
Date	Datetime	30	Date of admission
Login	Varchar	30	Login name of Patient
Password	integer		Password of Patient

Appointment Details.**Name- Lab-Result Details**

Name	Type	Size	Description
Appointment_no	Integer		ID of the Result , primary key
patient_id	Integer		From patient table
biologist_id	Integer		From biologist table
Doctor Remark	Varchar	450	Doctors Remark for patient

Doctor-Report Details**Name- Doctor-Report Details**

Name	Type	Size	Description
Report_no	Integer		ID of the Report
Patient_id	Integer		From patient table
Doctor_id	Integer		From Doctor table
Prescription	Varchar	150	Doctor Diagnosis for patient

Report Details**Name- Report Details**

Name	Type	Size	Description
Report_no	Integer		ID of the Report
Doctor-Report	Integer		Link to doctor-report table
Lab-Result			Link to Lab-Result table
Pharmacy_Report			Link to Pharmacy_Report table

Implementation

Implementation is the process of having system personal check out and provides new equipment's into use, train the user to install a new application and construct any files of data needed to use it. There are three types of implementations. Implementation of computer system to replace a manual system. To problem encountered are covering files, training user, creating accurate files and verifying print outs for integrity. Implementation of a new computer system to replace an existing one. This is usually difficult conversion. If not properly planned, there can be many problems. So large computer system many take as long as a year to convert. Implementation of a modified application to replace the existing one using the same computer. This type of conversing is relatively easy to handle, usually there are no major change in the file. Our project is yet to be implemented

Implementation Environment

The implementation view of software requirement presents the real world manifestation of processing functions and information structures. This computerized system is specified in a manner that dictates accommodation of certain implementation details. The implementation environment of the developed system facilitates multiple users to use this system simultaneously. The user interfaces are designed keeping in mind that the users of this system are familiar to using GUI-based systems. Thus, we restricted ourselves to developing a GUI-based system so that it becomes easier for the end user to get acquainted to the developed system.

Functional Requirement of the IBB Health Care Centre

This system interface is divided into three sections

1. Administrator interface.
2. Doctor interface
3. User interface.

Administrator Interface of the IBB Health Care Centre

1. Administrator can delete any post.
2. Administrator can verify user account.
3. Administrator can modify user account
4. Administrator can add new user account..
5. Administrator can block/ restrict users

Doctor's Interface

1. Doctor can add new patient
2. Doctor can edit patient information
3. Doctor can delete patient record
4. view patients and complaints

User Interface

1. User can lodge a complain
2. Book an appointment
3. User can update/edit their own account.
4. Log in and Log out system.
5. To create a new account user must be needs to verify his email with verification code.
6. If any user forgets his/her password he/she can recovery his account with verify his email and create a new password.

Physical Network Connection

The IBB Health care center system is applied in a LAN as shown in the figure. In a Client-Server scenario, we will have the SQL Server installed on a server machine. Clients will be the computers accessing that server using the developed software (which we programmed using C sharp). Each of the clients will provide a way of making a connection to the server instance running on the server. From the server, we will need IP address or server name along with SQL server instance name. They both combined form the host name.

Data Source = ServerName\HostName

Once we add a user to SQL Server Instance, we should attach the user to databases we want the user to access and provide the appropriate role(s).

For each computer that will run this software application, should install the executable version on each computer.

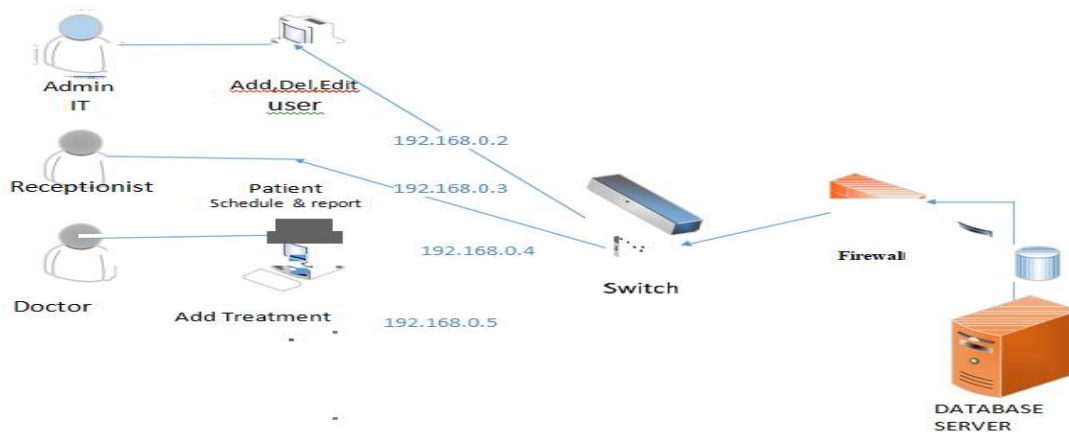


Figure 3. Physical Network Connection Diagram

User Interface

Home Page

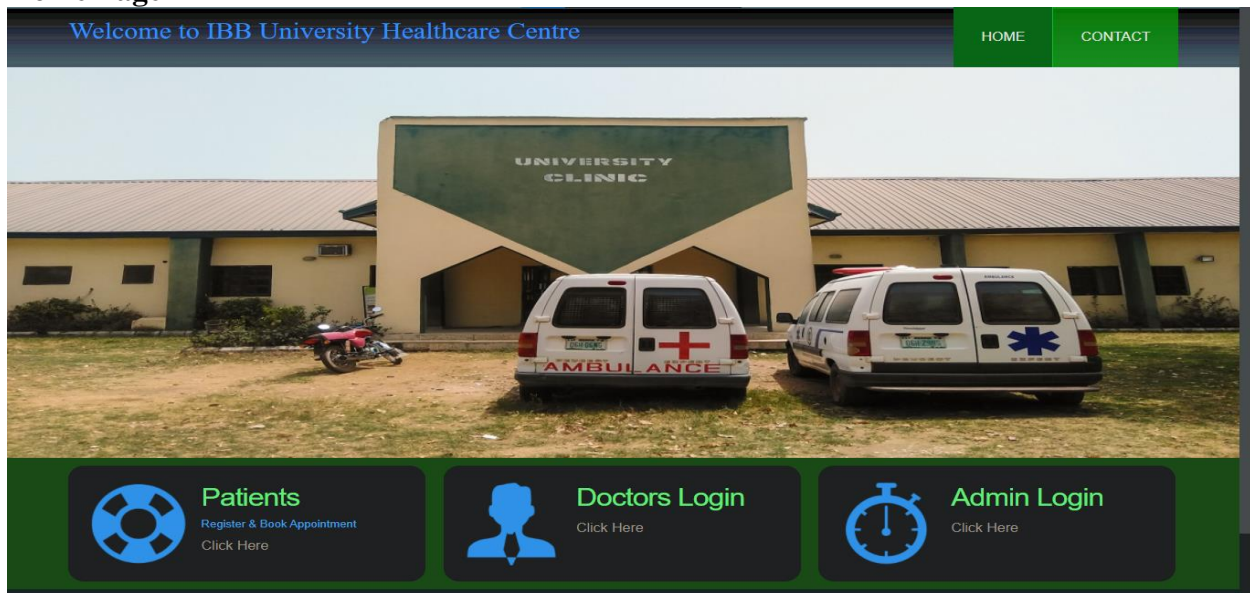


Figure 4: Home page

Actor: In the main window shown above, when the user wants to login to the system, he/she should choose his/her role in the system and type the user name and password to enter the system.

The system maintains three levels of users:

1. Administrator
2. Doctor
3. Patient/ Users

Flow:

1. Any user can browse this page
2. User(patient)

3. Doctors

4. Admin

Admin Login Page

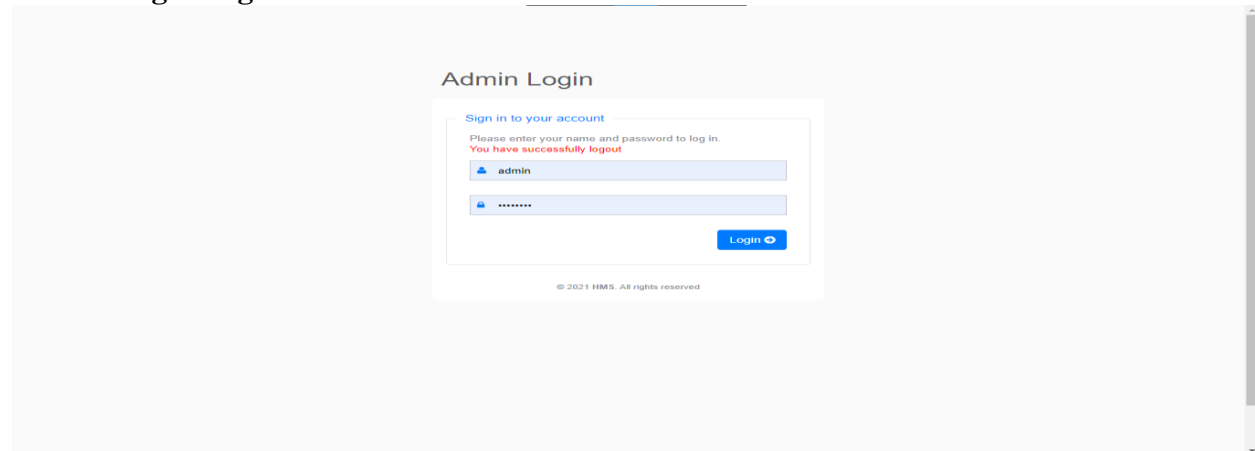


Figure 5: admin login page

Actor: Admin user

Flow:

1. Only Admin user can browse this page
2. Admin user can search all patient appointment and all user's activities

Admin user Dashboard Page

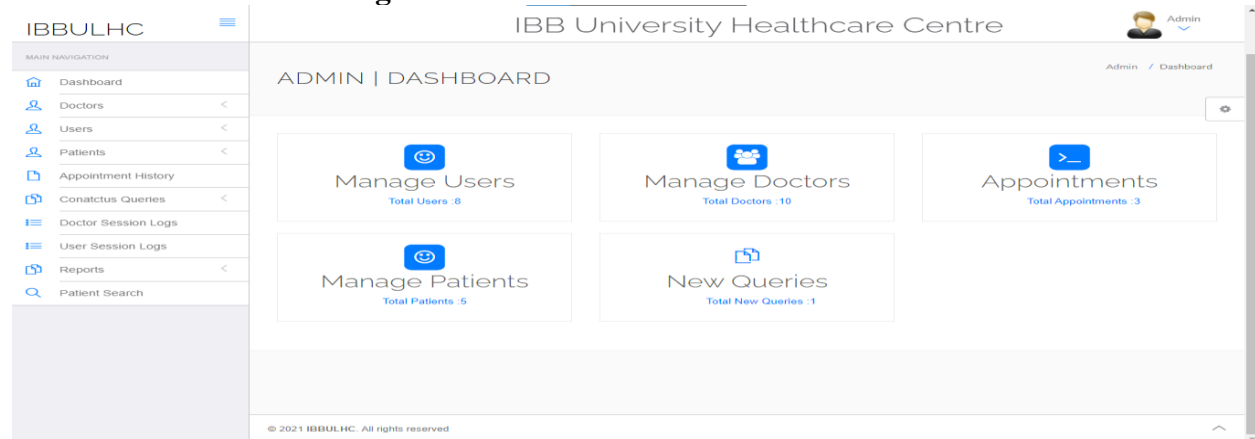


Figure 6: Admin Dashboard

Actor: When the user logs in as an admin, the window above will be displayed. The admin adds the user of the system and can backup the database and restore it.

Output: Admin page

Flow:

1. Only Admin user can browse this page
2. Admin user can view all modules here

Appointment History Page



#	Doctor Name	Patient Name	Specialization	Consultancy Fee	Appointment Date / Time	Appointment Creation Date	Current Status	Action
1.	abc	Test user	Demo test	600	2019-06-29 / 9:15 AM	2019-06-23 11:31:28	Cancel by Doctor	Canceled
2.	Sanjeev	Amit kumar	Ayurveda	8050	2019-11-08 / 1:00 PM	2019-11-05 02:28:54	Active	No Action yet
3.	Anuj kumar	John	Dermatologist	500	2019-11-30 / 5:30 PM	2019-11-10 10:41:34	Cancel by Doctor	Canceled

Figure 7 Appointment History Page

Actor: Admin user as well as the Doctors can view this page

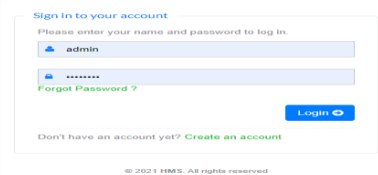
Output: Appointment History

Flow:

1. Only Admin and doctors user can browse this page
2. Admin user can view all appointment history

User(patient) login Page

HMS | Patient Login



Sign In to your account

Please enter your name and password to log in.

admin

[Forgot Password ?](#)

[Login](#)

Don't have an account yet? [Create an account](#)

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Figure 8: User(patient) login Page

Actor: User

Input: user Email and Password

Output: user page

Flow: (1) User Logs in with user email and password.

Alternate Flow:

- (1) If the user email is wrong then it is asked to login again.
- (2) If the password is wrong then the user is asked to enter again.

User Account Registration Page

Figure 9: Account create Page

Actor: User

Input: User name, email, password and confirm password.

Output: Create a new user and show user profile page.

Flow:

- (1) Password must be more than 8 character.
- (2) Password and confirm password must be same

Alternate Flow:

- (1) If the mandatory fields are not fill up then alert is shown.
- (2) If password less than 8 cheater or password and confirm password not match alert is shown.

User(Patient) Dashboard

Figure 10: User Dashboard Page

Actor: User Dashboard

Flow:

- (1) User must be fill up all input field.

Alternate Flow:

- (1) If the mandatory fields are not fill up then alert is shown.

Doctor Login Page

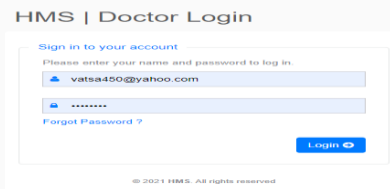


Figure 11: Doctor Login Page

Actor: doctor

Flow:

1. Login with user Email and password

Patient complaint page



Figure. 12: Patient complaint Page

Actor: user (patient)

Flow:

1. User Lodge in complain and send to medical doctor
2. Select the category of complain either general complain or specified
3. Select nature of complain and Add images if required

Doctor Medical History

Figure 13: Doctor's Patient Management Page

Actor: Doctor

Flow:

1. Doctor add, edit and delete patient medical history

Database Page

Figure 14: Database Table

4.0 CONCLUSION:

The IBB University Healthcare system software, has come to eliminate the manual way in which healthcare records are being taking at the clinic. Since the establishment of the university the record of patient in the university has been taken manually this result in loss of some records and sometimes delay in finding patient records when the need arises, there has also been increase in expenditure from the unit as a result of purchases for record purpose. The implementation of this e-healthcare system will assist both the medical doctors in getting prompt information about a patient record, it will also assist the patient in knowing when the medical personnel will be available to attend to him.

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