

**Project title: Developing a smart hospital management system for
Debre tabor Comprehensive Specialized Hospital**

By

Mikiyas Birhanu Ejigu
Email: mikebirsh@gmail.com

And

Yohannes Ayana
yohannesayana10@gmail.com

ABSTRACT

The traditional paperwork system that is currently used by many hospitals in Ethiopia has a tremendous problem for the patients, hospital staff, as well as the efficiency of the whole management system of hospitals. This innovative Smart Hospital Management System has been developed to effectively replace cumbersome paperwork, offering a seamless solution for documenting patient and staff profiles.

The system encompasses comprehensive patient registration, capturing essential information such as identification, medical history, physical examination details, laboratory and imaging investigation results, treatments administered, procedures done, the healthcare provider's subsequent plans for the patient, and scheduled appointments—all securely stored in a centralized database.

This approach facilitates swift and easy access to patient information by utilizing a unique patient Medical Record Number (MRN), ensuring efficient service provision and reducing delays, particularly for emergency cases. The software also addresses the issue of lost patient charts which is common in traditional paper-based systems.

Applicable to both outpatient and admitted patients, the Smart Hospital Management System extends its functionality to include staff members' registration and a billing section. Healthcare providers can seamlessly schedule appointments, with access to patients' appointment histories, previous treatments, and any required investigations for the current visit. This integrated system aims to enhance overall hospital management, streamline patient care, and improve the efficiency of healthcare services.

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1. GENERAL BACKGROUND

1.1 Introduction

The human body is a highly intricate and sophisticated structure, comprising millions of functions that have been understood through human research and experimentation, dissecting its complexities part by part. The progression of science and technology has seen medicine evolve into an independent branch, forming a critical component of the health sector. Presently, the Health Sector encompasses medical institutions, including hospitals, research and development facilities, and medical colleges, all aimed at providing optimal medical facilities to the population.

In today's context, the health sector, particularly in developed regions, is characterized by a rapidly increasing reliance on information technology in patient care, heightened documentation, coding and billing practices, and overall management improvement. The global rise of health information technology has enhanced the efficiency of healthcare service delivery, reduced medical errors, improved the quality of care, and provided better information for both patients and physicians.

The overarching goal of information management within the healthcare sector is to acquire, handle, and utilize information to enhance healthcare and medical services, bolster performance, governance, and management, and support various processes. Recognizing the significance of healthcare to individuals and governments, as well as its escalating economic costs, has led to an increased focus on healthcare as a vital research area across various disciplines.

Information systems (IS) play a crucial role in managing healthcare costs and elevating the quality of care. Healthcare information systems have transformed the industry significantly over the past decade, with paperless systems becoming an inevitable trend. Any healthcare institute failing to adopt this trend risks falling behind the industry as a whole.

The adoption of a health information system is not only a necessity but also a determinant of a healthcare facility's success. DeLone and McLean's model, widely cited in the information systems field, comprehensively examines information systems' success by identifying and explaining relationships between six key variables: systems quality, information quality, user satisfaction, individual impact, and organizational impact.

The World Health Organization emphasizes that the goal of a health information system extends beyond the production of high-quality data. Instead, it aims to generate relevant information that stakeholders can use for transparent, evidence-based decisions to improve health system interventions. Evaluating health information management system performance should focus not only on data quality but also on the continued use of data to enhance health system performance, respond to emerging threats, and improve overall health.

Despite the potential offered by technology and communication developments in health information systems, some regions, such as the Kenyan health sector, are lagging in taking full advantage. Challenges include the underutilization of health data by healthcare workers for service delivery planning and decision-making, underreported performance, and a culture of information generation and use that remains underdeveloped. Mechanisms for validating and ensuring reliability are not optimally functional, highlighting the need for comprehensive interventions to enhance the performance of health information systems.

1.2 Problem Statement

The manual handling of the record in hospitals is tedious and time consuming which is highly prone to error. So that to solve this tiresome and error exposed paperwork, we came up with an idea of developing a software that makes the work more easy, fast and reliable.

1.3 Objectives of the project

General Objective

The general objective of our project is to implement a hospital management system in Debre Tabor Comprehensive Specialized Hospital.

Keeping track of all the activities and their records on paper is very cumbersome and error prone. It also is very inefficient and a time-consuming process. Observing the continuous increase in population and number of people visiting the hospital. Recording and maintaining all these records is highly unreliable, inefficient and error-prone. It is also not economically & technically feasible to maintain these records on paper. Thus, keep working of the manual system as the basis of our project. We have developed an automated version of the manual system, named as “Smart Hospital Management system”.

1.4 Significance of the project

- Helps for evidence-based policy-making
- Informed decision-making during planning, implementation and evaluation of health programs
- For appropriate use of resources at all levels of the health system

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2. SYSTEM DESCRIPTION AND ANALAYSIS

2.1 System description

Our software bases python3 language and sqlite3 database. The system will configure to a minimum requirement of 1.6MHZ processor and 1GB RAM with the computers through Local Area Network (LAN). We can implement in either of the two LAN connection ways (Either peer to peer or client_server) depending on the interest of the Hospital.

Features of our Hospital management system

1) Login Page

The system has login page with a username and password. This user name and password is known by the admin. So, to access the features u should know the password and username. If passwords are forgotten by a user, he/she can't login.

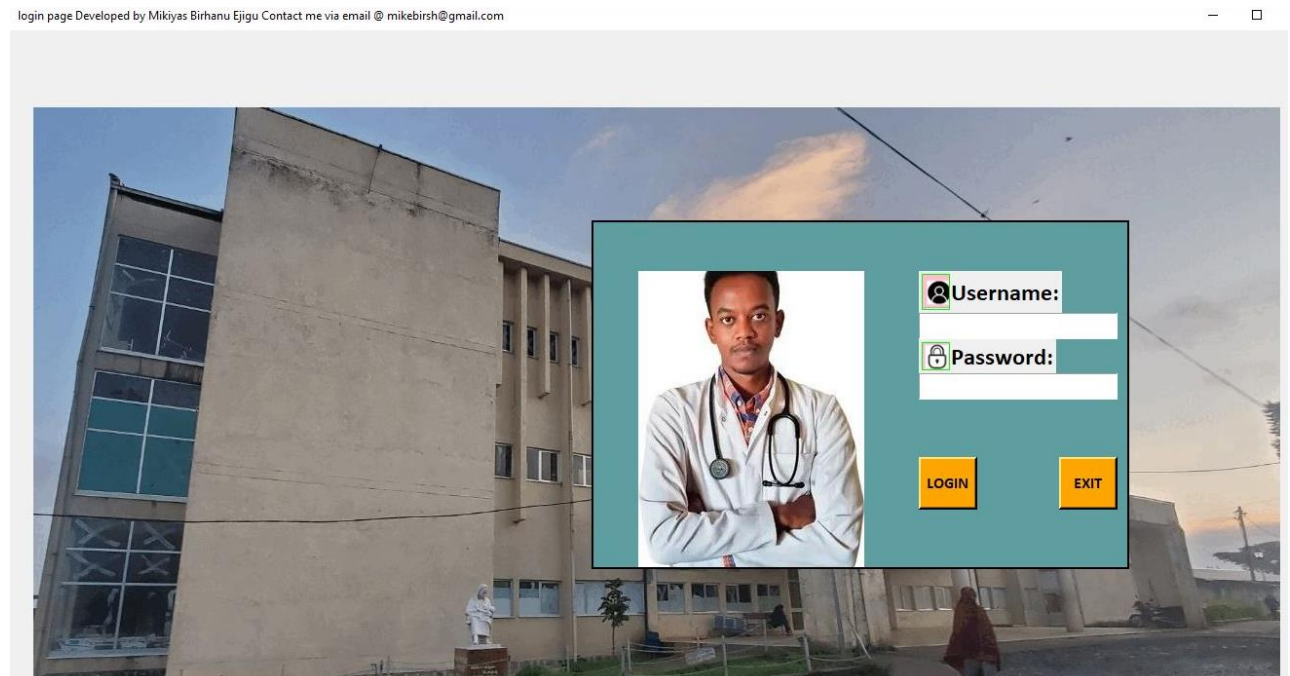


Fig1 Login page

2) Menu

The menu of our system with images of the actual Debretabor comprehensive specialized Hospital holds UI of the system with many tasks inside. Patient registration, Registration information, admit registration, Admit information, Staff registration, Staff information, Registration record, Staff record, Bill record, billing, Appointment, History registration and Investigation.



Fig2 Menu of the system (UI)

Home

By pressing home button, the image for the building of the hospital will be displayed.

Debretabor Comprehensive Hospital



Fig3 image of Debre Tabor comprehensive Specialized Hospital

3) Patient registration

The required data will be inserted to the patient registration screen. All information of the patient will be included to the database. If the patient needs his files a printed receipt can be given to him.

| Debretabor Comprehensive Hospital | |
|---|---|
| Patient Registration | |
| Patient ID | <input type="text"/> |
| Name | <input type="text"/> |
| Gender: | <input type="radio"/> male <input type="radio"/> female |
| Age | <input type="text"/> |
| Phone | <input type="text"/> |
| Address | <input type="text"/> |
| Disease | <input type="text"/> |
| CheckIn | <input type="text"/> |
| Blood Group | <input type="text"/> |
| Doctor Name | <input type="text"/> |
| Room No | <input type="text"/> |
| <input type="button" value="ADD"/> <input type="button" value="Receipt"/> | |

Fig4 Patient registration

4) Registration Information

In this feature of our system the information of the patient that already added by registration format will be available after a search made by a user. Ids are used for searching method.

| Debretabor Comprehensive Hospital | | |
|---------------------------------------|---|---------------------------------------|
| Registration information | | |
| Input Patients ID | Patient ID: <input type="text"/> | Blood Group <input type="text"/> |
| <input type="button" value="Search"/> | Patient ID: <input type="text"/> | Doctor Name <input type="text"/> |
| | Gender: <input type="radio"/> male <input type="radio"/> female | Room NO <input type="text"/> |
| | Age <input type="text"/> | |
| | Phone <input type="text"/> | |
| | Address <input type="text"/> | |
| | Disease <input type="text"/> | <input type="button" value="Update"/> |
| | CheckIn <input type="text"/> | |

Fig5 Patient registration information

5) Patient admits

All necessary information's of admit will be filled in this area.

| Debretabor Comprehensive Hospital | |
|------------------------------------|---|
| Patient Admit | |
| Patient ID | <input type="text"/> |
| Name | <input type="text"/> |
| Gender | <input type="radio"/> male <input type="radio"/> female |
| Age | <input type="text"/> |
| Phone | <input type="text"/> |
| Address | <input type="text"/> |
| Disease | <input type="text"/> |
| CheckIn | <input type="text"/> |
| Bloodgroup | <input type="text"/> |
| Doctorname | <input type="text"/> |
| CheckOut | <input type="text"/> |
| RoomNO | <input type="text"/> |
| Room type | <input type="text"/> |
| Price. | <input type="text"/> |
| <input type="button" value="ADD"/> | |

Fig6 admit registration

6) Admit information

Information of admit patients can be accessed by searching using Ids.

| Debretabor Comprehensive Hospital | | | |
|-----------------------------------|------------|---|----------------------|
| Admit information | | | |
| Input Patient's ID | Patient ID | <input type="text"/> | loodgroup |
| | | | <input type="text"/> |
| Search | Name | <input type="text"/> | Doctorname |
| | Gender | <input type="radio"/> male <input type="radio"/> female | <input type="text"/> |
| | Age | <input type="text"/> | Check Out |
| | Phone | <input type="text"/> | <input type="text"/> |
| | Address | <input type="text"/> | RoomNO |
| | Disease | <input type="text"/> | <input type="text"/> |
| | CheckIn | <input type="text"/> | RoomNO |
| | | | Price |
| | | | <input type="text"/> |
| | | | Update |

Fig7 Patient admit search screen

7) Staff registration

All staff members will be registered in staff registration. New comers will also be added in this system.

| Debretabor Comprehensive Hospital | |
|------------------------------------|---|
| Staff Registration | |
| ID | <input type="text"/> |
| Name | <input type="text"/> |
| Gender | <input type="radio"/> male <input type="radio"/> female |
| Position | <input type="text"/> |
| Department | <input type="text"/> |
| Mailid | <input type="text"/> |
| Salary | <input type="text"/> |
| Phone | <input type="text"/> |
| Address | <input type="text"/> |
| <input type="button" value="ADD"/> | |

Fig8 Staff registration form

8) Staff information

Like Admit information hold admit registration and patient registration information holds data of patient registration by search method, Staff information also enables users to search the registered staffs.

| Debretabor Comprehensive Hospital | | |
|-----------------------------------|-------------|---|
| Staff information | | |
| User ID | ID: | <input type="text"/> |
| | Name: | <input type="text"/> |
| Search | Gender | <input type="radio"/> male <input type="radio"/> female |
| | Position: | <input type="text"/> |
| | Department: | <input type="text"/> |
| | Mailid | <input type="text"/> |
| | Salary | <input type="text"/> |
| | Phone | <input type="text"/> |
| | Address | <input type="text"/> |
| | | Update |

Fig9 Staff information form

9) Patient registration record

The recorded data of patients will be available here. The whole information of the database registered as a patient registration form will be visible in a readable form.

| Debretabor Comprehensive Hospital | | | | | | | | | |
|-----------------------------------|--------|--------|-----|-----------|-----------|---------|-----------|------------|------------|
| patientid | Name | Gender | Age | Phone | Address | Disease | CheckIn | Bloodgroup | Doctorname |
| 2021-446968 | eyerus | Female | 17 | 934345 | Injibara | Corona | 21/2/21 | O | Matthy |
| 2021-1634902 | mat | Male | 21 | 911234567 | aa | coro | 2/2/2022 | b | mat |
| 2021-6735783 | John | Male | 26 | 927883592 | Bahir Dar | Typhoid | 21/12/23 | AB | Mike |
| 2021-6589217 | John | Male | 26 | 95636099 | BahirDar | Typhoid | 21/2/2023 | A | Mike |
| 2021-6755565 | John | Male | 26 | 925636099 | Bahir Dar | Typhoid | 21/2/2023 | A | Mike |

Fig10 Patient registration record

10) Staff record

All the recorded things from the doctors and other staff will be available in this screen.

This is recorded from the information inserted in staff information

| Debretabor Comprehensive Hospital | | | | | | | | | |
|-----------------------------------|-----------------|--------|-------------|-----------------|-------------------|--------|-----------|-------------|--|
| ID | Name | Gender | Position | Department | Mailid | Salary | Phone | Address | |
| Staff 2021-130 | Mathias | Male | Pathologist | Patho | matt27@gmail.com | 23000 | 918002646 | Netherlands | |
| Staff 2021-681 | Mikiyas Birhanu | Male | Doctor | Pato | mikebirsh@gmail.c | 23000 | 941683614 | Debretabor | |
| Staff 2021-718 | Emuye | Female | Radiologist | Computer vision | emuye@gmail.com | 55000 | 987654321 | Lideta | |

Fig11 staff files record

11) Billing

Patients are required to pay money in return to services he gained

| Debretabor Comprehensive Hospital | | |
|-----------------------------------|---|--|
| Billing | | |
| Identity: | <input type="text"/> | Disease: |
| Name: | <input type="text"/> | Phone: |
| Gender: | <input type="radio"/> male <input type="radio"/> female | Address: |
| Age: | <input type="text"/> | Doctor Name: |
| Sr. No : | Particulars : | Amount : |
| 01 : | Doctor Charges : | <input type="text"/> |
| 02 : | Lab Test : | <input type="text"/> |
| 03 : | Treatment Charges: | <input type="text"/> |
| 04 : | Procedure Charges : | <input type="text"/> |
| 05 : | Other Charges : | <input type="text"/> |
| 06 : | Miscelenous Charges : | <input type="text"/> |
| 07 : | Room Charges : | <input type="text"/> |
| | Total: | <input type="text"/> |
| | | <input type="button" value="Save"/> <input type="button" value="Print"/> |

Fig12 Billing form

12) Bill record

By searching using Id the bill that previously paid will be displayed in this page.

| Bill Record | | | | |
|---|-----------------------|---|----------------------|----------------------|
| <div>Input Patient ID</div> <div>Search</div> | Identity: | <input type="text"/> | Disease: | <input type="text"/> |
| | Name: | <input type="text"/> | Phone: | <input type="text"/> |
| | Gender: | <input type="radio"/> male <input type="radio"/> female | Address: | <input type="text"/> |
| | Age: | <input type="text"/> | Doctor Name: | <input type="text"/> |
| | Sr No: | Particulars: | Amount: | |
| | 01: | Doctor Charges: | <input type="text"/> | |
| | 02: | Labt Test: | <input type="text"/> | |
| | 03: | Treatment charges: | <input type="text"/> | |
| | 04: | Procedure Charges: | <input type="text"/> | |
| | 05: | Other Charges: | <input type="text"/> | |
| 06: | Misceleneous Charges: | <input type="text"/> | | |
| 07: | Room Charges: | <input type="text"/> | | |
| | Total | <input type="text"/> | | |

Fig13 generate bill

13) Appointment

Appointment is one of the features included in our system which can easily get by searching in either of some methods.

Debretabor Comprehensive Hospital

Appointment:-
Appointment No:
Patient Name:
Gender: ☐ male ☐ female
Age:
Phone No
Address:
Time/Date:
Add **Update**

Appointment List:-
Search By

| Number | Name | Gender | Age | Phone No. | Address | Time. |
|--------|------|--------|-----|-----------|---------|-------|
|--------|------|--------|-----|-----------|---------|-------|

Fig14 Appointment

14) History registration

History of a patient will be written and filled here.

The screenshot displays the 'History Registration' form. At the top, there is an orange header bar with the title 'History Registration'. Below this is a green bar containing the text 'Chelf Compliant' and a text input field with the name 'matthy'. The main area of the form is a large white text box with a light gray border and a vertical scrollbar on the right. Inside this box, the text 'History of a patient will be registerd here...' is visible, followed by several lines of dots and a cursor. Below the text box, there is a 'Congratulations' message with a close button (X). A blue information icon (i) is followed by the text 'Data Added successfully'. At the bottom, there is a yellow 'ADD' button and a gray 'OK' button.

Fig15 History registration sample

15) Investigation

Investigation includes Laboratory and Imaging with details inside them.

| Investigation | |
|-------------------|----------------|
| Laboratory | Imaging |
| Hematology | X_ray |
| CBC | Ultrasound |
| Urine | CT |
| Stool | MRI |
| Chemistry | |
| Mbiology | |
| Flu analogy | |
| | ADD |

Fig16 Investigation sample

