

Bed Management Optimization

A Project Report

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in partial fulfillment for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

INFROMATION SCIENCE AND TECHNOLOGY (IST)
At



**SCHOOL OF COMPUTER SCIENCE & ENGINEERING
PRESIDENCY UNIVERSITY
BENGALURU**

JUNE 2023

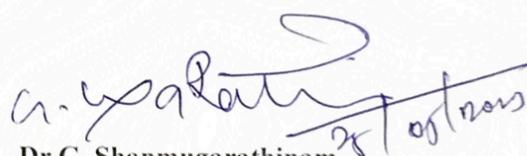
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CERTIFICATE

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DECLARATION

We hereby declare that the work, which is being presented in the project report entitled **Bed Management Optimization** in partial fulfilment for the award of Degree of **Bachelor of Technology in Information Science & Technology**, is a record of our own investigations carried under the guidance of Dr **Mohammed Mujeer Ulla, Assistant Professor, School of Computer Science & Engineering, Presidency University, Bengaluru.**

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ABSTRACT

The "Bed Management Optimization" project aims to automate and streamline the Front Office Bed Management process in healthcare facilities through the development of a user-friendly and cost-effective website. The project focuses on improving the efficiency and effectiveness of bed allocation and utilization by leveraging real-time bed availability tracking, automated bed assignments, and enhanced communication between staff members.

By creating a web-based platform, hospital staff can easily access up-to-date information on bed availability, enabling them to allocate beds efficiently based on patient needs and medical urgency. The system automates the bed assignment process, considering various factors such as the patient's condition and required level of care, to ensure accurate and timely bed assignments. Additionally, the website facilitates improved communication among staff members involved in bed management, reducing delays and enhancing workflow.

The website is designed with simplicity and ease of use in mind, requiring minimal training for staff members to adapt and navigate the system. It is compatible with various operating systems and devices, allowing access from computers, tablets, and smartphones.

The "Bed Management Optimization" project utilizes modern web technologies to create a robust and scalable solution that addresses the challenges faced in bed management. The goal is to optimize resource utilization, reduce costs, and improve patient care and experience.

Overall, the project aims to revolutionize the bed management process, enhance operational efficiency, and contribute to improved patient outcomes in healthcare facilities.

ACKNOWLEDGEMENT

First of all, we indebted to the **GOD ALMIGHTY** for giving me an opportunity to excel in our efforts to complete this project on time.

We express our sincere thanks to our respected dean **Dr. Md. Sameeruddin Khan**, Dean, School of Computer Science & Engineering, Presidency University for getting us permission to undergo the project.

We record our heartfelt gratitude to our beloved Associate Dean **Dr. C. Kalaiarasan**, Professor **Dr. T K Thivakaran**, University Project-II In-charge, School of Computer Science & Engineering, Presidency University for rendering timely help for the successful completion of this project.

We would like to convey our gratitude and heartfelt thanks to the University Project-II Co-Ordinator's **Mr. Mrutyunjaya MS**, **Mr. Sanjeev P Kaulgud**, **Mr. Rama Krishna K** and **Dr. Madhusudhan MV**.

We are greatly indebted to our guide **Dr.Mohammed Mujeer Ulla, Assistant Professor**, School of Computer Science & Engineering, Presidency University for his inspirational guidance, valuable suggestions and providing us a chance to express our technical capabilities in every respect for the completion of the project work.

We thank our family and friends for the strong support and inspiration they have provided us in bringing out this project.

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CHAPTER-1

INTRODUCTION

1.1: - Problem Introduction:

Lack of immediate retrievals: -

Retrieving and locating information in such circumstances is an arduous task- E.g. - To manually go out there and find out the information of a particular specification bed that in need, the user must go through various processes. This results in convenience and waste of time.

Lack of prompt updating: -

Various changes to information like patient details or immunization details or hospital details are difficult to make as paperwork is involved.

Poor Management: -

The lack of efficient bed management can result in a multitude of problems such as increased patient waiting times, underutilized operating theaters, and overcrowded emergency rooms.

The Time-Consuming Process -

The inadequate management of beds results in a prolonged process of bed allocation, causing significant time consumption for both patients and hospital staff.

1.2: - Introduction:

Bed management optimization is a crucial aspect of healthcare management that involves the efficient allocation and utilization of hospital beds. In the healthcare industry, bed management optimization has become an essential strategy for reducing hospital costs, improving patient outcomes, and ensuring the delivery of high-quality care.

This project aims to provide healthcare professionals with valuable insights and practical tools for optimizing the allocation and utilization of hospital beds. Bed management optimization is an essential strategy for healthcare providers to improve patient outcomes, reduce costs, and increase efficiency. This web page project aims to serve as a comprehensive resource for healthcare providers, administrators, and policymakers who are seeking to improve their bed management processes.[1]

CHAPTER-2

REQUIREMENTS ANALYSIS

2.1: - Requirements

2.1.1: - Hardware Requirements

Hardware requirements, also referred to as physical computer resources, form a crucial set of specifications defined by operating systems and software applications. Often accompanied by a hardware compatibility list (HCL), particularly in the case of operating systems, this list provides information on tested hardware devices that are compatible, and sometimes incompatible, with a specific operating system or application. In the following sections, we will delve into the different aspects and considerations associated with hardware requirements.

Hardware Requirements for Present Project:

PROCESSOR	:	Intel dual Core, i3 to i10, MacOS M1/M2
RAM	:	4 GB
HARD DISK	:	80 GB

2.1.2: - Software Requirements:

Software requirements refer to the resources and pre-requisites needed to ensure a software application functions optimally on a computer. These requirements are not typically included in the software installation package and must be installed separately beforehand. Examples of software requirements include hardware components, operating systems, and other software resources. Manufacturers often provide both minimum and recommended system requirements for their software, with the latter being a more advanced set of specifications. It is important to consider these requirements to prevent conflicts with other applications and ensure the software operates as intended.

Software Requirements for Present Project:

OPERATING SYSTEM : Windows 10/11/12 or MAC OS
FRONT END : Html, CSS, JavaScript, Bootstrap4.
BACK END : Python
API & Libraries : flask, mysqlclient, flask SQLAlchemy, flask login
SERVER-SIDE SCRIPT : MYSQL
DATABASE : MySQL

2.2: - Software Specifications Requirements

2.2.1: - HTML, CSS & JavaScript:

HTML, CSS, and JavaScript are three fundamental technologies used in web development to create and design interactive websites and web applications.

HTML is the standard markup language used to structure and present the content of web pages. It consists of a series of tags that define the elements and their properties. HTML tags are used to markup headings, paragraphs, lists, images, tables, forms, and more. By using these tags, developers can organize and semantically structure the content on a webpage. HTML provides the basic framework for creating web pages, defining the structure of the page and its various elements.

CSS is a style sheet language used to describe the presentation and layout of HTML documents. It allows developers to define the visual appearance of HTML elements, such as colors, fonts, sizes, margins, padding, and positioning. CSS provides a powerful way to separate the presentation from the structure of a webpage, allowing for consistent styling across multiple pages. It enables developers to create visually appealing and responsive designs, and it offers flexibility in customizing the look and feel of a website. CSS can be applied directly within an HTML file using inline styles, or it can be stored in external CSS files to be referenced by multiple web pages.

JavaScript is a dynamic scripting language that adds interactivity and functionality to web pages. It allows developers to create interactive elements, handle events, manipulate the content of a webpage, and communicate with external resources. JavaScript can be used to validate form inputs, perform calculations, create animations, implement responsive features, fetch data from servers asynchronously (AJAX), and much more. With JavaScript, developers can create dynamic and interactive web experiences that respond to user actions and provide real-time updates. JavaScript is supported by all modern web browsers, making it a versatile and widely used language in web development.

In combination, HTML, CSS, and JavaScript form the foundation of modern web development. HTML provides the structure, CSS adds the visual styling, and JavaScript adds interactivity and functionality. These three technologies work together to create visually appealing, responsive, and interactive websites and web applications. They are essential tools for web developers to craft engaging user experiences on the internet.[2]

2.2.2: -MySQL:

MySQL is an open-source relational database management system (RDBMS) that is widely used in web development and other applications requiring the storage and management of structured data. It is a robust and reliable database solution that offers high performance, scalability, and ease of use.

MySQL is designed to handle large amounts of data efficiently and provides powerful features for managing and manipulating that data. It uses a structured query language (SQL) to interact with the database and perform various operations such as creating, reading, updating, and deleting data (CRUD operations, defining and modifying database structures, and executing complex queries for data analysis and retrieval).

One of the key advantages of MySQL is its flexibility and compatibility. It supports multiple platforms, including Windows, Linux, macOS, and various cloud environments, making it accessible and adaptable to different development environments. MySQL is also compatible with various programming languages such as PHP, Python, Java, and more, allowing seamless integration with different application frameworks and systems

2.2.2.1: - Security

MySQL places significant emphasis on security, particularly through its privilege and password system. This system allows administrators to carefully manage user privileges, granting or revoking permissions based on specific roles and responsibilities. By controlling access to databases, tables, and operations, MySQL ensures that only authorized users can interact with and modify data.

The password security aspect of MySQL is also robust. Password traffic is encrypted during authentication, preventing unauthorized interception and access to sensitive information. Additionally, MySQL supports SSL encryption, which enhances the security of data transmission between clients and servers.

MySQL's focus on security is evident in its privilege and password system, encryption measures, and support for SSL. The use of strong password encryption algorithms and continuous security updates further reinforces the protection of data. With these features, MySQL provides a secure and reliable solution for safeguarding sensitive information.

2.2.2.2: - Scalability and Limits:

MySQL is capable of handling large databases with millions of records, making it a reliable choice for organizations dealing with significant data volumes. It has been successfully used with databases containing 50 million records or more, demonstrating its scalability and ability to maintain performance and stability.

In terms of table structure, MySQL supports up to 64 indexes per table (32 indexes before MySQL 4.1.2). Indexes are essential for efficient data retrieval operations, and MySQL allows indexes to consist of one to sixteen columns or parts of columns. This flexibility enables developers to create efficient indexing strategies tailored to their specific data and query requirements.

MySQL also imposes limits on the maximum index width, which is 767 bytes for InnoDB tables and 1000 bytes for MyISAM tables (500 bytes before MySQL 4.1.2). The index width refers to the combined size of the indexed columns. This limitation ensures efficient storage and retrieval of indexed data.

By supporting large databases, multiple indexes per table, and customizable index configurations, MySQL provides developers and organizations with the scalability and performance required to handle vast amounts of data effectively. It is a reliable solution for managing complex data structures and optimizing data retrieval operations.

2.2.2.3: - Clients and Tools:

MySQL provides a range of client and utility programs to assist users in effectively managing their databases. These tools include:

- mysqldump: Command-line program for creating logical backups of MySQL databases.
- mysqladmin: Command-line program for managing MySQL servers and performing administrative tasks.
- MySQL Workbench: Graphical tool for database design, SQL development, and administration tasks.
- mysqlcheck: Command-line utility for checking, optimizing, and repairing MySQL tables.
- myisamchk: Command-line utility for performing maintenance operations specifically on MyISAM tables.

These programs offer a combination of command-line and graphical interfaces, catering to different user preferences. They enable tasks such as backup and restore, server administration, SQL querying, database design, and table maintenance. Online assistance is available for each program, providing detailed information on their functionalities and options. Overall, these tools enhance the efficiency and productivity of database management in MySQL [3]

2.3.: - Python:

Python's versatility and seamless integration with various web technologies make it a powerful language for full-stack web development. Key components of a web application that can be developed using Python include:

1. **Back-End Development:** Python web frameworks like Django and Flask provide robust tools and libraries for building scalable and secure web applications. These frameworks handle URL routing, database integration, session management, and user authentication, enabling developers to focus on application logic.
2. **API Development:** Python frameworks such as Django REST Framework and Flask-RESTful facilitate the creation of APIs for communication between different components or multiple applications. These frameworks simplify the development of RESTful APIs, allowing for data exchange and integration between systems.
3. **Data Processing and Manipulation:** Python's extensive libraries, such as NumPy, Pandas, and SciPy, make it a powerful tool for handling and analyzing data in web applications. These libraries enable tasks like data cleaning, transformation, statistical analysis, and machine learning integration.
4. **Task Automation and Scripting:** Python's simplicity and readability make it ideal for scripting and automating tasks in web development. Python can be used to automate repetitive tasks, schedule cron jobs, perform data scraping, file management, or database maintenance.
5. **Template Engines:** Python web frameworks often come with built-in or third-party template engines like Jinja2. These template engines separate the presentation layer from the back-end logic, making it easier to design and render dynamic web pages.
6. **Testing and Quality Assurance:** Python's testing frameworks, such as PyTest and unit testing libraries like unittest, enable developers to write automated tests to ensure the reliability and quality of their web applications. These frameworks help catch bugs and maintain code integrity.
7. **Deployment and Infrastructure:** Python is widely used in web application deployment and infrastructure management. Tools like Docker, Kubernetes, and Ansible have extensive Python libraries and APIs for managing containerized

deployments, orchestration, and configuration management.

2.3.1: - Libraries used:

1. **Flask**: Flask is a popular micro web framework for Python that allows developers to build web applications quickly and with minimal boilerplate code. It provides a simple and flexible architecture for creating web applications, handling routing, request handling, and response generation. Flask follows the WSGI (Web Server Gateway Interface) standard and can be easily integrated with other libraries and tools.
2. **Flask.globals**: Flask.globals is a module within the Flask framework that provides access to global objects throughout the application. It includes the current request, session, and application context. These global objects allow developers to access information and perform operations related to the current request or application context within their Flask application.
3. **Flask-SQLAlchemy**: Flask-SQLAlchemy is a Flask extension that simplifies the integration of SQLAlchemy, a popular Object-Relational Mapping (ORM) library, with Flask applications. SQLAlchemy provides a high-level interface for interacting with databases using Python, and Flask-SQLAlchemy adds additional functionality and convenience methods specifically tailored for Flask. It helps streamline database operations, simplifies query construction, and supports easy database migrations.
4. **Werkzeug.security**: Werkzeug is a comprehensive WSGI utility library for Python, and werkzeug.security is a module within Werkzeug that provides various security-related functions. It includes password hashing and verification utilities, such as generating secure password hashes using different algorithms and checking if a provided password matches a stored hash. Werkzeug.security is often used in web applications, including Flask, to handle user authentication and ensure secure password storage practices.

In summary, Flask is a lightweight web framework, Flask.globals provides access to global objects within a Flask application, Flask-SQLAlchemy simplifies database integration, and werkzeug.security offers security-related functions for password hashing and verification.

These components are commonly used together in Flask applications to create secure and efficient web applications.[4]

CHAPTER-3

LITERATURE SURVEY

3.1: - Literature Review on Research Papers:

The paper titled "Hospital Management and Control System, Volume 7, 2020" highlights the significant growth of the Network of Medical Records due to increasing patient demands. It emphasizes the importance of providing prompt and precise medical services to patients through the efficient utilization of patient management systems. The paper also emphasizes the crucial role of patient information options equipped in the healthcare sector and the need for modifications or specialized software creation based on unique patient specifications. The research focuses on evaluating and recognizing the core elements of Electronic Health Management System and Hospital Information System, considering their global requirements and administration. The success of these systems is often measured through a benchmarking viewpoint.[5]

The article titled "HAMS: An Integrated Hospital Management System to Improve Information Exchange" highlights the importance of communication between hospitals and emergency care providers during times of crisis. It is crucial for hospitals to share information about their resources, such as bed and staff availability, so that first responders can manage patient flow efficiently. This leads to improved response time and resilient health services during emergencies. The successful management of crises depends on each healthcare facility's awareness of their own resource status and the availability of reliable and understandable information in a timely manner.[6]

The article outlines a proposal for a web-based application for managing beds in hospitals. The aim is to allocate beds more efficiently to reduce the number of patients who need to be transferred to other facilities, which can result in longer stays. The application is intended to be integrated with an existing facility management system, which will provide information about the number and location of beds in each room. The system will analyze patient interaction, admission status, and staff to help reduce hospital costs and length of stay. It is important to note that the article does not include a review of existing literature.[7]

In the paper, the topic of managing hospital beds and the flow of patients into emergency rooms is discussed. A computer simulation study was conducted using actual hospital data to assess the impact of various patient prioritization scenarios. The study compared four scenarios, which included prioritizing emergency and surgery, emergency and medicine, planned admissions and surgery, and planned admissions and medicine. The most effective scenario was found to be prioritizing planned admissions and surgery. The paper contributes to the current understanding of hospital management by demonstrating that changing bed management policies can enhance patient flow and reduce the duration of their stay.[8]

In the paper, the use of Data Mining (DM) in hospital management is explored. The aim is to find relevant patient data that can be used by managers to make informed decisions. The literature review section of the paper defines the hospital as a medical and social organization that offers a wide range of health services to the population. It also serves as a center for training health workers and conducting biosocial research. The section stresses the significance of managers having an in-depth understanding of the hospital's policies and services, including their strengths and weaknesses. This knowledge can help them identify areas that require improvement.[9]

The management of hospital beds is a crucial aspect of elective patient admission and assignment planning, as discussed in this paper. The paper reviews previous studies on the subject, which have mainly focused on computing efficient assignments based on fixed estimates of patient length of stay and preferences. However, these approaches fail to consider the uncertainty of patient recovery or the impact of shared resources, such as combined bed capacities. The paper aims to overcome these limitations by introducing a cost function for patient admission that accounts for flexible length of stay predictions and aggregated resources. Additionally, the paper proposes multiple algorithmic techniques for solving the bed assignment problem.[10]

CHAPTER-4

EXISTING SYSTEM

4.1: - Existing Models:

There are several existing methods for bed management optimization in healthcare facilities, popularly including manual bed tracking and electronic bed management systems(semi-computerized), But Many Hospitals Still use a manual system for the management and maintenance of critical information The current system requires numerous paper forms, with data stores spread throughout the hospital infrastructure. Often information is incomplete or does not follow management standards. Forms are often lost in transit between departments requiring a comprehensive auditing process to ensure that no vital information is lost. Multiple copies of the same information exist in the hospital and may lead to inconsistencies in data in various data stores. Each of these methods may not be effective in addressing dynamic bed demand fluctuations. While other side with semi-computerized, there are some benefits to using it compared to traditional paper-based methods, but there are also some drawbacks. This type of system may not provide real-time updates, complete data integration, or automated processes. Additionally, it may rely on manual data entry or have limited connectivity between different departments, leading to delays, inconsistencies in data, and increased administrative work. Data privacy and security are important considerations in a semi-computerized system. Access controls may be implemented to ensure that only authorized personnel can access and update patient information. Basic security measures, such as user authentication and data encryption, help protect sensitive data from unauthorized disclosure or tampering.

However, relying on a manual paper-based system or semi-computerized bed management has several limitations. It can be time-consuming, prone to errors, and lacks real-time visibility and accessibility to bed availability information, while a semi-computerized system offers certain advantages over manual paper-based methods, it still has limitations. It can also be challenging to track and manage beds across different units or departments within the hospitals.[11]

4.2: - Some challenges associated with Existing Bed Management Systems:

Sl.no	Problems	Explanation
1	Limited Visibility and Transparency	Manual paper-based systems and semi-computerized systems usually do not have immediate access to information on available beds and occupancy status. As a result, it can cause inefficiencies, delays, and challenges in identifying and assigning suitable beds for incoming patients.
2	Inefficient Resource Utilization	Hospitals may find it challenging to make the most of their beds if they lack a centralized and automated system. This can cause some areas to have beds that are not being fully utilized while others become overcrowded or face a shortage of beds. As a result, the flow of patients can decrease, and waiting times can become longer.
3	Communication and Coordination Issues	Manual systems often necessitate that staff members depend on personal interactions or phone calls to exchange information regarding bed availability or patient transfer. This can result in misunderstandings, holdups, and mistakes in bed allocation, leading to unwanted disruptions and inefficiencies.

Sl.no	Problems	Explanation
4	Data Inconsistencies and Errors:	Manual or semi-computerized systems carry a greater risk of errors in data entry, duplication, and outdated information. Such inaccuracies and incomplete data can pose a threat to patient safety, impede decision-making, and create administrative difficulties.

Table4.2: - Some challenges associated with existing bed management systems

Chapter-5 **PROPOSED METHOD**

5.1: - Purpose

The purpose of the Bed Management optimization is to introduce a new system to hospitals that will replace their current paper-based manual system. This system will be responsible for managing patient information, room availability, operating room schedules. The aim is to provide these services in a way that is both efficient and cost-effective, with the goal of reducing the time and resources currently required for these tasks

5.2: -Scope

The Bed Management Optimization webpage connects multiple hospitals to enable efficient bed management, seamless coordination, and improved healthcare delivery. It provides real-time data on bed availability and critical patient information, facilitating continuity of care and reducing medical errors. By utilizing advanced technology to enhance communication and coordination between healthcare facilities, this platform is transforming the healthcare industry and improving patient outcomes.

5.3: - Advantages of Webpage over Existing models

Sl.no	Advt	Explanation
1	Centralization and Accessibility	<p>The webpage serves as a central platform where hospitals can register and showcase their services, including bed availability. This centralization ensures that patients have easy and convenient access to information about multiple hospitals and their respective services. By providing a unified database, the webpage eliminates the need for patients to search through different sources or make numerous phone calls, simplifying the process of finding</p>

Sl.no	Advt	Explanation
2	Efficient Bed Allocation	<p>By facilitating real-time updates on bed availability, the webpage enables hospitals to efficiently manage their resources. Hospitals can promptly update their bed status, allowing for effective bed allocation and reducing the time patients spend waiting for admission. This optimization ensures that patients are admitted to the most appropriate hospital based on their medical needs, location, and urgency.</p>
3	Streamlined Patient Admissions:	<p>The webpage incorporates a range of features to streamline patient admissions. It includes a waitlist management system, allowing patients to join waitlists for specific hospitals or medical specialties. Hospitals can efficiently track and manage these waitlists, ensuring fair and organized prioritization of patient admissions. This streamlining of the admission process reduces delays, enhances patient satisfaction, and improves overall healthcare</p>

Sl.no	Advt	Explanation
4	Enhanced Healthcare Coordination	<p>Acting as a connecting platform, the webpage promotes seamless communication and coordination among hospitals, patients, and other healthcare providers. It facilitates the exchange of vital information such as bed availability, medical specialties, referral processes, and relevant patient details. This improved communication streamlines the coordination of care, enabling smoother transitions for patients who require specialized services or transfers between hospitals.</p>
5	Resource Optimization	<p>The webpage aids in resource optimization by providing hospitals with a holistic view of bed availability across the network. Hospitals can identify underutilized resources and make informed decisions to optimize their staffing, equipment, and facilities accordingly. This optimization ensures efficient resource allocation, leading to cost savings, improved utilization, and ultimately better patient care.</p>

6	Expansion and Scalability	The webpage is designed to accommodate the expansion of the network, allowing more hospitals to join over time. This scalability provides patients with an increased number of options and healthcare providers with a broader reach. As the network grows, the webpage fosters healthy competition among hospitals, driving continuous improvement in the quality and accessibility of healthcare services.
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Table 5.3: - Advantages of Webpage over Existing models

5.4: - Disadvantages (less conceded)

- Requires large database.
- The admin must manually keep updating the information of Availability into the database
- Need Internet connection

5.5: - Brief Summary

In summary, the Bed Management Optimization webpage acts as a central connecting platform for hospitals, streamlining bed management processes and enhancing healthcare coordination. By promoting efficient bed allocation, streamlining patient admissions, optimizing resources, and facilitating data analysis, the webpage improves patient access to healthcare services while enabling hospitals to deliver more efficient and effective care. Its expandability ensures that more hospitals and patients can benefit from this comprehensive platform, fostering a connected and patient-centric healthcare ecosystem.

5.6: - Objectives

1. Create a user-friendly web page that allows users to quickly access hospital bed availability information
2. Develop a system that allows hospitals to easily manage their bed availability data
3. Provide real-time updates on the availability of hospital beds by creating dashboards
4. Allow users to search for beds based on medical urgency, speciality, and other criteria
5. Facilitate communication between hospitals and patients regarding bed availability
6. Develop an intuitive interface that enables User to easily adjust the availability of beds.
7. Implement a system that allows hospitals to track how many beds are available at any given time

Chapter-6

SYSTEM DESIGN

6.1: - Data Flow Diagram Level -I

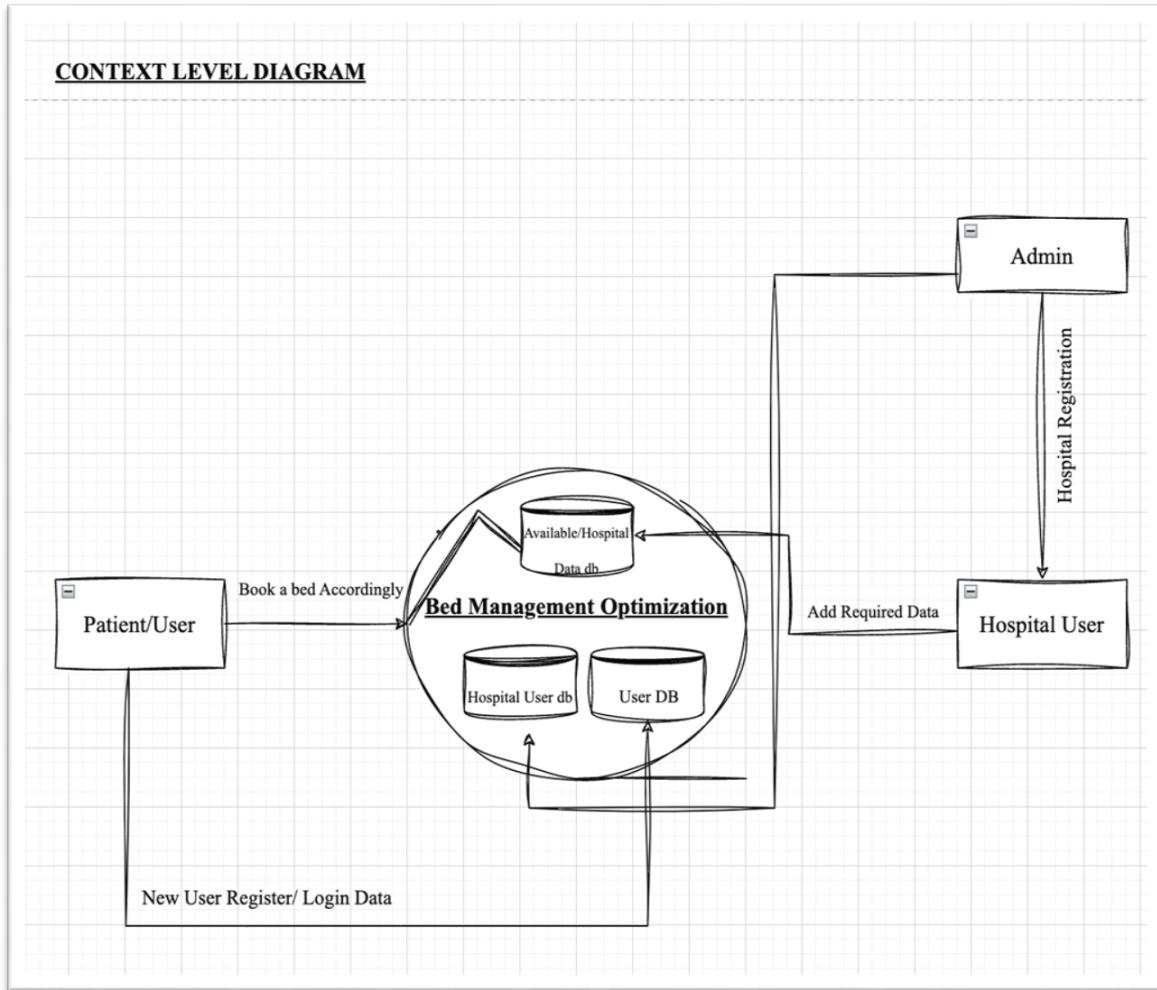


Fig6.1: - Context Level Diagram

6.2: - Data Flow Diagram Level-II

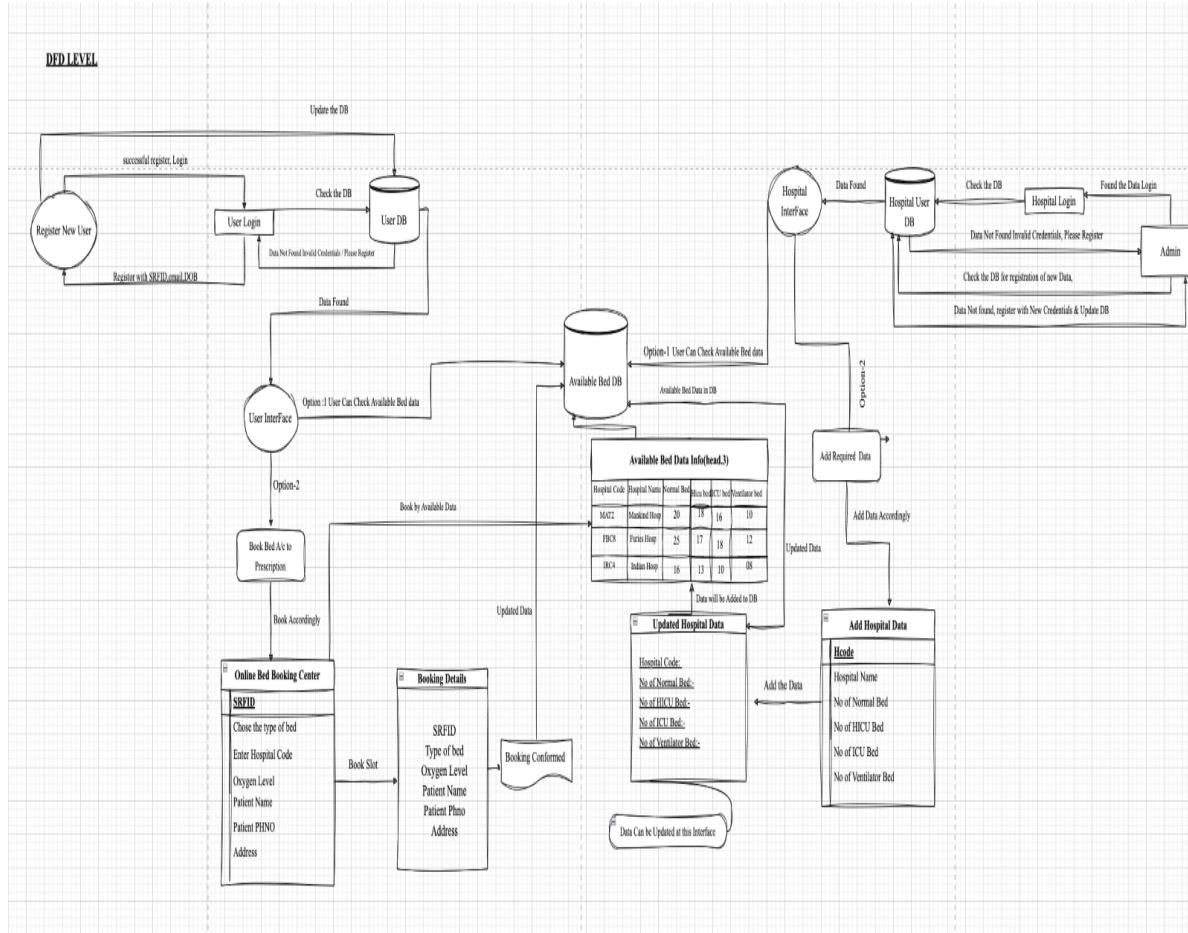


Fig6.2: - DFD Level Diagram

6.2.1: - DFD (Data Flow Diagrams)

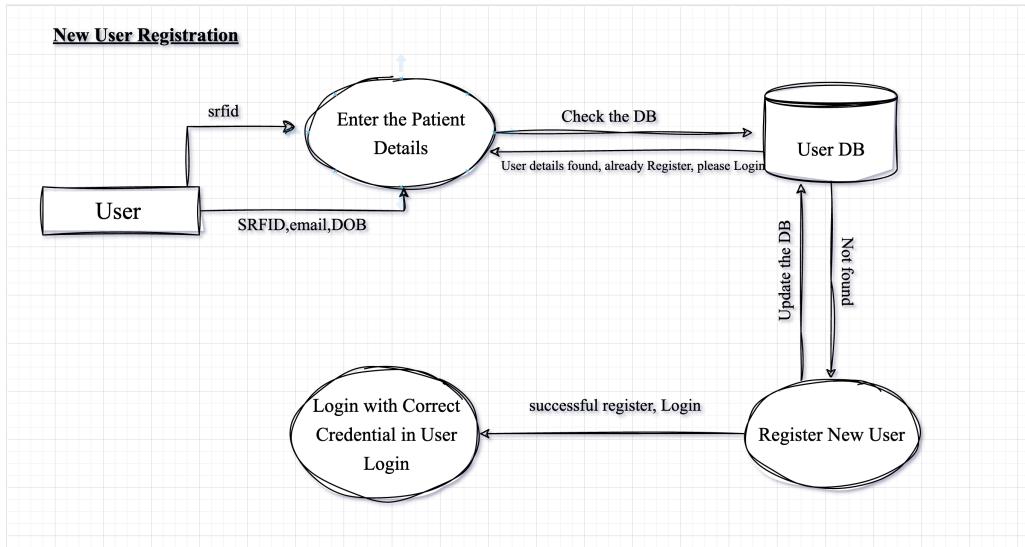


Fig6.2.1: - New User Registration

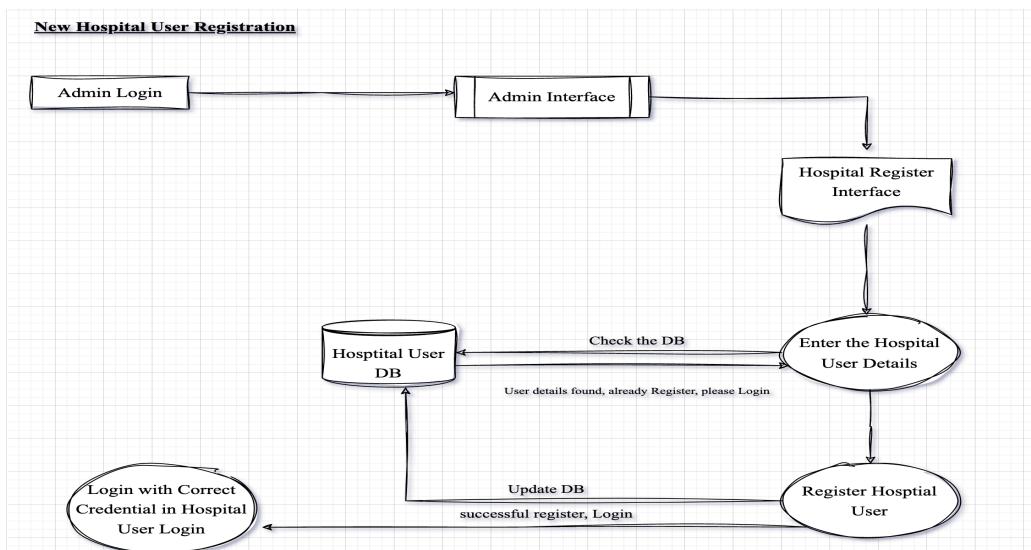


Fig6.2.2: - New Hospital User Registration

6.2.3: - DFD of User Login & its Functions

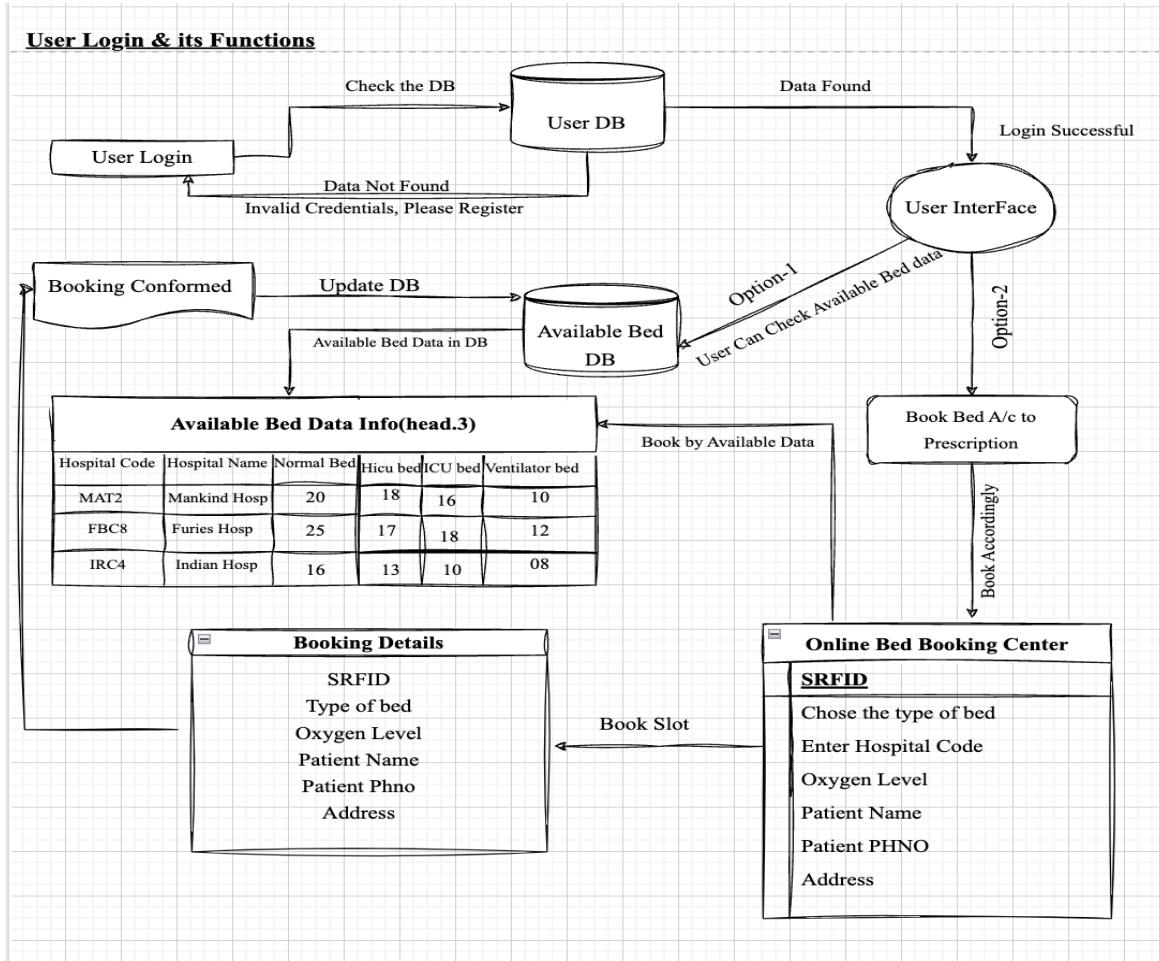


Fig6.2.3: - User Login & its Functions

6.2.4: - DFD of Hospital User Login & its Functions

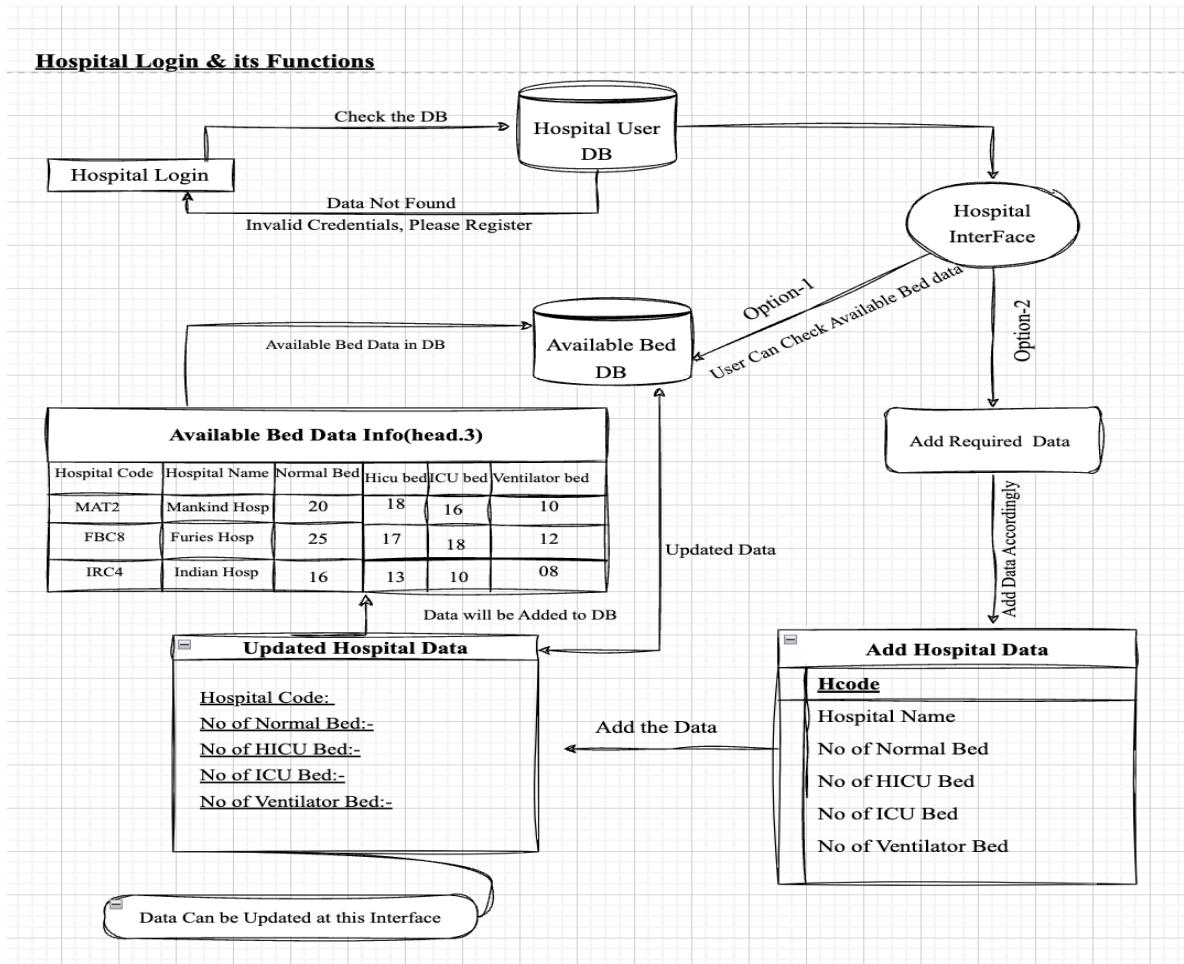


Fig6.2.4: - Hospital Login & its Functions

6.3: - User Case Diagram

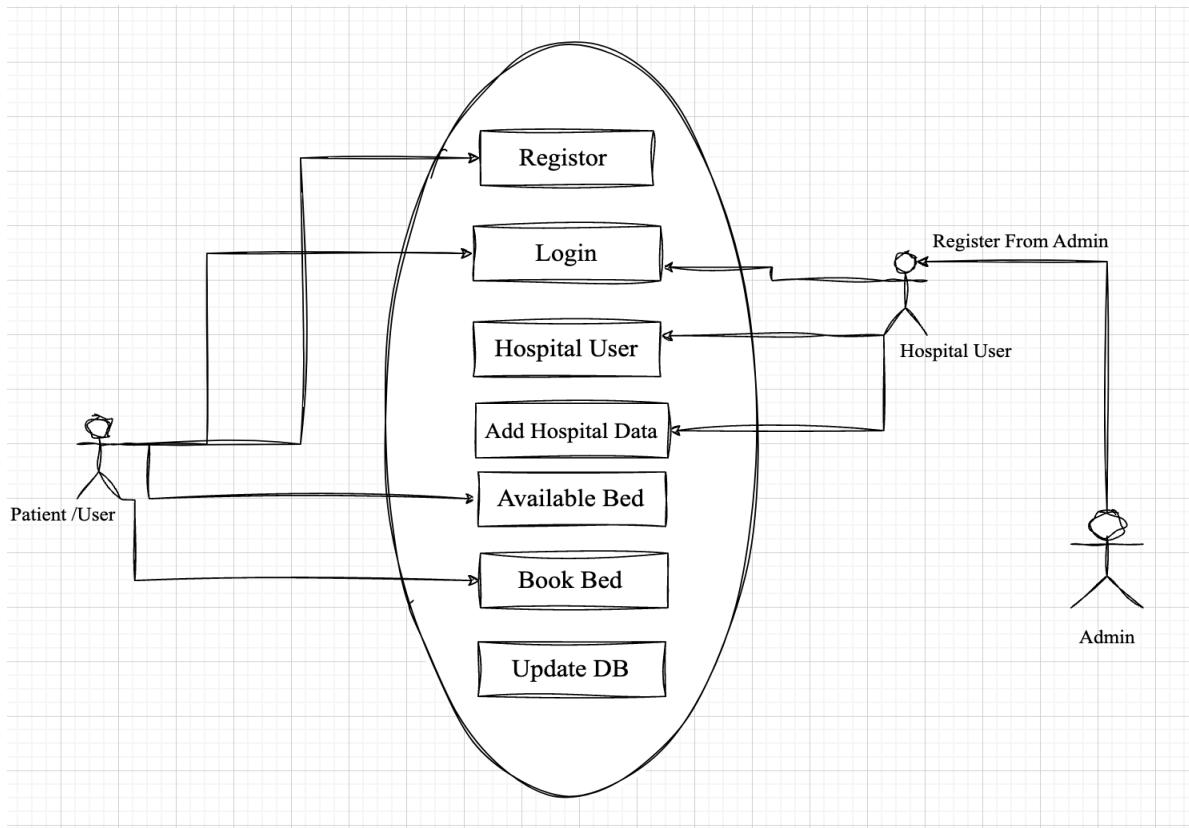


Fig: - 6.3: - User Case Diagram

6.4: - Descriptive Expiations

6.4.1: - Patient/User

6.4.1.1: - New User Registration

DESCRIPTION - The new Patient/User can register themselves and add their details like srfid, email, dob. And the patient/User entry will be made in the User database.

PRE -CONDITION – The patient/user must be a new patient/user.

MAIN FLOW OF EVENTS

- New patient/user selects the "sign up" option in the login module.
- Registration form is displayed.
- Patient fills in SRFID, email, and date of birth.
- System checks for missing fields and prompts for necessary information.
- Patient clicks "submit" or "register" button to complete registration.
- Patient/user gains access to the system.
- Patient's record with SRFID, email, and date of birth is stored securely in the User database

POST CONDITIONS - The patient's record, including their srfid, email, and date of birth, is securely stored in the User database, ensuring that their information is readily available for future interactions with the system.

6.4.1.2: - User Login & its Functions

Description – The user login with valid credential's (like SRFID, DOB), if mismatch of details, Login module throw an error of “invalid credential's, please enter correct credential's or Register for new user”

Pre-condition: - The user must have already registered in the User Database before attempting to log in

1. Main Flow of events: User enters valid credentials (SRFID, DOB) during login.
2. System verifies the credentials entered with the user data in the database.
3. If credentials match, the user is redirected to the user interface.
4. User can view available bed data (bed types, hospital codes, hospital names).
5. User provides details to book a bed (bed type, hospital code, name, phone number,

address).

6. System updates booking patient database and reserves the selected bed.
7. User receives confirmation of booking with details.
8. User can access patient details module to view booking history, modify personal info, check current booking status.
9. The available bed database is updated in real-time to reflect booked beds and availability.
10. Patient's booking details are stored in booking patient database, and bed availability is updated in the system.

Post-condition: - The patient's booking details are successfully stored in the booking patient database, and the available bed database is updated to reflect the current bed availability status.

6.4.2: - Hospital User

6.4.2.1: - New Hospital User Registration

DESCRIPTION - The new Hospital User can register through Admin by adding their details like Hcode(Hospital Code), Email, password. And the Hospital User entry will be Stored in the HospitalUser database.

PRE -CONDITION – The Hospital user must be a new Hospital user.

MAIN FLOW OF EVENTS

1. The Hospital user initiates the registration process by Requesting the Admin
2. After Requesting the Admin, the Admin Enter the necessary details like Hcode(Hospital Code), Email, Password.
3. Before completing the registration, the system checks for any necessary fields that were left blank by the patient. If any necessary fields are missing, the system prompts the patient to fill in the required information.
4. Once all the required details are provided, the patient clicks the "submit" or "register" button to complete the registration process.
5. With the completion of the registration process, the Hospital user gains access to the system and can proceed to utilize other functionalities, such as checking bed availability or adding the required details.

POST CONDITIONS - The Hospital User Data record, including their Hcode and email is securely stored in the Hospital User database, ensuring that their information is readily available for future interactions with the system.

6.4.2.2: - Hospital User Login & its Functions

Description – The user login with valid credential's (like Email, Password), if mismatch of details, Login module throw an error of “invalid credential's, please enter correct credential's or Register for new Hospital user”

Pre-condition: - The Hospital user must have already registered in the Hospital User Database before attempting to log in.

Main Flow of events:

1. The Hospital User enters their login credentials, such as username and password, into the login form provided by the system.
2. After entering the credentials, the Hospital User clicks the login button to initiate the authentication process.
3. The system verifies the entered credentials against the stored Hospital User data in the database.
4. If the entered credentials match the records, the system grants access to the Hospital User and redirects them to the Hospital User interface.
5. In the Hospital User interface, the user can access various features and functionalities specifically designed for bed management.
6. The key functionalities available to the Hospital User is the ability to manage bed availability data.
7. The Hospital User can add relevant information such as the hospital name, available bed count, and different types of beds (e.g., normal bed, HICU bed, ICU bed, ventilator bed) to the system.
8. Once the bed data is added or updated by the Hospital User, the system ensures that the information is synchronized with the available bed database.
9. The updated bed availability data can then be accessed by other users or patients seeking information about bed availability in the hospital.

10. The Hospital User can continue to utilize the Hospital User interface to perform various tasks, manage other hospital-related data, and access relevant features provided by the system.

Post-condition: - The patient's booking details are successfully stored in the booking patient database, and the available bed database is updated to reflect the current bed availability status.

6.4.3: - User characteristics

6.4.3.1: - User/Patient

1. Role: Individual seeking hospital bed availability information.
2. Registration: Creates an account by providing necessary details.
3. Access Rights: Limited access to view and book available beds.
4. Search and Selection: Searches for beds based on location and specialty.
5. Data Entry: Provides details for smooth bed booking process.
6. Information Retrieval: Accesses booking details and relevant information.
7. Interaction: Communicates with hospital staff regarding queries or changes.

Key Functions of Patient/User:

- Search and view available beds
- Book a bed based on preferences
- Retrieve and review booking details
- Communicate with hospital staff for inquiries or changes

6.4.3.2: - Hospital User/Patient

1. Role: Hospital staff responsible for managing and updating bed availability data.
2. Credentials: Possesses login credentials for system access.
3. Knowledge and Expertise: Familiar with the hospital's bed management system.
4. Access Rights: Granted permissions to add, update, and delete bed data.
5. Attention to Detail: Ensures accuracy in entering and updating bed availability.
6. Time Management: Promptly updates bed data for real-time availability.
7. Compliance and Security: Adheres to protocols for data security and privacy.

Key Functions of Hospital User:

- Manage and update bed availability data
- Grant and revoke access rights
- Coordinate with hospital staff for accurate information

6.5: - Constraints

1. The system utilizes wireless networking with encryption to ensure secure data transmission.
2. Access to the system is restricted to the website interface, providing a controlled environment.
3. The database is protected by a password, adding an additional layer of security.
4. The system is designed to be resource-efficient, utilizing minimal RAM and processing power.
5. Each user is assigned a unique ID and password for personalized access and authentication.

6.6: - Assumptions and dependencies

1. User authentication requires a valid user ID and password for access to the system.
2. The system relies on a running server for its proper functioning.
3. Users are required to log in to the system to access any records or data.
4. The ability to delete records is restricted to the Administrator role only.

6.7: - Data Dictionary

Sl.no	Character	Implications
1	legal_character	[a-z] [A-Z]
2	Dig it	[0-9]
3	special_ch	[@ \$ # + -]

Table 6.7.1 Data Dictionary-I

Sl.no	Character	Implications
1	Name	FirstName+(middlename)+LastName
1.1	FirstName,middlename,LastName	{legal_character}* {legal_character + digit} *
2	SRFID	{legal_character + digit} *
3	DOB (Date of Birth)	{digit}
4	Email	legal_character +special_ch + digit} *
5	Password	{legal_character + digit + special_ch}* {legal_character + digit} *
6	Hcode(Hospital Code)	{legal_character + digit} *
7	HName(Hospital Name)	{legal_character}* {digit}
8	Normal bed	{digit}
9	Hicubed	{digit}
10	Icubed	{digit}
11	Vbed	{digit}
12	date	{legal_character + digit} *
13	bedtype	{legal_character}* {digit}
14	Pnumber	{digit}

Table 6.7.2 Data Dictionary-II

6.8: - Data Design

Sl.no	Column Name	DataType	Constraints	Description
1	srfid	varchar (20)	Primary key	Contain Unique code
2	email	varchar (100)	-	Contain email Id
3	dob	varchar (1000)	-	Contain Date of birth

6.8.1- User Signup Table

Sl.no	Column Name	DataType	Constraints	Description
1	srfid	varchar (20)	Primary key	Contain Unique code
2	bedtype	varchar (100)	-	Contain email Id
3	dob	varchar (1000)	-	Contain Date of birth
4	hcode	varchar (50)	-	Contain Hospital code
5	spo2	int (11)	-	Contain oxygen level
6	pname	varchar (50)	-	Contain patient name
7	pphone	varchar (12)	-	Contain patient phno
8	paddress	text	-	Contain patient address

6.8.2-User Bed Booking Table

Sl.no	Column Name	DataType	Constraints	Description
1	hcode	varchar (20)	Primary key	Contain Unique code
2	email	varchar (100)	-	Contain email Id
3	password	varchar (1000)	-	Contain password

6.8.3- Hospital User Table

Sl.no	Column Name	DataType	Constraints	Description
1	hcode	varchar (20)	Primary key	Contain Unique code
2	hname	varchar (100)	-	Contain hospital name
3	Normalbed	int (11)	-	Contain no.of normal bed
4	hicubed	int (11)	-	Contain no.of Hicu bed
5	icubed	int (11)	-	Contain no.of Icu bed
6	vbed	int (11)	-	Contain no.of Ventilator bed

6.8.4-Hospital User Bed Data Table

6.9 ER Diagram

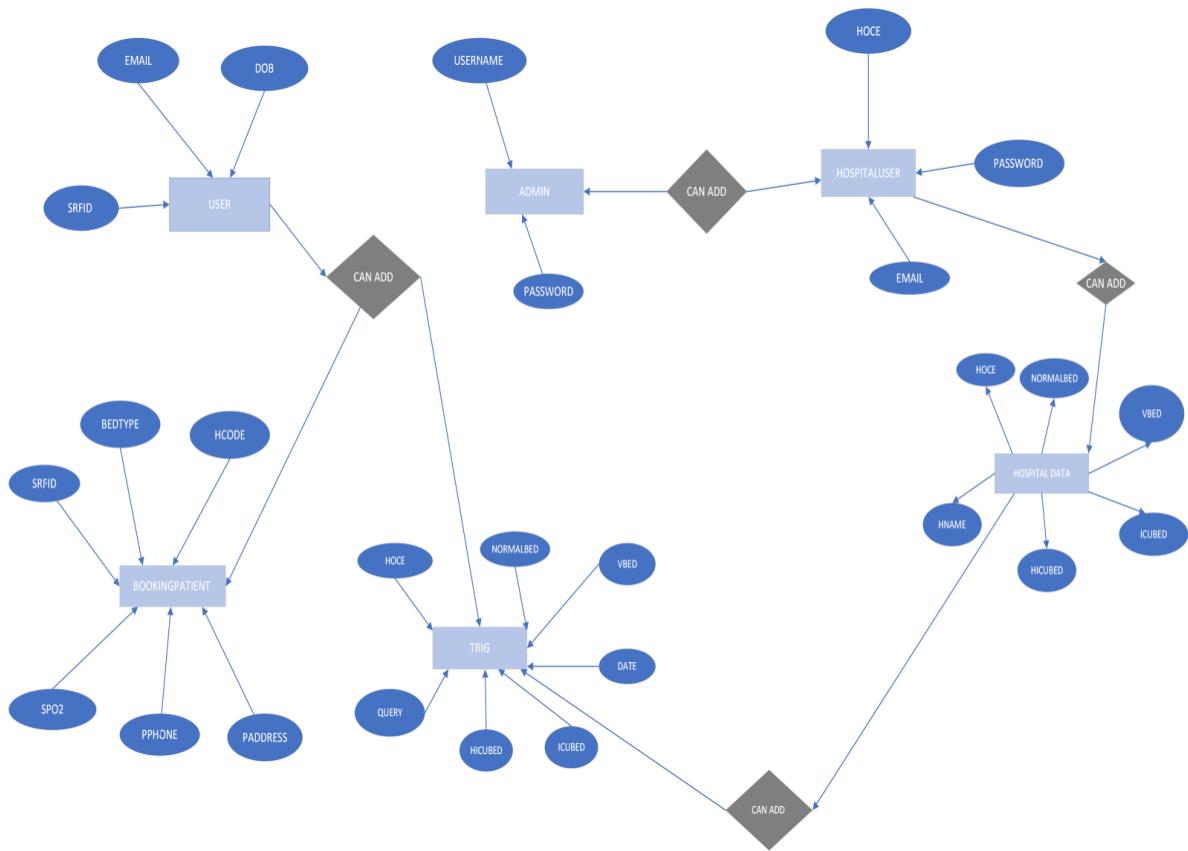


Fig.6.9: - ER Diagram

Chapter-7

TIMELINE FOR EXECUTION OF PROJECT

7.1 Timeline of Project

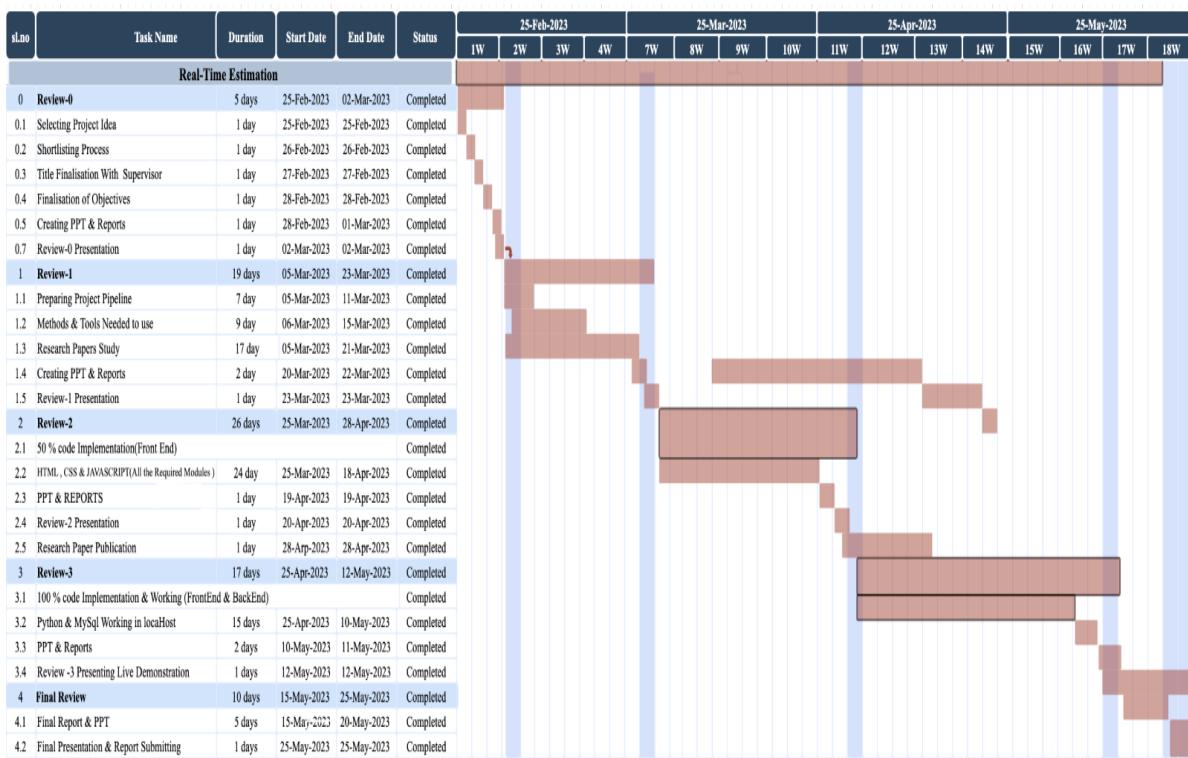


Fig.7.1: -Gantt Chart

7.2: - Project Scheduling

Review-0 (25-Feb-2023 to 02-Mar-2023): During this review, the project team completed the crucial task of selecting a suitable project idea, and also successfully shortlisted potential options and finalized the project's title in consultation with the supervisor (Guide). Additionally, the objectives of the project were carefully determined and finalized. Completed the comprehensive PowerPoint presentation and the project report within given time & presented the review-0 within the deadline.

Review-1 (05-Mar-2023 to 23-Mar-2023): In this review phase, the team made significant progress. They completed the preparation of the project pipeline, which provides a structured framework for executing the project. We also started researching relevant materials, including research papers and IEEE papers, to gather valuable insights and establish a strong foundation for their project. The team successfully completed the development of a comprehensive PowerPoint presentation and the project report within the given timeframe. They ensured that all the necessary information, findings, and outcomes were effectively communicated through these deliverables via Review -1.

Review-2(25-Mar-2023 to 28-Apr-2023): The team accomplished a significant milestone during this review. We successfully publicized their research paper, reaching a wider audience and contributing to the academic community. Additionally, the team made substantial progress in the implementation of the project code, reaching a completion rate of 50%. We also developed a fully functional webpage, involving front-end technologies such as HTML and CSS. Reports and the PowerPoint presentation are scheduled to be completed by the specified deadline and Presented to the Guide within timeframe given.

Review-3(25-Apr-2023 to 12-May-2023): During this review, the team focused on finalizing the implementation of the project code. We achieved 100% completion of the code, ensuring that both the front-end (HTML and CSS) and the back end (Python and MySQL) components are fully functional and error-free. The efforts have resulted in seamless and robust project execution. Reports detailing their findings and progress were planned and delivered and explained 100& working of Webpage to the Guide.

Review-4: We Finally Completed all the stages of the project. the diligently prepared the final project report, which will comprehensively document their research, methodology,

findings, and outcomes. In addition, the team is gearing up for the final presentation, where they will showcase their work and highlight the key aspects and achievements of the project.

Chapter-8 OUTCOMES

8.1: - Outcomes Benefit's over Existing Models

Bed management optimization web page would be to improve the efficiency and effectiveness of managing beds within a healthcare facility. This can be achieved by providing real-time data on bed availability, patient status, and hospital capacity, allowing healthcare professionals to make informed decisions and optimize bed utilization.

Some potential benefits of such a web page could include:

Improved patient outcomes: By having access to real-time data on bed availability, healthcare providers can promptly assign beds to patients, ensuring that they receive timely and appropriate care. This reduces waiting times, enhances patient flow, minimizes the risk of delays or complications and potentially improves patient outcomes.

Reduced costs: Effective bed management can prevent unnecessary hospital admissions or readmissions by ensuring that beds are utilized optimally. This can lead to cost savings for the healthcare facility by reducing unnecessary resource allocation and streamlining patient transitions throughout the care continuum

Increased capacity: a bed management optimization web page can contribute to increased capacity within the healthcare facility. By having a comprehensive overview of bed availability, healthcare providers can identify opportunities to maximize bed utilization, such as managing discharges efficiently or reallocating beds based on patient needs. This proactive approach to bed management helps accommodate more patients, particularly during peak periods, without compromising the quality of care.

Improved data analysis: By capturing and analyzing bed utilization data, healthcare administrators can identify trends, patterns, and bottlenecks in the system. This information can be utilized to implement targeted interventions, streamline processes, and improve overall operational efficiency. Data-driven insights enable healthcare facilities to make evidence-based decisions and continuously optimize their bed management strategies.

Improved Patient Care & Experience: By efficiently managing bed assignments, patients experience reduced waiting times and smoother transitions throughout their healthcare journey. It enhances communication and coordination among healthcare teams, ensuring that patients receive the right care in the right place at the right time. This patient-centric approach enhances satisfaction levels and overall patient experience.

8.2: - Implementation

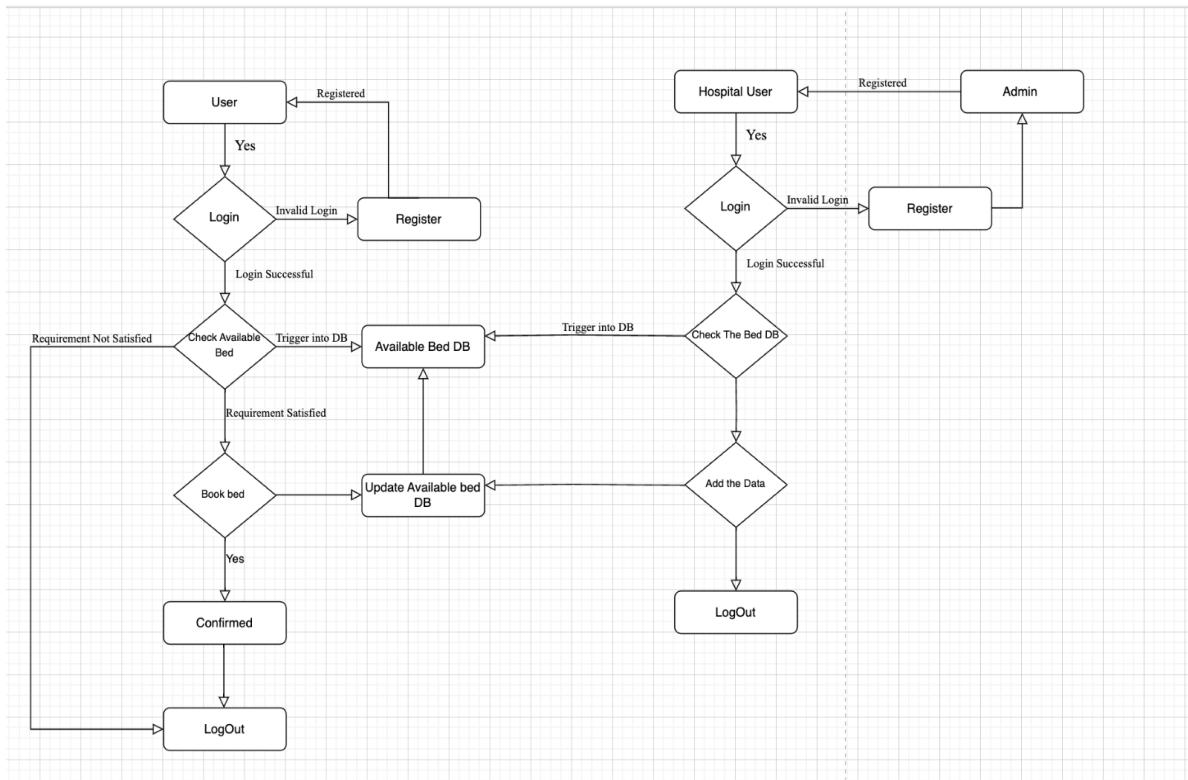


Fig.8.2: - Compound Level Diagram

Chapter-9

RESULTS AND DISCUSSIONS

9.1: - Functional detailed of website(webpage)

Sl.no	Module Name	Application Role	Description
1	Registration	User Hospital	<p>User: The registration process allows new patients or users to create a profile within the bed management system by providing their necessary details. This ensures their information is securely stored and enables them to actively participate in the system's functionalities and services.</p> <p>Hospital: The registration process is via Requesting the Admin, Where Admin Register the Hospital User in Hospital User database, creating the new profile within the bed management system. And enables them to actively participate in the system's functionalities and services.</p>

2	Login	Admin User Hospital	<p>Admin: Can login using unique Id and Password after this system shall show a profile with links to maintain the website.</p> <p>User: Can login using unique Id (SRFID) and DOB after this system shall show his/her profile.</p> <p>Hospital: Can login using email id and Password after this system shall show the Hospital User profile.</p>
3	Add Data	Hospital	<p>The Hospital User can securely log in, access the Hospital User interface, update bed availability data, and ensure that the system reflects the most accurate and up-to-date information regarding available beds in the hospital.</p>

Sl.no	Module Name	Application Role	Description
4	Book bed slot	User	After login process, the system enables users/patients to securely access the system, browse available bed options, and make bookings based on their specific requirements. The system maintains accurate records of patient bookings and ensures the availability of real-time information for both users and hospital administrators.
5	Available Bed	Triggered	Real-time bed tracking is a comprehensive system that allows healthcare facilities to monitor and manage bed availability in real time. By utilizing advanced technologies and data-driven approaches, this system provides up-to-date information on bed occupancy, availability, and patient status

Table 9.1: - Functional detailed of website

9.2 Feasibility Study

In the project analysis phase, the feasibility of a project is evaluated to determine whether it is worth pursuing. This involves conducting a feasibility study that assesses the viability of the project in terms of financial, technological, and operational factors. The goal of the feasibility study is to determine whether the proposed project is feasible and whether it will be a benefit or a burden to the company.

Key considerations involved in the feasibility analysis are:

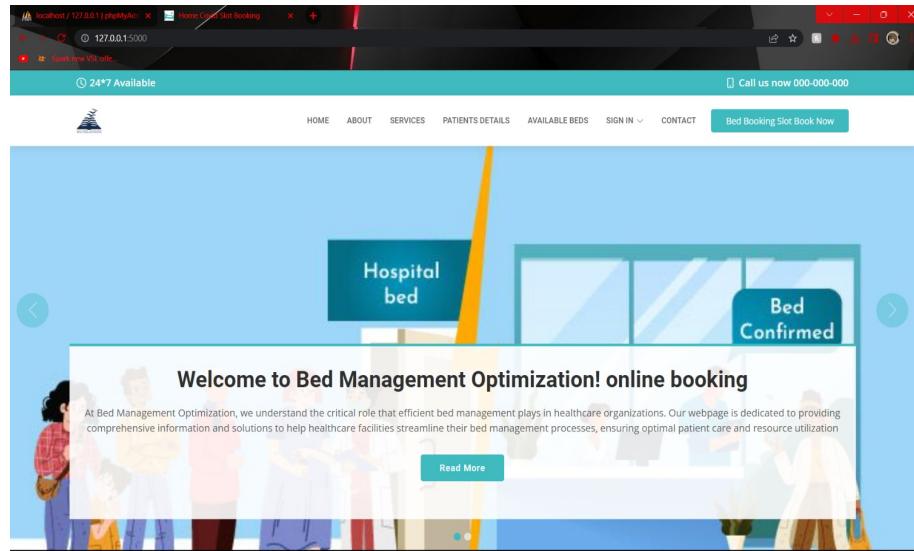
1. **Economic Feasibility:** This aspect evaluates the financial viability of the project. It involves assessing the costs and benefits associated with developing and implementing the bed management optimization system. Cost estimates are prepared, including expenses for hardware, software, infrastructure, personnel, and ongoing maintenance. The potential benefits, such as improved efficiency, reduced costs, and increased patient satisfaction, are also evaluated to determine if the project is economically feasible.
2. **Technical Feasibility:** The technical feasibility analysis focuses on the organization's existing technological infrastructure and capabilities. It examines whether the required hardware, software, and technical resources are available or can be acquired to support the implementation of the bed management optimization system. Compatibility with existing systems, integration requirements, and the availability of skilled personnel are assessed to determine if the project is technically feasible.
3. **Operational Feasibility:** This aspect evaluates the impact of the proposed system on the organization's operations and processes. It considers the organization's readiness and willingness to adopt the new system and any potential resistance to change. Operational feasibility assesses if the system aligns with the organization's workflow, if staff members can adapt to the new processes, and if it will ultimately improve operational efficiency and effectiveness.

Requirements Understanding: To conduct a thorough feasibility analysis, a clear understanding of the major requirements for the bed management optimization system is necessary. This includes identifying the key functionalities, data management requirements, user roles and permissions, and integration needs. Understanding these requirements helps in assessing the feasibility of the proposed system and its alignment with the organization's needs.

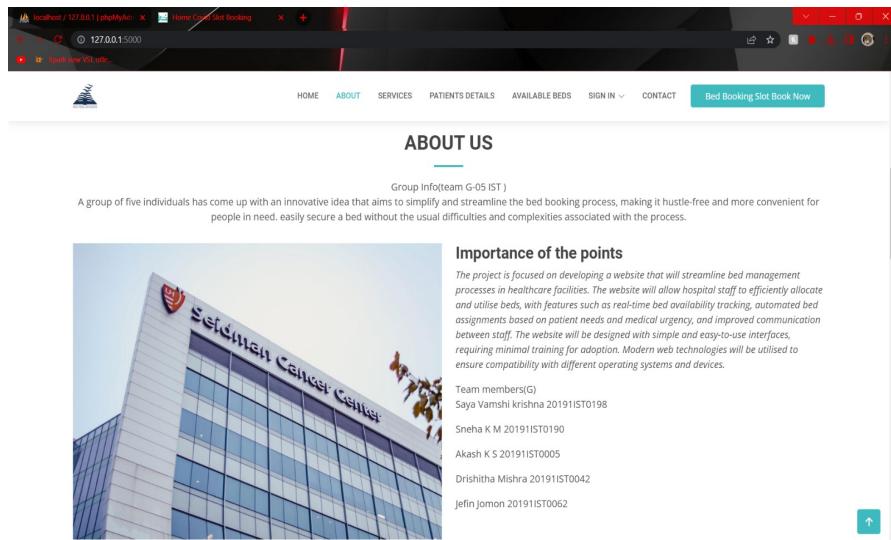
Based on the findings of the feasibility analysis, a business proposal is developed, outlining the general plan for the project and providing cost estimates. This proposal serves as a foundation for decision-making and helps determine whether to proceed with the development and implementation of the bed management optimization system.

Overall, the feasibility analysis phase is crucial in ensuring that the proposed bed management optimization system is practical, beneficial, and aligns with the organization's requirements and capabilities. It provides valuable insights to stakeholders and decision-makers, enabling them to make informed decisions regarding the project's feasibility and viability.

9.3: - Screenshots



9.3.1 Home Page



9.3.1 About Page

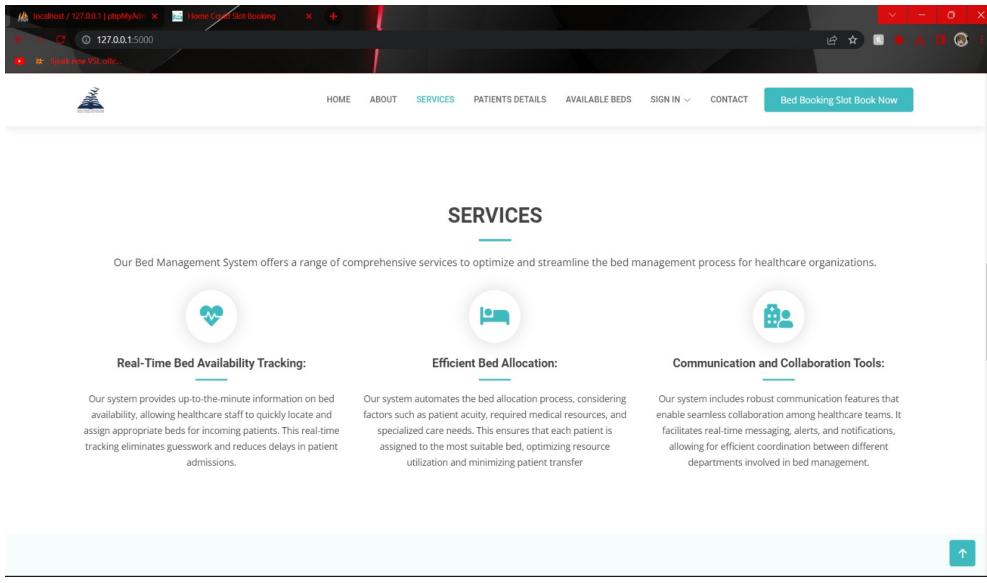


Fig. 9.3.3 Services Page

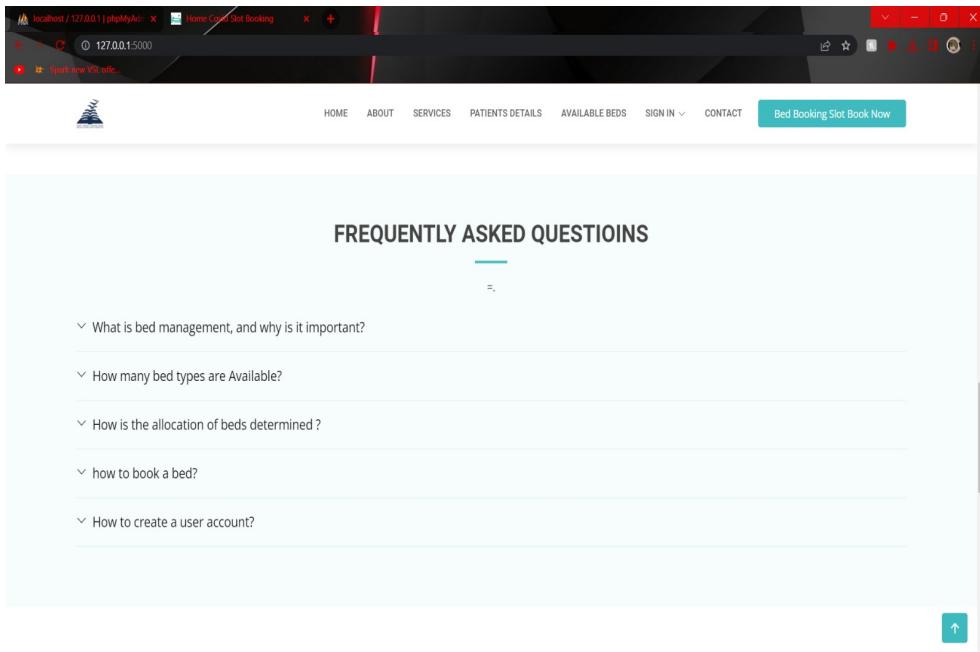


Fig 9.3.4 Frequently Asked Questions Page

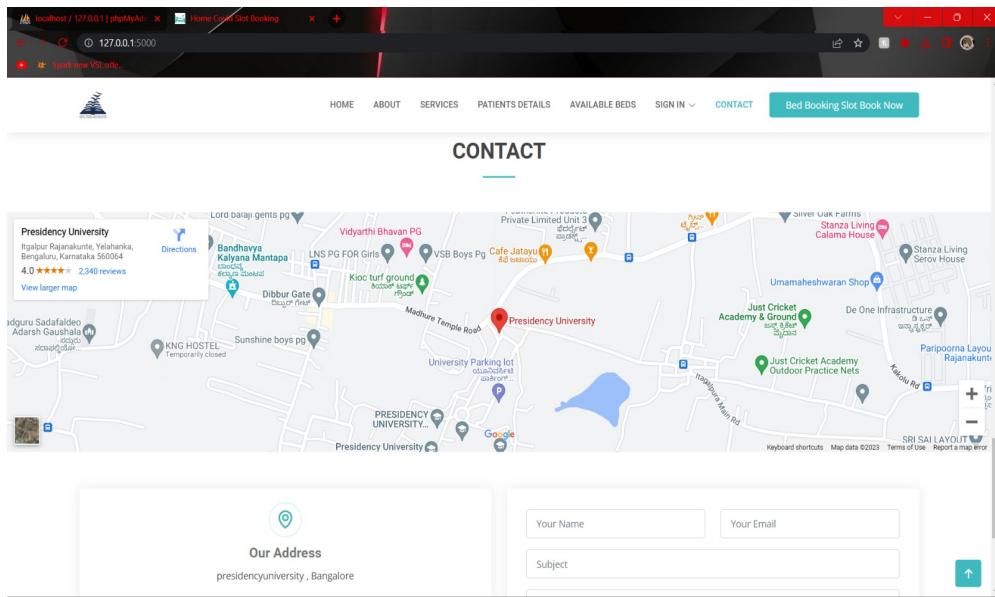


Fig 9.3.5 Contact Us page

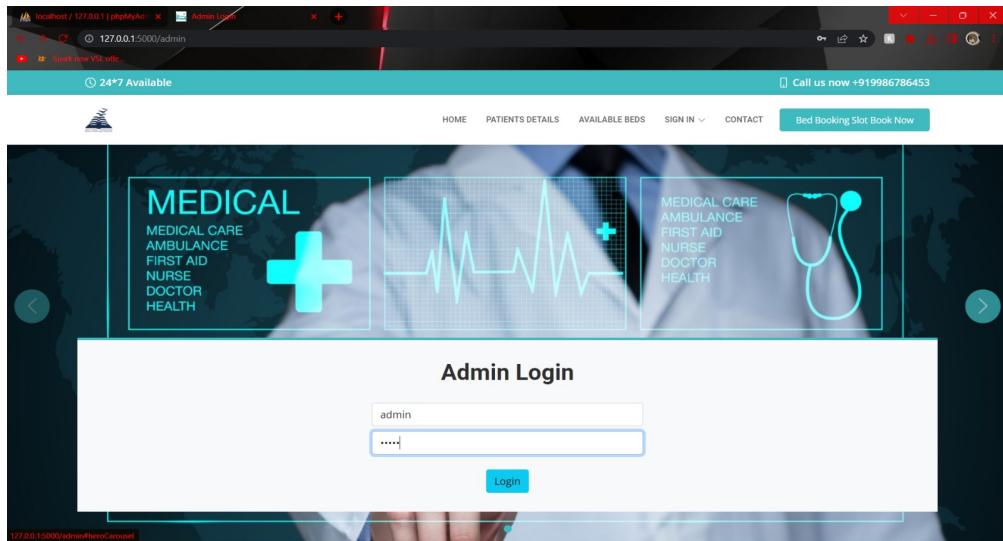


Fig 9.4 Admin Login Page

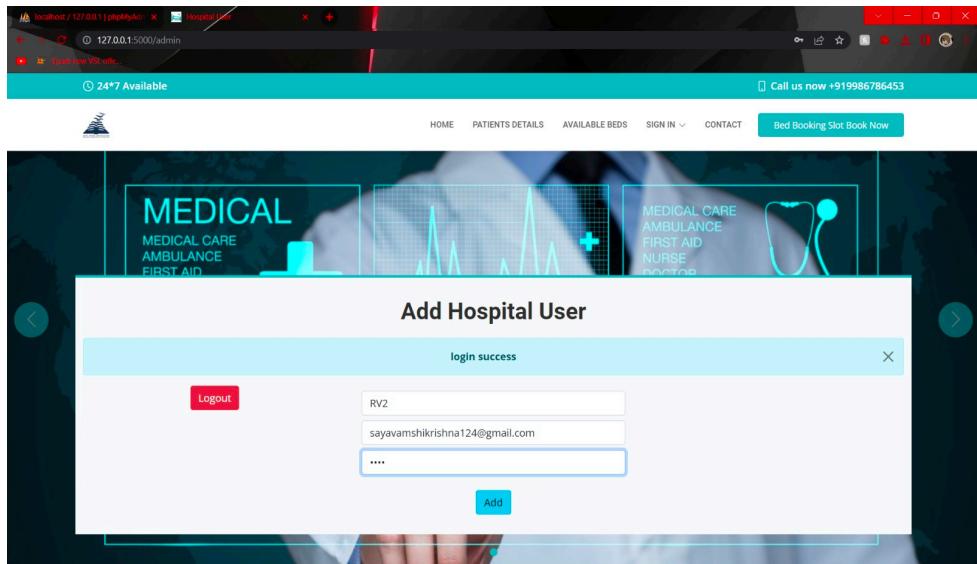


Fig 9.4.1 Admin User page

A screenshot of a web browser window titled "Triggers". The URL is "127.0.0.1:5000/triggers". The page has a teal header with the text "24*7 Available", "Call us now +919986786453", and a "Bed Booking Slot Book Now" button. Below the header is a navigation bar with links for "HOME", "PATIENTS DETAILS", "AVAILABLE BEDS", "SIGN IN", and "CONTACT". A central table titled "Triggered Data" is displayed, showing the following information:

Hospital Code	Normal Bed	HICU Bed	I.C.U Bed	Ventilator Bed	Action	DATE
RV2.	40	35	28	15	INSERTED	2023-05-21
RV2	40	35	28	15	DELETED	2023-05-21
RV2	50	40	30	20	INSERTED	2023-05-21
RV2	50	40	30	10	UPDATED	2023-05-21

Fig 9.5 Available Bed Data

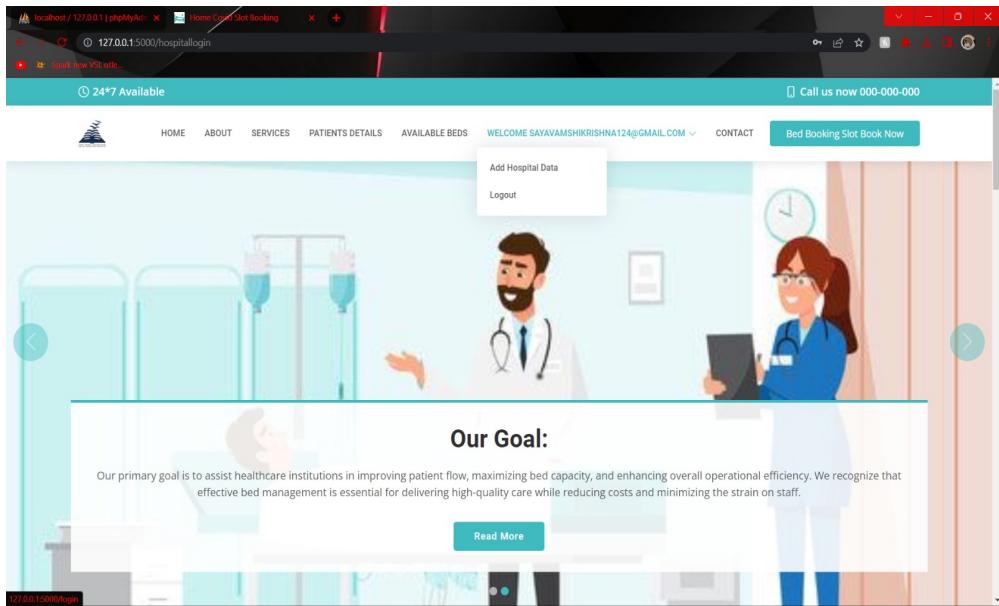


Fig 9.6.1 Hospital User Interface Page

A screenshot of a web browser showing a form to add hospital data. The URL is 127.0.0.1:5000/adhospitalinfo. The page has a header with a "Call us now +919986786453" link. It features a main title "Add Hospital Data" above two input forms. The left form is titled "Covid Care Center" and includes fields for "Hospital Code : RV2", "Enter Hospital Name", "Normal Bed Available?", "H.I.C.U Bed Available?", "I.C.U Bed Available?", and "Ventilators Bed Available?". An "Add" button is at the bottom. The right form is titled "Hospital Data" and lists fields for "Hospital Code:", "Hospital Name:", "Normal Beds Available:", "H.I.C.U Beds Available:", "I.C.U Beds Available:", and "Ventilators Beds Available:". A checkbox is checked next to the first field. A background image of a medical professional in blue gloves is visible.

Fig 9.6.2 Add Hospital Data

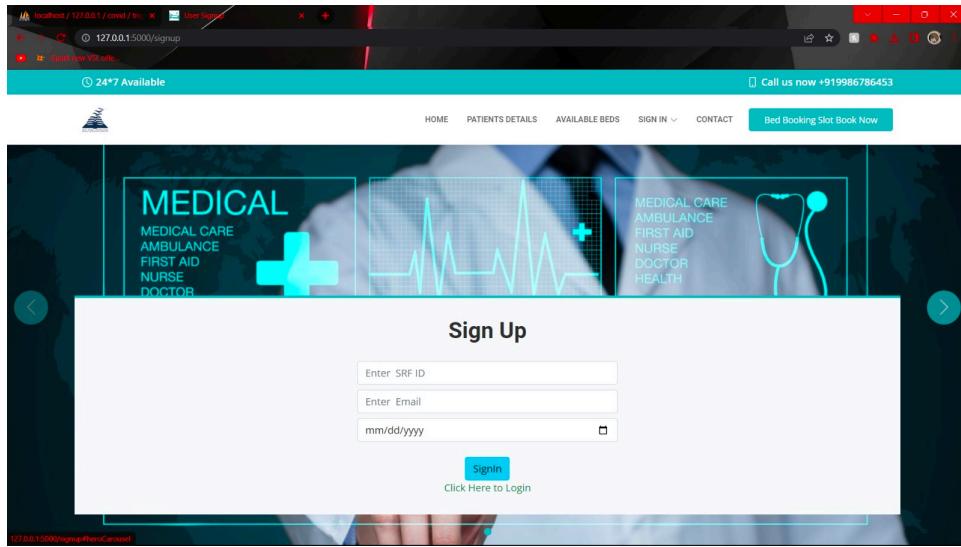


Fig 9.7.1 User Sign Up Page

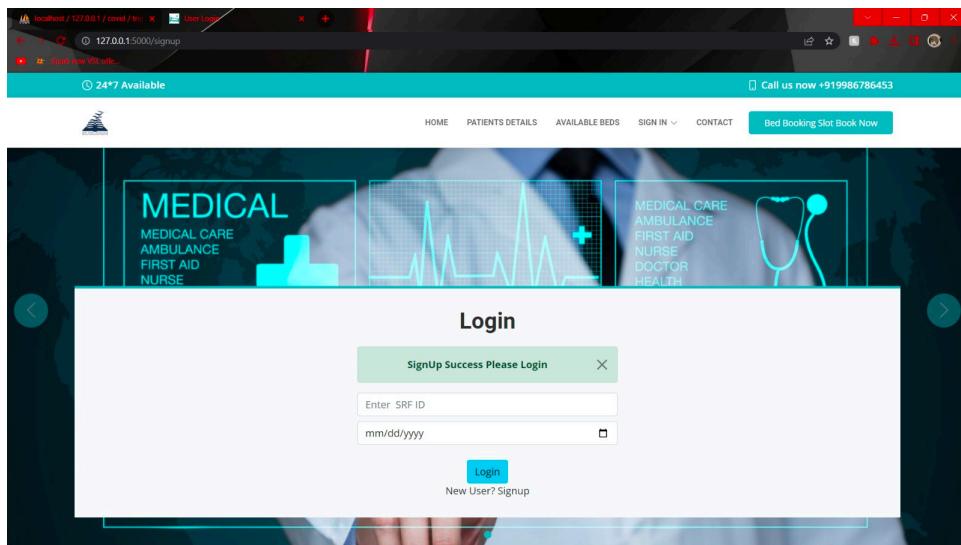


Fig 9.7.2 User Login Page

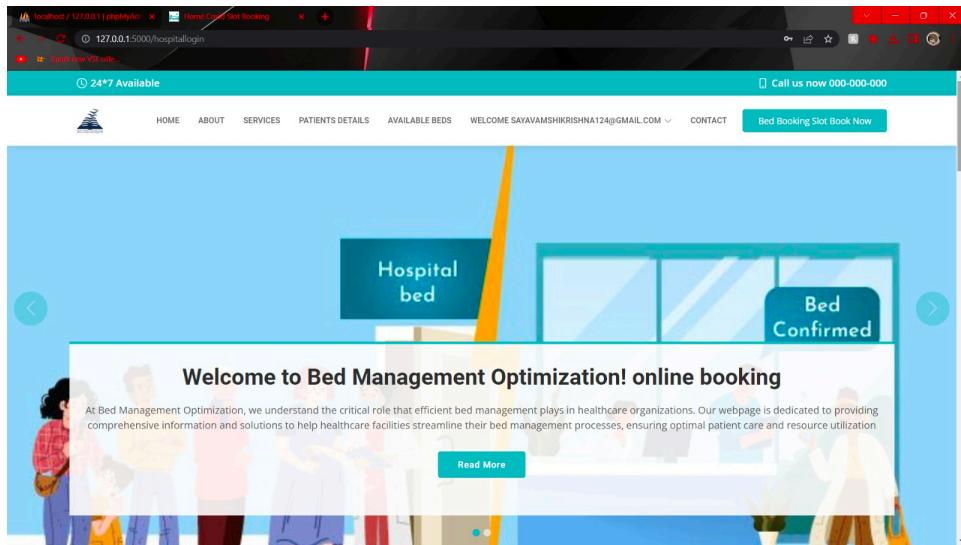


Fig 9.7.3 User Interface Page

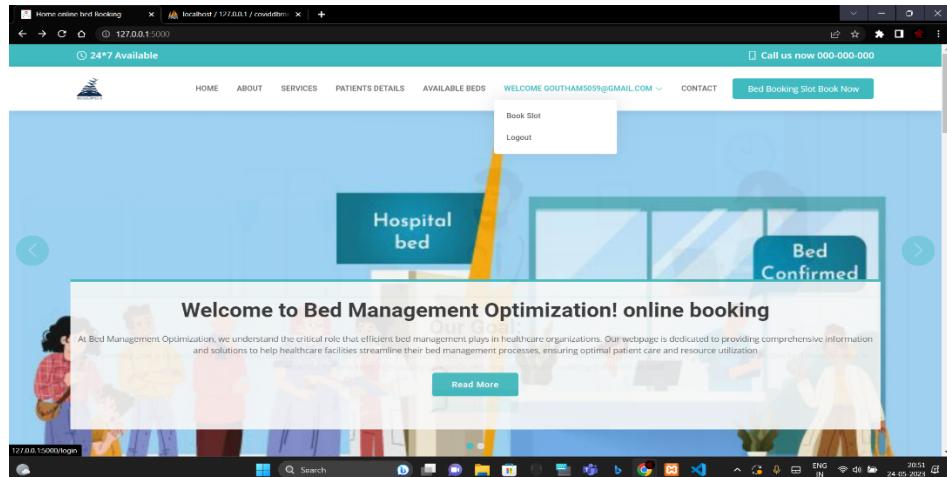


Fig 9.7.4 Book Slot

Hospital Code	Hospital Name	Normal Bed	HICU Bed	I.C.U Bed	Ventilator Bed
Mv3	archarya	36	20	20	8
TH2	murthy	40	9	10	8
FC2	murthy hospital	14	4	7	3

Fig 9.7.5 Bed Booking Process

Chapter-9

CONCLUSION

Bed management optimization is crucial for hospitals to ensure efficient and timely patient care. The online web page dedicated to bed management optimization serves as a valuable tool for healthcare organizations seeking to enhance their bed management processes. By offering real-time access to bed availability information, patient flow data, and predictive analytics, this web page empowers healthcare providers to make informed decisions regarding patient care and resource allocation.

With the features and resources available on this web page, healthcare organizations can streamline their operations and improve overall efficiency. By closely monitoring bed availability in real time, hospitals can better manage patient admissions, transfers, and discharges, ensuring that beds are utilized optimally. This not only reduces delays and wait times but also maximizes the capacity of the hospital, allowing for the efficient utilization of resources.

The web page provides healthcare providers with access to comprehensive data and analytics related to bed management. By analyzing patient flow patterns, occupancy rates, and other relevant metrics, hospitals can identify bottlenecks, predict high-demand periods, and make proactive adjustments to their bed allocation strategies. This enables hospitals to proactively manage bed availability, anticipate resource needs, and deliver timely care to patients.

By optimizing bed management processes through the web page, healthcare organizations can also reduce costs. Efficient bed allocation and utilization minimize the need for additional beds or unnecessary transfers, resulting in financial savings. Additionally, streamlined operations and improved patient flow contribute to shorter hospital stays and decreased resource consumption.

In summary, a well-designed bed management optimization web page empowers healthcare organizations to streamline their operations, reduce costs, and enhance the overall quality of care provided to patients. By leveraging real-time data, predictive analytics, and efficient resource allocation, hospitals can achieve optimal bed management, improving patient outcomes and maximizing the utilization of resources.

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