Tribhuvan University

Faculty of Humanities and Social Sciences

HOSPITAL APPOINTMENT SYSTEM

A PROJECT REPORT

Submitted to

Department of Computer Application

National College

In partial fulfillment of the requirements for the Bachelors in Computer Application

Submitted by

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SUPERVISOR'S RECOMMENDATION

I hereby recommend that this project prepared under my supervision by Ashish Khadka entitled "Hospital Appointment System" in partial fulfillment of the requirements for the degree of Bachelor of Computer Application is recommended for the final evaluation.

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LETTER OF APPROVAL

This is to certify that this project prepared by Ashish Khadka entitled "**Hospital Appointment System**" in partial fulfillment of the requirements for the degree of Bachelor's in computer application has been evaluated. In our opinion it is satisfactory in the scope and quality as a project for the required degree.

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ABSTRACT

The hospital appointment system is a vital component of healthcare management, streamlining the process of scheduling and managing patient appointments. This system plays a crucial role in optimizing the utilization of healthcare resources, improving patient satisfaction, and enhancing overall efficiency within the healthcare facility. Through the implementation of advanced Linear searching algorithms and integrated electronic health records, the system facilitates seamless communication between healthcare providers and patients. Patients can conveniently book appointments online, receive automated reminders, and access their medical information, contributing to a more patient-centric and responsive healthcare experience. Additionally, the system aids healthcare providers in maintaining an organized and efficient schedule, reducing wait times, and ensuring that medical professionals can allocate their time effectively. Overall, the hospital appointment system represents a key technological advancement in healthcare administration, promoting accessibility, efficiency, and patient engagement.

ACKNOWLEDGEMENT

LIST OF ABBREVIATIONS

DFD   Data Flow Diagram

ER   Entity Relationship Diagram

EHR   Electronic Health Record

JVM   Java Runtime Environment

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CHAPTER 1: INTRODUCTION

1.1 Introduction

The project Hospital Appointment System includes registration of patients, storing their details into the system. The software has the facility to give a unique id for every patient and stores the details of every patient and the staff automatically. It includes a search facility to know the current status of each room. User can search availability of a doctor and the details of a patient using the id. The Hospital Appointment System can be entered using a username and password. It is accessible by an administrator. Only he/she can add user data into the database. The data can be retrieved easily. The interface is very user-friendly. The data are well protected for personal use and makes the data processing very fast. Hospital Appointment System is designed for multispecialty hospitals, to cover a wide range of hospital administration and management processes. It is an integrated end-to-end Hospital Appointment System that provides relevant information across the hospital to support effective decision making for patient care in a seamless flow. Hospital Appointment System is a software product suite designed to improve the quality and management of hospital appointment in the areas of clinical process analysis. Hospital Appointment System enables you to develop your organization and improve its effectiveness and quality of work. Managing the key processes efficiently is critical to the success of the hospital helps you manage your processes.

1.2 Problem Statement

This system is mainly developed for proper management of hospitals. The health of any person is far more important than any other basic needs. The hospital, doctor has a huge responsibility to save a life of person. The doctor and hospital responsibility would be better if a system can track the history of patient and overall place of hospital. A person life could be saved if hospital can be managed effectively and if hospital failed to manage then, the death rate will be high. Even the reputation of hospital will be low. Therefore, a solution to this problem would be to track the overall situation of hospital, patient history, called Hospital Appointment System.

- Unmanaged patient Logging and Tracking system due to which there may be loss of life.

- Manual data record of patient
- Unmanaged hospital management tracking system
- Error prone Appointment System

1.3 Objectives

The main objectives of the Hospital Appointment System are listed below:

- Recording information about the Patients that come.
- Recording information related to diagnosis given to patients.
- For selecting doctor of the hospital and create an appointment with the doctor.
- Reduce manual workload for administrators.
- Improve timely facility by simplifying appointments.

1.4 Scope and Limitation

1.4.1 Scope
The Scope of this project will be limited to the following:

- The application requires very fewer time factors as compared to manual system.
- The application will provide fast and efficient automated environment instead of slow and error prone manual system, thus reducing both time and manpower spent in running the system.
- Can be implemented in Hospital, clinic and etc. by the owner.
- Can help in preparing reports for higher-ups in decision making.

All this work is done manually by the receptionist and other operational staff and lot of papers are needed to be handled and taken care of. Doctors have to remember various medicines available for diagnosis and sometimes miss better alternatives as they can't remember them at that time.

1.4.2 Limitation
While the Hospital Appointment System strives to enhance user experience, it is important to note that the system's effectiveness relies on network connectivity. Users

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without internet access may face limitations in utilizing certain features, such as real-time getting doctor's prescription.

1.5 Development Methodology

We developed this system for the appointment based on the agile model. Regardless of this, it was necessary to mention and consider certain models including the following generic software development models:

- Agile Model: Agile is an iterative and incremental software development approach that prioritizes collaboration and adaptability. It emphasizes delivering functional software in short cycles called sprints. Agile development welcomes changing requirements, encourages customer feedback, and focuses on continuous improvement. Scrum and Kanban are popular Agile frameworks.

- Spiral Model: The Spiral Model combines elements of the Waterfall Model and iterative development. It involves multiple iterations, each building on the previous one, and incorporates risk assessment and mitigation at each stage. The model is ideal for large, complex projects where risks need constant evaluation, but it may be resource-intensive and time-consuming.

- V-Model (Verification and Validation Model): The V-Model is an extension of the Waterfall Model, where each development stage has a corresponding testing phase. It emphasizes the importance of testing at every step to ensure high-quality software. The model ensures that software requirements are thoroughly validated and that the final product meets the expected quality standards.

- Incremental Model: The Incremental Model divides the development process into smaller, manageable increments. Each increment represents a functional part of the software. Developers build and deliver these increments in successive iterations. This approach allows for faster delivery of essential functionalities, but it may require careful planning to integrate different increments effectively.

- RAD (Rapid Application Development): RAD is a fast-paced, iterative model that focuses on prototyping and quick feedback. It is well-suited for projects with rapidly changing requirements. RAD emphasizes user involvement and produces functional prototypes quickly to gather user feedback and refine the software incrementally.

The Waterfall Methodology for software development

The Hospital Appointment System will be built based on the waterfall model, which is a traditional project management approach that follows a sequential, linear progression through distinct phases of a project. The model is suitable for projects with well-defined requirements and minimal changes.

Phases of Waterfall Methodology:

- Requirements Gathering: The project requirements are identified and documented in detail.
- System Design: The system architecture, modules, and components are designed based on the requirements.
- Implementation: The system is developed and implemented according to the design specifications.
- Testing: The system is thoroughly tested to ensure its functionality, reliability, and adherence to requirements.
- Deployment: The fully tested system is deployed and made operational in the production environment.
- Maintenance: Ongoing maintenance and support activities are carried out to address issues and implement enhancements.

Why Waterfall Methodology?

- Clear Structure: The waterfall methodology provides a clear and well-defined structure for project execution, with distinct phases and deliverables. This ensures that each phase is completed before moving on to the next, promoting a systematic and organized approach.

- Predictability: The linear nature of the waterfall methodology allows for better predictability in terms of project timelines, costs, and scope. With requirements being defined upfront, there is greater clarity and visibility into the project's progress and outcomes.

- Documentation Emphasis: The waterfall methodology emphasizes documentation throughout the project lifecycle. Each phase generates documentation, including requirements specifications, design documents, test plans, and user manuals. This documentation aids in knowledge transfer, future maintenance, and traceability of decisions made during the project.

- Early Identification of Risks: Since the requirements are defined at the beginning, the waterfall methodology facilitates early identification of potential risks and challenges. This allows for better risk management and mitigation strategies to be implemented during the subsequent phases.

- Well-suited for Stable Requirements: The waterfall methodology is particularly suitable when project requirements are stable and well-understood. It works best when the scope is well-defined and unlikely to change significantly during the project.

- Client Visibility and Approval: The waterfall methodology encourages client involvement and provides opportunities for regular review and approval at the end of each phase. This allows clients to have visibility into the progress and provide feedback before proceeding to the next phase.

- Comprehensive Testing: The waterfall methodology incorporates testing as a dedicated phase, ensuring that the system is thoroughly tested before deployment. This helps identify defects and issues early in the project lifecycle, reducing the risk of major problems emerging at later stages.

- Well-suited for Large-Scale Projects: The waterfall methodology is often considered suitable for large-scale projects with complex requirements, as it provides a structured approach for managing and coordinating different aspects of the project.

This software methodology has been illustrated below in the figure:
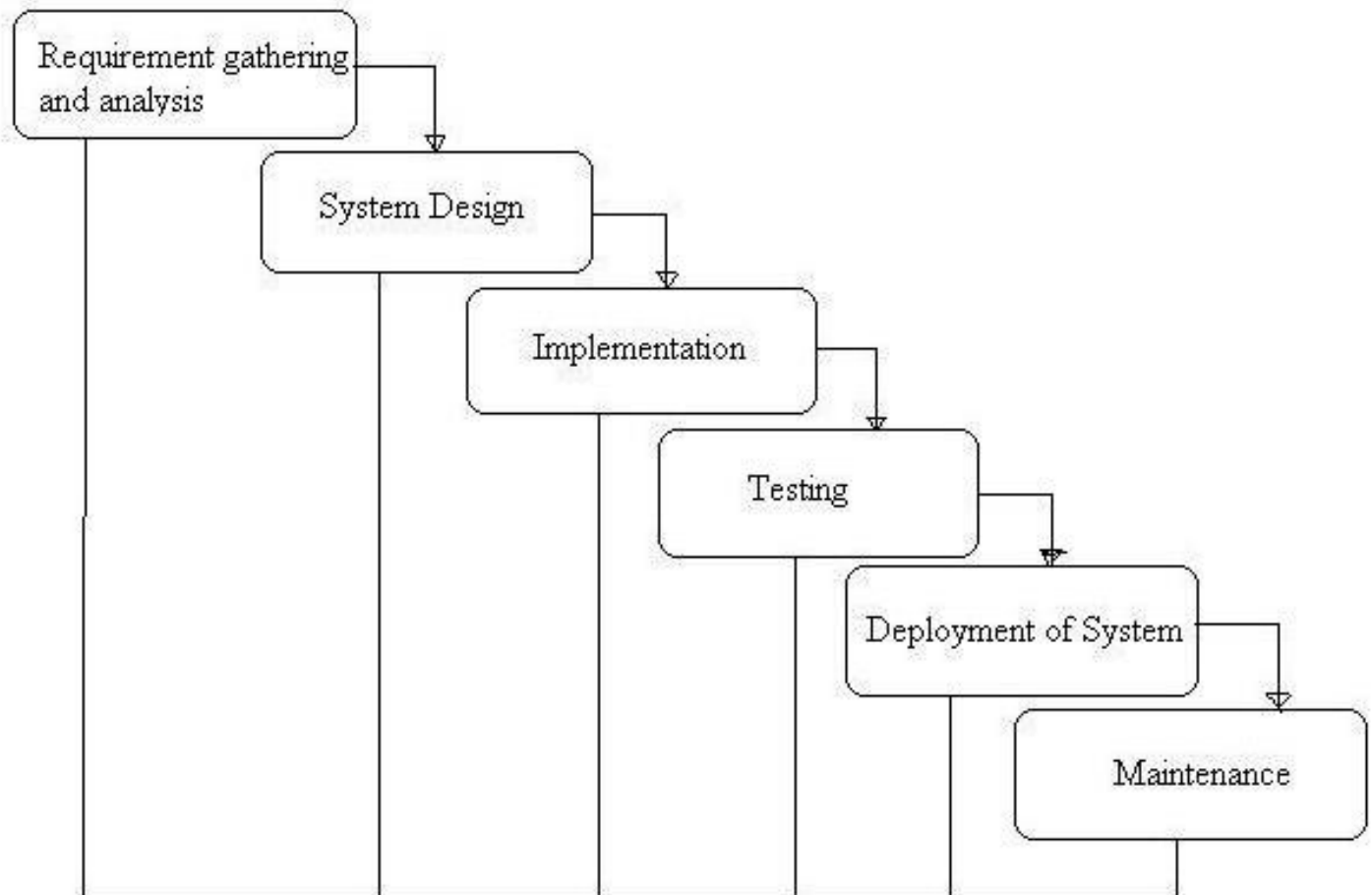
Figure 1 Waterfall Model Design

1.6 Report Organization

The structure of this report is designed to provide a logical and coherent flow of information for readers.

Chapter 1 Introduction: Highlights

Shows the background and overview, problem statement, objectives, scope and limitations of the project. Problem statement highlights the project for which the project was developed. This section is theoretical, and research based. The project objectives, scope and limitations are discussed.

Chapter 2 Background Study and Literature Review: Highlights

Defines and describes Background Study and literature review about existing systems along with their advantages and disadvantages.

Chapter 3 System Analysis and Design: Highlights

Presents the System Analysis and Design including Requirement Analysis and Feasibility Analysis. Requirement Analysis explains the Functional and Non-Functional Requirements of the project and Feasibility Analysis explains why/how the project is implemented.

Chapter 4 Implementation and Testing: Highlights

Presents the Implementation and Testing, it clarifies the system workflow, and provides an indication of how the system is implemented, and what tools/platforms have been used.

Chapter 5 Conclusion and Future Recommendations: Highlights

Presents the Conclusion and Recommendation, it marks an end to the documents by summing up the entire project and by opening a door for future research mentioning future enhancements that can be carried out on the system. This chapter summarizes the findings, discusses the project's implications, and suggests areas for future enhancements.

CHAPTER 2: BACKGROUND STUDY AND LITERATURE REVIEW

2.1 Background Study

The development of a hospital appointment system requires a comprehensive background study to effectively address the complex and critical aspects of healthcare scheduling. This project entails understanding the intricacies of healthcare processes, including the diverse types of appointments and their unique requirements. Stakeholder analysis is essential to identify the needs of patients, healthcare providers, administrative staff, and IT administrators. Compliance with healthcare regulations, such as HIPAA, must be a priority to ensure the security and confidentiality of patient data. An examination of existing appointment systems reveals potential challenges and opportunities for improvement, with a focus on patient experiences and feedback. Integration with other hospital systems, such as EHR and billing, demands attention to streamline workflows. Exploring the technological landscape of healthcare software development, including considerations for telemedicine and mobile applications, is crucial. Security and privacy concerns surrounding sensitive patient information necessitate robust measures like encryption and access controls. UI/UX design considerations must accommodate the varied needs of both administrative staff and patients, promoting a positive and accessible user experience. Scalability planning and future expansion considerations, along with an awareness of budget constraints, round out the essential elements of this comprehensive background study, providing a solid foundation for the successful implementation of a hospital appointment system.

2.2 Literature Review

2.2.1 Introduction

In the dynamic landscape of modern healthcare, the efficient management of hospital appointment stands as a critical component in ensuring timely and effective patient care. Appointment scheduling not only plays a pivotal role in optimizing resource utilization within healthcare facilities but also directly impacts the overall patient experience. As healthcare systems continue to evolve, there is an increasing recognition of the need for sophisticated and technologically-driven solutions to streamline appointment processes, enhance patient accessibility, and improve the overall efficiency of healthcare delivery. This literature review delves into the research and existing literature related to appointment system to understand its evolution, key features, benefits, challenges, and future trends. In this section we are going to discuss the fundamentals of a similar existing system. Here we are going to compare ourselves with "Epic Systems" which is one of the most popular electronic health record (EHR) system. Epic Systems is a leading healthcare software company that provides a suite of integrated software solutions to hospitals, clinics, and other healthcare providers. Epic's software is used by over 2,500 organizations in the United States and around the world. Epic's primary offering is its electronic health records (EHR) system, known as EpicCare.

EpicCare is an integrated software suite designed to support various healthcare functions, including clinical workflows, patient records, scheduling, billing, and more.

Some of the key features of EHR include:

1. **Manage patient records:** Epic's electronic health record (EHR) system allows providers to store and manage patient records in a secure, electronic format. The EHR system provides a comprehensive view of a patient's medical history

2. **Care coordination**: Epic supports care coordination by providing tools for clinicians to track patient progress, communicate with other providers, and manage referrals

3. **Billing**: Epic's billing system automates the billing process, making it easier for healthcare organizations to collect payments from patients and insurance companies.

4. **Denial management**: Epic can help to reduce denials by identifying potential problems with claims before they are submitted.

5. **Population health analytics**: Epic includes tools for analyzing population health data to identify trends and improve care.

2.2. 2 Evolution of Hospital Appointment System

The evolution of hospital appointment systems has witnessed a transformative journey from manual, paper-based processes to sophisticated, technology-driven solutions. In the early stages, appointment scheduling relied heavily on manual record-keeping, leading to inefficiencies, scheduling errors, and prolonged waiting times. With the advent of computerization in healthcare, the first electronic appointment systems emerged, streamlining some processes but often lacking the integration needed for comprehensive healthcare management. In recent years, the evolution has been marked by the integration of Electronic Health Records (EHR), patient portals, and advanced scheduling algorithms. These modern systems offer seamless appointment booking, real-time availability, and improved patient engagement.

2.2.3 Key Features of Hospital Appointment Systems:

Various research studies have highlighted the essential features of an effective appointment system, including:

- Real-Time Availability: Enables real-time visibility into available time slots for appointments.
- Patient Database: Stores and manages patient information, including contact details, medical history, and insurance information.
- Seamless Data Flow: Integrates with EHR systems for streamlined access to patient records and relevant medical information.
- Video Conferencing: Provides secure and HIPAA-compliant video conferencing tools.
- Check-In Systems: Enables patients to check in digitally upon arrival.

2.2.4 Benefits of Implementing Hospital Appointment Systems:

Research has consistently shown that the adoption of appointment system provides numerous benefits to patients, including:

- Enhanced Efficiency: Automates the appointment scheduling process, reducing the workload on administrative staff and minimizing scheduling errors.

- Online Access: Provides patients with online portals or mobile apps for easy access to their appointment details, medical records, and communication with healthcare providers.

- Automated Workload Monitoring: Monitors provider workloads to ensure optimal scheduling and patient care delivery.

- Secure Communication: Facilitates secure communication channels between patients and healthcare providers, maintaining confidentiality.

- Reporting and Analytics: Provides insights into appointment trends, patient flow, and resource utilization through reporting and analytics tools.

2.2.5 Challenges in Implementing Hospital Appointment Systems:

While appointments systems offer significant advantages, its implementation may face certain challenges, such as:

- HIPAA Compliance: Meeting regulatory requirements, such as the Health Insurance Portability and Accountability Act (HIPAA), is critical for protecting patient data and ensuring compliance with privacy regulations.

- Staff Resistance: Healthcare professionals and administrative staff may resist adopting new technologies and workflows, leading to challenges in system acceptance and utilization.

- Data Migration: Transferring data from legacy systems to the new appointment system can be challenging, risking data integrity and consistency

- System Downtime: Technical glitches or system downtime can disrupt appointment scheduling and cause inconvenience to both staff and patients.

2.2.6 Future Trends in Hospital Appointment Systems:

Looking ahead, several trends are shaping the evolution of hospital appointment systems:

- AI-Powered Scheduling: The integration of artificial intelligence (AI) algorithms will become more prevalent, allowing for intelligent and dynamic appointment scheduling. AI can analyze historical data, predict patient attendance patterns, and optimize scheduling to reduce wait times and improve resource utilization.

- Blockchain for Secure Data Exchange: The adoption of blockchain technology in healthcare appointment systems will enhance security and privacy. Blockchain can facilitate secure and transparent sharing of patient data across different healthcare entities, ensuring data integrity and compliance with privacy regulations.

- Chatbot Assistance and Automated Communication: Chatbots will play a more significant role in assisting patients with appointment scheduling, answering inquiries, and providing information. Automated communication will become more sophisticated, ensuring timely and personalized interactions with patients.

- Predictive Analytics for No-Show Reduction: Predictive analytics will be increasingly used to identify factors contributing to patient no-shows. By analyzing patient data and behavior patterns, healthcare providers can implement personalized interventions and reminders to reduce no-show rates.

2.2.7 Conclusion

The literature reviewed here indicates that Hospital Appointment Systems is essential for enhancing the efficiency and effectiveness of healthcare facilities. This system streamlines administrative tasks, facilitates accurate record-keeping, improves communication among healthcare professionals, and ultimately contributes to better patient care. Hospital Appointment System plays a crucial role in modernizing healthcare delivery, reducing errors, and optimizing overall hospital operations.

CHAPTER 3: SYSTEM ANALYSIS AND DESIGN

3.1 System Analysis

The system analysis phase serves as the bedrock for successful software development, providing a systematic approach to understanding, planning, and defining the scope of the Hospital Appointment System project. Adopting the Waterfall Model as our chosen methodology, the system analysis phase unfolds as a structured, sequential process, emphasizing a meticulous progression through each stage. This phase commences with a thorough exploration of existing hospital appointment systems, seeking inspiration and identifying unique features that can enhance the user experience and operational efficiency. The Waterfall Model's linear progression ensures a well-defined path, allowing for in-depth investigation and comprehensive insights before moving to subsequent phases.

3.1.1 Requirement Analysis

The requirement analysis phase, a key element within the Waterfall Model, was initiated with a thorough examination of existing appointment systems. Insights gained from studying these systems identified unique features that inspired the design of the new Hospital Appointment System. Additionally, a critical observation was made regarding the complexity of previous systems, highlighting the need for simplicity in the user interface and overall functionality. Within the systematic framework of the Waterfall Model, the requirement analysis phase stands as a crucial juncture where the blueprint for the Hospital management System takes shape. This phase follows a meticulous study of existing appointment systems, serving as the initial stepping stone in translating user expectations and operational needs into concrete project requirements.

This phase is not merely a data-gathering exercise but a strategic process that forms the bedrock for subsequent stages. It lays the groundwork for decision-making, allowing the project team to make informed choices about the system's scope, design, and functionality. The insights gathered during requirement analysis crystallize into a roadmap, guiding the development team toward a shared vision that prioritizes user satisfaction and operational efficiency.

I. Functional Requirements

- User must be able to create the appointment between doctor

- User must be able to see the detail record of their treatment

- Doctor should be able to record the patient details

- Admin should be able to insert the record of all the ember that involved in organization
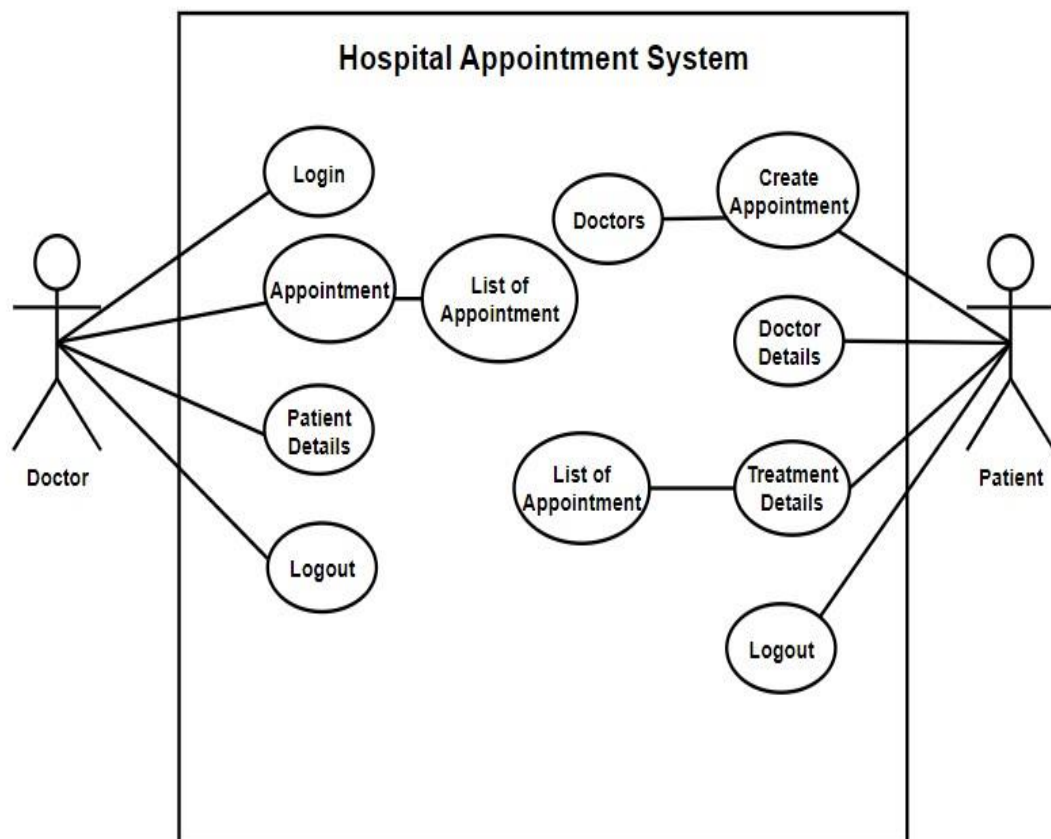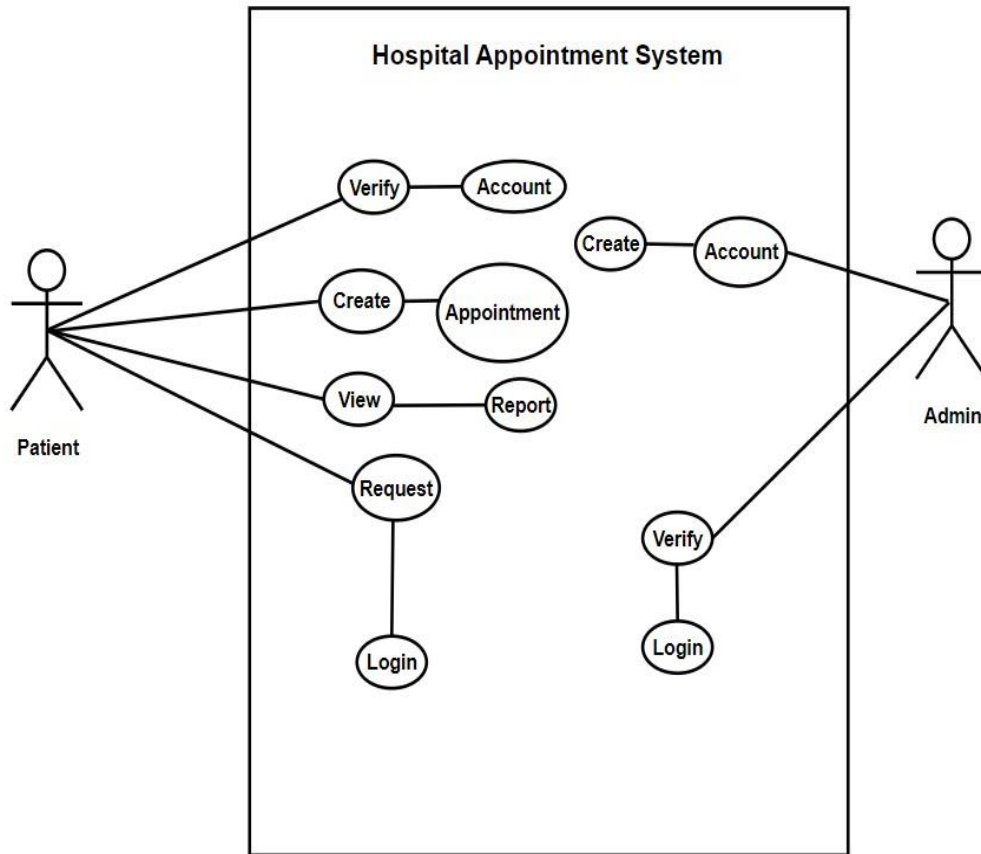

Figure 2: Use Case Diagram

Figure 3: Use Case Diagram

Above use case diagram summarizes the detail of system and the users within the Hospital Appointment System. We can see the events and flow of events in above diagram. Above diagram summarizes how users will be interacting with the system with different events. Other events can be triggered anonymously too. Admin can do special event of managing overall system.

II. Non-Functional Requirements

- **Security:** Software security is an idea implemented to protect software against malicious attacks and other hacker risks so that the software continues to function correctly under such potential risks. Security is necessary to provide integrity, authentication, and availability.

- **Reliability:** Reliability is defined as the probability of failure-free software operation for a specified period in a specified environment. Software Reliability is hard to achieve because the complexity of software tends to be high.

- **Performance:** Performance is an indicator of how well a software system or component meets its requirements for timeliness. Timeliness is measured in terms of response time or throughput. The response time is the time required to respond to a request.

- **Maintainability:** The ease with which a software system or component can be modified to correct faults, improve performance or other attributes, or adapt to a changed environment is known as maintainability.

- **Usability:** Usability refers to the quality of a user's experience when interacting with products or systems, including websites, software, devices, or applications. Usability is about effectiveness, efficiency, and the overall satisfaction of the user.

- **Delivery in time:** Software delivery is the process of deploying an application to the market. The software should be completed within the allotted time and delivered on time.

3.1.2 Feasibility Study

Feasibility study is a report directed management. It evaluates the impact of the proposed changes in the areas. It is an analysis that considers all of project's relevant factors-including economic technical and so on. This evaluation is needed when a project involves a significant investment, so that decision makers can decide whether the project should continue, be altered or cancelled. With the help of feasibility study, we will conduct objective and rational analysis of the strengths and weakness of our proposed system. Our analysis focuses on queries like

- What are user requirements and how will system meet them?
- Workability of objectives and what are its impact to system?
- Problem statements and are they worth solving?
- Does this proposed system define the final system?
- Are there any stated problems and if so, are that worth solving?
- What is the possible outcome and what are other possible alternative outcomes?

This analysis will help us understand our system better and the strategy, design and plan are worth reviewing.

I. Technical Feasibility

This assessment focuses on the technical resources available to the organization. It helps organization determine whether the technical resources meet the capacity and whether the technical team is capable of converting the ideas into working systems. It is planned to implement the proposed system using java language which is portable. It is evident that the necessary hardware and software are available for development and implementation of the proposed system. Hence, the system is technically feasible.

II. Operational Feasibility

This assessment involves undertaking a study to analyze and determine whether and how the organization need can be met by completing the project. Operational feasibility studies also examine how a project plan satisfies the requirements identified in the requirements analysis phase of system development. The proposed system is user friendly which allows user to adapt to the system very quickly. So, in term of cost and service quality, it is acceptable to user. Hence, the system is operationally feasible.

III. Economic Feasibility

This assessment typically involves a cost and analysis of the project, helping organizations determine the viability, cost and benefits associated with a project before financial resources are allocated. It enhances project credibility and helps in decision making to determine the positive economic benefits to the organization that the proposed project will provide. The proposed system is economically feasible. There is no need of spending money as the system constructed by existing tools and devices only. So, both tangible and intangible benefits outweigh cost. Hence, the system is economically feasible

Gantt-Chart

A Gantt chart is a form of bar chart that shows the progress of a project. A Gantt chart, which is widely used in project management, is one of the most popular and useful methods for displaying activities against time. It can also be used to examine a project's start and finish dates in a single graph. Gantt charts were created in our project using Microsoft Excel, as seen in the picture below.

Table 1 Gantt Chart

Week / Stage	1	2	4	6	8	10	12
Requirement Analysis	■						
Designing	■	■	■				
Coding		■	■	■	■	■	
Coding Evaluation		■	■	■	■	■	
Review and Update		■	■	■	■	■	
Testing & Debugging					■	■	■
Documentation	■	■	■	■	■	■	■
Maintenance					■	■	■

3.1.3 Data Modelling: Entity-Relationship (ER) Diagram
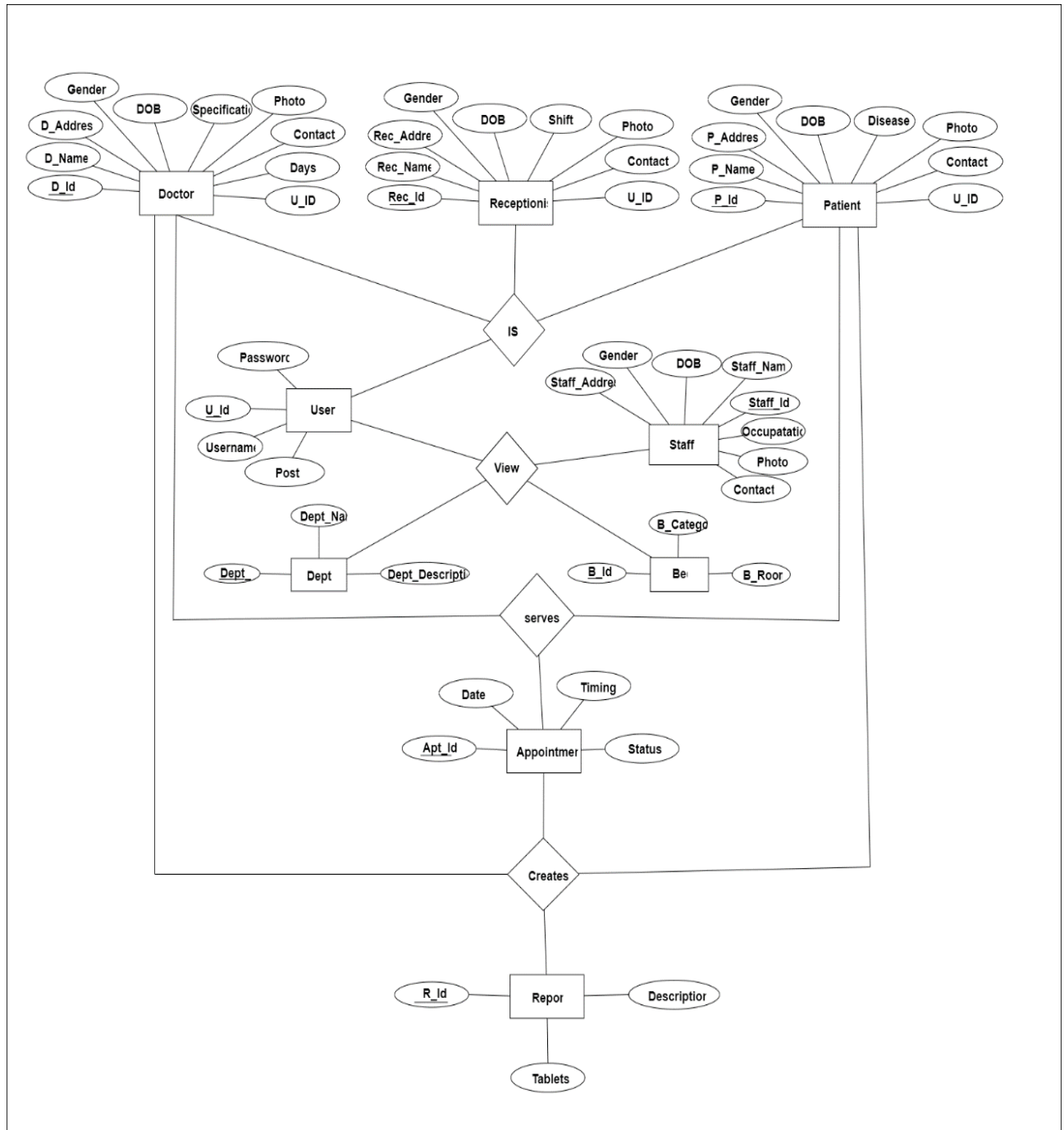
Figure 4: Entity Relationship Diagram

In the Above Entity-Relationship (ER) diagram for Hospital Appointment System have many entities representing key components of the system and relationships between them.

Entities:

- Doctor: Represents individuals who interact with patients.
- Patients: Represents individuals who makes appointment for the checkup.
- Receptionist: Represents individuals who interact with the shifts of doctors for patient's checkup .
- List of Appointment: Represents Patients who interact with the Appointment, with attributes like Patient_ID, Patient name, Disease, Timing, Action for Approval and Declining etc.
- Admin: Represents administrators with similar attributes to users but distinguished by UserType capable of managing Docotrs, Patients, Patient Reports and Appointment.
- Reports : Represents the prescription given by doctor to patient.

Attributes:

- Doctor: Doctor_ID, DoctorName, Specialization, Days, Timing.
- Patient: Patient_ID, PatientName, Gender, Disease, Username.
- List of Appointment: Appointment ID, Patient_id, Patient Name, Age, Disease, Timing, Status, Action for Approval and Declining.
- Admin: Doctor Details, Lower Staff Details, Receptionist Details, Patients Details, Bed Details, Department Details.
- Reports: Name, Age, Gender, Disease, Description, Medicine.

Relationships:

- Doctor-Patient Relationship: Pateint has to book an appointment selecting familiar doctor and as the timing meets than doctor will approve the appointment.
- Receptionist and Staff – User Relationship: Receptionist and Staff makes the shift available and works as an employee under admin.
- Doctor-Report Relationship: Doctor will provide prescription as an report to patient by acknowledging his/her disease.
- Patient-Appointment Relationship: Patient can view doctors listing and make appointment choosing specialized doctor for their disease.

- Doctor-Appointment Relationship: Doctor can view patient appointment and make an report providing description and medicine to take by acknowledging their disease.

3.1.4 Process Modelling: Data Flow Diagram (DFD)

A process model describes the flow of work or activities, usually in a graphic format, that contributes to accomplishing a specific goal. Process models are typically used to represent and analyze a series of activities that occur repeatedly and regularly. A data flow diagram (DFD) is a graphical or visual representation using a standardized set of symbols and notations to describe a business's operations through data movement.

Context level DFD (0 Level)

The 0 Level DFD shows flow of data of the application. DFD Level 0 is also called a Context Diagram. It's a basic overview of the whole system or process being analyzed or modeled.
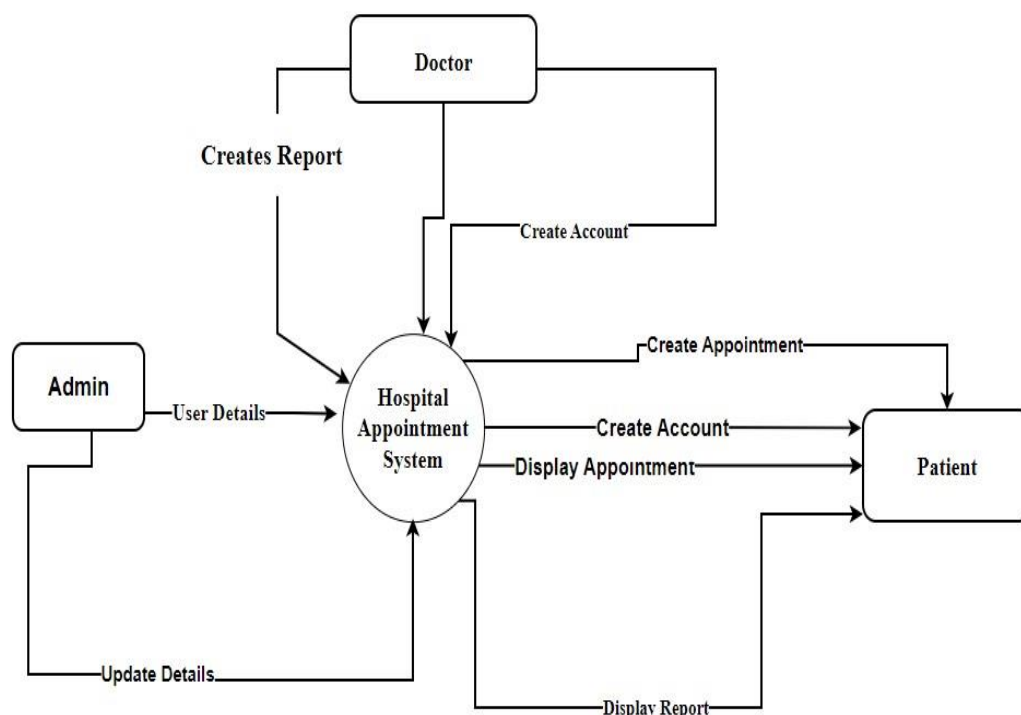
Figure 5: Context Level DFD

In the above Figure, we can see basic overview of Hospital appointment system processing various operations. The Central part defines Hospital management system process as its Core that handles all the operations of the System. Total of three Entities are connected to the System using parallel lines denoting request and response cycle. This simplified representation serves as the cornerstone for understanding the interplay of data in the broader context of the Hospital Management System.

DFD Level One

DFD Level one provides a more detailed breakout of pieces of the Context Level Diagram. This DFD describes the main functions carried out by the system, as we break down the high-level process of the context Diagram into its sub-processes.
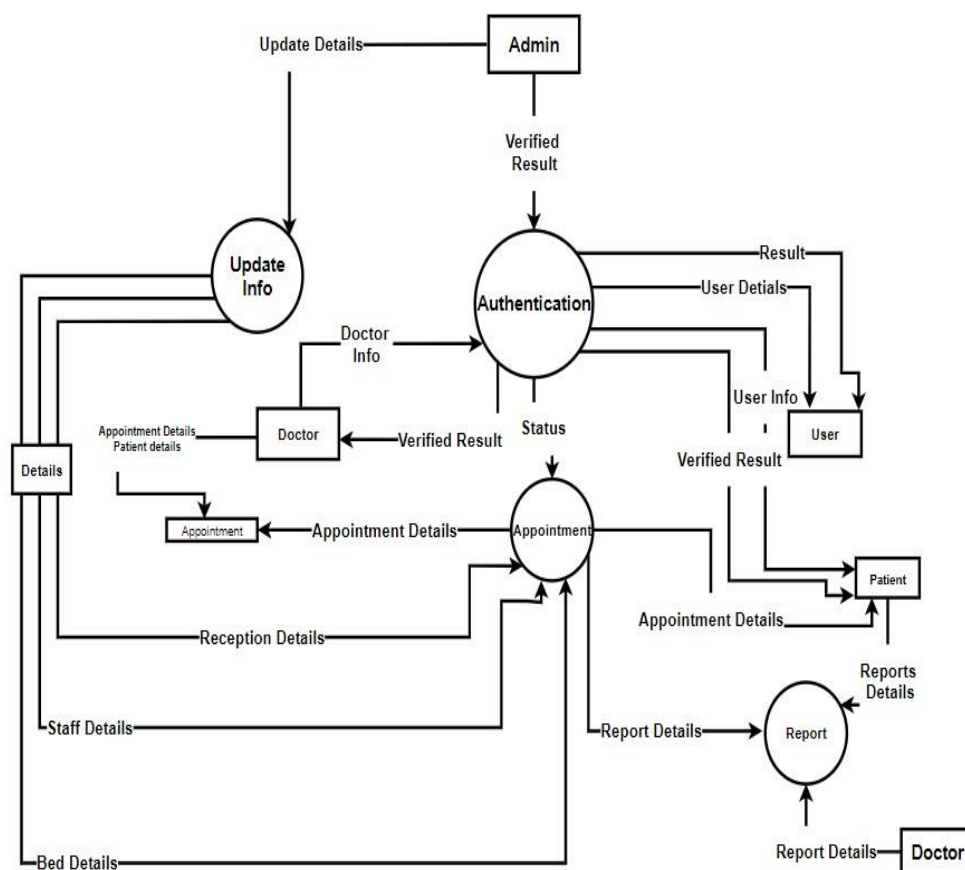
Figure 6: Level One DFD

In the above Figure, data flow between various entities, process and database models are shown. We have two major entities participating in request/response cycle i.e., Admin, User, etc. Login process represents the authentication process of the System.

3.2 System Design

This section defines the basic views of the system. How the application flows to achieve the required objectives. It explains how the system works in simple language.

3.2.1 Architectural Design

Architectural design in software development is the process of defining the overall structure and organization of a system. It involves making high-level decisions on how different components will interact, ensuring scalability, maintainability, and meeting project requirements.
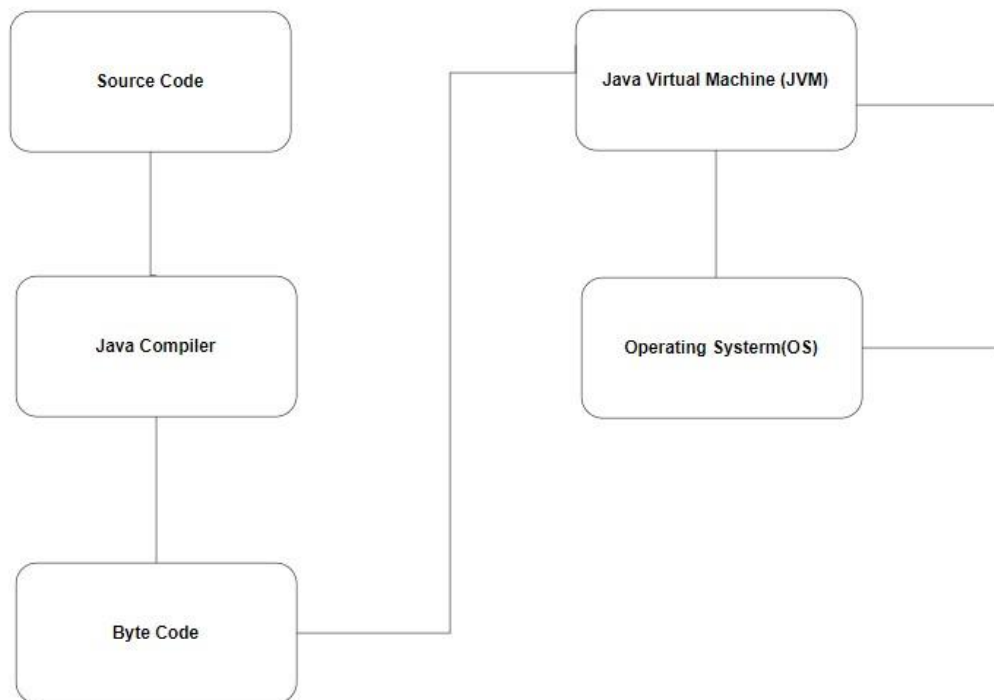
Figure 7: Architectural Design

In the above Figure, it represents a collection of components, i.e., JVM, JRE, and JDK. It integrates the process of interpretation and compilation. It defines all the processes involved in creating a Java program. Java Architecture explains each and every step of how a program is compiled and executed. we can connect our Java application with the MySQL database through the Java code. JDBC (Java Database Connectivity) is one of the standard APIs for database connectivity, using it we can easily run our query, statement, and also fetch data from the database.

3.2.2 Database Schema Design

Database schema design is the process of defining the structure that organizes and represents data in a database system. It involves specifying tables, fields, relationships, and constraints to ensure efficient data storage, retrieval, and integrity.
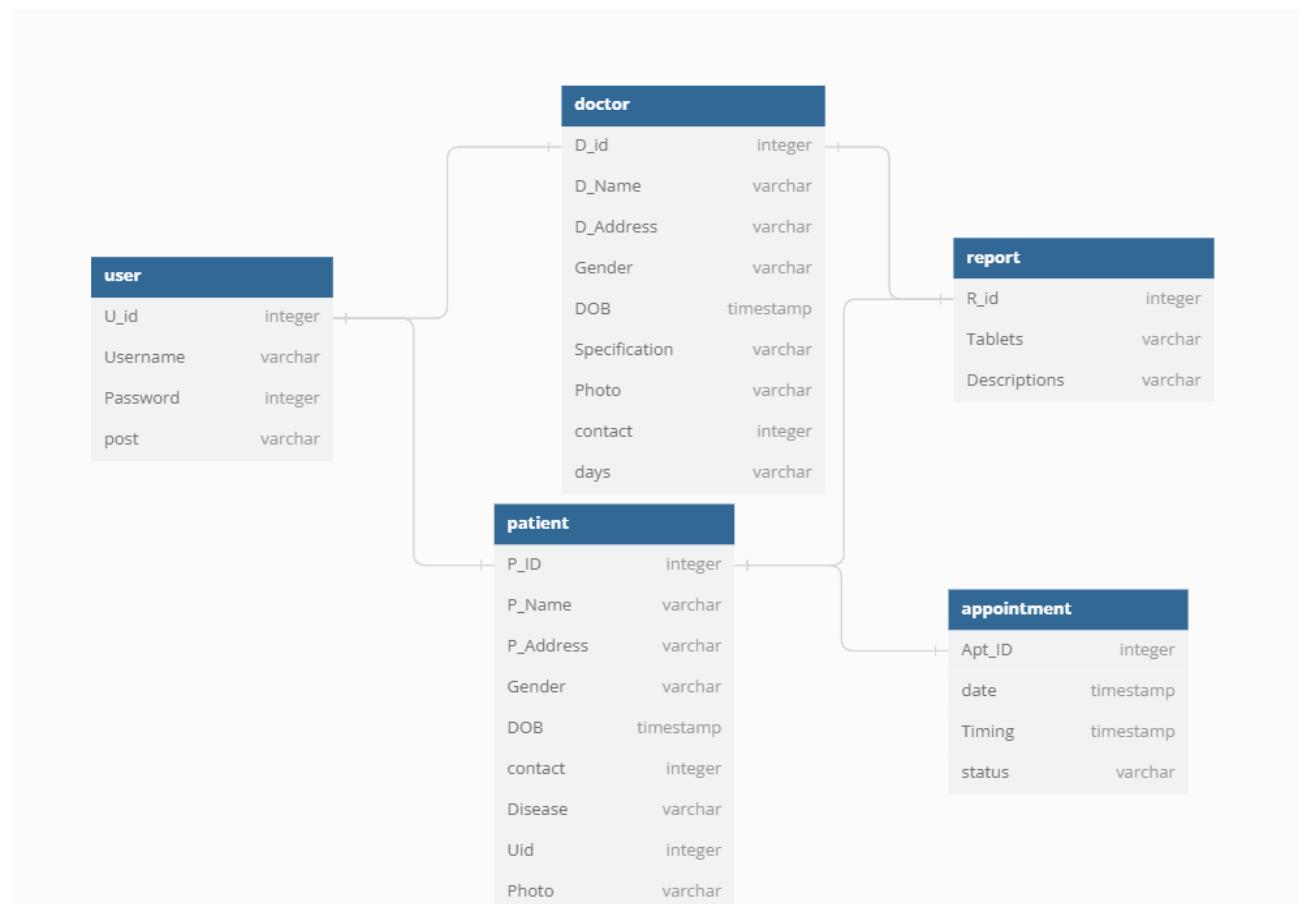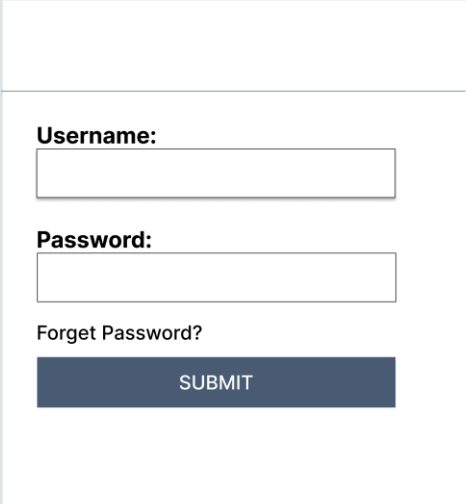
Figure 8: Database Schema Design of Hospital Appointment System

In the above Figure, each table has specified fields, data types, and relationships, providing a comprehensive overview of how data is stored and related within the Mysql database. The doctor table contains details about each doctor with their specialized field. Report table contains the prescription given by doctor to patient regarding the medicine and description about the medicine to take. Appointment table stores patient information, including Appointment Id, date, timing, status, and availability. user table contains all the information of individual connected to hospital appointment system. The patient table has all the related information of patient and their disease including patient name, patient Id, contact number ,photo, disease.

3.2.3 Interface Design (UI/UX)

Interface Design, often referred to as UI/UX design, involves creating user-friendly and visually appealing interfaces for software or websites. It focuses on enhancing user experience by optimizing layout, navigation, and visual elements, ensuring an intuitive and enjoyable interaction with the product. Good UI/UX design aims to make technology accessible, easy to use, and aesthetically pleasing for users.

Figure 9: Login Page UI/UX

Figure 10: Admin-Doctor Details UI/UX

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Figure 11: Admin-Patient Details UI/UX

Figure 12: Patient Panel UI/UX

3.3 Algorithm Details

Linear search, also known as sequential search, is a straightforward algorithm used to find a specific element in a list. The process involves iterating through each element in the list, one at a time, until the desired element is found or the end of the list is reached. The algorithm starts at the beginning of the list and compares the target element with each element in sequence. If a match is found, the index of that element is returned; otherwise, the search continues until the end of the list is reached, indicating that the element is not present.

Working Mechanism of Linear Search Algorithm:

- Initialization: The algorithm starts with an initial position, typically the beginning of the list or array.
- Comparison: The algorithm compares the value at the current position with the target value (the element being searched for).
- Match Check: If the current value matches the target value, the algorithm returns the current position as the index of the target element. The search is complete.
- No Match Check: If the current value does not match the target value, the algorithm moves to the next position in the list.
- Repeat: Steps 2-4 are repeated until a match is found or the end of the list is reached.
- End of List Check: If the algorithm reaches the end of the list without finding a match, it indicates that the target element is not present in the list.

In summary, Linear Search Algorithm is a reliable choice when a basic, sequential search mechanism is sufficient, and its fundamental principles contribute to a solid understanding of searching algorithms in general. In the context for making people ease in finding their familiar doctor as fast as possible and also easier for admin to search patient details in short period of time so for hospital appointment system Linear Search Algorithm plays an vital role.

CHAPTER 4: IMPLEMENTATION AND TESTING

4.1 Implementation

This describes how the system works and how it can be important for Hospital Appointment So, at first, we did research about the necessary tools and sources required to be developed. Many tools and technologies that were utilized to develop the system are discussed in the proceeding chapter.

4.1.1 Tools Used

The various system tools that have been used in developing both the front end and backend of the project are being discussed in this chapter. The project utilizes Java as the primary programming language. The CASE tools used for a project are based on the requirements of the project. Following types of CASE tools are used for this project:

- IDEs (Integrated Development Environments): IntelliJ IDEA, a free IDE built on open-source code that provides essential features for Java and Kotlin enthusiasts.
- Version Control: Git version control system used for tracking changes in source code during development.
- Diagramming Tools: Draw.io and DbDiagram.io is used for creating database schema design, entity-relationship diagrams, and other visual representations of system architecture.

Table 2: Tools Used for Project

Tools	Purpose
JAVA	Frontend Development
JAVA	Backend Development
JVM	Java Runtime Environment
MYSQL	Database
XAMMP	(Apache Server)Server
Intellij IDEA	Coding and Development
Figma	Designing wireframe and UI
GitHub	Version Control

1. JAVA (Frontend / Backend Development): Java is a widely-used programming language for coding web applications. It has been a popular choice among developers for over two decades, with millions of Java applications in use today. Java is a multi-platform, object-oriented, and network-centric language that can be used as a platform in itself.

2. JVM (Java Runtime Environment): JVM a virtual machine that enables a computer to run Java programs as well as programs written in other languages that are also compiled to Java bytecode.

3. MYSQL (Database): The MySQL Database forms a vital component of the XAMPP Stack, being one of the most significant features offered by it. With XAMPP, you can use phpMyAdmin to create & use your XAMPP MySQL Database in minutes

4. Intellij IDEA (Coding and Development): IntelliJ IDEA is undoubtedly the top-choice IDE for software developers. Efficiency and intelligence are built into the design, which enables a very smooth development workflow experience, from design, implementation, building, deploying, testing, and debugging, to refactoring! It is loaded with features and also offers a plethora of plugins that we can integrate into the editor.

5. Figma (Designing wireframe and UI): Figma is a collaborative design tool used for creating wireframes and designing user interfaces. It ensures a visually appealing and user-friendly frontend design.

6. GitHub (Version Control): GitHub is a web-based platform for version control and collaboration. It enables developers to track changes, manage code repositories, and collaborate on projects. GitHub ensures versioning control for the entire codebase, promoting teamwork and code integrity.

4.1.2 Implementation details of Modules

This section elaborates on how the modules are implemented and what functions does they contribute to the system.

The entire project mainly consists of 3 modules, which are

- Admin module
- User module (patient)
- Doctor module

Admin module:

- Manage department of hospitals, user, doctor accounts.

User module(patient):

- View appointment list and status with doctors
- View prescription details
- View medication from doctor
- View doctor list
- View operation history
- Create appointment with doctor

Doctor module:

- Manage patient
- Manage appointment with patient
- Create prescription for patient
- Provide medication for patients.

4.2 Testing

It describes about the different testing techniques used to test the system including the results of some of the testing techniques applied. The tests did not just test the code directly but also tested some of the non-functional aspects of the system.

4.2.1 Unit Testing

A Unit testing is a testing technique to verify and validate individual units of code. With the generation of the unit test cases early within the development cycle, the test cases were repeatedly used at the end of each iteration to check the new functionality added does not have any unintended side effects the output of testing is shown in the table below:

Table 3: Test Case for Admin

Test Id	Test Case	Pre-conditions	Input test data	Steps to be executed	Expected result	Actual result	Pass /Fail
1	Test if user is able to login successfully.	User must be registered	Correct username, Correct password	1. Enter input (correct username and password) on the respective fields, 2. Click login	User must successfully login to the system	User logged in successfully	Pass
2	Test if unregistered users is not able to login to the site	User isn't registered	Incorrect username, incorrect password	1. Enter input (incorrect username and password) on the respective fields 2. Click login	Proper error must be displayed and prompt to enter login again	User cannot login	Pass

3	Test with valid username and wrong password such that login must get failed	User must be registered	Valid username and wrong password	1. Enter the valid username in username and enter wrong password in the password field 2. Click login	Proper error must be displayed and prompt to enter login again	User cannot login	Pass
4	Test if patient can create appointment	User logged in must select doctor from table	Appointment detail	1. Select the doctor from table and provide date and time and press create button to add appointment	Doctor should be able to view created appointment	Doctor can see the appointment sucessfully	Pass
5	Test if patient logged in must be able to view the report successfully	Doctor logged in must have table with appointment in it	Report details	1. Click the add details from appointment table	Report must be available according to the appointment	Report generated successfully	Pass

CHAPTER 5: CONCLUSION AND FUTURE RECOMMENDATIONS

5.1 Conclusion

The 'Hospital Appointment System' project was great experience for us to implement all the knowledge and skills imparted in our college till fourth semester. We implemented these knowledge and skill imparted in our college into real life experience by developing this system. First of all, we came up with specifications with all the requirements collected from end-users and those requirements were analyzed. Then the system was designed and developed following specification strictly but enhanced some of the features fulfilling all the objectives. The biggest advantage of using this system is that it can be implemented on small as well as large scale businesses like Hospital, clinics and etc. such that the scale of business doesn't make any difference. The tracking of patient medical status in this system helps a lot during busy hour. The patient and doctor relationship will increase. Hence, this project has brought an opportunity to explore innovative ideas and implement them in the system.

5.2 Lesson Learnt

This Project helped gaining a significant technical insight into the intricacies of our chosen technologies, such as Java Language, XAMPP, IntellijIDEA (IDE) etc. navigating challenges and finding innovative solutions. Project management taught the value of realistic timelines and adaptive planning. The testing phase underscored the need for robust quality assurance practices and early bug detection. User experience considerations became pivotal, emphasizing iterative design processes and responsive interfaces. Scalability and future enhancements were on our radar, prompting us to build with flexibility in mind. Adaptability was key, as we navigated unforeseen challenges with agility. Knowledge transfer within the team emerged as a priority, ensuring that insights and best practices are documented for future reference. Embracing a culture of continuous improvement, we conducted retrospectives to refine our processes.

5.3 Future Recommendation

With the help of the machine learning and artificial intelligence, system will be able to notify the condition to the guardians of patient. This will even help the doctor in the treatment of the patient. This system will also be able to track the blood bank and availability of blood, which will help user to determine which blood bank they need to go with the shortest route possible. This improves the chance of the survival of patient. System will be able to calculate the bill according to the entry provided by pharmacist, test department and doctor. The machine learning algorithms can also be used for the prediction of some disease which will reduce the time.

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APPENDICIES

Figure 12: Admin Panel

Figure 13: Admin Doctor Details

Figure 14:Admin Lower Level Staffs Details

Figure 15: Admin Receptionist Details

Figure 16: Admin Patient Details

Figure 17: Admin Bed Details

Figure 18: Admin Department Details

Figure 19: Admin Patient Panel

Figure 20: Create Appointment

Figure 21: Patient-View Doctors

Figure 22: Patient-Treatment Details
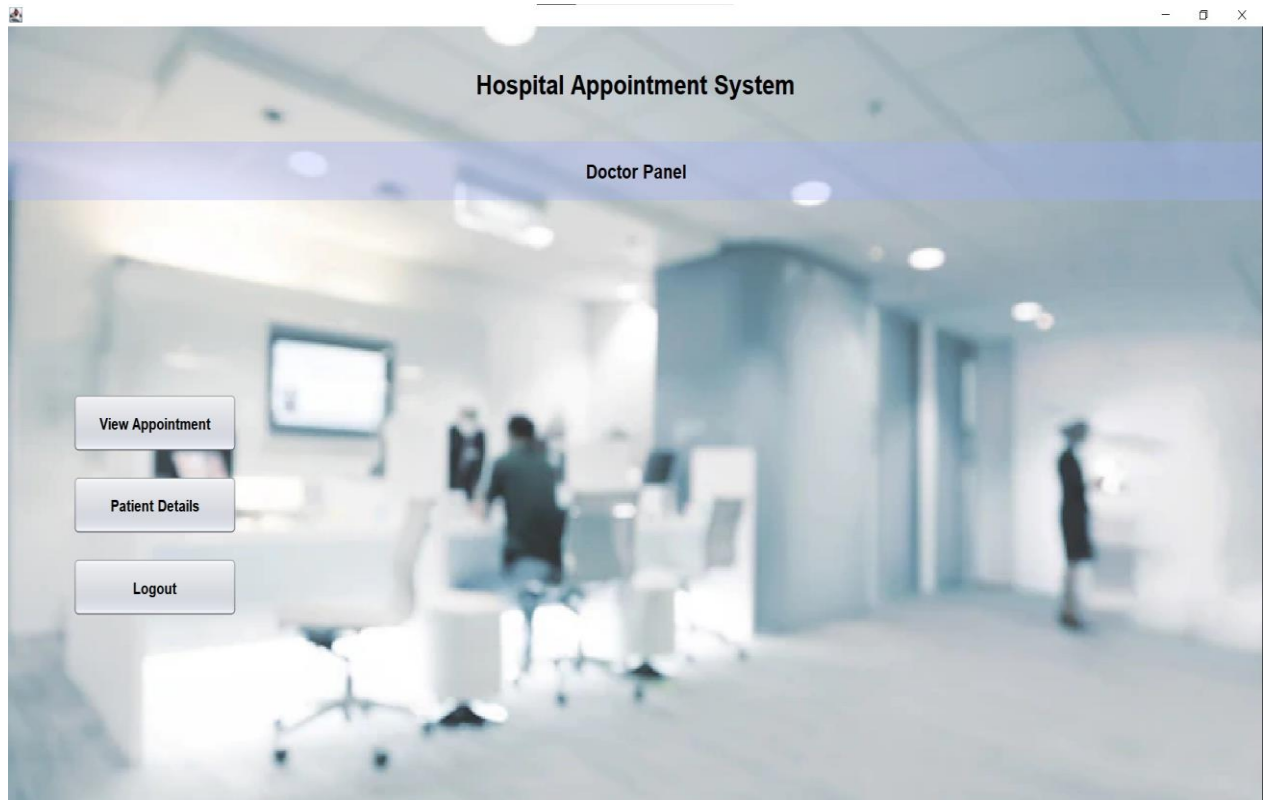
Figure 23: Report

Figure 23: Doctor Panel
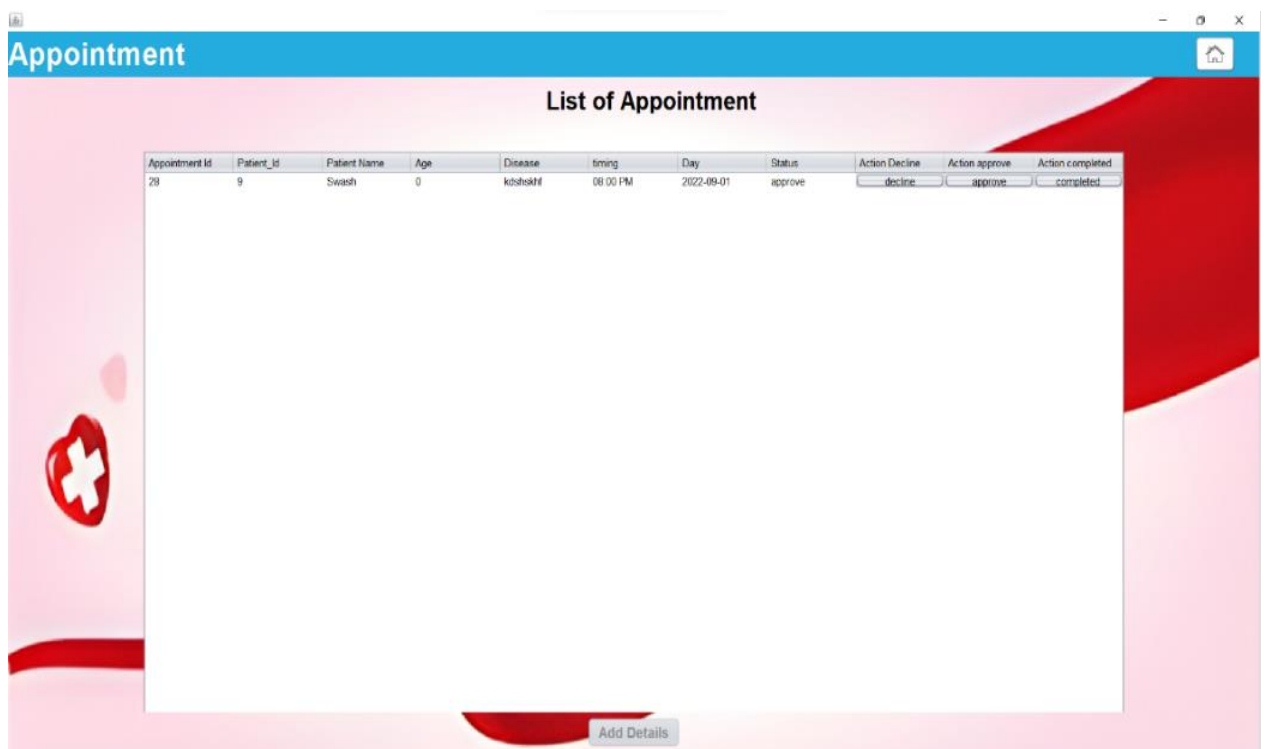
Figure 24: List of Appointment

Figure 25: Doctor Add Report

SUPERVISOR VISIT LOG SHEET

Supervisor Name	Date	Visit Details	Signature
Anil Pandey	14th May, 2023	General overview on how project should be implemented.	
Anil Pandey	21st July, 2023	Discussed how algorithm and which algorithm should be implemented.	
Anil Pandey	8th August, 2023	Overall assessment of whole project and dealt with some functionality's errors.	
Anil Pandey	25th September, 2023	Mid-Term Defense	
Anil Pandey	5th November, 2023	Overall assessment of project report.	