Hospital Management System

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Website Project Development: Hospital Management System

Pana Hazhar Mahmood

A thesis submitted in fulfilment of the
requirements for the award of the degree of
Bachelor of Computer Science (Software Engineering)

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DEDICATION

This thesis is dedicated to my father, who taught me that the best kind of knowledge to have is that which is learned for its own sake. It is also dedicated to my mother, who taught me that even the largest task can be accomplished if it is done one step at a time.

ACKNOWLEDGEMENT

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HMS – Hospital Management System

HER – Electronic Health Record

EMR – Electronic Medical Record

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Computer-based instruments called hospital management systems (HMS) are used to monitor several facets of hospital care. They take care of things like keeping track of inventories, setting up appointments, billing patients, and keeping patient records. The quality of patient care and hospital operational efficiency can both be improved by using HMS. Many hospitals in Kurdistan do not have an HMS, which causes problems including long wait times, traffic jams, and medical blunders. In order to tackle these obstacles, a website that functions as an HMS for Kurdistan's hospitals will be created. Standard HMS functions, such as keeping track of patient records, setting up appointments, and managing invoicing, would be provided by this online portal. Additionally, it will have features designed especially for Kurdistan, such the ability to process payments in Kurdish currency and produce reports in Kurdish.

The website hopes to be an invaluable tool for Kurdistan's medical facilities, helping to raise the standard of both patient care and operational effectiveness. Hospital employees will have simple access to patient data, appointment scheduling, and medical records thanks to the consolidated digital platform. Moreover, the integration of an automated payment system would optimize revenue management by decreasing delays and streamlining financial processes

1.2 Problem Background

As a result of the lack of a productive management structure, several hospitals in Kurdistan are currently experiencing serious difficulties. This has caused a number of issues, including crowding, laborious financial transactions, and a disproportionate reliance on paper-based procedures. Hospitals now struggle to manage patient appointments, obtain medical records quickly, and manage congestion due to a lack of an organized structure. Due to hospitals' reliance on manual processes for payment receipts, this congestion also affects financial transactions. The manual method affects the hospital's financial management since it causes processing delays and inaccuracies. Additionally, for duties like record- keeping, scheduling, and inventory management, hospitals significantly rely on physical documentation. This reliance on paper-based systems takes time and is subject to human error, which can result in errors in crucial papers and interfere with hospital operations.

The lack of a productive management system in hospitals puts a heavy burden on the medical personnel and lowers the standard of patient care. It prevents processes from running smoothly, which causes inefficiencies and delays in the delivery of medical services. As a result, patients can encounter lengthier wait times, difficulty making appointment arrangements, and possible inaccuracies in their medical records.

1.3 Project Aim

The goal of this project is to create a user-friendly hospital website for Kurdistan while putting in place a complete hospital management system. The main objective is to streamline processes, automate administrative activities, and boost management efficiency across the board for hospitals. This initiative seeks to overcome the difficulties hospitals encounter, including traffic, manual financial transactions, and a reliance on paper-based procedures, by developing an intuitive digital platform. The initiative intends to modernize hospital operations and offer a seamless experience for both patients and healthcare professionals by streamlining patient appointment administration, enhancing financial transactions, and removing the need for physical paperwork

1.4 Project Objectives

1. **Create a website that is user-friendly:** To provide a user-friendly experience for both hospital employees and patients, make the website simple to access and understand.

2. **Use a website to Simplify Work in Hospitals:** Create a website system so that the hospital can accomplish tasks like scheduling appointments, managing supplies, and maintaining patient data online instead of on paper. This modification will assist complete daily chores at the hospital more quickly, with fewer errors, and with greater efficiency.

3. **Enable Healthcare Providers to Work Together and Share Real-Time Data:** Provide a single platform inside the hospital management system

that allows various healthcare providers to securely and instantly share patient data and medical records. By guaranteeing that all treating physicians have prompt access to the required patient data, this program seeks to improve treatment outcomes and decision-making while also raising the standard of care.

4. **To Enable Online Patient Portals**: In order to improve patient involvement and health self-management, provide safe online patient portals that allow patients to view their test results, prescription history, medical information, and direct communication with their healthcare providers.

1.5 Project Scope

The goal of this project is to create an approachable website that functions as a thorough healthcare management system for hospitals in Kurdistan. The main emphasis is on finding solutions for the problems caused by traffic, laborious financial transactions, and excessive reliance on paper paperwork.

- Development of a web-based Hospital Management System (HMS). The HMS will be used to manage all aspects of hospital care, including patient records, scheduling, billing, and inventory.
- Adaptation of the HMS to the specific needs of hospitals in Kurdistan. This includes ensuring that the HMS is in Kurdish and that it meets the specific requirements of Kurdish hospitals.

- Implementation of the HMS in a secure way that protects patient data. This includes ensuring that the HMS is compliant with all relevant data protection regulations.

1.6 Project Importance

For Kurdistan's hospitals, creating a hospital management system is crucial to resolving current issues and enhancing all aspects of healthcare delivery. The benefits that this project seeks to achieve are as follows:

Enhanced Efficiency: The project will streamline hospital operations, decreasing traffic, and enhancing the flow of patient appointments by adopting a user-friendly website. As a result, waiting times will be reduced, resources will be used more effectively, and eventually, the efficiency of providing medical services will increase.

- Financial Transactions Will Be Simplified: The Hospital Management System's automated payment system will do away with the necessity for manual management of financial transactions. As a result, payment processing will be sped up, errors will be reduced, and hospitals' revenue management will run more smoothly

- Paperless processes: Converting from a physical paper-based system to a digital one will make record-keeping, scheduling, and inventory management easier. The project will lessen the possibility of errors and free up crucial time for medical staff, allowing them to concentrate more on patient care.

- Accurate and Accessible Information: The unified digital platform will make it simple for healthcare professionals to access patient data, medical records, and appointments. This will make sure that correct and current information is easily accessible, improving patient care overall and improving diagnosis and treatment.

- Collaboration Will Be Facilitated Better by the Hospital Management System: The hospital employees will be able to communicate and work together more effectively. It would enable seamless information sharing between several departments, resulting in better patient outcomes, coordinated efforts, and effective decision-making.

1.7 Report Organization

Chapter 1 (Introduction): This chapter provides a general summary of the project, difficulties, and attempts to clarify the potential effects of the suggested remedies. goals. The project's literature review, case studies, and a comparison of current systems are covered in.

Chapter 2 (Literature Study).
In **Chapter 3** (Technique), the technique chosen for the project is defined, along with the rationale behind the decision.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Any project development process must include a literature evaluation since it establishes the basis of knowledge in a particular field. The purpose of the literature review is to examine current studies, research, and pertinent articles concerning hospital management systems and their functioning. By reviewing earlier studies and research papers, this review focuses on the advantages, difficulties, and key components of hospital management systems. Finding areas for improvement and gaining insight into the existing condition of hospital management systems are the goals. In addition, the influence of technology on the provision of healthcare, particularly with reference to hospital administration systems, is investigated. Understanding how hospital management systems have evolved over time and their role in improving patient care, increasing operational efficiency, and reducing costs is essential given how the healthcare business is being shaped by constant technological breakthroughs.

The purpose of this literature study is to provide a comprehensive assessment of the body of information currently available on hospital management systems, identify any knowledge gaps, and lay the foundation for the project's subsequent stages. A robust and effective hospital management system will be created as a result of compiling and analyzing the available data to improve decision-making.

2.2 Case Study (If any)

It was difficult for a hospital in Kurdistan to maintain patient records. The hospital used a paper-based system, and it was getting harder and harder to locate patient data. The hospital experienced issues making appointments as well. The hospital was losing money as a result of the lengthy wait times for medical appointments among patients. The hospital made the decision to put a hospital management system in place. The system made it simpler to arrange visits and allowed for the computerized tracking of patient records. The approach decreased the amount of time personnel spent on paperwork, which allowed the hospital to save money. Success was achieved through the hospital management system. The hospital was able to increase productivity, make financial savings, and provide patients with better care.

2.2.1 Company Organization Structure

A Hospital Management System's (HMS) organizational structure defines roles, duties, and hierarchies inside a hospital or healthcare facility in a way that makes sure healthcare delivery is efficient and effective. In order to handle the complex nature of healthcare administration, this structure usually consists of a number of essential elements that work together to ensure that clinical and administrative tasks are properly integrated. The hospital's support and administrative staff is essential to its smooth running. They handle everything from patient registration and invoicing to supply chain management, maintenance, and support to clinical departments' patient care delivery. An HMS's organizational structure is adaptable and can change based on the size and nature of the healthcare facility. The fundamental goal is still the same, though: to enable coordinated efforts amongst many departments so that patients receive excellent care quickly and effectively.

2.2.2 Manual Operation

In order to understand the objectives and future needs of the artist sector, I conducted extensive study on the issues pertaining to hospitals in Kurdistan and the causes of the condition.

2.3 Current System Analysis

A Hospital Management System (HMS)'s current system analysis entails a thorough examination and assessment of the hospital or healthcare facility's current healthcare delivery and management procedures. This study is essential for determining the system's advantages, disadvantages, areas for development, and future difficulties. The major objectives are to guarantee adherence to healthcare laws and standards, increase operational effectiveness, and improve patient care.

2.4 Comparison between existing systems

Table1: Comparison between existing system

Aspects	**Existing Systems in Hospitals**	**Proposed New System**
Patient Management	Manual appointment scheduling and record-keeping. Difficulties in	Automated appointment scheduling and centralized patient records accessible

	accessing patient information promptly.	by authorized personnel. Improved patient information management and efficient retrieval
Financial Management	Manual cash handling and paper-based billing. Delays and errors in payment processing.	Automated payment system and digital billing. Streamlined financial transactions and improved revenue management.
Record-Keeping	Physical paperwork and manual data entry. Higher chances of errors, misplacement, and loss of records.	Electronic record-keeping and digitized data entry. Enhanced accuracy, easy retrieval, and secure storage of medical documents
Inventory Management	Manual tracking and recording of inventory. Challenges in maintaining adequate stock levels and tracking expiration dates.	Automated inventory management with real-time tracking and alerts. Improved stock management, reduced wastage, and better tracking of expiration dates.
Communication	Limited and fragmented communication channels between hospital departments. Reliance on phone calls and physical documents for information sharing.	Integrated communication system with messaging and notification features. Enhanced collaboration and streamlined communication among hospital staff.
Reporting and Analytics	Manual compilation and analysis of data. Time-consuming and prone to	Automated reporting and analytics capabilities. Timely access to accurate

	errors.	data for informed decision-making and performance evaluation.
User-Friendliness	Older and complex user interfaces. Steep learning curve for staff.	Intuitive and user-friendly interface design. Easy adoption and reduced training time for staff.
Scalability	Limited scalability and difficulties in expanding the system to accommodate growing hospital needs.	Scalable architecture and flexibility to adapt to evolving hospital requirements. Ability to expand and cater to additional hospitals or departments.

2.5 Literature Review of Technology Used

A programming language called JavaScript (JS) is used to create interactive web pages. It enables the addition of dynamic elements to websites, such as the ability to react to user input without requiring a page refresh.

PHP is a computer language mostly used for creating websites that require database interaction. It's frequently utilized to create web pages that show database data.

MySQL: A database management and manipulation system for data storage, retrieval, and management. It is the repository for all the data used by your healthcare system, including appointment calendars and patient records.

The acronym for Hypertext Markup Language is HTML. It's the common language for building and designing webpages. HTML provides instructions to the web browser on how to display web page content.

The acronym for Cascading Style Sheets is CSS. It is utilized in conjunction with HTML to create a website's style and appearance. The web page's design, colors, fonts, and layout are all controlled by CSS.

Frameworks & Libraries:

JavaScript libraries like jQuery make using JavaScript on your website simpler. It makes writing code simpler and easier by streamlining tasks like event handling, animation, and HTML page manipulation.

A framework for creating websites and online apps is called Bootstrap. It offers ready-to-use elements and styles that assist you in optimizing your website's performance across a range of devices, including desktop computers and smartphones.

Tools:

XAMPP: An application bundle that facilitates the installation of MySQL, PHP, Perl, and the Apache web server. Before websites are transferred to a live web server, they are tested and developed on a local server environment.

Writing and editing code is done with Visual Studio Code (VSCode), a code editor. Because it supports a wide range of programming languages and includes practical features like code completion, syntax highlighting, and extensions for more functionality, it is well-liked by developers.

2.6 Chapter Summary

Chapter 2 summarizes the literature review conducted for developing a website It discusses the objectives of creating a fast, reliable, user- friendly, website. Case studies of Hospital Management System use Technologies like Js, Php,Mysql , html, css.

CHAPTER 3

SYSTEM DEVELOPMENT METHODOLOGY

3.1 Introduction

The creation of a Hospital Management System (HMS) project is well suited for the flexible and cooperative nature of the agile methodology. Working directly with end users, allowing for ongoing feedback, and adjusting to shifting requirements during the development process are the main emphasis of this methodology. Agile technique enables the development team in an HMS project to divide the project into smaller, more manageable units called sprints. A particular section of the HMS is developed and delivered at each sprint. With this gradual approach, working software can be delivered more quickly, and administrators and healthcare experts are frequently given the chance to provide input. Agile makes ensuring that the HMS satisfies end users' particular wants and requirements by including them in all stages of the development process. The team can grasp stakeholders' priorities and change as needed thanks to regular contact and collaboration with them. The development team and the HMS users are able to work together more effectively because to this collaborative approach.

Agile also places a strong emphasis on adaptability, which is important in the healthcare industry because requirements can change over time. Agile technique must have the capacity to adapt to shifting priorities and needs. As the project develops, the team can add new features or change old ones to keep the HMS current with the changing healthcare environment. Agile also encourages a heavy emphasis on quality. The team can find and fix any problems or bugs early in the development process through continuous testing and feedback loops. With this iterative process, improvements may be made continuously, ensuring that the HMS lives up to high expectations for usability, dependability, and usefulness.

3.2 Methodology Choice and Justification

The Agile technique is a good fit for creating a Hospital Management System (HMS). Agile methodology is the best method for an HMS project since it promotes collaboration, adaptability, and gradual development.

Several factors support the selection of the Agile methodology:

- **User Involvement**: Agile methodology encourages end users must take an active role in the process of development, including administrators and healthcare experts. Building an HMS that satisfies their particular wants and requirements depends heavily on their input and feedback.

- **Development in Smaller Steps**: An HMS project may be intricate, with numerous capabilities and modules. Agile permits incremental development, where the system is created in digestible, little pieces called sprints. With this strategy, the development team can swiftly deploy usable software, collect feedback, and make necessary improvements as the project moves along.

- **Flexibility in the Face of Changing Needs**: Healthcare environments are dynamic, and demands may alter over time. Due to the agility of agile methodologies, changes can be made easily, allowing the HMS to adapt to changing needs and priorities in the healthcare industry.

- The agile methodology promotes cooperation and communication between team members, stakeholders, and end users. Collaboration is encouraged, transparency is encouraged, and quick decision-making is made possible—all of which ensure that the final HMS closely reflects the desired outcomes.

- **Focus on Quality**: Agile methodology places a strong emphasis on the prompt and ongoing delivery of functional software. This enables regular testing, quality control, and feedback loops that guarantee the HMS satisfies high requirements for performance, dependability, and user pleasure.

- **Risk reduction**: The Agile methodology enables early identification and management of potential risks and obstacles by splitting the development process into smaller iterations. The team can detect problems quickly and take action to reduce risk.

3.3 Phases of the Chosen Methodology

1. **Scheduling of Projects Determine the Stakeholders**: Ascertain who will be impacted or involved in the HMS project, including administrators, patients, and hospital staff. Define Scope: Clearly state the objectives, characteristics, and functionalities of the HMS that need to be enhanced or developed. Plan Releases: Divide the project into more manageable, smaller releases that each provide a subset of the features.

2. **Conditions for Collecting User Stories**: Write user stories to express end-user requirements and needs in an easy-to-understand manner.

Set priorities. Conditions: Prioritize the user stories according to their significance and the project's goals in collaboration with the stakeholders.

3. **Sketching and Modeling Design Iterations**: Create preliminary HMS prototypes or design models, concentrating on the system architecture, user interface, and experience. Feedback loops: Show prototypes to relevant parties and solicit their comments. Then, modify the design in response to their suggestions.

4. **Work Sprints Organizing a Sprint**:

Schedule brief development cycles, or sprints, lasting two to four weeks, during which time particular HMS features or components will be created. Hold daily stand-ups to talk about the day's progress, any challenges, and the next course of action. Sprint Review: Evaluate the work done with stakeholders after each sprint, and make any necessary adjustments to plans

3.4 Technology Used Description

Front-end technologies: HTML, CSS, JavaScript, jQuery, and Bootstrap are used to create the HMS website's interactive and graphic elements. HTML establishes the framework, organizing the website's components and content. These elements are styled using CSS, which improves the website's visual appeal and user interface. With the help of the jQuery library, JavaScript adds dynamic functionality that makes the website interactive and responsive. A front-end framework called Bootstrap makes sure the website is responsive and looks well on different screens.

Back-end Technologies: PHP and MySQL are used on the server side to control the essential features of the system. PHP manages server-side scripting, which permits database interactions, user session management, and the creation of dynamic content. All information about hospital operations, the website can effectively handle and process massive amounts of data while preserving the security and integrity of the data. The HMS website project has selected a technology stack that combines the capabilities of HTML, CSS, JavaScript, jQuery, Bootstrap, PHP, and MySQL.

The development of an extensive, reliable, and interactive HMS website that is suited to hospital administration and operations is made possible by this combination of front-end and back-end technology. The developer has proven through this project that they can properly utilize these technologies, producing an HMS platform that is both aesthetically beautiful and functional.

3.5 System Requirement Analysis

The requirements of the project serve as the primary premise and point of origin of this chapter, which focuses more on the analysis of the project's system design.
Every design decision and analysis are based on the project's needs. Diagrams such use case diagrams, sequence diagrams, activity diagrams, package diagrams, requirements, and analytical results are created using the data that was acquired.
Additionally, the database architecture of the system is addressed in this chapter, which helps us comprehend how well the structural structure of the database diagrams is done.

3.6 Chapter Summary

In this chapter, the Agile methodology is introduced as the way chosen for creating an online marketplace for up-and-coming artists. It draws attention to Agile's advantages, including adaptation, flexibility, and teamwork. The phases of the approach are described in the chapter, including requirement gathering, design, implementation, testing, deployment, review, and maintenance. It also addresses the use of various diagrams and underlines the need of system requirement analysis. The chapter summarizes the use of Agile technique in projects overall.

CHAPTER 4

REQUIREMENT ANALYSIS AND DESIGN

4.1 Introduction

Requirement analysis and design are crucial phases in the development of a hospital management system (HMS). This chapter aims to analyse the requirements of the system and design its various components. By understanding the needs of the users and stakeholders, the system can be tailored to effectively meet their expectations.

4.2 Requirement Analysis

Requirements analysis involves gathering and documenting the functional and non-functional requirements of the HMS. This proves includes understanding the workflows, user roles, and desired features of the system. Through interviews, surveys, and research, the specific needs and challenges faced by hospital in Kurdistan are identified.

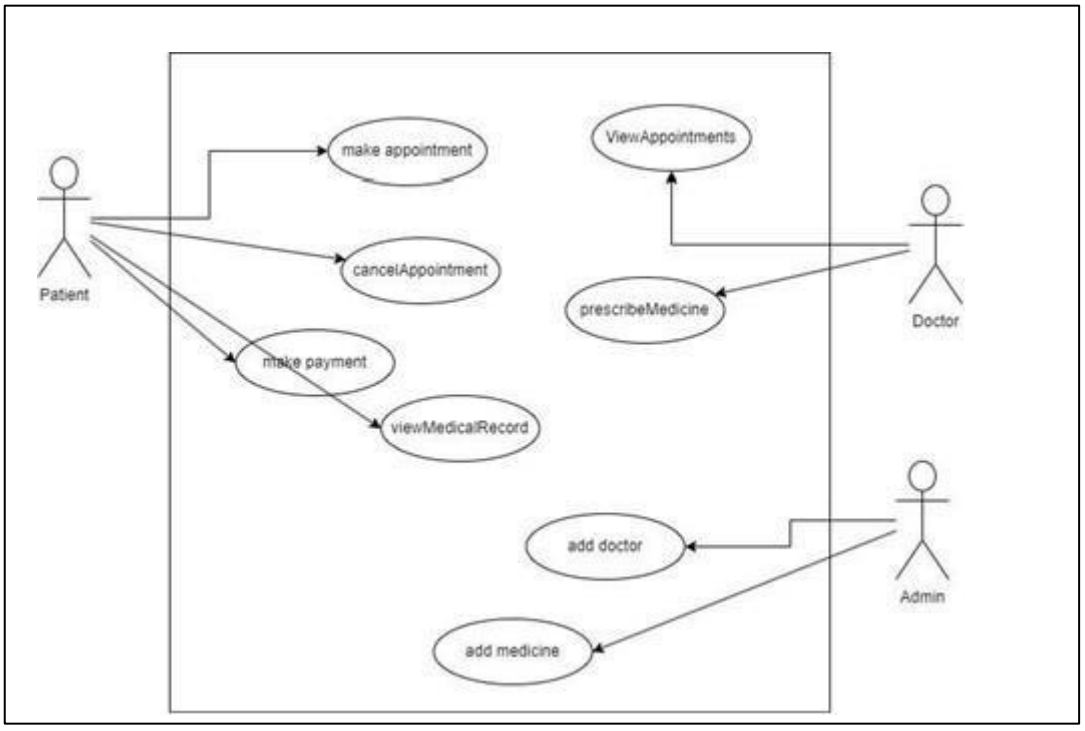

Figure 1: Use case diagram

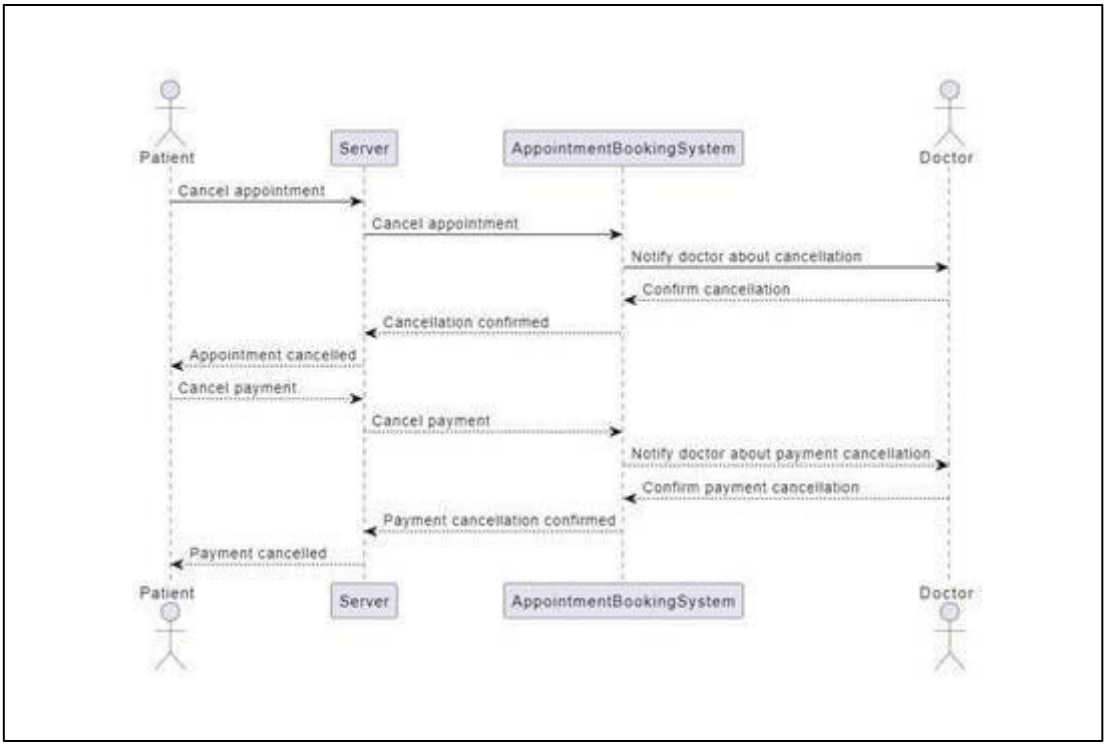

Figure 2: sequence diagram cancel appointment

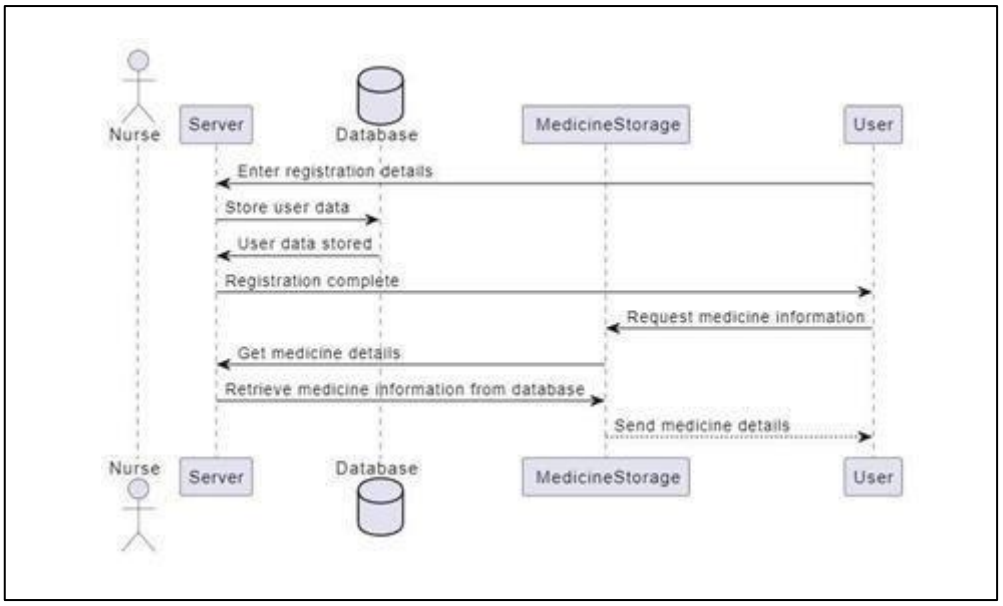

Figure 3: Register new medicine

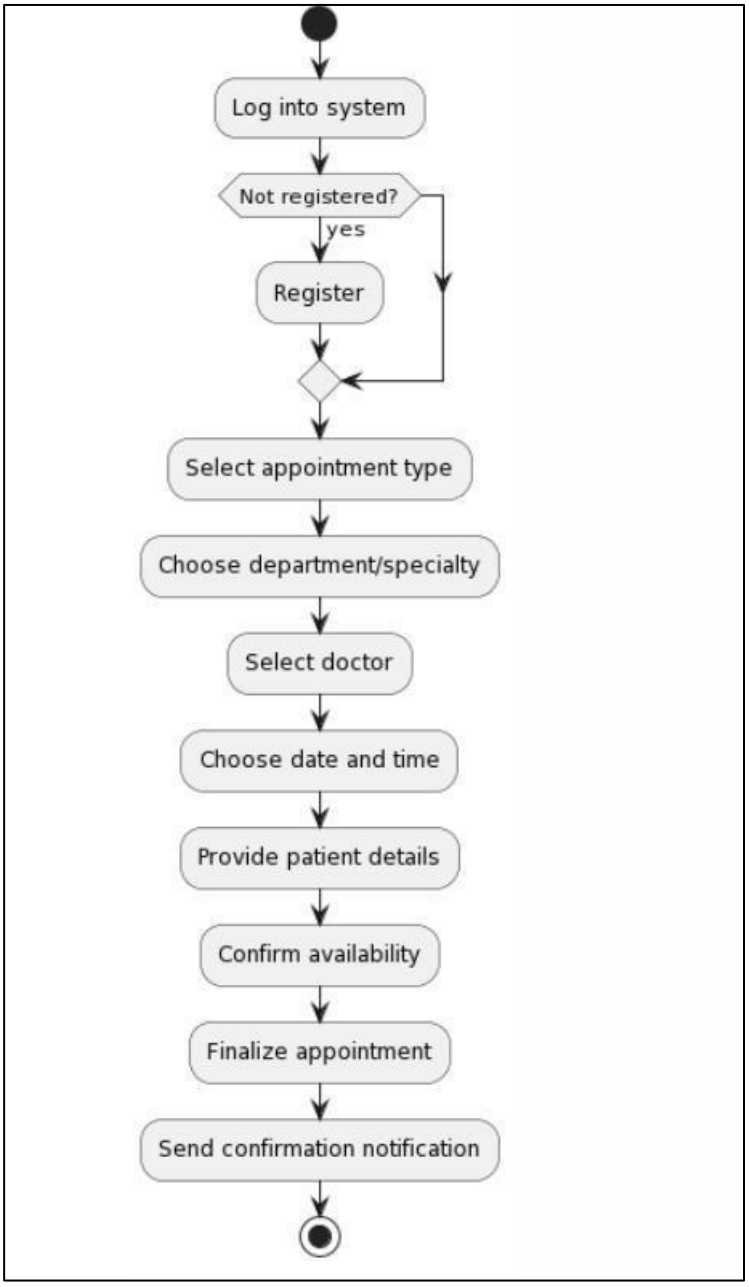

Figure 4: ACTIVITY DIAGRAM MAKE APPOINTMENT

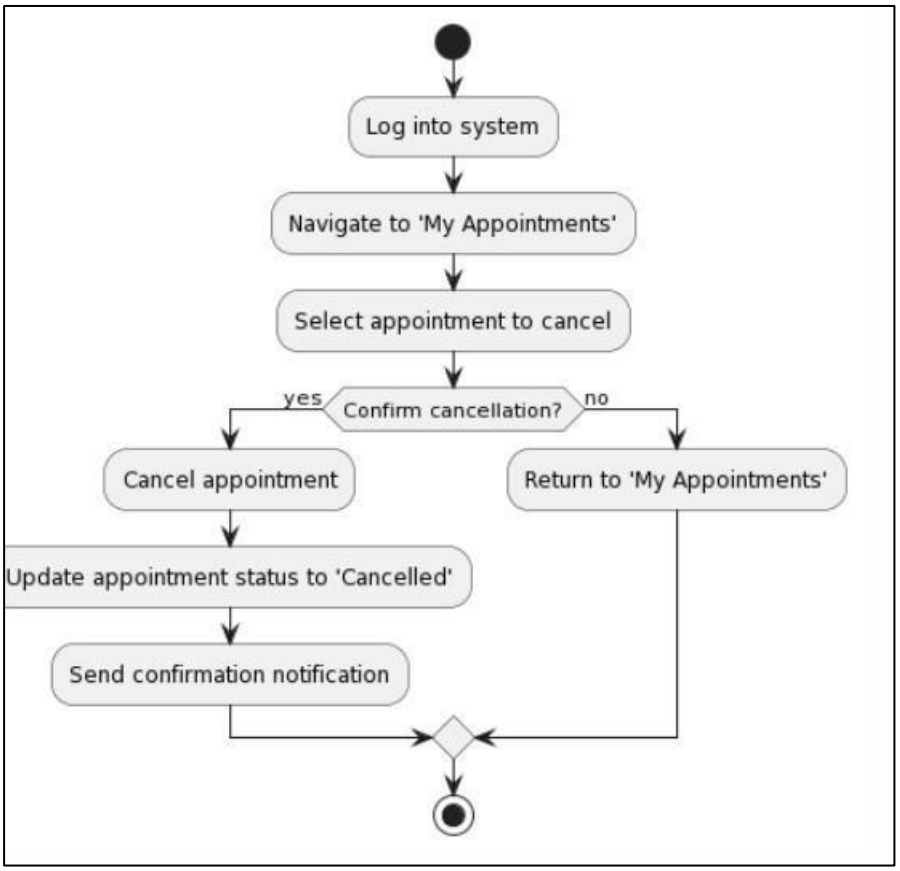

Figure 5: ACTIVITY DIAGRAM Cancel APPOINTMENT

4.3 Project Design

Project design encompasses creating a comprehensive plan for developing the HMS. This includes defining the system architecture, determining the technology stack, and outlining the development approach. The design phases consider factors such as a scalability, security, and integrations with existing hospital systems.

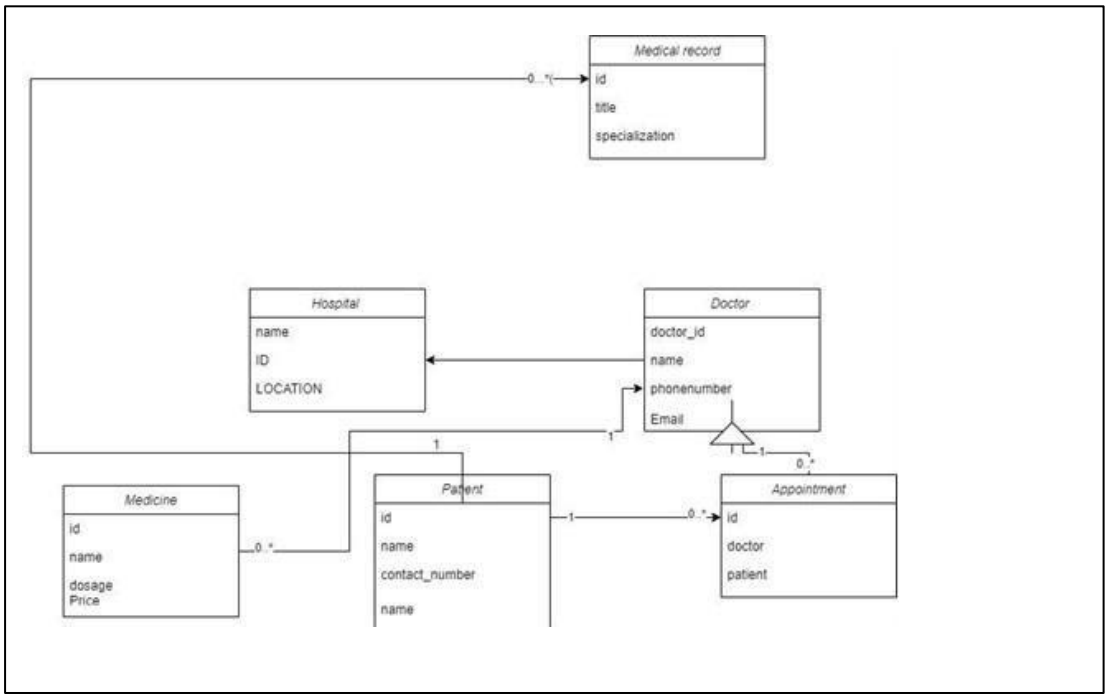

Figure 6: Class diagram HMS

4.4 Database Design

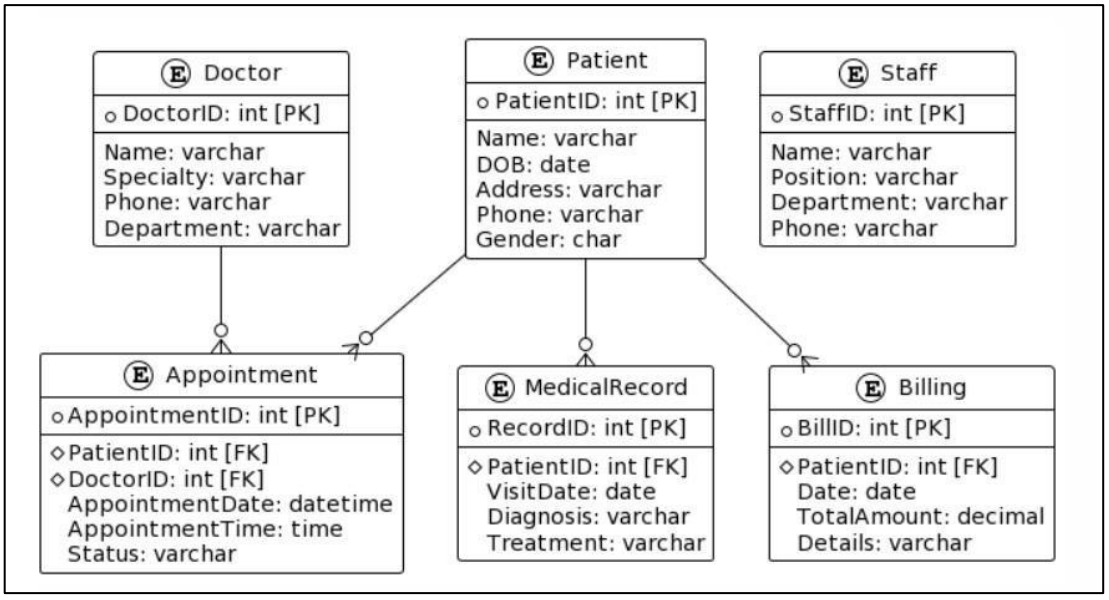

Figure 7: Class diagram HMS

4.5 Interface Design

The process of developing a digital product's visual components, like a website, to make them simple and intuitive for consumers to interact with is called interface design, sometimes referred to as user interface (UI) design. It includes developing the user interface elements' interactions and behaviours in addition to producing the product's structure, visual hierarchy, and general look and feel. The primary advantage of interface design is that, by facilitating user interaction with the product, it contributes to a positive user experience. Users may do activities quickly and without irritation when they have an intuitive and efficient user interface. Higher levels of user happiness and product engagement may result from this.

4.6 Chapter Summary

In this chapter, the significance of understanding customer requirements and effective communication is emphasized. Various diagrams, such as use cases, sequences, and activity diagrams, are used to illustrate the system's structure and functionality. The chapter covers requirement analysis, project design, database design, and interface design, highlighting the importance of precise software development to meet the expectations and needs of hospitals in Kurdistan.

Table 2: The actor roles

No	Actor	Role
1	Patient	Can make and cancel appointments, make payments, view medical records, and possibly interact with other system features like receiving notifications or updates.

2	Doctor	Can view appointments, prescribe medicine, possibly access patient medical records, set availability for appointments, and manage patient follow-ups.
3	Admin	Can add doctors, add medicine, manage system data, oversee appointment scheduling, control user access, and maintain the overall system health.

CHAPTER 5

IMPLEMENTATION AND TESTING

5.1 Introduction

The Hospital Management System web project's testing phase is presented in this chapter

Table3: Principle of test case

Principle	Description
Clarity	HMS system interface should be clear and easy to understand for all healthcare stakeholders.
Consistency	The interface uphold consistency across different modules of the system, such as scheduling, billing, and patient records.
Efficiency	The system optimization hospital operations, allowing staff to complete tasks like documentation, ordering , and communication swiftly and accurately
Accessibility	The system should be accessible to all users
User Testing	routine examination actual hospital staff should be conducted to ensure the system meets their needs
Heuristic Usability testing	Heuristic evaluations should be performed to identify usability issue within the system before they affect clinical use

Table4: Test case one

Test Case ID	Test Case Description	Test Steps	Expected Results	Actual Results
TC-1	Patient Login	1. Open the HMS application. 2. Enter the patient's username and password. 3. Click the "Login" button.	The patient should be logged in to their account.	Patient was successfully logged in to their account.
TC-2	Doctor Registration	1. Open the HMS application. 2. Navigate to the "Staff" section. 3. Click the "Register Doctor" button. 4. Enter the doctor's name, specialty, and contact information, and create a username and password. 5. Click the "Register" button.	The doctor should be registered and able to log in.	Doctor was successfully registered and able to log in.
TC-3	Schedule Appointment	1. Log in to the HMS. 2. Navigate to the "Appointments" section. 3. Click the "Schedule Appointment" button. 4. Select patient, physician, date, and time. 5. Confirm the appointment details and submit.	The appointment should be scheduled and visible in both the patient's and doctor's schedules.	Appointment was successfully scheduled and visible in the schedules.

TC-4	Add Medical Record	1. Log in as a doctor or nurse. 2. Select a patient from the list. 3. Click the "Add Medical Record" button. 4. Enter the details of the patient's diagnosis, treatment, and medication. 5. Submit the medical record.	The medical record should be added to the patient's history.	Medical record was successfully added to the patient's history.
TC-5	Dispense Medication	1. Log in to the HMS. 2. Go to the "Pharmacy" module. 3. Enter	The system should record the	Medication was successfully

5.2 Coding of System Main Functions

The area of a program where users interact is called the user interface. We adhere to fundamental concepts like accessibility, efficiency, consistency, and clarity in order to create user interfaces that are easy to use. We use critical processes, including usability testing, heuristic evaluation, and user testing, to test our user interfaces and make sure they are useful. This chart lists the essential ideas and procedures for creating user

5.3 Interfaces of System Main Functions

A website system’s functionality is built upon its code base. It contains the front-end and back-end development elements required for the system to function properly.
Best practices are used in the code base's structure to guarantee its security, scalability, and maintainability.

5.4 Testing

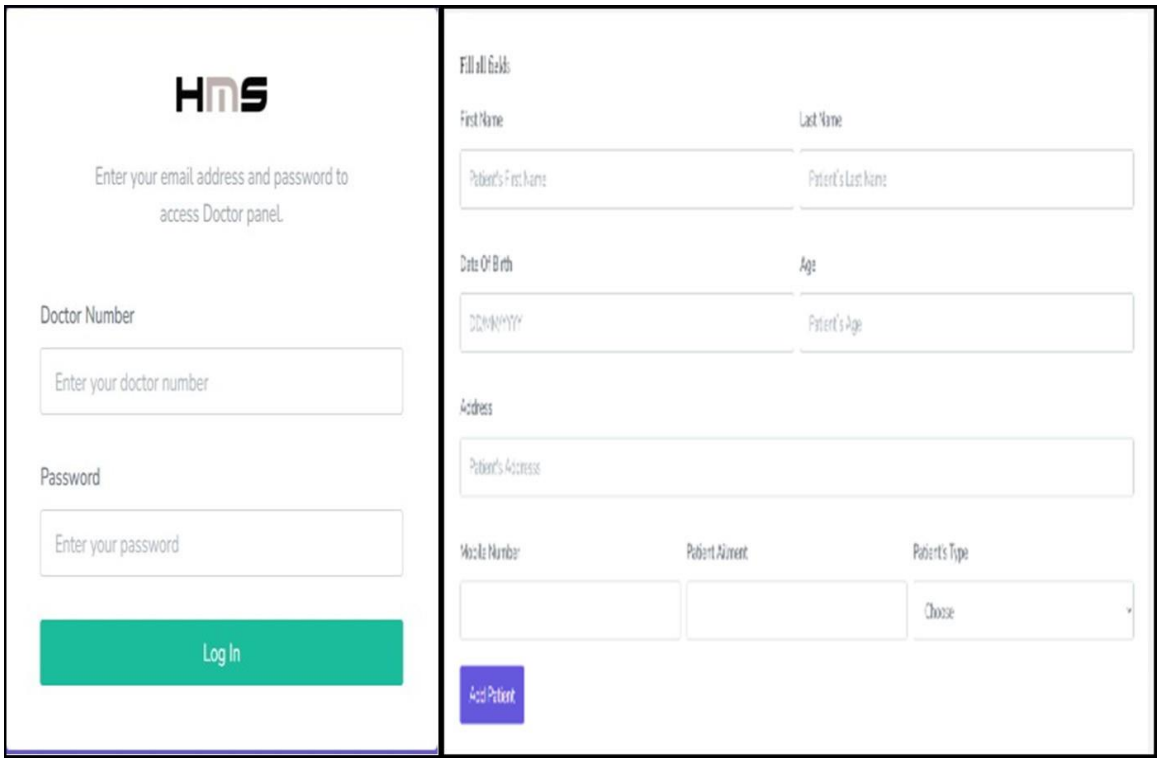

Figure 8: Login

Table 4: First use case

ase	Test Case Description	Test Steps	Expected Results	Actual Result	User Target	Test Input	Test Output	What Exists in Test
C001	Verify login functionality with valid credentials	1. Go to the screen where you log in. 2. Fill in the 'Doctor Number' field with a legitimate doctor number. 3. Fill in the 'Password' field with the appropriate password. 4. Select 'Log In' from the menu.	The system authenticates the credentials and grants access to the Doctor panel.	The system authenticated the credentials successfully and granted access to the Doctor panel.	Doctor	Valid Doctor Number, Valid Password	Access to Doctor panel	Login screen with input fields for Doctor Number and Password, and a 'Lo In' button

Table5: Test case two

as e d	Test Case Description	Test Steps	Expected Results	Actual Result	User Target	Test Input	Test Output	What Exists in Test
	Verify patient registration	1. Navigate to the patient registration screen. 2. Enter a valid first name in the 'First Name' field. 3. Enter a valid last name in the 'Last Name' field. 4. Enter a valid date of birth in the 'Date Of Birth' field. 5. Enter a valid age in the 'Age' field. 6. Enter a valid address in the 'Address' field. 7. Enter a valid mobile number in the 'Mobile Number' field. 8. Enter a valid ailment in the 'Patient Ailment' field. 9. Select a patient type from the 'Patient's Type' dropdown. 10. Click the 'Add Patient'	The system successfully registers the new patient and displays a confirmation message or redirects to the patient details	The system registered the new patient successfully and displayed a	Medical	Valid entries for all patient registration	Confirmation of patient	Patient registration screen with fields for First Name, Last Name, Date Of Birth, Age, Addre Mobile Number, Patient Ailment, and Patient's
002	functionality	button.	page.	confirmation message.	staff	fields	registration	Type, and an 'Add Patient' button

Table 6: Test case third

st Case cription ion	Test Steps	Expected Results	Actual Result	User Target	Test Input	Test Output
	1. Navigate to the					
	pharmaceutical category					
	addition screen. 2. Enter a					
	valid category name in		The system			
	the 'Pharmaceutical		added the			
	Category Name' field. 3.		new			
	Enter a valid description in		categor y		Valid category	
	the 'Pharmaceutical	The system successfully	success fully		name,	

	Category Description'	adds the new category	and		descriptio n, and	
mace utical	field. 4. Select a vendor	and displays a	display ed a		selected vendor	
ory	from the 'Pharmaceutical	confirmation message or	confirm ation		from the	
on	Vendor' dropdown. 5.	updates the category list.	messag e.	Pharm acist	dropdown list.	Confirmation of category addition

Table7: Test case fourth

Test Case Description	Test Steps	Expected Results	Actual Result	User Target	Test Input	Test Output	Wh
	1. Navigate to the laboratory test entry						
	screen. 2. Enter 'pana hazhar' in the 'Patient						
	Name' field. 3. Enter 'demo' in the 'Patient	The system	The system		Patient Name: 'pana		
	Ailment' field. 4. Enter '56WG2' in the	successfully records	recorded the		hazhar', Patient		For
	'Patient Number' field. 5. Enter relevant	the laboratory test	laboratory test		Ailment: 'demo',		Pati
Verify	laboratory tests in the 'Laboratory Tests'	details and displays a	details successfully		Patient Number:		Pati
laboratory	field. 6. Click the 'Submit' button (assuming	confirmation message	and displayed a		'56WG2', Laboratory	Confirmation	Pati
test entry	it's there, as 'Add Category' in the image	or updates the test	confirmation	Medical	Tests: [relevant test	of lab test	and
form	might be a placeholder).	list.	message.	staff	details]	entry	Test

5.4.1 Black box Testing

Black-box testing was centered on analyzing end-user behavior within the program without taking into account internal implementation. In a test scenario, for instance, the user had to create a new account and confirm that the registration procedure had gone through properly, enabling the user to log in.

5.4.1.1 Input Output Verification

1. **Data Validation:** Input verification starts with data validation, which ensures that the data entered into the system meets predefined criteria. This could include checking for valid formats in email addresses, phone numbers, and dates, ensuring numerical values are within acceptable ranges, or verifying that required fields are not left empty.

2. **Error Checking:** If the data does not meet the validation criteria, the system should provide informative error messages to guide users in correcting their input.
3. **Data Sanitization:** This involves cleaning the data to prevent security vulnerabilities, such as SQL injection attacks, particularly important in fields where users enter free-form text.
4. **Consistency Checks:** Ensuring the data is consistent with existing data. For example, a patient's record should not have conflicting information across different sections of the HMS.

Output Verification

1. **Accuracy:** The system should accurately reflect the input data in its outputs. This is critical in a healthcare setting where incorrect information can lead to serious consequences.
2. **Reporting:** Outputs often include reports for doctors, administrative staff, or regulatory bodies. Ensuring these reports are accurate and formatted correctly is vital for effective decision-making.
3. **User Interface Display:** User interface information should be accurate, current, and presented in a way that makes sense to the user and allows for easy action.
4. **Data Export:** When the system exports data (e.g., for sharing with other hospitals or systems), it's crucial to ensure that the exported data maintains its integrity and format.

Verification

1. **Unit Testing:** Writing tests for individual components or functions to ensure

they correctly process input and generate the expected output.

2. **Integration Testing:** Ensuring that different parts of the system work together correctly and that the data flow from input to output is seamless and accurate.

3. **User Acceptance Testing:** Involving real users (like doctors, nurses, and administrative staff) to test the system with real-world scenarios to ensure it meets their needs and produces the correct outputs.

4. **Security Testing:** Specifically for input verification to prevent malicious data inputs that could compromise the system.

5.4.1.2 Error Messages

A Hospital Management System's (HMS) error messages are essential for improving user satisfaction and system dependability. They serve as alerts to users when something goes wrong or isn't finished as planned. These messages must be useful, succinct, and clear in the context of an HMS, instructing users on how to resolve the problem.

1. **Validation Errors**: Occur when user input does not meet predefined criteria. Examples include:
    - "Invalid email address format."
    - "Date of birth cannot be in the future."
    - "Patient ID is required."

2. **Authentication and Authorization Errors**: Related to login and access control. Examples include:
    - "Incorrect username or password."
    - " Access to the resource is restricted; permission is not granted."

5.4.2 White box Testing

White-box testing entailed examining the application's internal workings and constituent parts. To verify that each module and feature is functioning correctly, unit testing was done. To make sure, for instance, that the process of adding a new animal for adoption to the database was operating correctly, a unit test was carried out.

5.5 Chapter Summary

The introduction to the implementation phase is covered in full in Chapter 5, "Implementation and Testing," which covers the coding of the system's primary functions and the design of their interfaces. After that, it explores other testing approaches, including White Box Testing, which looks at the internal workings of the code, Black Box Testing, which concentrates on system flow, input-output verification, and error messages, and User Testing, which evaluates the usability and functioning of the system with actual users. This chapter offers a thorough summary of the meticulous testing and development procedures necessary to guarantee the effectiveness and dependability of the system.

CHAPTER 6

CONCLUSION

6.1 Introduction

In conclusion, the identified issue with the hospital management sector's lack of an effective system has led to traffic jams, manual financial transactions, and a disproportionate reliance on paper paperwork. The creation of a website-based hospital management system is the suggested remedy for these problems. It streamlines procedures, makes administrative work easier, and boosts productivity. It has been evident via research and analysis of the current system that many hospitals in Kurdistan lack a structured management system, creating a number of difficulties. The suggested solution attempts to develop an easy-to-use, accessible, and effective platform for hospital personnel to handle patient appointments, financial transactions, and data by utilizing a user-friendly website.

6.2 Achievement of Project Objectives

The intended outcome—that the suggested remedy would be an appropriate replacement for the current problem related—becomes clearer. After gathering requirements from stakeholders, evaluating their needs, and contrasting current systems, artists create works that address the unique difficulties we face. Architectural design patterns and detail designs of the suggested solution have been created in order to better understand how to develop the system, what the suggested system's behaviours and structures are, and how precisely the system should operate.

6.3 Suggestions for Future Improvement

Making strategic improvements is necessary to take your Hospital Management System (HMS) to new levels. To guarantee a smooth and sophisticated user experience, think about putting the following into practice:

1. Updates in real time:

Enable real-time notifications for upcoming appointments, patient status updates, and other pertinent information. This guarantees prompt responses and improves communication.

2. Information Visualization:

Dashboard Analytics: Include a visible dashboard with informative data on patient demographics, appointment patterns, and resource usage for administrators and medical professionals.

3. Multilingual Assistance:

Language Localization: To serve a diverse patient and staff group, provide multilingual support. This can improve inclusivity and accessibility.

4. Blockchain Technology for Protecting Data:

Integration of Blockchain: Examine how blockchain technology can improve data security, integrity, and transparency, especially when it comes to exchanging and preserving private medical records.

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Appendix A Overall description

Overall Description

The HMS is made up of Eight (8) modules which are:

1. View Appointments
2. Make Appointment
3. Cancel Appointment
4. Make Payment
5. View Medical Records
6. Prescribe Medicine
7. Add Doctor
8. Add Medicine

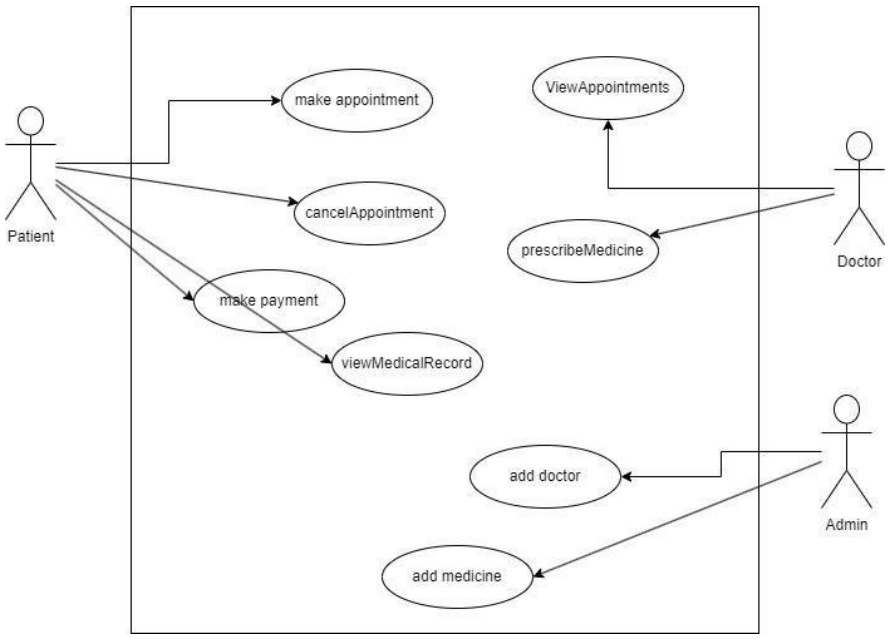

Figure 1.1 Use case Diagram of hospital Management System

1.1 Product Perspective

Hospital Management System is a web-based system that is built for employees and patients to facilitate the work flow in the Hospital in term of time and patient management, as for the patients they can easily see their appointments and make

payments with a click of a finger. It will help the Hospital to reduce the crowdedness in the wards and it will also help with the management of the medicines in the storage and in the Pharmacy.

1.1.1 System Interfaces

To ensure that the Hospital Management System functions properly. It made up of 8 (modules) and two main (3) actors. According to the module, each actor has a separate task and purpose. The user interface is easy to use and appealing for the users. This is likewise made to look basic yet appealing by utilizing nice colors and icons to represent each section.

1.1.2 User Interfaces

Software: Device Specification:

1. OS Edition: Windows 11 Pro
2. Intergraded Development Environment: Visual Studio code, XAMPP
3. Database Management System: MySQL
4. Web Browser: google chrome
5. Visual Modelling & Design Tool: Draw.io, LucidChart, and Creately
6. High Fidelity Prototype: Framer
7. Microsoft Power Point 2018: To create presentation slide

Microsoft Word 2016: To document project report, SRS and SDD

1.1.3 Hardware Interfaces

Minimum Requirements:

1. Operating system: IOS 11
2. Processor: A9
3. Memory: 2GB minimum, 4GB recommended
4. Screen Resolution: 1334X 750 or larger
5. Internet Connection: Required

1.2 Product Functions

There are 8 use cases that represent the main functions performed by the proposed system:

Table 2.1 Use Case Table

No	Actor	Role
1.	View Appointments	Doctor can view appointments
2.	Make Appointment	Patients can Book appointments
3.	Cancel Appointment	Patients can cancel appointments
4.	Make Payment	Patients can make Payments for their hospital fees
5.	View Medical Records	patients can view medical Records
6.	Prescribe Medicine	Doctor can Prescribe medicine to the patients
7.	Add Doctor	Admin will be able to add doctor
8.	Add Medicine	Admin can Add Medicine

1.3 User Characteristics

Based on Table 2.2, there are 3 main actors in the system which are Patients, Admin and Doctors. Table 2.2 provides the brief description of these actors.

Table 2.2 Actor Description Table

No	Actor	Role
1.	Patients	Patients plays a significate role in this project since they will be the main users of the system, they can cancel appointment, view medical records, make appointments, and make payments
2.	Admin	Admin is responsible for Adding Doctor and Adding Medicines .
3.	Doctor	Doctor is responsible for Viewing Appointments and Prescribing medicines

1.4 Constraints

Table 2.3 Software Requirements in process of developing the HMS

Category	Software	Software Description

Operating System	IOS and Android	Platform to run the Hospital Management System
Source-code editor	Virtual Studio Code	Use for proposed system development by writing a code that implements Flutter
Database	MySQL XAMMP	Responsible for the back-end of the system that manages and manipulates all the transaction of data into the database.

Detailed Description of Components

1.5 Complete Package Diagram

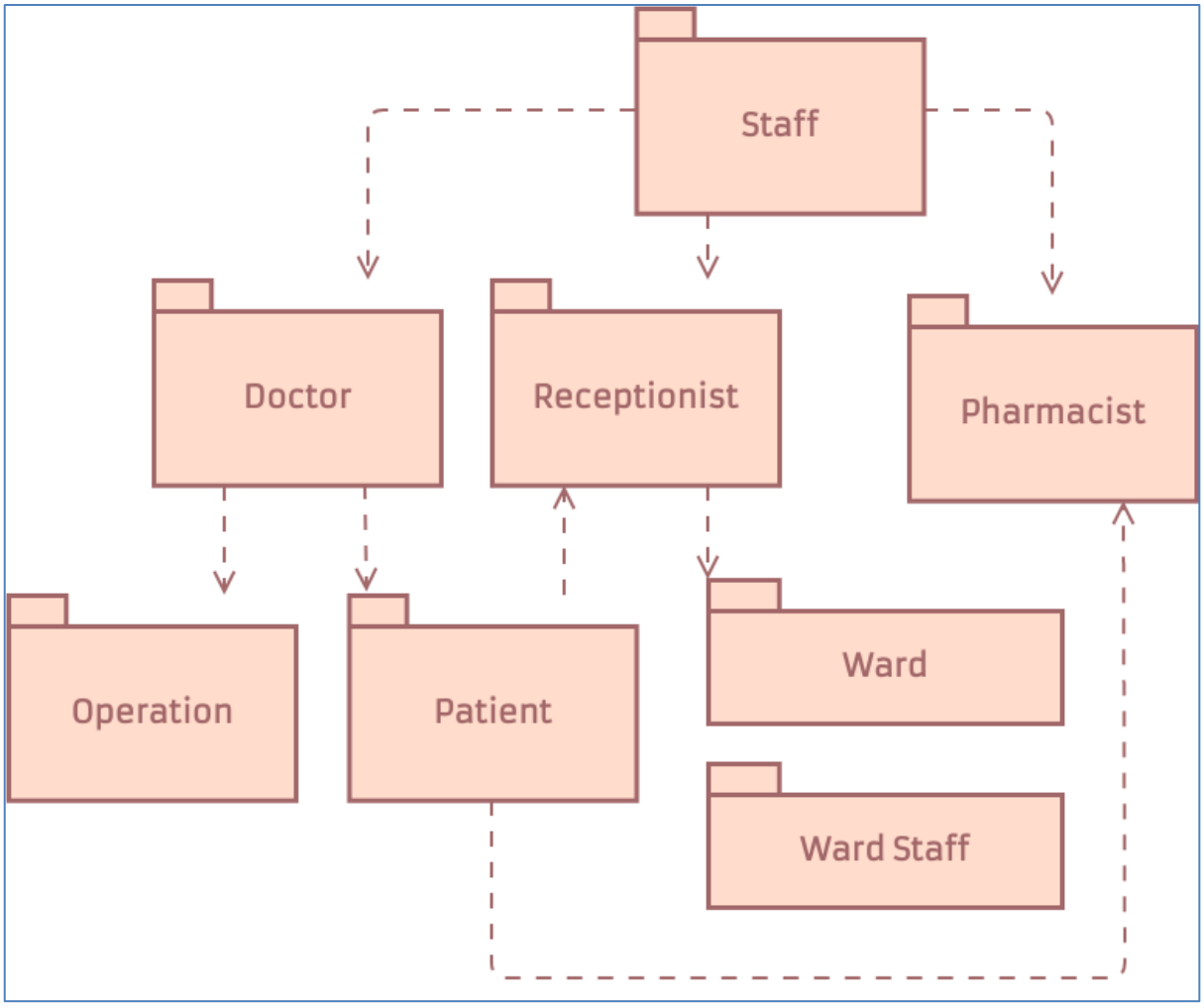

Figure 3.1: Package Diagram <HMS>

1.6 Component Model

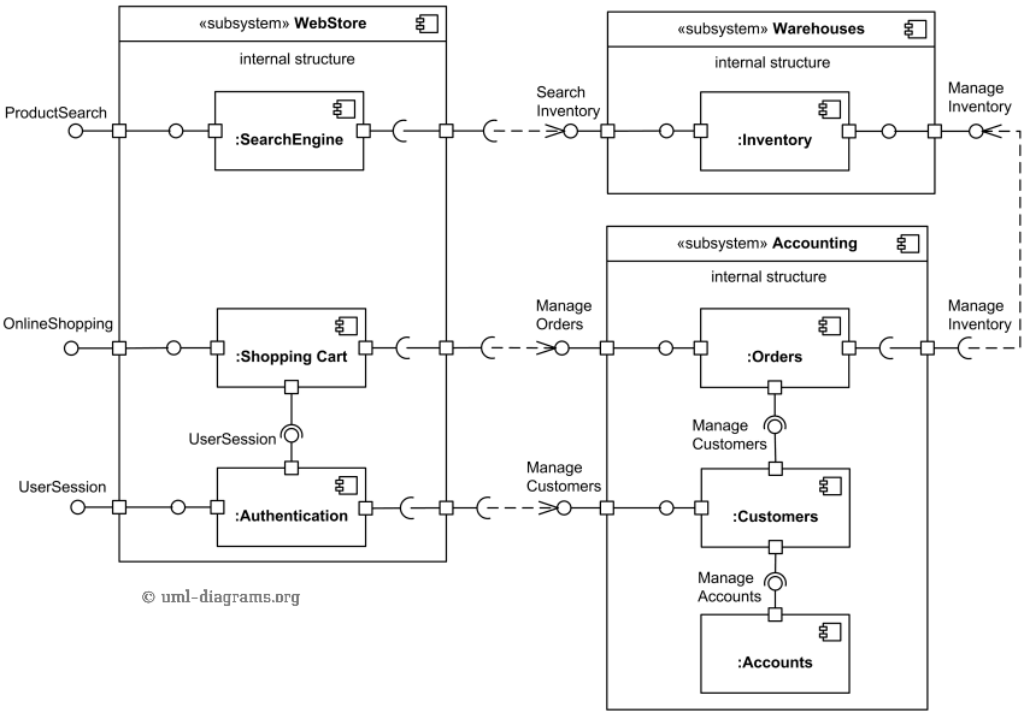

Figure 3.2: Component Diagram of <Name of the System>

1.7 Detailed Description

A detailed description is a thorough explanation of how a software system or component is built and functions. This could comprise the system's architecture, data structures, algorithms, interfaces, and other technical components. A thorough description is frequently used in the documentation and technical specifications to help developers, stakeholders, and other interested parties fully understand the software. It is also used to ensure that the software is developed and tested in accordance with the requirements and standards.

Appendix C Test Cases

1.1 Test TC001 for Module View Appointments: <View Appointments (UC001)>

This test contains the following test cases:

Doctor need to login to the system to be allowed to view their Appointments in the system.

UC001_01: e.g. View Appointments

Test Case ID	Input data	Expected result	Actual result	Pass / Fail
TC001_01_01	Logged in as Dr Mohammed Aziz	System shows the list of appointments	System successfully showed list of appointments	Pass
TC001_01_02	Logged in as Dr Yousuf Ahmed	System shows the list of appointments	System successfully showed list of appointments	Pass
TC001_01_03	Logged in as Dr Mustafa Qazi	System shows the list of appointments	System successfully showed list of appointments	Pass
TC001_01_04	Logged in as Chenar Zuhair	System shows the list of appointments	System failed to show the users Appointments due to no being into the system	Fail

1.2 Test TC002 for Module Prescribe Medicine: <Prescribe Medicine (UC002)>

UC002_01: Prescribe Medicine

Test Case ID	Input data	Expected result	Actual result	Pass / Fail
TC002_01_01	User Click on Prescribe medicine and fills the Prescription form	System saves prescription details	System successfully saves prescription details	Pass
TC002_01_02	User click on prescribe medicine button and doesn't fill the form	System Saves Prescription details	System unsuccessfully saves prescription details	Fail
TC002_01_03	User don't click on prescribe medicine	System Saves Prescription details	System unsuccessfully saves	Fail

			prescription details	

1.3 Test TC003 for Module Add Medicine: <Add Medicine (UC003)>

UC003_01: Add Medicine

Test Case ID	Input data	Expected result	Actual result	Pass / Fail
TC003_01_01	User clicks on add Medicine and enter medicine details	System store new medicine in database	System successfully add medicine	Pass
TC003_01_02	User click on add Medicine and doesn't enter medicine details	System store new medicine in database	System unsuccessfully add medicine	Pass
TC003_01_03	User doesn't click on add Medicine	System store new medicine in database	System unsuccessfully add medicine	Fail

1.4 Test TC004 for Module Add Doctor: < Add Doctor (UC004)>

UC004_01: Add Doctor

Test Case ID	Input data	Expected result	Actual result	Pass / Fail
TC004_01_01	User clicks on add Doctor and enter Doctor details	System Add doctor to database	System successfully Add Doctor	Pass
TC004_01_02	User clicks on add Doctor and enter Doctor details wrongly	System Add doctor to database	System unsuccessfully Add Doctor	Fail
TC004_01_03	User clicks on add Doctor and doesn't enter Doctor details	System Add doctor to database	System unsuccessfully Add Doctor	Fail

1.5 Test TC005 for Module Make Payment: < Make Payment (UC005)>

UC005_01: Make Payment

Test Case ID	Input data	Expected result	Actual result	Pass / Fail
TC005_01_01	User click on make payment and enter payment details	System accepts payment and book appointment	System successfully Make Payment and book appointment	Pass
TC005_01_02	User click on make payment and enter payment details wrongly	System accepts payment and book appointment	System unsuccessfully make Payment and book Appointment	Fail
TC005_01_03	User click on make payment and don't enter payment details	System accepts payment and book appointment	System unsuccessfully make payment and book appointments	Fail

1.6 Test TC006 for Module Make Appointment: < Make Appointment (UC006)>

UC006_01: Make Appointment

Test Case ID	Input data	Expected result	Actual result	Pass / Fail
TC006_01_01	User click on make appointment and	System book appointment	System successfully	Pass

	request available times and book	for the user	Book Appointment	
TC006_01_02	User click on make appointment and request available times and doesn't book	System book appointment for the user	System unsuccessfully Book Appointment	Fail
TC006_01_03	User click on make appointment but there's no available time slot	System book appointment for the user	System unsuccessfully Book Appointment	Fail

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