PATIENT RECORD MANAGEMENT SYSTEM FOR RHU MATALAM

DONNA M. DIAMA

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Name	DONNA M. DIAMA
Major	N/A
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APPROVED BY THE GUIDANCE COMMITTEE

DANILYN A. FLORES
Adviser

2025. 02. 06
Date

Co-Adviser
(Optional)

Date

CATHERINE C. DAFFON
Department Research Coordinator

Statistician
(Optional)

Date

2025. 02. 06
Date

ARJAY S. AGBUNAG
Department Chairperson

2025. 02. 06
Date

SHIERYL P. ORTIZA
College Research Coordinator
2025. 02. 07
Date

MARICEL G. DAYADAY
Dean
2025-02.06
Date

Study No: BSIS2024-29
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Recorded by: _____

LYDIA C. PASCUAL
Director for Research and Development Office

Recorded by _____ _____
Date

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The thesis attached hereto, entitled **"PATIENT RECORD MANAGEMENT SYSTEM FOR RHU MATALAM."** prepared and submitted by **DONNA M. DIAMA** in partial fulfillment of the requirements for the degree of **BACHELOR OF SCIENCE IN INFORMATION SYSTEMS** is hereby accepted.

DANILYN A. FLORES
Adviser

2025. 02. 06
Date

SHIERYL P. ORTIZA
College Research Coordinator

2025. 02. 07
Date

BIOGRAPHICAL DATA

The researcher was born on January 23, 2001, in F. Valdevieso New Bugasong Matalam. She is the second daughter of Mr. Daniel Diama and Mrs. Alma Diama. Her educational journey began at F. Valdevieso Elementary School, where she completed her elementary education in 2013. She completed her Junior High School at Matalam High School in 2017. Her senior High School years were spent at Matalam High School-Senior High, and she successfully graduated in 2019. Currently, she is pursuing her tertiary education at the University of Southern Mindanao, taking up a Bachelor of Science in Information Systems. In spite of the trials and difficulties she has encountered, she determined that someday, she will be able to finish her studies.

Despite the struggles and difficulties encountered, she continued to face those challenges with his strong determination and compassion for life with the hope of finishing the degree with the loving support of his family, friends, classmates, and adviser, and with the guidance of our almighty God.

DONNA M. DIAMA

Researcher

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ABSTRACT

DONNA, DIAMA MANGGA. 2024. Patient Record Management System for Rhu Matalam. Bachelor of Science in Information System Capstone Project, College of Engineering and Information Technology, University of Southern Mindanao, Kabacan, North Cotabato. 63 pp.

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The Patient Record Management System for RHU Matalam was developed to streamline patient data management and improve record-keeping efficiency. Conducted from February 2023 to December 2024, this project addressed challenges such as manual record handling, data retrieval inefficiencies, and limited accessibility to patient information. To resolve these issues, a digital system was designed to store, retrieve, and manage patient records efficiently while ensuring data security and ease of use. The evaluation results confirmed that the system provided reliable and valid data management, with ethical considerations taken into account during the research. Respondents agreed that the system successfully improved functionality, reducing errors and enhancing workflow efficiency. Recommendations for further improvements include optimizing storage, retrieval, and management processes to better meet user needs. This system offers an effective solution for RHU Matalam, supporting improved healthcare services and patient record management.

INTRODUCTION

The Rural Health Unit (RHU) in Matalam, North Cotabato, relied on a traditional paper-based system for managing patient information. Patient data was manually written on paper forms and stored across various departments, which led to significant challenges in accessing, updating, and retrieving important medical records. This outdated system created delays and inefficiencies, especially when healthcare providers and administrative staff had to physically search for and handle paper records. As a result, the timely delivery of medical care was often hindered, and healthcare providers faced difficulty in obtaining essential patient histories, test results, and treatment plans.

The challenge faced by RHU Matalam, from the perspective of future healthcare administrators and practitioners, lies in the inefficiencies of managing patient data through manual, paper-based methods. The dispersed storage of records in different departments made it time-consuming and difficult to locate pertinent patient information when needed. This not only slowed down the delivery of medical care but also reduced the overall effectiveness of healthcare services. Implementing a digital and web-based Patient Record Management System (PRMS) could have significantly alleviated these issues by streamlining the process of storing, accessing, and updating patient records, thereby improving the efficiency of healthcare delivery.

The primary goal of the project was to develop a web-based Patient Record Management System (PRMS) for RHU Matalam. Specifically, the project aimed to (1) develop a web-based patient record management system that streamlines the process of storing, accessing, and updating patient information; (2). develop payment transactions via online banking and e-wallets such as Paymaya and Gcash, and (3) evaluate the functionality of the system.

The Patient Record Management System (PRMS) aimed to digitize the management of patient records and eliminate the need for paper-based documentation. This system provided an automated platform for healthcare providers to store and access patient information quickly and easily. The web-based system allowed for real-time updates and quick retrieval of medical histories, test results, and treatment plans, thereby reducing delays in patient care. Additionally, the system develops payments through various methods, such as online banking and e-wallets like Paymaya and GCash, providing greater convenience for both patients and healthcare providers.

The study sought to address the challenges faced by RHUs in managing patient data by developing a digital, user-friendly, and efficient Patient Record Management System (PRMS). By moving away from manual, paper-based methods, The system enhanced patient care by providing healthcare providers with instant access to patient records,

allowing for more informed medical decision. This system was specifically designed for RHU Matalam and was not intended for broader use by other healthcare institutions or government agencies. The focus of the project was on improving patient record management within RHU Matalam by providing administrators and healthcare staff with a more efficient tool for storing and managing patient data.

Operational Definition of Terms

The terms below were defined to have a better understanding on how they are being used in the study.

Admin – referred to authorized users, such as nurses, doctors, or other authorized personnel responsible for managing the system. This included tasks such as adding, updating, and accessing patient records, as well as handling billing and financial transactions.

Bill Receipt – referred to a document generated by the system that confirmed the payment of patient bills. It contained details such as the patient's name, the amount paid, payment method, and transaction date.

Billing – referred to the process of managing financial transactions related to patient services. This included generating invoices, recording payments, and issuing receipts.

Cash Payment – referred to a method of settling patient bills using physical currency or cash equivalents at the healthcare facility's premises.

Check-up – referred to a patient's visit to the healthcare facility for medical examination, diagnosis, and treatment. Each check-up may have resulted in the creation or update of a medical record.

Dashboard – referred to the main interface of the system where admins could access various functionalities, such as patient records, billing, and system settings.

Generate – referred to the process of creating or producing a specific document or record within the system, such as patient records, bills, or receipts.

Medical Record – referred to a comprehensive document containing information about a patient's medical history, including diagnoses, treatments, prescriptions, test results, and other relevant healthcare data.

Online Payment – referred to a method of settling patient bills electronically through various online payment platforms, including bank transfers, credit/debit cards, or digital wallets.

Patient – denoted individuals receiving medical care within the healthcare facility. Each patient had a unique profile containing personal information, medical history, and treatment records.

Save – referred to the action of storing or preserving data entered or modified within the system, ensuring that changes were retained and accessible for future reference.

Search – referred to the process of locating specific information or records within the system by entering relevant keywords or criteria, which facilitated efficient data retrieval and access.

Conceptual Framework

Figure 1 shows the conceptual framework for developing the Patient Record Management System (PRMS) for Rural Health Units (RHUs), considering input, process, output, and outcome aspects. Input entities included requirements and challenges identified through stakeholder consultations and relevant literature, which guided the design phase.

The process involved a series of steps, including analyzing requirements, designing the system architecture and functionalities, implementing the PRMS, and conducting comprehensive system testing to ensure usability and reliability. Each step was essential to translate the identified needs into a fully functional and efficient system.

The outputs comprised the developed PRMS, featuring accessible and searchable patient records, supporting documentation such as training materials and user manuals, and enhanced system functionalities to streamline data management. These deliverables ensured that users could effectively utilize the system to improve healthcare services.

Finally, the outcome phase focused on evaluating the system's effectiveness based on metrics such as usability, user satisfaction, operational efficiency, and its impact on patient care. This evaluation informed further refinements, fostering continuous improvement of the PRMS. The framework emphasizes systematic development, user-centered design, and ongoing

enhancement to meet the dynamic needs of healthcare service delivery in RHUs.
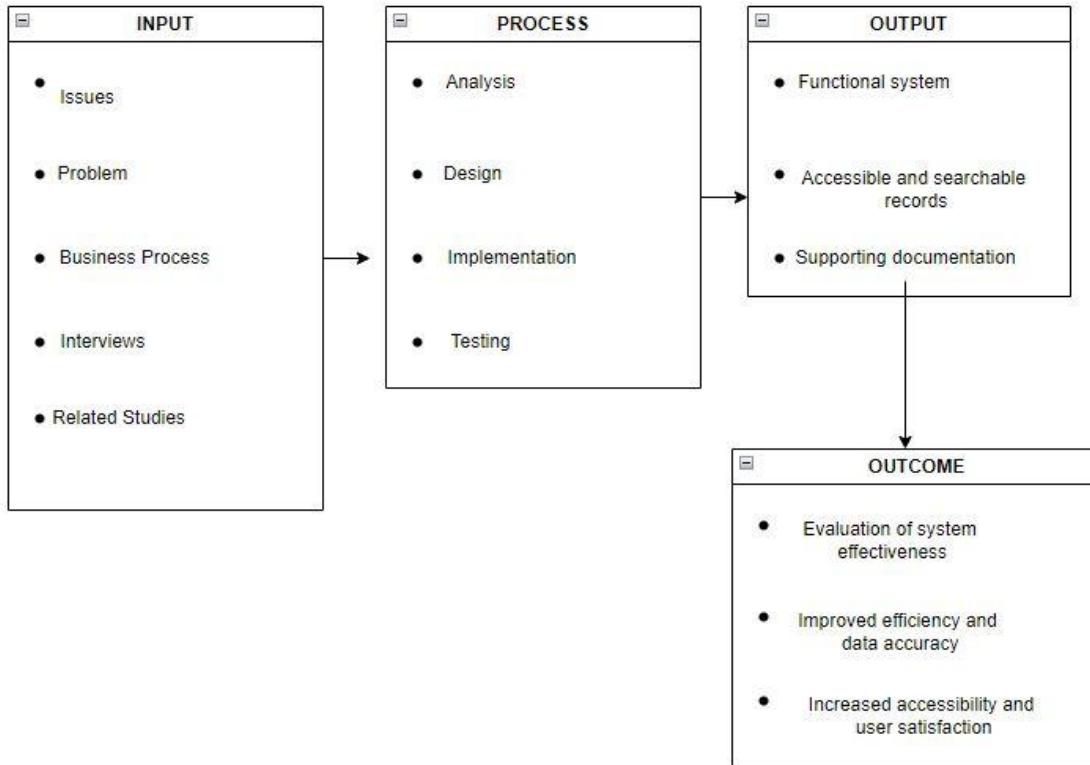

Figure 1. Conceptual Framework

REVIEW OF RELATED LITERATURE

This chapter focused on reviewing publications and studies relevant to the proposed project, aiming to provide researchers with insights into existing systems. By examining these resources, researchers gained a deeper understanding of related systems, which enabled them to develop a more sophisticated and efficient Patient Record Management System (PRMS) tailored for use in Rural Health Units (RHU).

Web-based record management system

A study addressed the challenges associated with manual outpatient records systems at General Hospital, Mina, and proposed solutions through the design of an web-based outpatient database system. Interviews with medical staff and an examination of outpatient records informed the identification of issues such as folder distortion, difficulty in searching records, and slow access to patient history during emergencies. The research employed PHP, MySQL, and Macro media Dream weaver to develop the web-based system, which aimed to streamline record-keeping processes and enhance medical service delivery. The findings underscored the importance of transitioning to digital record management to overcome existing challenges and improve overall healthcare provision (Abisoye et al. 2016).

Another study aimed to create a computerized system for managing patient medical and dental records. The system incorporated various components such as clinical, scheduling, electronic medical records, and data consolidation/reporting to facilitate clinics in delivering high-quality care to patients efficiently and affordably. The patient record management system provided several advantages, including the ability for users to capture, store, view, add, and delete records. Users could also post information directly to the database, streamlining the process and eliminating the need for external storage devices like flash drives (Ganiron, 2023).

A study presented the development of a Patient Record Management System utilizing Laravel, combining Laravel PHP and Vue.js technologies. The system was designed to streamline patient record management, enhance data accessibility, and improve overall healthcare efficiency. Through an analysis of existing systems, the study identified the advantages of adopting Laravue. The methodology encompassed system design, development tools, and user feedback. Results included a thorough evaluation of system features, performance, and scalability. The Laravue-based system showcased its ability to effectively manage patient records, ensuring secure and dependable healthcare data management (Cabañero & Ralph, 2023).

The healthcare industry, as of 2022, underwent significant transformation driven by advancements in technology, particularly Electronic Health Record (EHR) systems. These systems revolutionized the

management of patient medical information, replacing traditional paper-based records with digital platforms. The adoption of EHR systems resulted in improved patient care, enhanced healthcare productivity, better decision-making at managerial levels, and reduced overall healthcare expenditures. Despite these benefits, challenges persisted, including concerns regarding data privacy, interoperability, ownership, and security. Patient misidentification and misdiagnosis posed serious risks to patient health and safety. In response to these challenges, this project introduced the Patientcare Mauritius application, a mobile app-based patient records management system leveraging blockchain technology and IPFS to ensure the secure storage of medical records. Additionally, the application integrated NFC technology with patients' photo IDs to accurately identify patients at medical facilities, mitigating the risk of misdiagnosis. The Technology Acceptance Model (TAM) was employed to assess the acceptance and usability of the Patientcare Mauritius application, yielding a favorable TAM score of 4.33, indicating its value and user-friendliness (Rago et al. 2024).

A study conducted by the Zimbabwean AIDS & TB Unit assessed the usability of an electronic Patient Management System implemented in 83 health facilities. The objective was to determine how effectively the system was being utilized by users and to identify factors affecting its usability. A cross-sectional survey was conducted using a self-administered questionnaire, with 48 out of 83 facilities responding. The analysis revealed that the amount

of time spent with the system had a linear relationship with its usability, suggesting that familiarity and experience played significant roles. Interestingly, demographic factors did not significantly impact usability, indicating that the training provided during system installation effectively mitigated potential differences among users. However, factors like acquiescence response bias and social desirability bias may have influenced the results. The study concluded that perceptions of system usability and competency were likely to improve over time and suggested that a comprehensive assessment involving all facilities would provide better insights into usability issues (Mukumba, 2014).

Electronic Medical Records Implementation and Challenges

Electronic medical records (EMRs) played a crucial role in enhancing healthcare quality, particularly in specialized wards such as Female Pelvic Floor Dysfunction. This study focused on designing and assessing the feasibility of EMRs in such a ward, with the primary objectives of comprehensive documentation, evidence-based decision-making, active patient follow-up, and improved patient satisfaction. The Electronic Registry System for Female Pelvic Floor Dysfunction at Vali e Asr Hospital, Tehran, Iran, was developed and tested between mid-2014 and March 2015. The software was designed based on previous paper questionnaires used in the ward, with electronic questionnaires filled out upon hospitalization and during follow-up visits (Ghanbari et al. 2015).

Advancements in communication and information technology had significantly impacted the healthcare sector, particularly in services like hospitals, where Electronic Medical Records (EMRs) became increasingly prevalent. EMRs involved the application of information technology to collect, store, process, and access patient data as part of their medical records. The Ministry of Health had set a target for all health facilities to implement EMRs by December 2023. However, the implementation of EMRs faced multifaceted challenges, necessitating the identification and evaluation of inhibiting factors. This study aimed to identify the factors hindering the implementation of Electronic Medical Records in hospitals. Data collection involved searching through various sources such as Google Scholar, ScienceDirect, PubMed, and Digital Referral Garba (Garuda) using specific keywords related to EMR barriers and readiness. The findings from a review of 10 journals revealed that barriers to EMR implementation were primarily attributed to individual readiness factors and organizational readiness factors. These factors encompassed both psychological and structural aspects, with common themes including individual unpreparedness for technological changes and advancements, as well as insufficient training. In conclusion, the barriers to implementing EMRs were influenced by individual and organizational factors, emphasizing the importance of addressing both psychological and structural aspects to enhance readiness for EMR adoption in hospitals (Maharani & Dhamanti 2024).

Blockchain in Healthcare Management

According to Alkhateeb (2021) the potential implications of blockchain on managing patient complaints in healthcare settings. Through structured qualitative review and content analysis of the literature, the characteristics of blockchain were compared with the desired features for patient complaint management. Patient complaints played a crucial role in driving continuous improvements in healthcare quality. Results suggested that a complaint management system based on blockchain could offer features such as data integrity, security, and transparency. However, limitations such as cybersecurity concerns, scalability issues, and readiness for adoption needed to be addressed. Overall, implementing a blockchain-based system for managing patient complaints showed promise but required careful consideration of its limitations.

The advancement of modern technologies had revolutionized healthcare record management, shifting from physical ledgers to digital records stored in local databases. However, centralized databases posed challenges in privacy, accessibility, security, and data loss during natural disasters. Patients often faced bureaucratic hurdles in accessing and sharing their medical records. Blockchain technology offered a solution by providing a secure and decentralized platform for managing electronic health records (EHRs). Blockchain-based EHRs enabled secure sharing of patient records with healthcare professionals and stakeholders over the Internet, with features

such as access control and tracking changes in medical records. This paper proposed a decentralized application (DApp) based on the Tezos blockchain network, leveraging the InterPlanetary File System (IPFS) for off-chain data storage and public cryptography for data security. The implementation utilized Liquid Proof of Stake (L-PoS) consensus process to ensure data integrity and accessibility (Jaiswal et al. 2023).

The blockchain-based mobile app-based patient records management system aimed at securely storing and exchanging data in an open manner. Developed using Android Studio with Flutter SDK, the system leveraged the flexibility and scalability of Flutter to create cross-platform mobile apps. Traditional paper-based medical record management presented challenges such as data loss and delays in emergencies. Existing electronic record systems often lacked robust security. In response, this project proposed a mobile app that utilized blockchain technology to address these limitations and revolutionize healthcare management. Rigorous testing ensured the system's scalability, with documentation covering system architecture, user requirements, interface designs, sequential patterns, and development processes (Soochit et al. 2024).

METHODOLOGY

This chapter presents the research design of the project, who and how the participants were selected, the research instruments that were utilized, and how the research were conducted.

Research Design

The researcher used a descriptive-survey research design to evaluate the developed system and determine its functionality.

Research Participants and Materials

There were thirty (30) respondents in this project. The respondents included two (2) selected doctors or staff and twenty-eight (28) random patients from Rural Health Units.

Data Collection

The researcher collected data for the Patient Record Management System for Rhu Matalam through interviews with the Doctor and selected staff involved in the patient record process. These interviews provided insights into current practices and challenges. Additionally, a structured survey questionnaire was used to assess system requirements such as performance,

reliability, and data integrity to ensure secure record-keeping. These methods helped the researcher gather essential data to meet the study's objectives.

Statistical Analysis

The result of this survey in the study was summarized by using descriptive tools in frequency counts, means, and percentage. The result of the evaluation was measured using the four-point rating scale. The verbal description is based on the following ranges of the value reflected Table 1:

Table 1. Likert Scale for Evaluating System Functionality

NUMERIC VALUE	DESCRIPTION	VALUE
1	Strongly Disagree	1.00-1.49
2	Disagree	1.50-2.49
3	Agree	2.50-3.49
4	Strongly Agree	3.50-4.00

Project Development Approach

Figure 2 shows the waterfall model that the researcher used to develop the system. The following phases were followed by the researcher.
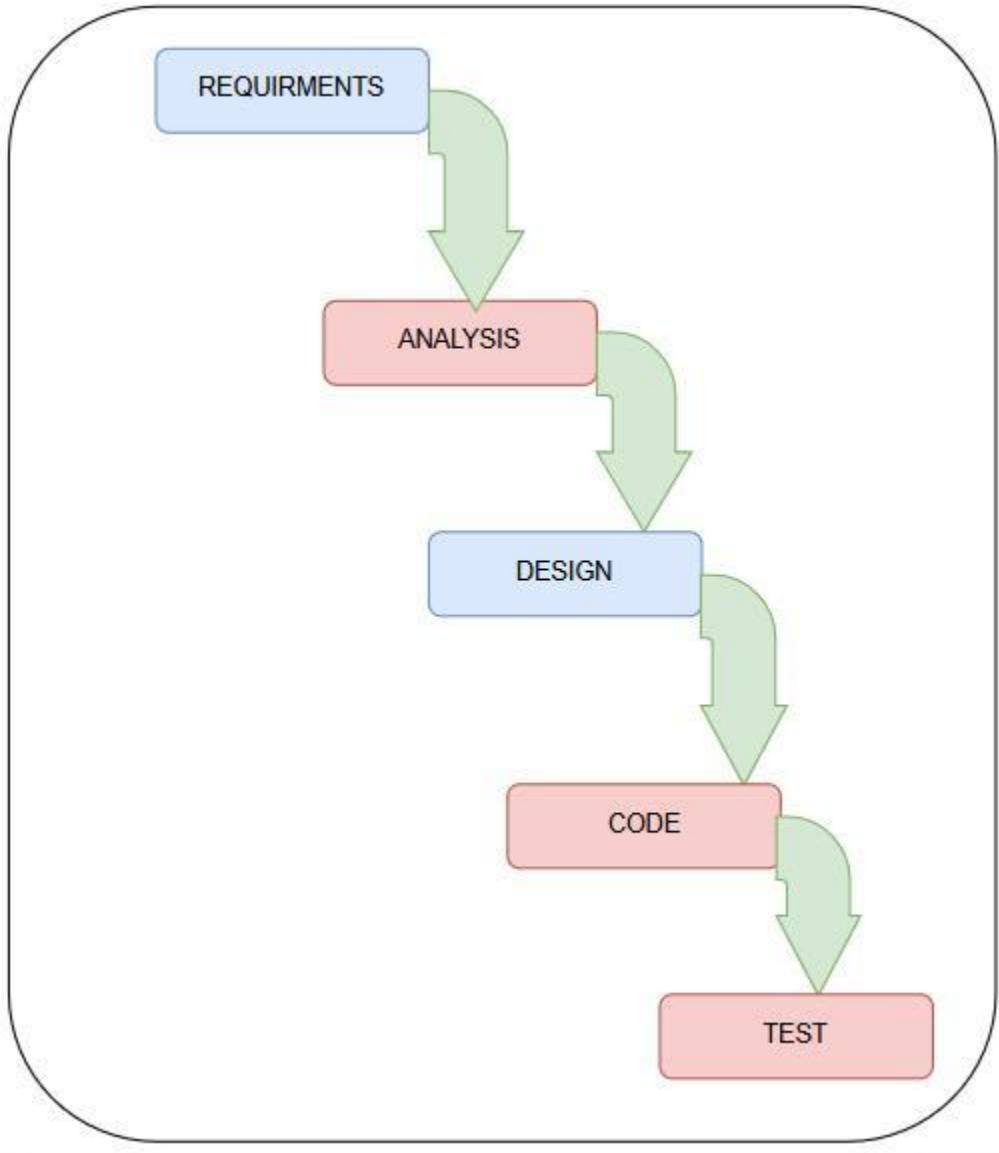
Figure 2. Waterfall Model.

Requirements analysis - In the requirements analysis phase, all necessary features and functions of the Patient Record Management System were thoroughly gathered to ensure a complete understanding of the project goals. Detailed discussions with stakeholders, including the doctor, staffs, were conducted to document all requirements, ensuring a clear understanding of the system's intended use.

Design – The design phase was divided into two sub-phases: logical (preliminary) design and physical (detailed) design. During the logical design phase, potential solutions were explored and analyzed to evaluate their strengths and weaknesses within the context of the project requirements. Once the most effective solution was identified, the physical design phase involved creating detailed specifications and documenting them as concrete plans to guide the development of the system.

Implementation/Coding – In the implementation phase, the software development team began translating the detailed design specifications into actual code. This involved writing and assembling the code to create the core functions of the Patient Record Management System, ensuring the system's components aligned with the requirements and design documentation.

Testing – Testing was conducted to verify the system's functionality. This involved running both manual tests and automated tools to check each component and ensure the system worked as expected, this phase confirmed that all system functions were operating correctly.

Gantt chart

Figure 3 shows the Gantt chart of the visual representation of a venture plan that makes a difference extend supervisors arrange, plan, and track errands. It shows venture exercises as even bars along a timeline, appearing the begin and conclusion dates. The project started on February 4, 2024. The planning phase took 28 days, the analysis phase took 23 days, and the design phase took 118 days. the implementation phase took 77 days, and the system was completely built on October 31, 2024

ID	Project Start: 02/04/2024 Task Name	Start	Finish	Duration
1	Planning			
2	Define goals	02-04-2023	02-08-2023	5 days
3	Define procedure	02-09-2023	02-13-2023	5 days
4	Problem Identification	02-14-2023	02-18-2023	5 days
5	Creation of title	02-19-2023	02-23-2023	5 days
6	Title defense	03-29-2023	03-29-2023	1 day
7	Introduction of RRL			
8	Significance of the project	04-01-2023	04-02-2023	2 days
9	Objectives	04-03-2023	04-04-2023	2 days
10	Expected Output	04-05-2023	04-06-2023	2 days
11	Limitations	04-07-2023	04-07-2023	1 day
12	Conceptual framework	04-08-2023	04-10-2023	3 days
13	Methodology	04-11-2023	04-13-2023	3 days
14	Research Design	04-14-2023	04-14-2023	1 day
15	Data Collection	04-15-2023	04-15-2023	1 day
16	Sampling Procedure	04-16-2023	04-16-2023	1 day
17	Statistical analysis	04-17-2023	04-17-2023	1 day
18	Research instrument	04-18-2023	04-18-2023	1 day
19	Validity	04-19-2023	04-19-2023	1 day
20	Ethical Consideration	04-20-2023	04-20-2023	1 day
21	Project Development			
22	Development Approach	04-21-2024	04-23-2024	3 days
23	Gantt chart	04-24-2024	04-28-2024	5 days
24	Analysis Phase			
25	System requirement specification	04-29-2024	04-30-2024	2 days
26	Design Phase			
27	UI design	05-01-2024	05-10-2024	10 days
28	Entity relationship diagram	05-13-2024	05-24-2024	10 days
29	Use case diagram	05-27-2024	06-07-2024	10 days
30	Class diagram	06-10-2024	06-21-2024	10 days
31	Activity diagram	06-24-2024	07-05-2024	10 days
32	Testing Phase	07-08-2024	08-16-2024	34 days
33	Implementation	08-19-2024	08-30-2024	10 days
34	System evaluation	09-02-2024	10-11-2024	34 days

Figure 3. Duration of the project.

The Functional Requirement Specification

Functional Requirements

A. Administrator / Doctor

Creating Account for Admin

Input: Admin's name, email address, admin type, username, and password.

Process: Validates input to ensure the completeness and correctness of the data.

Output: A success message or an error if the credentials are invalid.

Admin Login

Input: Admin's username and password.

Process: The system verifies the admin's credentials.

Output: Successful login or an error message for invalid credentials.

Accessing Patient Records

Input: Patient's name or ID.

Process: Admin selects the option to view the patient's history.

Output: Displays the selected patient's name along with detailed medical history.

Updating Patient Information/Check-up

Input: Patient's name or ID.

Process: Admin creates a new check-up entry for the patient.

Output: The system saves the new check-up record and updates the patient's information.

Recording Paid Bills

Input: Admin enters total bill information.

Process: Admin selects payment method (online or cash).

Output: System saves the transaction details and documents the paid bills.

Recording Patient Check-Up Details

Input: Admin logs in with credentials, searches for the patient by name or ID, and fills out a check-up form with details (date, symptoms, diagnosis, treatment).

Process: The system validates and stores the check-up details.

Output: The system updates the patient's medical history and provides an option to print the report.

Retrieving Patient History

    Input: Patient's name or ID.

    Process: Admin searches the system for the patient's medical history.

    Output: Displays the patient's complete medical history.

Generating Bills

    Input: Select the patient and services rendered.

    Process: Admin generates the bill.

    Output: The system calculates the total cost, displays a detailed bill, and allows it to be printed.

Adding New Patients

    Input: Patient's personal and medical information (name, date of birth, contact details, check-up details, diagnosis, prescriptions).

    Process: Admin enters the new patient's details and check-up information.

Output: Saves the new patient record and adds the patient to the system.

Giving a Prescription

Input: Doctor conducts a check-up, enters the patient's ID, and specifies medication details.

Process: The doctor enters prescription information into the system.

Output: The prescription is saved in the system and can be printed or signed by the doctor on a prescription note.

B. **Staff**

Managing Patient Appointments

Input: Patient's name, appointment time, and details.

Process: Staff schedules or manages the appointments.

Output: The system confirms and records the appointment details.

Supporting Patient Check-Up

Input: Basic patient information and assistance with check-up procedures.

Process: Staff may assist the doctor with initial assessments or take vital signs.

Output: Documented observations or data entered into the system for doctor review.

Patient Billing Assistance

Input: Patient billing information (e.g., service rendered, amount).

Process: Staff may assist in processing the payment or generating bills.

Output: Billing information is entered into the system.

Handling Patient Information

Input: Patient's name, contact information, or medical updates.

Process: Staff assists in updating or retrieving patient records.

Output: Patient information is updated or retrieved as per requests.

Assisting with Prescription Management

Input: Prescription details or patient ID.

Process: Staff may assist by ensuring prescriptions are ready for collection or confirming medication details.

Output: Printed or written prescription for patient collection.

Software Requirements Specification

Table 2 shows the software requirements specification of the system. In addition, the table displays the minimum and recommendation software requirements.

Table 2. Developer Software Requirements

SPECIFICATION	MINIMUM	RECOMMENDED
Operating System	Windows 10	Windows 11
System Type	64-bit O.S.	64-bit O.S.
Database	MySQL	MySQL
Programming language	PHP, JavaScript	PHP, JavaScript

Hardware Requirements Specification

Table 3 shows the hardware requirements specification of the system. In addition, the table displays the minimum and recommendation hardware requirements.

Table 3. User Hardware Requirement

SPECIFICATION	MINIMUM	RECOMMENDED
Processor	Intel Core i3	Intel Core i5 or higher
Memory (RAM)	8Gb	8Gb
Storage	250Gb HDD	500Gb-1T HDD/SDD
Monitor	14 inch	16 inch

Entity Relationship Diagram

Figure 4 The figure illustrated the Entity Relationship Diagram (ERD) for a Healthcare Management System. It depicted six main tables: Patients, Doctors, Checkup, Billing, Payment Types, and Receipt. Patients had a one-to-many relationship with Checkup, as one patient could have multiple checkups. Similarly, Doctors had a one-to-many relationship with Checkup, as one doctor could perform multiple checkups. Each Checkup had a one-to-one relationship with Billing, where each checkup generated a single billing record. Billing had a one-to-many relationship with Receipt, as one billing record could have multiple associated receipts. Payment Types were referenced by Receipt to specify the method of payment. Each table contained fields that supported the management of patient records, doctor information, checkup details, billing processes, payment methods, and receipt generation, ensuring efficient and organized record management within the healthcare system.
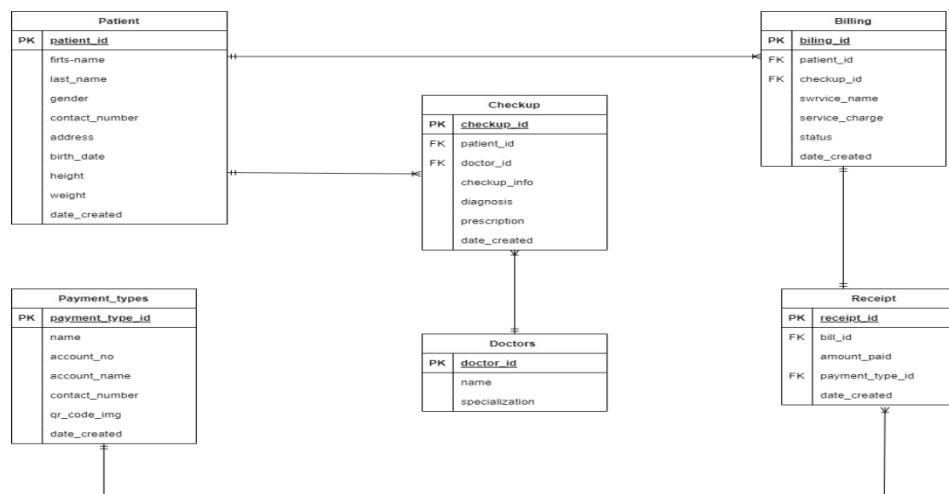
Figure 4. Entity Relationship Diagram.

Use Case Diagram

Figure 5 The use case diagram of the system illustrates the interactions between the system and its users, including doctors and staff members. This diagram outlines various functionalities accessible to these actors. Doctors and staff can create accounts and log in to access system features. Both actors have the ability to view and update patient records, ensuring the information remains current. Staff member primarily handle recording paid bills and generating bills for services rendered, while doctors focus on patient care tasks such as recording checkup details and providing prescriptions. The system allows both doctors and staff to retrieve patient history and add new patient records as needed. Notably, only doctors can give prescriptions following a diagnosis.
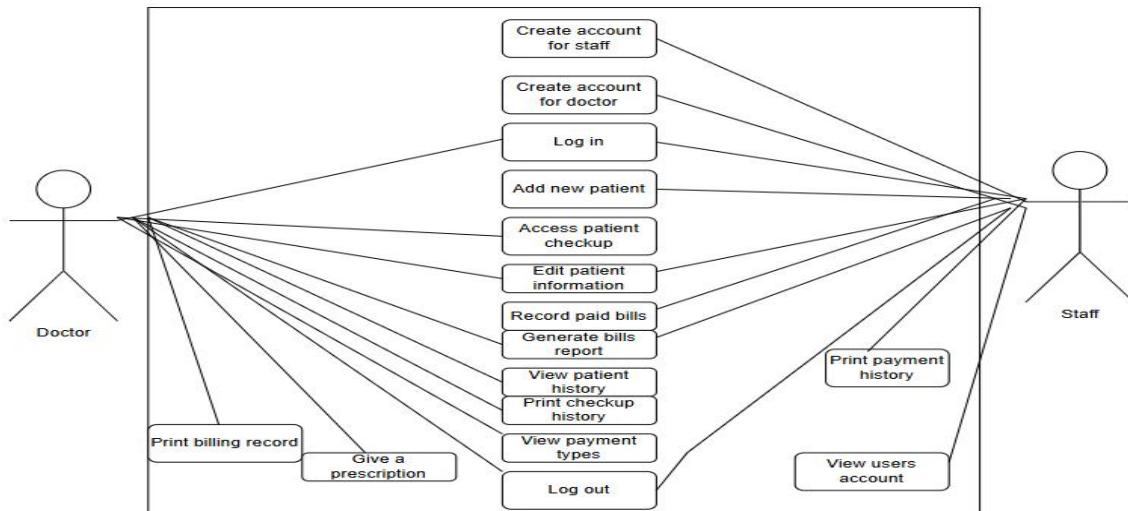
Figure 5. Use Case Diagram.

Class Diagram

Figure 6 shows the class diagram of the Patient Record Management System for Rhu Matalam with six main classes: Patients, Doctors, Checkup, Billing, Payment Types, and Receipt. The Checkup class links both patients and doctors, storing details of the medical checkup, diagnosis, and prescription. It includes a method for managing checkup records and establishes a one-to-many relationship with both Patients and Doctors (a patient can have multiple checkups, and a doctor can perform multiple checkups). The Billing class records financial information for each checkup, such as service details, charges, and status, and has a method for creating billing entries. It is directly linked to the Checkup class in a one-to-one relationship (each checkup has a single billing record). The Payment Types class defines various methods of payment, including account details and QR codes for digital payments, along with a method for managing payment types. The Receipt class logs payments made, referencing both the billing record and the payment type used, and includes a method for creating receipts. It has a one-to-many relationship with Billing, as one billing record can generate multiple receipts.
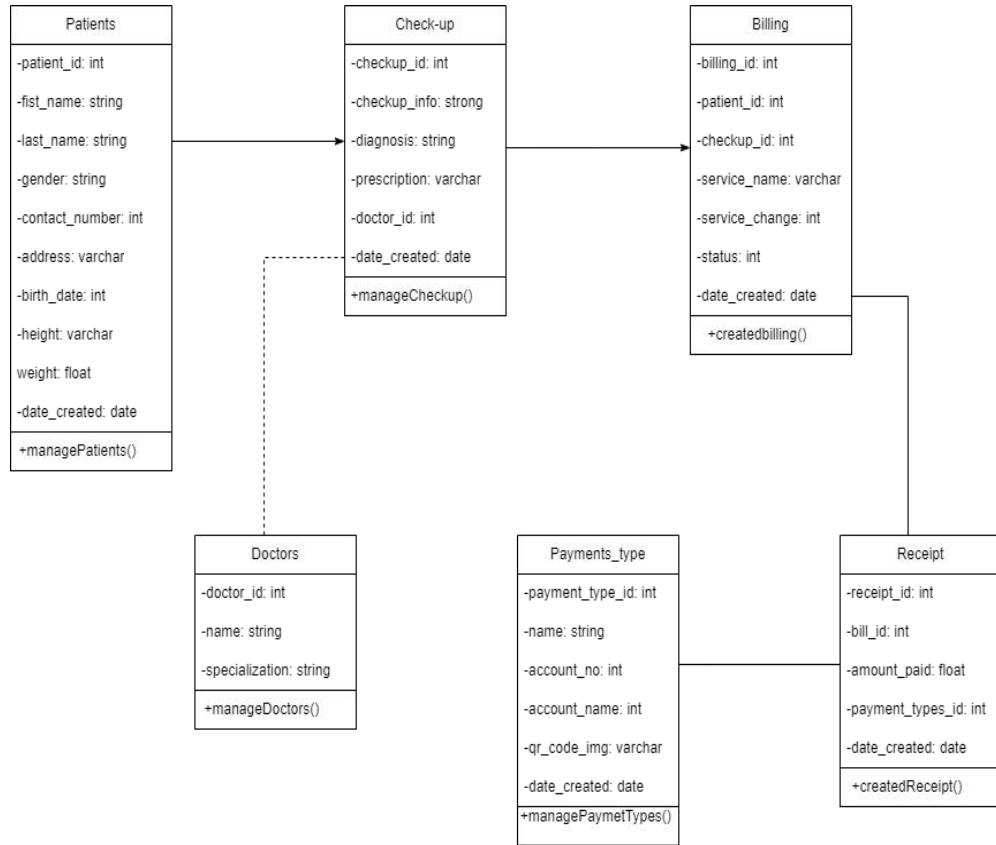
Figure 6. Class Diagram.

Activity Diagram

Figure 7 shows a step-by-step process for account creation. It begins with the initiation of the "Create Account" activity, prompting the admin to input required information such as their name, email address, admin type, username, and password. Upon submitting the account creation form, the system validates the entered information to ensure completeness and accuracy. If any validation errors occur, such as missing fields or incorrect data format, the admin is prompted to correct the errors before resubmitting. Once the entered information passes validation successfully, the system confirms the account creation and displays a success message, indicating that the admin account has been created successfully. This marks the end of the account creation process, allowing the admin to log in and access the system.
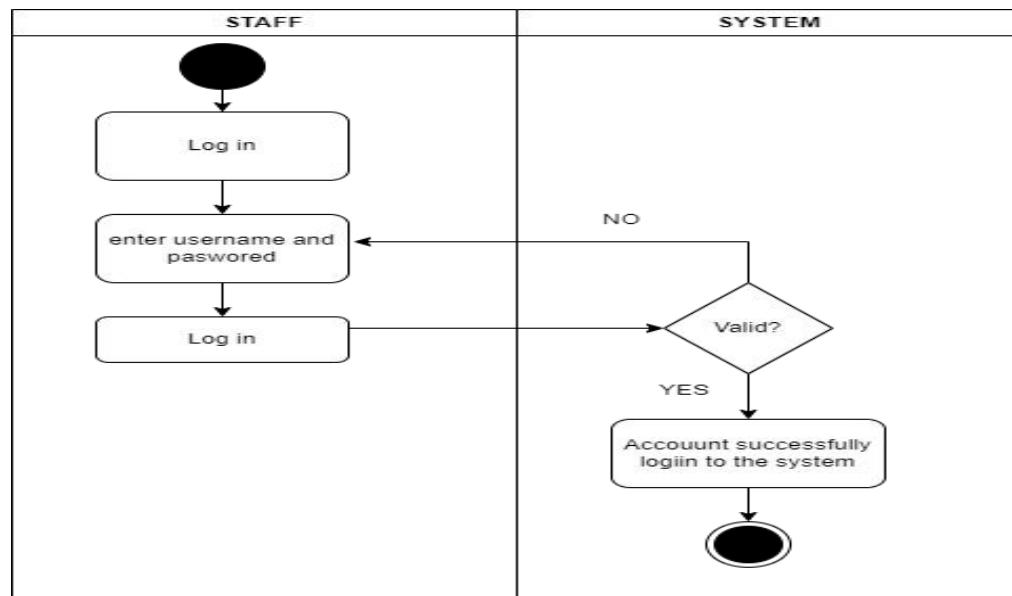
Figure 7. Creating account for the admin

Figure 8 shows the process begins with the initiation of the "Admin Login" activity. The admin is prompted to enter their username and password into the system. Once the login credentials are entered, the system validates the information provided by the admin to ensure accuracy. If any validation errors occur, such as incorrect username or password, the admin is prompted to correct the errors and re-enter the credentials. Upon successful validation of the login credentials, the system grants access to the admin and allows them to log in to the system. A success message is displayed, indicating that the admin has been successfully logged in.
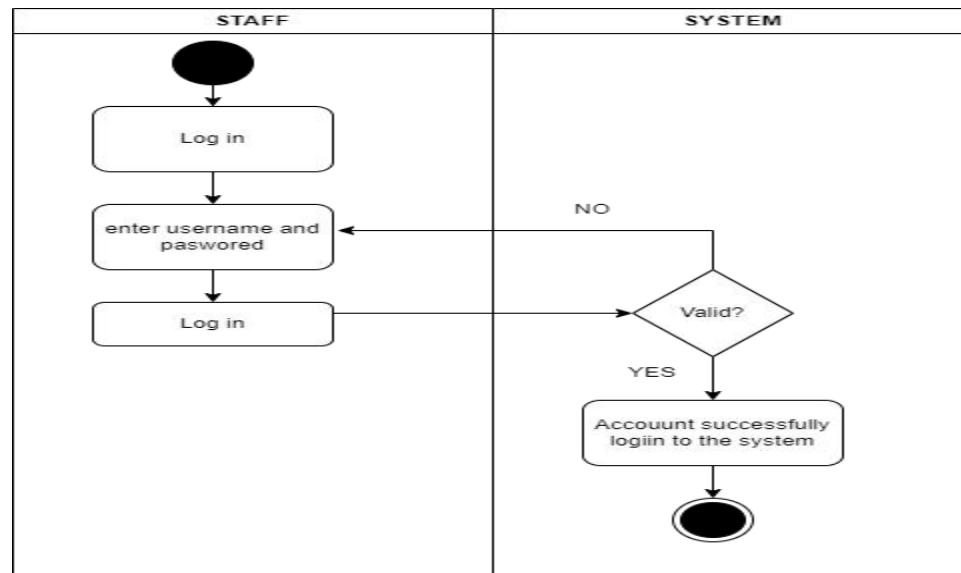
Figure 8. Activity Diagram Admin Login Account.

Figure 9 shows the activity diagram for accessing patient records in the Patient Record Management System and outlines a straightforward process for admin users to retrieve patient information. It begins with the admin logging into the system and navigating to the dashboard interface. From there, they select the option to view patient history, which leads to a list of patient names being displayed. The admin then clicks on the name of the specific patient whose records they wish to access. Subsequently, the system retrieves and displays the selected patient's name along with their detailed medical history, encompassing past visits, treatments, prescriptions, and test results.
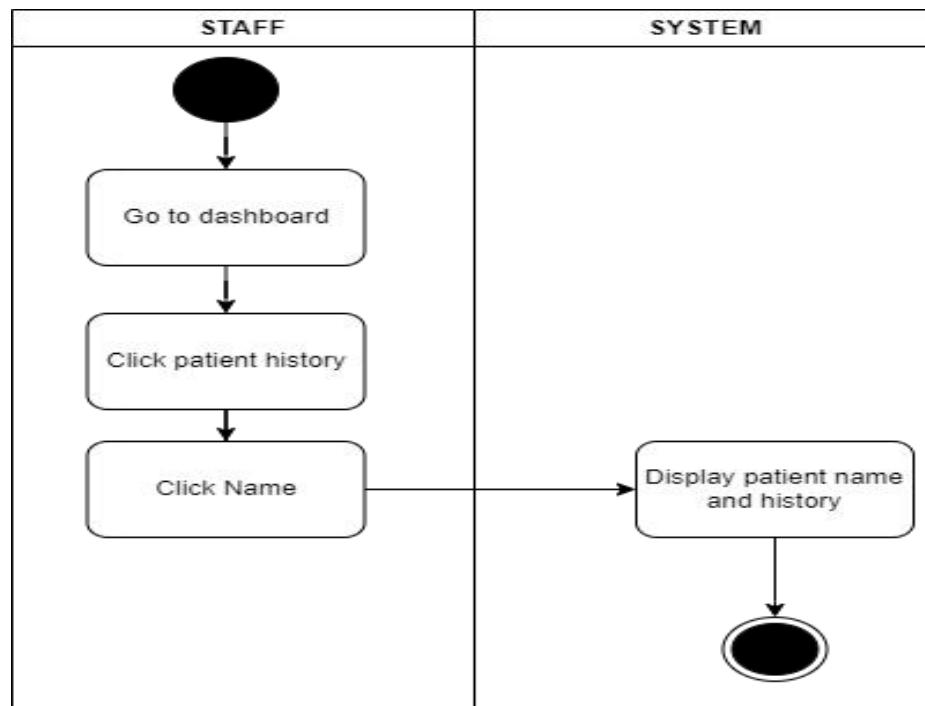
Figure 9. Activity Diagram for Accessing Patient Records.

Figure 10 shows the activity diagram for updating patient information in the Patient Record Management System and delineates a systematic procedure for admin users to modify patient data. Initially, the admin initiates the process by searching for the patient's name within the system. Once the desired patient is located, the admin clicks on the patient's name to access their records. Subsequently, the admin selects the option to create a new check-up entry for the patient. Within this interface, the admin adds or modifies relevant information such as diagnosis, treatment plans, prescriptions, and any other pertinent details. After ensuring that all necessary updates are made, the admin saves the changes.
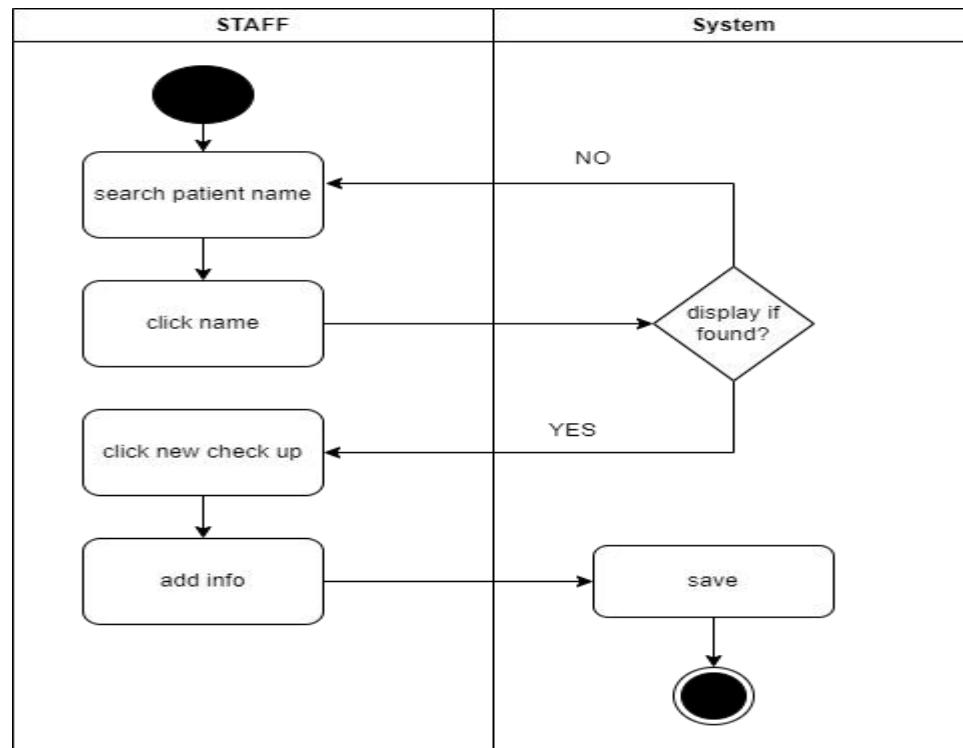
Figure 10. Activity Diagram for Updating Patient Information/Check-up.

Figure 11 shows the activity diagram for recording patient check-ups in the Patient Record Management System, the process starts with the admin either searching for an existing patient by name or adding a new patient to the system. Next, the admin creates a new check-up entry for the patient, inputting relevant information including the total bills incurred during the visit. Following this, the admin determines the patient's payment method either online or in cash. If the patient option for online payment, the admin provides the necessary bank details and processes the payment. If the patient chooses to pay in cash, the admin records the payment accordingly. Upon successful payment, the admin selects the appropriate payment method and generates a bill receipt. Finally, the admin saves the check-up details, ensuring accurate documentation and record-keeping of the patient's visit.
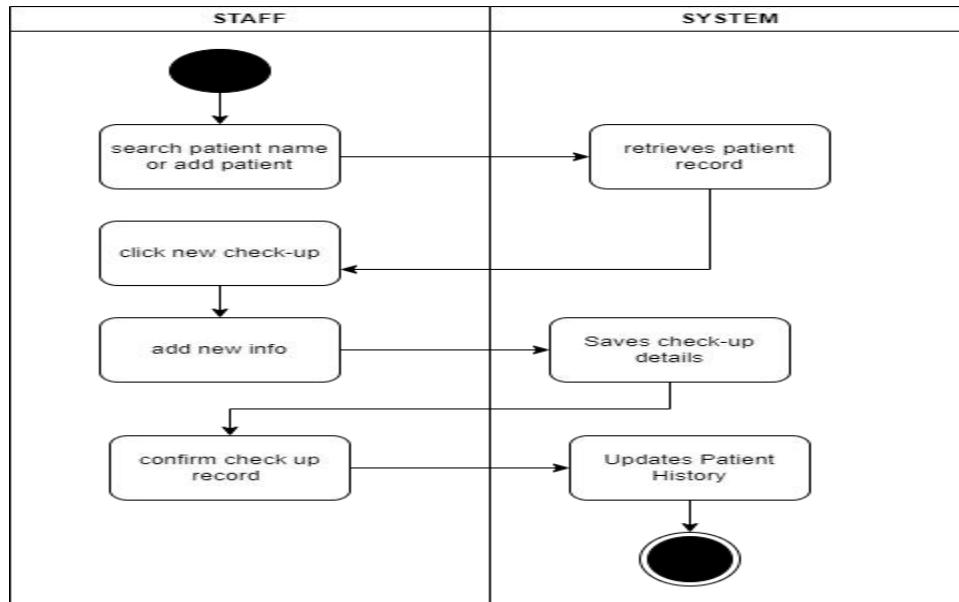
Figure 11. Activity Diagram for Record Patient Check-up.

Figure 12 shows the activity diagram for retrieving patient history in the Patiem Record Management System and outlines a structured approach for admin users to access comprehensive patient information. The process commences with the admin logging into the system and navigating to the dashboard interface. From the dashboard, the admin selects the option to view patient history, which leads to a designated search field where they can input the patient's name. After entering the name, the admin initiates the search, which filters and displays a list of matching patient names. Upon identifying the desired patient, the admin clicks on their name, prompting the system to retrieve and present the patient's complete medical history
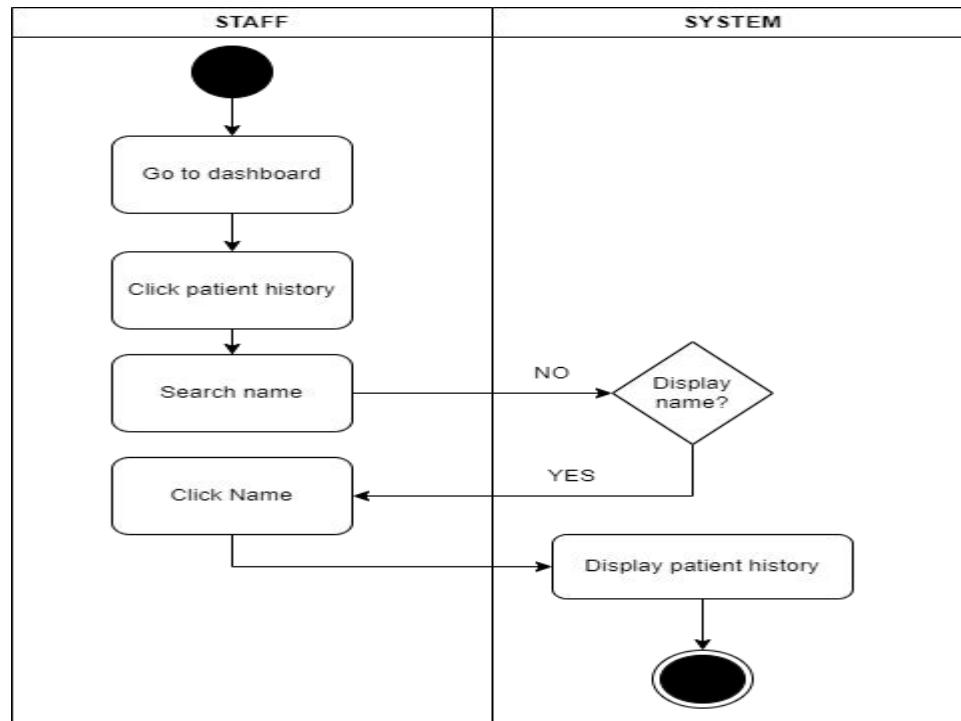
Figure 12. Activity Diagram for Retrieving Patient History.

Figure 13 shows the activity diagram for recording paid bills that begins with the admin conducting a check-up for the patient and subsequently adding new information, including the total bill amount, to the system. The patient then pays the bill, either online or in cash. The admin confirms the payment by selecting the appropriate method in the system. Upon confirmation, the system generates a bill receipt detailing the patient's name, total amount paid, payment method, and transaction date. Finally, the system saves the transaction details, including the bill receipt, into the patient's record, ensuring secure and accurate financial record management.
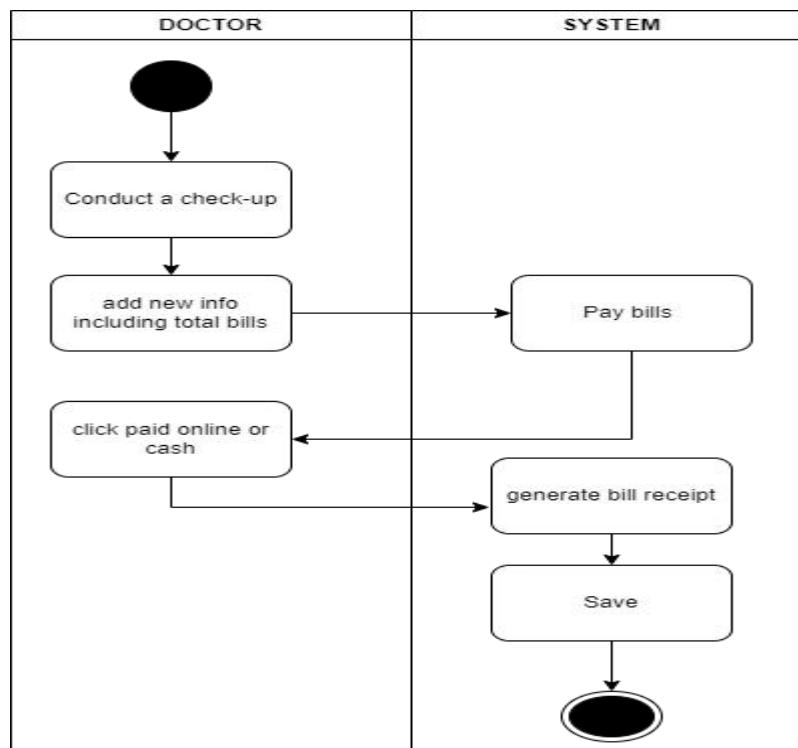
Figure 13. Activity Diagram for Record Paid bills.

Figure 14 illustrates the activity diagram for giving a prescription in the Patient Record Management System, detailing the steps taken by admin users to record patient check-ups and issue prescriptions. The process begins with the admin either searching for an existing patient by name or adding a new patient to the system. Once the patient is identified or added, the admin clicks on the option to create a new check-up entry. During the check-up, the admin conducts the examination and adds all relevant information, including the medical findings. After documenting the findings, the admin provides the patient with a prescription. The process concludes with the recording of this information in the system, ensuring that the patient's medical records are up-to-date and the prescription is properly documented.
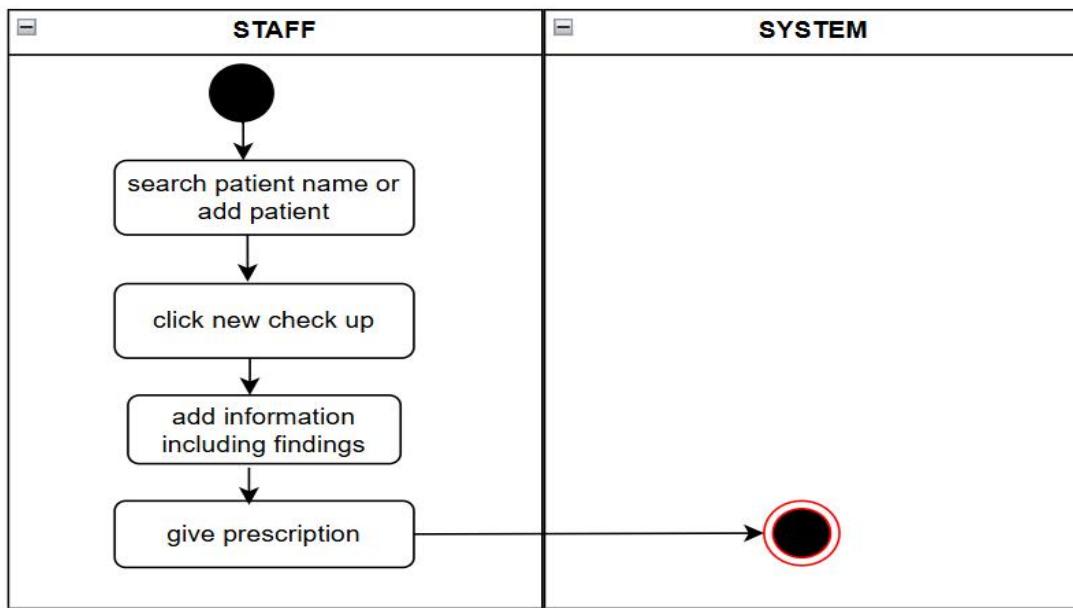
Figure 14. Activity Diagram for Giving a Prescription.

RESULTS AND DISCUSSION

The Patient Record Management System project was conducted to address the record management needs of RHU Matalam, located in Matalam, North Cotabato. The system featured modules for managing patient information, medical records, appointment scheduling, and billing.The system was successfully developed and met its objectives of streamlining patient record-keeping and enhancing the operational efficiency of RHU Matalam. It was evaluated by the healthcare staff and administrative personnel, receiving positive feedback for its functionality, user-friendliness, and effectiveness in managing patient records.

Design and System Development

Figure 15 shows the Web-Based Patient Record Management System for RHU Matalam was designed and developed to improve the manual processes of managing patient records and transactions. This project successfully achieved its objectives by providing a system that enables healthcare providers to efficiently manage patient information, medical history, and billing transactions. The system's functionality ensures streamlined operations, enhancing the overall efficiency and effectiveness of RHU Matalam's healthcare services.
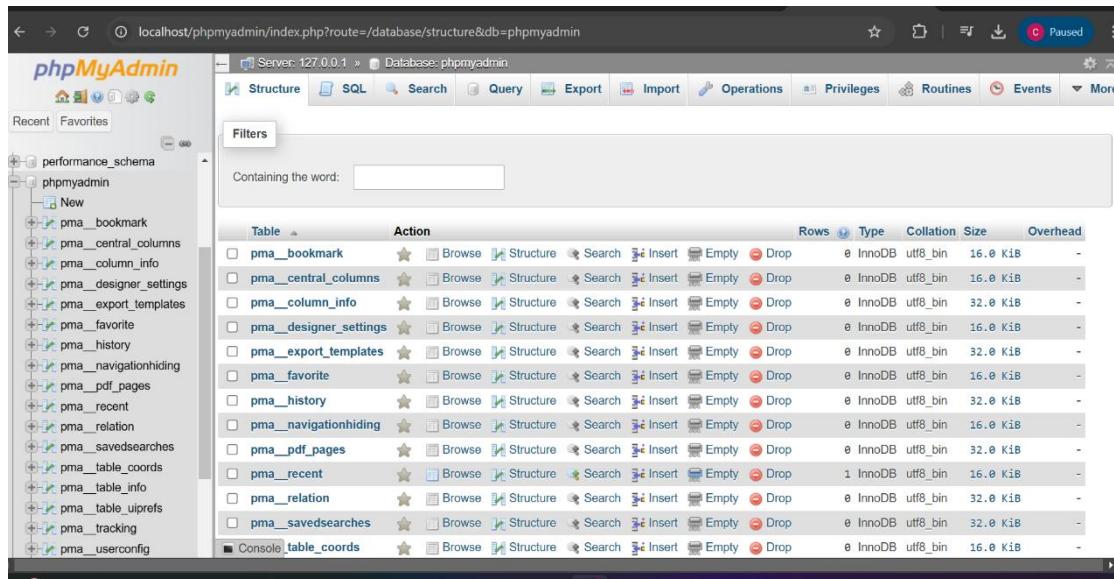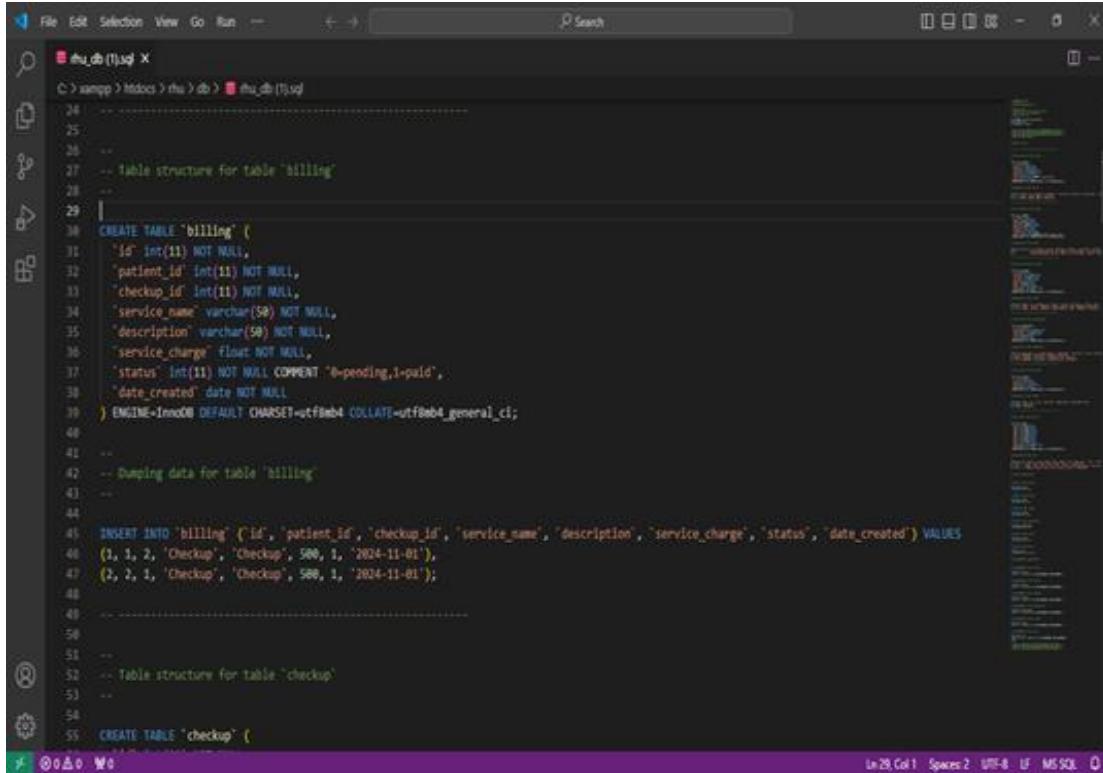
Figure 15. Database of the system

Figure 16 shows the Web-Based Patient Record Management System for RHU Matalam was developed using an advanced process that incorporated modern front-end and back-end technologies. The system provides both healthcare providers and administrators with a seamless experience through its responsive and user-friendly front-end interface, developed using HTML5, CSS3, PHP, and JavaScript. Emphasizing functionality and usability, the design ensures intuitive navigation and efficient interaction with the system.The back-end was built with PHP and JavaScript, ensuring secure data handling, fast processing, and seamless integration with the front-end. MySQL, a robust relational database, powers the system, enabling efficient management of patient records, medical histories, billing

transactions, and payment details. The integration of these technologies ensures the system's scalability, reliability, and maintainability

Figure 16. Sample code of the system

Development of the Patient Record Management System

Figure 17 shows the Patient Record Management System for RHU Matalam was developed to optimize the storage, access, and updating of patient information. This system enables healthcare providers to efficiently manage records, facilitating quick retrieval and seamless data updates. Key features include storing patient demographics, medical history, and vital signs, all accessible via a user-friendly interface.

Figure 17. Patient Records

Development of a Web-Based Patient Records System

Figure 18 shows the system was designed as a web-based application, ensuring accessibility at any time and from anywhere using internet-enabled devices. This feature eliminated the need for manual record-keeping, providing healthcare providers with a centralized and secure platform for managing patient records. The web-based design facilitated seamless integration with other healthcare services and improved coordination among staff members.
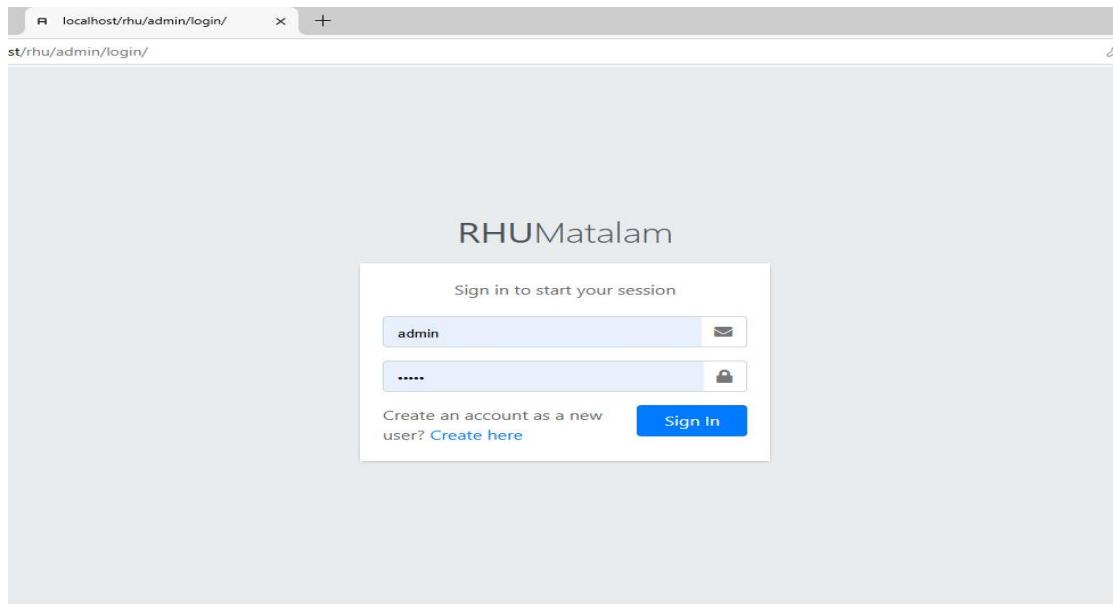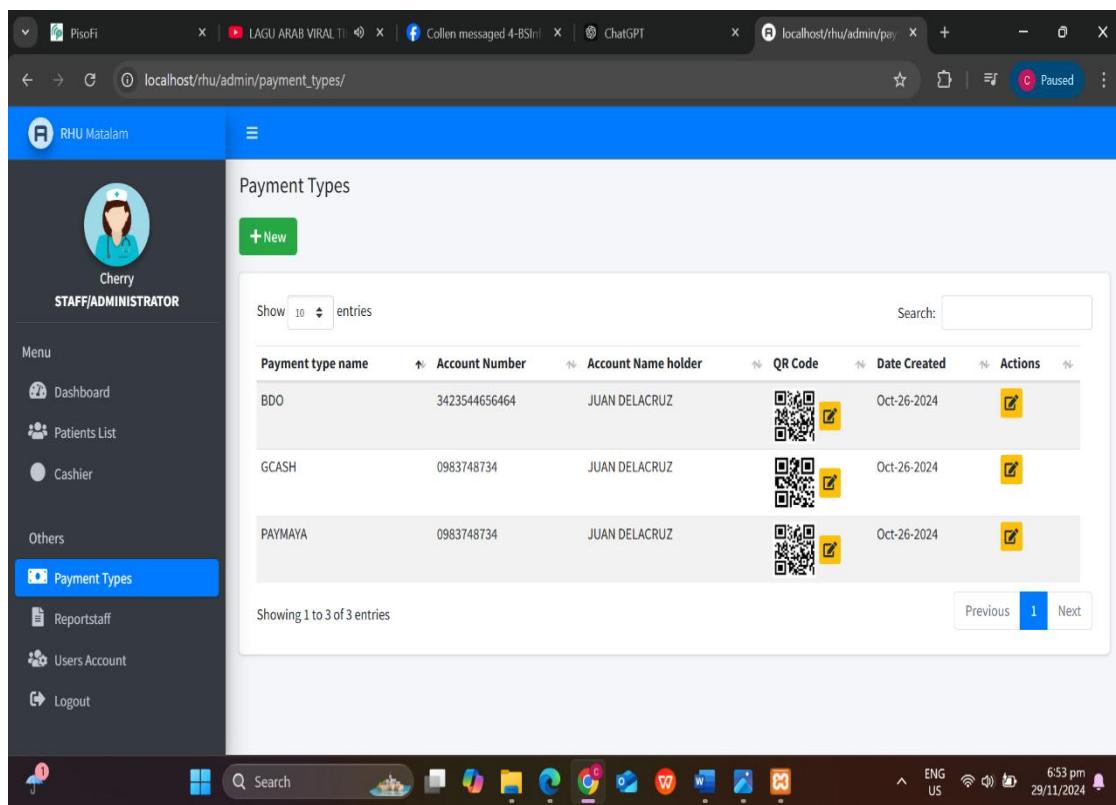

Figure 18. Log in page

Development of a Billing Module for Transactions

Figure 19 shows the billing module was implemented to manage payment transactions seamlessly. This module supported online banking and e-wallet services, allowing patients to pay their bills conveniently. The billing system automatically generated invoices, tracked payment statuses, and sent payment notifications, ensuring transparency and ease of use for both patients and healthcare providers.


Figure 19. Payment Types

Evaluation on the Functionality of the System

The researcher successfully achieved the fourth objective of the project by evaluating the functionality of the developed system to ensure it performed as intended. Through comprehensive testing and feedback from healthcare staff and patients, the system was assessed for its reliability, efficiency, and user-friendliness. The evaluation demonstrated that the system effectively streamlined the management of patient records and billing processes. Positive feedback from users confirmed that the system met its functional requirements and provided significant improvements to RHU Matalam's healthcare services.

Table 5 shows the staff's evaluation of the functionality of the system. The weighted means for each statement are as follows: the staff strongly agreed that they can create accounts for other staff members with a weighted mean of 4.00; the staff strongly agreed that they can create accounts for doctors with a weighted mean of 4.00; the staff strongly agreed that they can log in to the system with a weighted mean of 4.00; the staff strongly agreed that they can add patient checkups with a weighted mean of 4.00; the staff strongly agreed that they can edit patient information with a weighted mean of 4.00; the staff strongly agreed that they can record paid bills with a weighted mean of 4.00; the staff strongly agreed that they can print payment histories with a weighted mean of 4.00; the staff strongly agreed that they can view user accounts with a weighted mean of 4.00; the staff strongly agreed that they can

generate bill reports with a weighted mean of 4.00; and finally, the staff

strongly agreed that they can log out of the system with a weighted mean of

4.00. Overall, the average mean result for the staff is 4.00, indicating strong

agreement with the functionality of the system

Table 5. Results of the evaluation of the Staff in terms of functionality of the system. Rural Health Unit of Matalam. November 2024.

STATEMENT	WEIGHTED MEAN	VERBAL DESCRIPTION
FUNCTIONALITY		
1. I can create account of staff.	4.00	Strongly Agree
2. I can create account of doctor.	4.00	Strongly Agree
3. I can log in to the system.	4.00	Strongly Agree
4. I can add patient checkup.	4.00	Strongly Agree
5. I can edit patient information	4.00	Strongly Agree
6. I can record paid bills.	4.00	Strongly Agree
7. I can print payment history.	4.00	Strongly Agree
8. I can view user account.	4.00	Strongly Agree
9. I can generate my bills report.	4.00	Strongly Agree
10. I can log out from the system		
	4.00	Strongly agree
Average	4.00	Strongly Agree

Table 6 shows the doctor's evaluation of the system's functionality. The weighted means for each statement are as follows: the doctor strongly agreed that they can log in to the system with a weighted mean of 3.50; they agreed that they can view the patient list with a weighted mean of 3.49; they agreed that they can access patient checkup details with a weighted mean of 3.49; they strongly agreed that they can edit patient information with a weighted mean of 3.50; they strongly agreed that they can view payment types with a weighted mean of 3.50; they strongly agreed that they can generate their bills report with a weighted mean of 3.50; they strongly agreed that they can print checkup history with a weighted mean of 3.50; they strongly agreed that they can print billing records with a weighted mean of 3.50; they strongly agreed that they can give prescriptions with a weighted mean of 3.50; and they strongly agreed that they can log out of the system with a weighted mean of 3.50.

The overall average weighted mean is **3.50**, indicating that the doctor strongly agrees with the functionality of the system.

Table 6. Results of the evaluation of Doctor in terms of functionality of the system Rural Health Unit of Matalam. November 2024.

STATEMENT	WEIGHTED MEAN	VERBAL DESCRIPTION
FUNCTIONALITY		
1. I can log in to the system.	3.50	Strongly Agree
2. I can view patient list.	3.49	Agree
3. I can access patient checkup.	3.49	Agree
4. I can edit patient information.	3.50	Strongly Agree
5. I can view payment types.	3.50	Strongly Agree
6. I can generate my bills report.	3.50	Strongly Agree
7. I can print checkup history.	3.50	Strongly Agree
8. I can print billing record.	3.50	Strongly Agree
9. I can give prescription.	3.50	Strongly Agree
10. I can log out from the system.	3.50	Strongly Agree
Total Average	**3.50**	Strongly **Agree**

Legend	Scale	Description	Weighted Mean
	1	Strongly Disagree	1.00-1.49
	2	Disagree	1.50-2.49
	3	Agree	2.50-3.49
	4	Strongly Agree	3.50-4.00

Table 7 shows the staff evaluation, highlighting their strong satisfaction with the system. This is reflected in a weighted mean score of 4.00, indicating Strongly Agree. Staff members expressed highly positive feedback regarding the system's functionality, including account management, adding patient checkups, recording paid bills, and generating reports. These results demonstrate the system's effectiveness in supporting administrative tasks. Similarly, the doctor evaluation also yielded favorable feedback, with an average weighted mean of 3.50, signifying Strongly Agree. Doctors appreciated the ability to access and edit patient information, generate reports, and view payment types. However, some features, such as patient checkups, received slightly lower ratings. The combined evaluation shows that both staff and doctors perceive the system positively, with a total average weighted mean of 3.75, also indicating Strongly Agree. This suggests that the system effectively enhances both administrative and clinical workflows, contributing to improved patient management at the Rural Health Unit of Matalam.

Table 7. Overall Results of the evaluation of the Doctor and Staff in terms of functionality of the system Rural Health Unit of Matalam. November 2024.

STATEMENT	WEIGHTED MEAN	VERBAL DESCRIPTION
FUNCTIONALITY		
Doctor		
1. I can log in to the system.	3.50	Strongly Agree
2. I can view patient list.	3.49	Agree
3. I can access patient checkup.	3.49	Agree
4. I can edit patient information.	3.50	Strongly Agree
5. I can view payment types.	3.50	Strongly Agree
6. I can generate my bills report.	3.50	Strongly Agree
7. I can print checkup history.	3.50	Strongly Agree
8. I can print billing record.	3.50	Strongly Agree
9.I can give prescription.	3.50	Strongly Agree
10. I can log out from the system.	3.50	Strongly Agree
Staff		
1. I can create account of staff.	4.00	Strongly Agree
2. I can create account of doctor.	4.00	Strongly Agree
3. I can log in to the system.	4.00	Strongly Agree
4. I can add patient checkup.	4.00	Strongly Agree
5. I can edit patient information	4.00	Strongly Agree
6. I can record paid bills.	4.00	Strongly Agree
7. I can print payment history.	4.00	Strongly Agree
8. I can view user account.		
9. I can generate my bills report.	4.00	Strongly Agree
10. I can log out from the system	4.00	Strongly Agree
	4.00	Strongly agree
Average	3.75	Strongly Agree

SUMMARY, CONCLUSION AND RECOMMENDATIONS

The project aimed to develop a web base Patient Record Management System for the Rural Health Unit (RHU) of Matalam to improve the efficiency of managing patient information and related processes. Specifically, the objectives were to: (1) develop a system to streamline the storage, access, and updating of patient information; (2) develop payment transactions through online banking and e-wallets such as PayMaya and GCash; and (3) evaluate the functionality of the system.

The project's respondents included thirty (30) respondents (2) selected doctor and twenty-eight (28) random patients who tested the system and provided feedback on its functionality. Data collected from questionnaires were processed and analyzed. The evaluation results revealed that the developed system is functional, achieving an overall weighted mean of 3.50, indicating strong agreement among the users regarding the system's ability to enhance patient record and billing management.

The researcher concludes that the Web-Based Patient Record Management System developed for the Rural Health Unit (RHU) of Matalam has successfully achieved the objectives stated in this study. Based on the evaluation, the respondents, including the three (3) staff members and one (1) doctor, strongly agreed that the system is functional and meets the evaluated requirements. The system obtained a total average weighted mean of **3.50** in terms of functionality, indicating strong agreement among the respondents, including the doctor, regarding its effectiveness in managing patient records and billing processes.

The researcher recommends for a further development of the system in terms of the following:

1. Implement a feature to support real-time data synchronization to ensure up-to-date records across all users.

2. Provide training sessions for RHU staff to maximize the effective use of the system.

3. Introduce enhanced security features, such as multi-factor authentication, to protect sensitive patient information.

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APPENDICES

Appendix A. Actual Budget of the Research

|	UNIVERSITY OF SOUTHERN MINDANAO Kabacan, Cotabato Philippines	
	ACTUAL BUDGET OF THE RESEARCH	
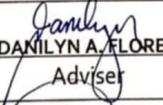
Title of Study: PATIENT RECORD MANAGEMENT SYSTEM FOR RHU MATALAM.

ITEMS/ DESCRIPTION	ACTUAL COST
1. Fare	1,500.00
2. Print	2,000.00
3. Internet (load)	3,500.00
4. Bond paper	1,500.00
Grand Total	8,500.00

Prepared and submitted by:

DONNA M. DIAMA
Printed Name and Signature of the Student
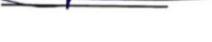
NOTED	
DANILYN A. FLORES Adviser	2025. 01. 22 Date
CATHERINE C. DAFFON Department Research Coordinator	2025. 02. 05 Date
ARJAY S. AGBUNAG Department Chairperson	2025. 02. 06 Date

USM-EDR-F18-Rev.0.2022.10.18

Appendix B. Application for Manuscript Defense

	UNIVERSITY OF SOUTHERN MINDANAO Kabacan, Cotabato Philippines	
	APPLICATION FOR THESIS MANUSCRIPT DEFENSE	

Name	DONNA M. DIAMA
Degree/Major	BACHELOR OF SCIENCE IN INFORMATION SYSTEMS
Thesis Title	PATIENT RECORD MANAGEMENT SYSTEM FOR RHU MATALAM
Date of Examination	DECEMBER 6, 2024
Time	1pm-3pm
Place	COLLEGE OF ENGINEERING AND INFORMATION TECHNOLOGY, DEPARTMENT OF COMPUTING AND LIBRARY INFORMATION SCIENCE OFFICE

MEMBERS OF THE EXAMINING COMMITTEE

Name	Signature	Date
NOR-AINE M. CORPUZ		2024.12.02
JOSEPH C. LORILLA		2024.12.02
ARJAY S. AGBUNAG		2024.12.02

RECOMMENDING APPROVAL:

DANILYN A. FLORES
Adviser
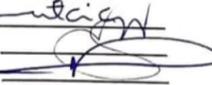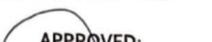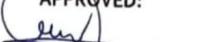
_____
Co-Adviser (Optional)

APPROVED:

CATHERINE C. DAFFON
Department Research Coordinator

_____
College Statistician
(Optional)

ARJAY S. AGBUNAG
Department Chairperson

REPORT ON THE RESULT OF EXAMINATION

Name	Signature	Remarks
NOR-AINE M. CORPUZ		passed
JOSEPH C. LORILLA		
ARJAY S. AGBUNAG		passed

APPROVED:

CATHERINE C. DAFFON
Department Research Coordinator
2024.12.06
Date

USM-EDR-F08-Rev.3.2020.02.24

Appendix C. Sample Answered Questionnaires

     The proponent conducted an evaluation of the system's functionality, and here are some sample answered questionnaires collected from the staff and doctors.

UNIVERSITY OF SOUTHERN MINDANAO
Kabacan, Cotabato
Philippines

SURVEY QUESTIONNAIRE

Direction: Please provide the necessary information being asked.

Name (Optional): Grace

Sex: F

Designation/Profession: Staff

I. System's Functionality

Directions: Read the following statements and rate the functionality of Patient Record Management System for Rhu Matalam. Check the column that corresponds to your answer.

1 – Strongly Agree   2 – Agree   3 – Disagree   4 – Strongly Disagree

Table 1: Staff

STATEMENT	RATING			
Functionality	1	2	3	4
1. I can create account of staff.	✓			
2. I can create account of doctor.	✓			
3. I can log in.	✓			
4. I can add patient check up.		✓		
5. I can edit patient information.	✓			
6. I can record paid bills.		✓		
7. I can print payment history.		✓		
8. I can view users acount.	✓			
9. I can generate my bills report.	✓			
10. I can log out.		✓		
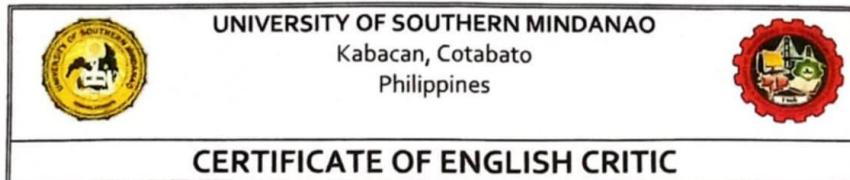
Comments/Suggestions/Recommendations:

UNIVERSITY OF SOUTHERN MINDANAO
Kabacan, Cotabato
Philippines

SURVEY QUESTIONNAIRE

Direction: Please provide the necessary information being asked.

Name (Optional): Khalid T. Tahya

Sex: M

Designation/Profession: Rural Health Physician

I. System's Functionality

Directions: Read the following statements and rate the functionality of Patient Record Management System for Rhu Matalam. Check the column that corresponds to your answer.

1 – Strongly Agree   2 – Agree   3 – Disagree   4 – Strongly Disagree

Table 1: Doctor

| STATEMENT	RATING			
Functionality	1	2	3	4
1. I can log in.	✓			
2. I can view patient list.	✓			
3. I can access patient check up.	✓			
4. I can edit patient information.	✓			
5. I can view payment types.	✓			
6. I can generate my bills report.	✓			
7. I can print check up history.	✓			
8. I can print billing record.	✓			
9. I can give a prescription.	✓			
10. I can log out.	✓			

Comments/Suggestions/Recommendations:

Appendix D. Evaluation Photos

The proponent conducted an evaluation for the functionality of the
system and here are some sample photos that were collected.

Appendix E. Certification of English Critique

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Philippines | |
| --- | --- | --- |
| | **CERTIFICATE OF ENGLISH CRITIC** | |

Republic of the Philippines
UNIVERSITY OF SOUTHERN MINDANAO
Kabacan, Cotabato

COLLEGE OF ENGINEERING AND INFORMATION TECHNOLOGY

CERTIFICATION OF ENGLISH CRITIC

Name: DONNA M. DIAMA

Degree Sought: BACHELOR OF SCIENCE IN INFORMATION SYSTEMS

This is to certify that the thesis project outline entitled: **PATIENT RECORD MANAGEMENT SYSTEM FOR RHU MATALAM** conducted by DONNA M. DIAMA was edited by the undersigned.

ARJAY S. AGBUNAG
Signature over Printed Name
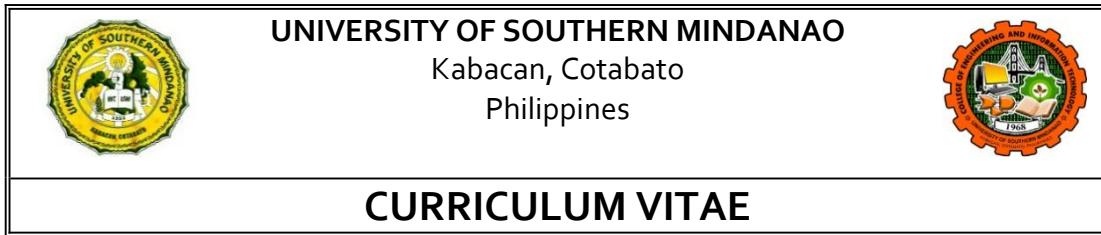
2025. 02. 06
Date

I confirm that this study has been checked by the English Critic.

DAMILYN A. FLORES
Adviser's Signature over Printed Name

2025. 02. 06
Date

Appendix F. Curriculum Vitae

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	CURRICULUM VITAE	
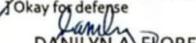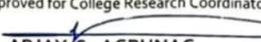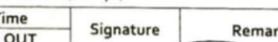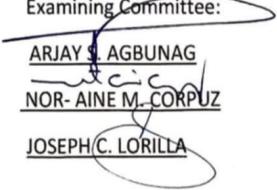
DONNA DIAMA
F. Valdevieso New Bugasong, Matalam, Cotabato
09500259306
ddiama@usm.com

PERSONAL INFORMATION	
Last Name	**DIAMA**
First Name	**DONNA**
Middle Name	**MANGGA**
Nickname	**DONS**
Age	**23**
Nationality	**FILIPINO**
Religion	**ROMAN CATHOLIC**
Civil Status	**SINGLE**
Father's Name	**DANIEL DIAMA**
Mother's Name	**ALMA DIAMA**
EDUCATIONAL BACKGROUND	
Elementary	**F VALDEVIESO ELEMENTARY SCHOOL, MATALAM, COTABATO 2013-2014**
Junior High School	**MATALAM HIGH SCHOOL, MATALAM, COTABATO 2017-2018**

Senior High School	**MATALAM SENIOR HIGH SCHOOL, MATALAM, COTABATO 2019-2020**
Tertiary	**BACHELOR OF SCIENCE IN INFORMATION SYSTEM UNIVERSITY OF SOUTHERN MINDANAO KABACAN, NORTH COTABATO 2020- PRESENT**

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Comments (use additional sheets, if necessary):

Chapter/Section	Comment	Action taken
Conceptual framework	Add some details in each box	Some details added
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DONNA M. DIAMA

Capstone Project Manuscript Submitted to the Department of Computing and
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Technology, University of Southern Mindanao
Kabacan, Cotabato in Partial Fulfillment of
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