Tribhuvan University

Faculty of Humanities and Social Science

A PROJECT PROPOSAL REPORT

ON

SWASTHYA TRACK

Submitted to

Department of Computer Application

National College

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

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ABSTRACT

SwasthyaTrack will be a LAMP-based hospital management web application that will digitize core clinical and administrative workflows. The system will provide online appointment booking, a centralized electronic medical record, electronic prescriptions, bed management, and automated billing. Role-based interfaces will restrict access and will enforce encrypted storage for sensitive data. Development will follow an Agile methodology with two-to-three-week sprints. The architecture will support modular services and horizontal scaling. Standard web security measures will include HTTPS, secure authentication, session controls, and database encryption. Performance targets will set sub-two second response for common operations and support concurrent users. Deliverables will include source code, deployment scripts, test suites, and user documentation. Expected operational benefits will include reduced paperwork, shorter patient wait times, and improved data accuracy as reported in prior electronic medical record deployments. The design will build on established open-source EMR patterns to ensure extensibility and low deployment cost. Implementation and testing will validate functional and non-functional requirements prior to production deployment.

Keywords: ***LAMP, Electronic Medical Records, Appointment Scheduling, Role-Based Access, Hospital Management***

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CHAPTER 1: INTRODUCTION

SwasthyaTrack is a comprehensive system designed to modernize patient care. It is a web-based platform developed on a LAMP (Linux, Apache, MySQL, PHP) stack where patients, doctors, nurses, and administrators can securely access and manage health data. The system will include modules for patient registration, online appointment scheduling, electronic medical records, bed allocation, billing, and reporting. It will allow authorized users to retrieve and update patient history, lab reports, prescriptions, and billing information through a user-friendly interface. The system digitizes patient records, schedules appointments, and automates billing to streamline daily hospital tasks.

The purpose of SwasthyaTrack will be to streamline healthcare workflows by replacing it with a digital solution. The system will enable real-time tracking of patient records which is critical for effective healthcare delivery. For example, a study by the World Health Organization reports that modern electronic health record systems improve accuracy and efficiency while reducing errors, by integrating patient data in real time. [1] SwasthyaTrack will build upon these best practices by providing features. It will ultimately facilitate data-driven decision-making, support evidence-based treatments, and improve access to care.

By automating record-keeping and communication, SwasthyaTrack aims to improve operational efficiency and reduce errors. It will reduce paperwork and waiting times, enhancing patient satisfaction. The system also provides data for better decision-making by hospital staff, ultimately improving the quality of care. SwasthyaTrack will deliver a unified, secure, and efficient digital healthcare platform that addresses current limitations of manual record-keeping and fragmented data storage.

CHAPTER 2: PROBLEM STATEMENT

- **Manual Processes:** The current healthcare system is heavily dependent on manual processes for handling patient registration, appointment scheduling, and documentation. These outdated practices not only increase patient wait times but also create operational inefficiencies across departments. The lack of automation slows down service delivery, frustrates patients, and prevents healthcare staff from focusing on direct care activities.

- **Limited Access to Medical Records:** There is no centralized digital repository for medical records and laboratory results. Patients are unable to quickly retrieve their health information when needed, while doctors and nurses struggle to access complete and accurate patient histories. This lack of timely information compromises decision-making, reduces transparency, and delays effective treatment planning.

- **Absence of Online Appointment System:** The scheduling of patient appointments is currently managed through manual or telephone-based methods, which are prone to conflicts and mismanagement. Double bookings, overlapping schedules, and last-minute cancellations often disrupt daily operations. Without an online appointment booking platform, patients face difficulties in securing timely consultations, while doctors are burdened with poorly managed schedules.

- **Fragmented Communication:** There is no integrated communication channel among doctors, nurses, laboratory staff, and administrative personnel. As a result, critical patient information is often delayed, overlooked, or miscommunicated. This fragmentation leads to unnecessary repetition of diagnostic tests, inconsistent care delivery, and a lack of continuity in patient management.

- **Lack of Centralized Tracking System:** Medications, vital signs, and treatment plans are tracked separately by individual staff members, often in disconnected records. Without a centralized tracking mechanism, coordinating patient care becomes challenging. This gap increases the risk of medication errors, missed updates on patient condition, and difficulty in monitoring treatment progress in real-time.

- **Repetitive Data Entry:** Healthcare staff, particularly nurses, are required to repeatedly enter the same patient information into multiple records and logs. This redundancy wastes valuable time, reduces overall efficiency, and diverts staff attention away from

critical patient care activities. The absence of an integrated data management system adds to workload stress and operational delays.

- **Inconsistent Patient Status Updates:** Patient status, including progress notes, test results, and treatment responses, is not consistently updated or communicated across departments. This lack of reliable, real-time information prevents healthcare professionals from making well-informed decisions. It also disrupts collaboration among team members and increases the likelihood of errors in treatment planning.
- **Paper-Based Recordkeeping:** Clinical documentation, such as diagnoses, prescriptions, and treatment plans, is still managed on paper. This method is prone to human error, misinterpretation due to illegible handwriting, and even the loss or damage of records. Paper-based systems not only compromise patient safety but also make it difficult to retrieve historical data for future treatment, research, or audits. For instance, WHO notes that reliance on paper-based processes leads to inaccuracies and delays in healthcare delivery. [1]

CHAPTER 3: OBJECTIVES

- To develop a LAMP-based web application for hospital management, integrating patient, clinical, and administrative functions.
- To build a platform that makes it simple for patients to book appointments, manage their medical records, and handle their bills alongside with bed availability
- To build a unified system that gives medical staff instant access to the appointments alongside with patient's full medical history.

CHAPTER 4: METHODOLOGY

The project will use the Agile software development model, to ensure flexibility and continuous stakeholder involvement. Agile is chosen over the traditional Waterfall model because it allows iterative development and accommodates changing requirements. [2] [3] Unlike Waterfall, which is rigidly phase-driven, Agile will enable the team to work on multiple phases in parallel and deliver functional increments early. For example, Mendix describes Agile as an iterative approach where teams work in short timeboxed sprints with continuous feedback. [3] This methodology will reduce risk and help meet evolving needs.

This process will be organized into several sprints, each lasting 2–3 weeks. Before each sprint, a planning meeting will define the goals and select backlog items to implement. Each sprint will include all development activities: requirements refinement, design, coding, testing, and review. At the end of each sprint, a review session will be held where completed features are demonstrated to stakeholders for feedback. This will be followed by a discussion what went well and what can improve.

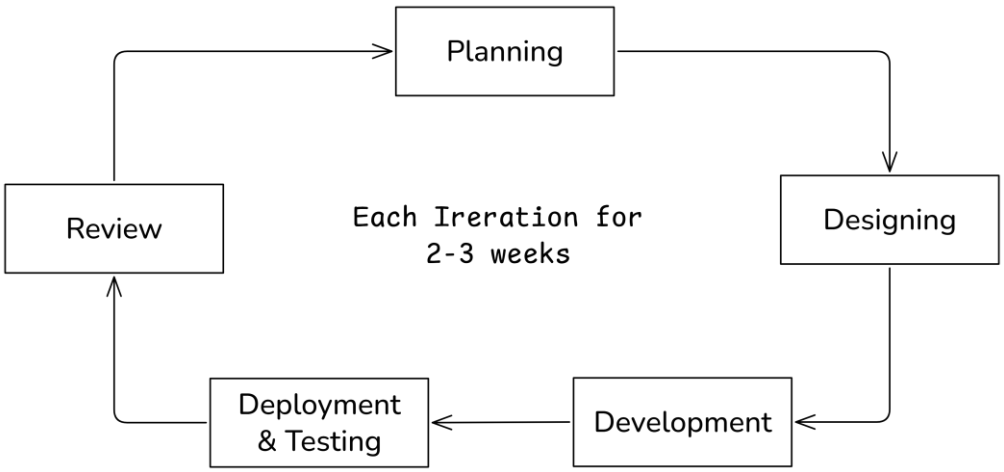


Figure 4.1 Agile Methodology

Each development sprint will cover the phases of planning, design, development, testing, and deployment:

- **Planning Phase:** Detailed requirements will be gathered from stakeholders. A product backlog of user stories will be created and prioritized. System architecture and technology stack will be decided. The team will estimate effort and resources for each story.

- **Design Phase:** UML diagrams (use case, class, sequence, ERD) will be refined. User interface designs and wireframes will be created. Database schema and data models will be finalized. Security and performance requirements will be incorporated into the design.
- **Development Phase:** Code will be written in incremental fashion for each sprint. Common web technologies (such as HTML/CSS/JavaScript, and a backend language like PHP with a database such as MySQL) will be used. Each feature (e.g. user login, appointment module, medical record entry) will be coded and unit tested during its sprint. Developers will collaborate closely, and the product owner will adjust priorities as needed.
- **Testing Phase:** Automated and manual tests will be conducted continuously. Unit tests and integration tests will run as code is completed. System testing will take place during each sprint to find defects early. A dedicated testing sprint or phase will be planned near the end of development to conduct full system and acceptance testing.
- **Deployment Phase:** After final testing and stakeholder approval, the system will be deployed to the production environment. This will include setting up servers, installing the application, and migrating any initial data. User training and documentation will be provided. Post-deployment, a support plan will be in place for maintenance.
- **Review Phase:** Stakeholders and the development team will evaluate progress at the end of each sprint. Completed features will be demonstrated to ensure they meet requirements. Feedback will be collected and used to refine the backlog. Any issues or improvements will be addressed before moving forward.

This Agile approach will allow SwasthyaTrack to be built incrementally with frequent validation. Agile is preferred because it handles requirement changes gracefully and keeps the client involved throughout. [2] The team will also conduct ongoing risk assessments and adapt the plan as needed. By continuously integrating and testing small pieces, the team will ensure the final product meets quality standards and stakeholder expectations.

4.1 Requirement Identification

Requirement Identification and Feasibility Study of the proposed system are evaluated here.

4.1.1 Study of the Existing System

A survey of current healthcare apps and systems reveals the following examples:

Hamro Doctor:

Hamro Doctor is a super handy app that offers all kinds of medical support and informative services. These online consultations are quick, convenient and half the price you pay to visit doctors physically. They offer information, including but not limited to an index of doctors according to field of medicine, a detailed menu of health checkup packages offered by private hospitals and ambulance service contact listing. There are also blog articles posted by doctors and live chat forums where users can ask specific health questions to doctors.

Dividing relevant health services into digital departments such as Coronavirus, Skin and Sex, Sugar, Thyroid and Heart, ENT, Cancer, and Women's Health and Pregnancy, makes it convenient for users to search for immediate help in the concerned department of health. All this, without the hassle of waiting rooms, standing in queues, wasting time filling paperwork and at the billing counter, etc. Additionally, a health feed with news and updates, blood donation information services and a feature that allows uploading of medical reports are also available on the app. [4]

Jeevee:

Jeevee is a professional, attractively designed one-stop health app that offers a range of health support services. The app offers online appointments and the option to upload your prescription to smoothly order medicines. A database of over 1000 doctors offers 100% online consultations. Jeeve also has a convenient e-commerce section with over 20,000 products such as medical devices, baby care products, personal care items, ayurvedic medicine, orthopedic accessories and dental care.

In case the user has difficulty finding the concerned category, they can also use the search bar on top to find the product they're looking for. Positive customer reviews confirm that Jeevee does not charge delivery fees, allows ordering from different vendors in the

shopping cart and also offers competitive prices that are often cheaper than the nearest drug store.

The Namaste Doctor feature has both free and pro (paid) models for patients to choose from, allowing them to consult with a doctor digitally without visiting them at their clinic. The pro version includes not 1 but 2 consultation sessions, 15 minutes of video calling, priority access, as well as lab and medical reports to make the consultation experience fully satisfying for the patient. Another useful feature of the app is the user's ability to create profiles of themselves as well as their family members, and have access to their medical records and history all in one place. [4]

Cura Health:

Cura Health was built to make sure that people can seek medical help without losing out on valuable time, digitally via this app. The app is designed to bridge the gap between patients and medical professionals. Unlike other health and medical apps, users cannot enter the home page without registering or signing in, and providing all their vital statistics (height, weight, blood type, disease history, etc.), as well as an emergency contact number, a thoughtful touch that physical forms at hospitals make mandatory but other apps seem to have skipped.

With no bugs and a smooth interface, this app is the epitome of simplicity. However, without an extensive main menu and comprehensive search bar, it leaves the user wanting. With time, after building a larger database of doctors and medical practitioners, this app has the potential to go a long way. Until then, Cura enjoys customer loyalty and appreciation with satisfying booking services that help patients skip lines at hospitals, thus helping save time every time they make a trip to the doctors. [4]

NepMeds:

NepMeds is a digital healthcare provider that is available on both web and mobile, offering medical shopping services and connecting users to doctors, laboratories, vaccination services, digital health record storage facilities, and tips on staying fit and happy. Currently, NepMeds operates in Kathmandu and Chitwan but aims to soon expand to other major cities of Nepal. NepMeds puts a focus on secure payment (128-bit SSL encryption) for e-shopping as well as affordable prices offered by reliable professional parties, to ensure customer satisfaction. The Health Library is a blog section that is filled with articles that

bust myths, clear doubts, share benefits of certain foods - plus, keep the audience informed with knowledge on Coronavirus, dengue, fever and such super relevant health problems.

In order to increase its number of users, NepMeds has a referral and rewards system that helps users earn wallet balance when they introduce others to the app. The app keeps updating its home feed with quick health tips, and also promises additional unique features that will get introduced soon, such as a medicine reminder, BMI measurement tool, and medicine refill hints to make sure users don't miss a single day of regular medication. [4]

Drugs Nepal:

Drugs Nepal is a brilliant simple single-purpose app that offers free, detailed information about thousands of drugs available in Nepal. Its main advantage is that it is available for offline use after the first time of loading the app, by storing all the information locally. The user needs to simply open up the app when connected to WiFi or mobile data and the updated information gets automatically synced for offline use again.

This digital medicine directory allows users to search either by generic name or brand name of the drug. The directory looks appealing at first scroll, but the lack of information in the drug detail pages, like missing info or the word 'NULL' in certain categories, is admittedly disappointing. With improvement on the data entry side and minimum front-end tweaks, this purely informative app can be a less used but lightweight, to keep handy at all times. Because this app does not require two-way communication between parties and user inputs or information uploads yet, it is one-dimensional and uncomplicated. [4]

Hamro Swasthya:

An official COVID-19 tracking app launched in 2020. It uses Bluetooth for contact tracing and provides features like case updates, self-assessment tests, and a plasma donation registry. While limited to pandemic-related functions, it demonstrates the government's move toward digital health tools. The Ministry of Health and Population officially launched this app in April 2020 as a quick response measure to the global Coronavirus pandemic. It requests enabling of the Bluetooth feature to help improve contact tracing and track people who might accidentally spread Covid-19. It also offers a warning feature when the user is in close proximity to a device (individual), who is in the red zone.

It has received criticism for only doing the base minimum of Coronavirus tracking, updating the app with daily new cases, offering a few mobile numbers and hotline number for emergency Covid-19 support, a Covid-19 self-assessment online automated test, and a plasma donation form section that allows both donors and requesters to fill necessary information to donate or receive. Many users have complained online that it is not a complete, comprehensive, efficient app that asks the right questions to ensure that users feed information that will prove useful and accurate.

While the app is named Hamro Swasthya, it is essentially only a Coronavirus tracking and information sharing app, which is rather misleading. Aside from this minor concern, the Hamro Swasthya app has potential to turn into a handy resource that offers online appointment booking at government hospitals and free digital services. The assumption that government-led initiatives are not as modern, efficient and professional as the private sector could be challenged by improving on the product to create a super health app that benefits the average Nepali in a way that private sector apps cannot. [4]

4.1.2 Requirement Collection

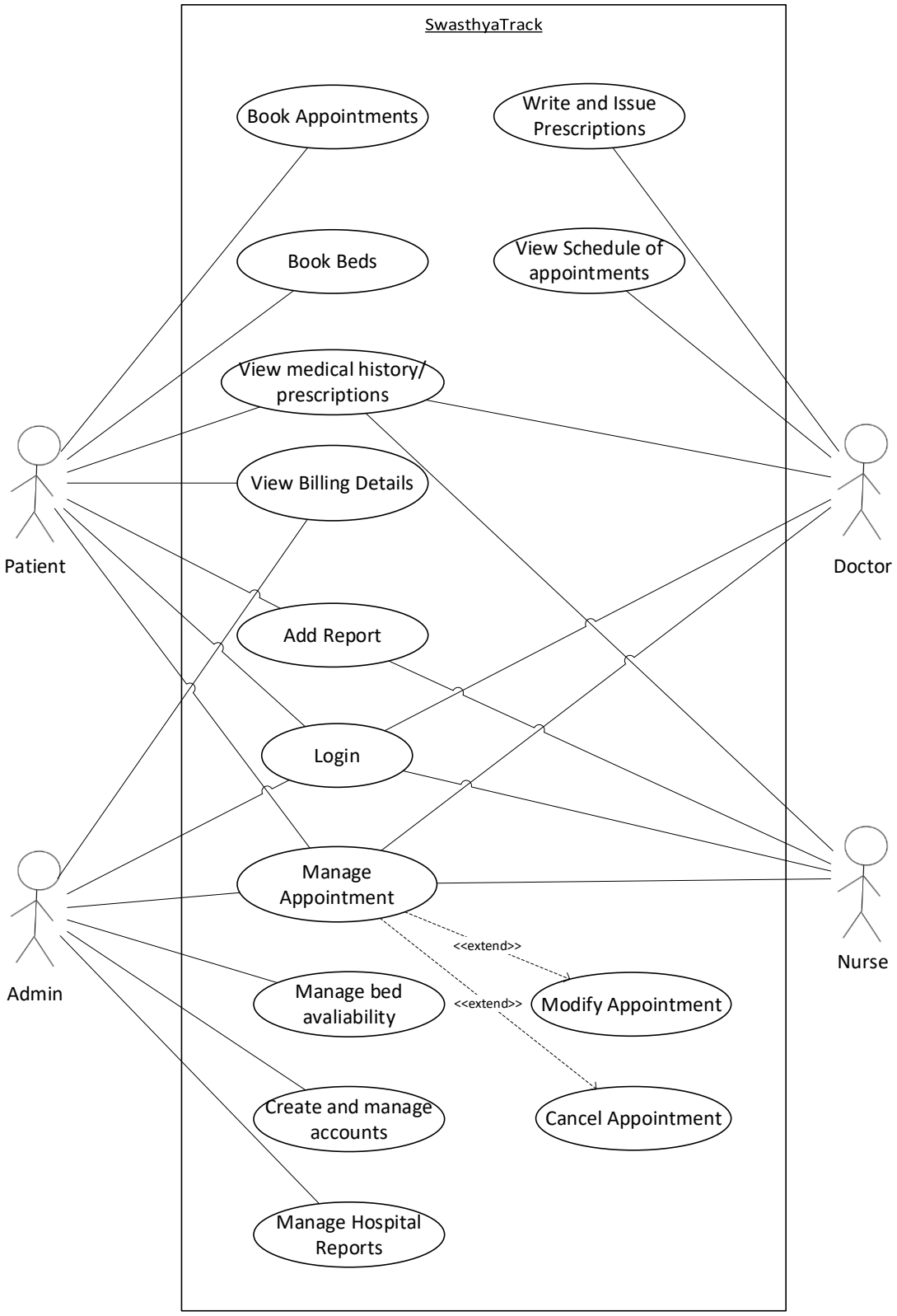


Figure 4.2 Use Case Diagram

4.1.2.1 Functional Requirements

- **User Accounts & Role-Based Access:** The system shall allow creation of secure user accounts for Patients, Doctors, Nurses, and Admins, each with appropriate permissions. Administrators can create and modify staff/patient accounts, and the system enforces role-based menus and access controls to restrict features by user type. All users must log in before accessing any personal or medical data, ensuring that only authorized personnel can view or edit records.

- **Appointment Management:** Patients shall be able to book, view, modify, and cancel appointments online. The system will display available time slots and automatically update availability upon booking or cancellation. Doctors and nurses can view their scheduled appointments through the system, and staff can manage or reassign appointments as needed.

- **Electronic Medical Records (EMR):** The system shall maintain a comprehensive digital medical record for each patient. This includes demographics, visit history, diagnoses, medications, immunizations, lab results, prescriptions, and billing history. Authorized doctors and nurses can add new notes, prescriptions, and diagnoses to a patient's file. The patient shall also be able to view parts of their own record via a portal. SwasthyaTrack must replicate this by providing secure, centralized storage of all patient data with audit trails.

- **Prescriptions and Laboratory Orders:** Doctors shall be able to enter electronic prescriptions through the system. Nurses can upload test results directly into the system under the patient's record. SwasthyaTrack should implement this to ensure prescriptions and lab results are managed digitally.

- **Billing and Financials:** The system shall calculate and generate patient bills based on services rendered (consultation fees, lab tests, medicines, etc.). Billing entries will be automatically populated from other modules to avoid re-entry. Patients should be able to view their current balance and pay bills. Administrators can view financial summaries. Automated billing in SwasthyaTrack will eliminate confusion from the "billing confusion" reported in manual systems.

- **Bed/Facility Booking:** The system shall track bed availability. Patients (or staff on their behalf) can request and book beds through the interface, the system will update

occupancy status. Staff (doctors or admins) can also release or reassign beds. This directly addresses the "poor bed visibility" issue by providing a digital bed management module. SwasthyaTrack will include a dashboard showing occupied and free beds so that admissions and transfers are handled efficiently.

- **Reporting and Analytics:** The system shall generate administrative reports for the hospital. For example, authorized staff can produce daily/weekly reports on appointments, bed usage, lab tests, or financial metrics. An integrated report management component will "record and store all the reports generated by the hospital" and allow analysis of key metrics over time. Dashboards may display occupancy rates, revenue, or patient flow trends. These features help management monitor performance and support data-driven decision-making in the same way existing HMS do.

- **Security and Data Privacy:** The system shall enforce strong security measures. All patient data will be stored securely (using encryption and secure databases) and only accessible through authenticated sessions. Data transmission must be protected (e.g. HTTPS). The system will maintain audit logs of all access and changes. OpenEMR's design includes encryption and strict access controls, and SwasthyaTrack will follow similar best practices (including session timeouts and CSRF protection) to comply with healthcare data regulations.

4.1.2.2 Non-functional Requirements

- **Performance:** The system shall deliver quick response times for all operations. Appointment booking, record retrieval, and billing generation under normal load. The system shall support concurrent users without degrading performance. Load testing will ensure that the system continues to operate smoothly during peak hospital hours.

- **Scalability:** The system shall be designed to scale horizontally and vertically. The architecture shall allow adding new modules, hospitals, or users without redesigning core components. As demand grows, additional servers and databases shall be deployed to maintain consistent performance.

- **Portability:** The application shall run on all major browsers and be optimized for different screen sizes. The backend shall be compatible with common operating systems such as Linux and Windows. Database schemas shall be designed to work with MySQL

but remain adaptable to other relational database systems if migration becomes necessary.

- **Efficiency:** The system shall optimize database queries and resource usage. It shall avoid redundant data storage by normalizing records. The software shall use caching where appropriate to improve data retrieval speed. The server shall handle concurrent transactions efficiently to reduce wait times for patients and staff.

4.2 Feasibility Study

4.2.1 Technical Feasibility

SwasthyaTrack will utilize widely adopted, open-source technologies, making it technically feasible. Development will use HTML/CSS/JavaScript for the front-end and a server-side platform (such as PHP) with a MySQL database. The required software tools (IDEs, libraries) are freely available. The university's existing computer lab or cloud services can host development and deployment, so no new infrastructure is needed. The project team has experience with similar technologies (gained in earlier coursework), ensuring the required technical skills are available. Overall, the architecture will be robust yet simple enough to implement within the semester timeline.

4.2.2 Operational Feasibility

Operationally, SwasthyaTrack aligns with the workflows of hospitals and clinics. Training workshops will be organized for end users to ensure smooth adoption. The system's user interfaces will match the logical tasks of each role (e.g. doctors will see their patient lists immediately after login). Because all data will be centralized, communication among staff will improve. Stakeholders (doctors, nurses, admin) will participate in design reviews to ensure the system meets practical needs. Maintenance duties (like backups and updates) will be defined in cooperation with IT staff. The solution will be flexible enough to adapt to future policy changes or additional health programs. Overall, SwasthyaTrack will integrate into existing operations and make daily tasks more efficient

4.2.3 Economic Feasibility

Economically, the project leverages existing resources: student labor and open-source software, resulting in minimal direct cost. No additional licensing fees are expected. Any required hardware (such as a web server) can use existing machines or low-cost cloud instances. In terms of benefits, SwasthyaTrack will reduce paper and administrative work,

saving staff time and reducing errors, which can translate into cost savings for the hospital. While exact ROI is difficult to calculate for this educational project, deploying a similar system in practice is known to reduce operational costs (by minimizing duplicate tests, paperwork, etc.). A simple cost estimate includes development time (as part of coursework) and occasional server costs, which are expected to be covered by the department. The net benefit (improved efficiency, error reduction) greatly outweighs the negligible incremental cost, making the project economically viable.

CHAPTER 5: HIGH LEVEL DESIGN OF SYSTEM

5.1 System Flow Diagram

The system flow diagram presents the logical flow of the application. It begins with the landing page, followed by user registration or login. After login, role-based access determines the dashboard displayed to the user. Patients can book appointments, view medical history, manage billing, and request beds. Doctors and Nurses can view appointments, update records, and access prescriptions. Administrators manage accounts, monitor reports, and update bed status. The flow diagram highlights clear decision points such as account existence, role identification, and error handling, ensuring smooth user navigation.

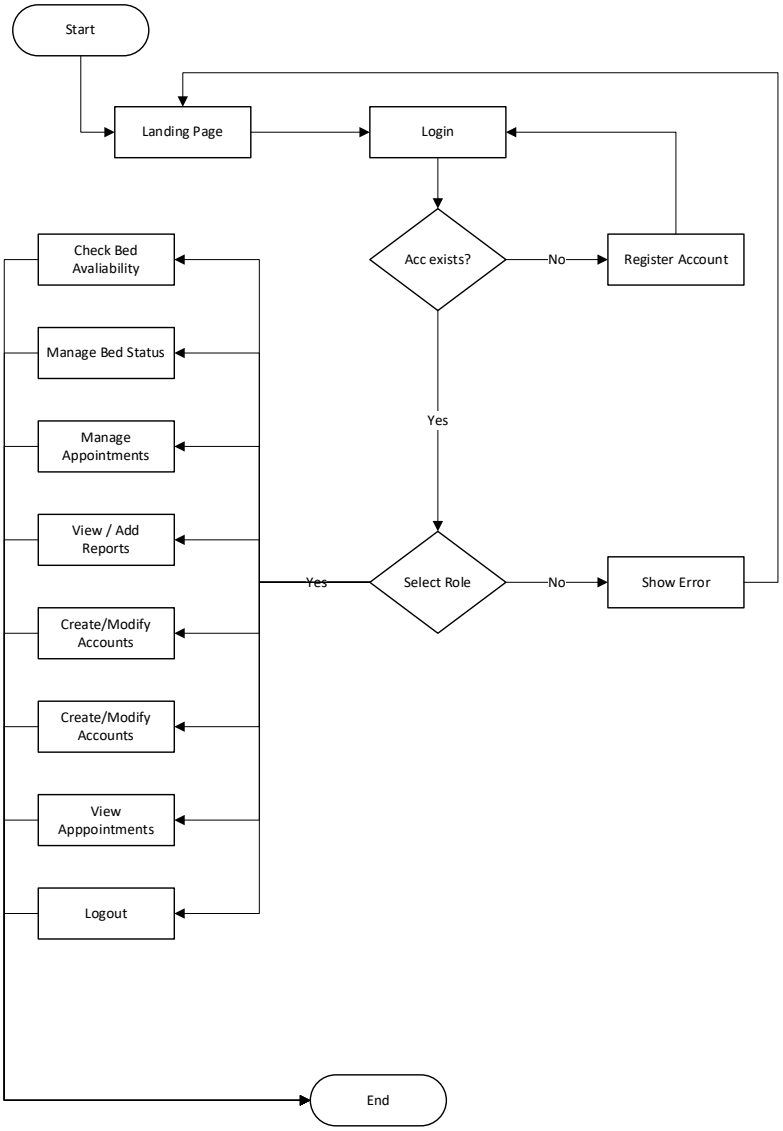


Figure 5.1 System Flow Chart

5.2 Entity Relation Diagram

The ERD illustrates the main entities of the system and their relationships. Core entities include Patient, Doctor, Nurse, Admin, Appointment, Billing, and Bed. Each entity contains attributes such as user details, identification numbers, and contact information. The diagram shows how a Patient is linked to Appointments and Billing, while Doctors and Nurses are connected through schedules and records. Administrators manage accounts and hospital-wide resources. This design ensures that all hospital operations are connected through a centralized relational database.

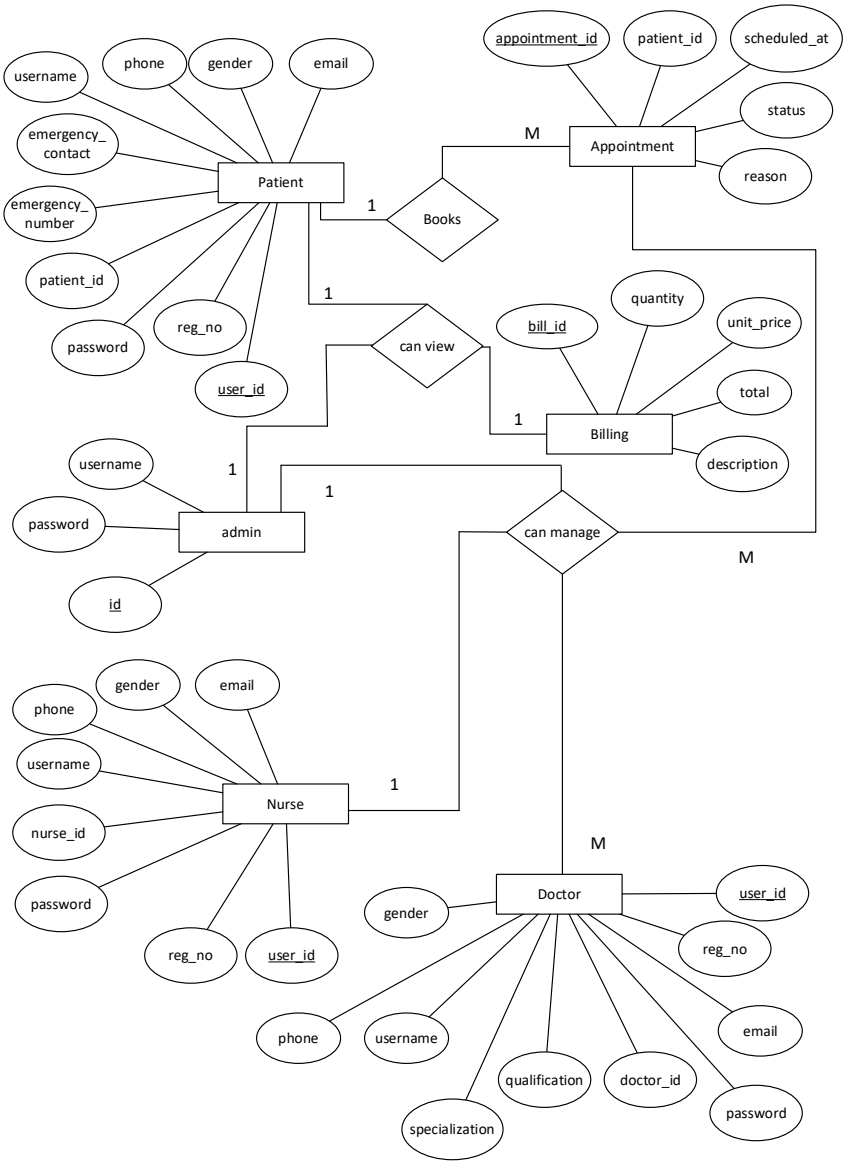


Figure 5.2 Entity Relation Diagram

5.3 Data Flow Diagram

The DFD illustrates how data will move across SwasthyaTrack's modules. Patients, Doctors, Nurses, and Admins act as external entities that exchange information with the system. Patient can make appointment requests and then flow into processes like Appointment Management and Bed Allocation. These processes interact with central data stores including Patient Records, Appointments, Prescriptions. Doctors and Nurses update records and prescriptions, while Administrators manage accounts and hospital reports. The diagram highlights the structured flow of information, ensuring accurate data exchange and role-based access throughout the system.

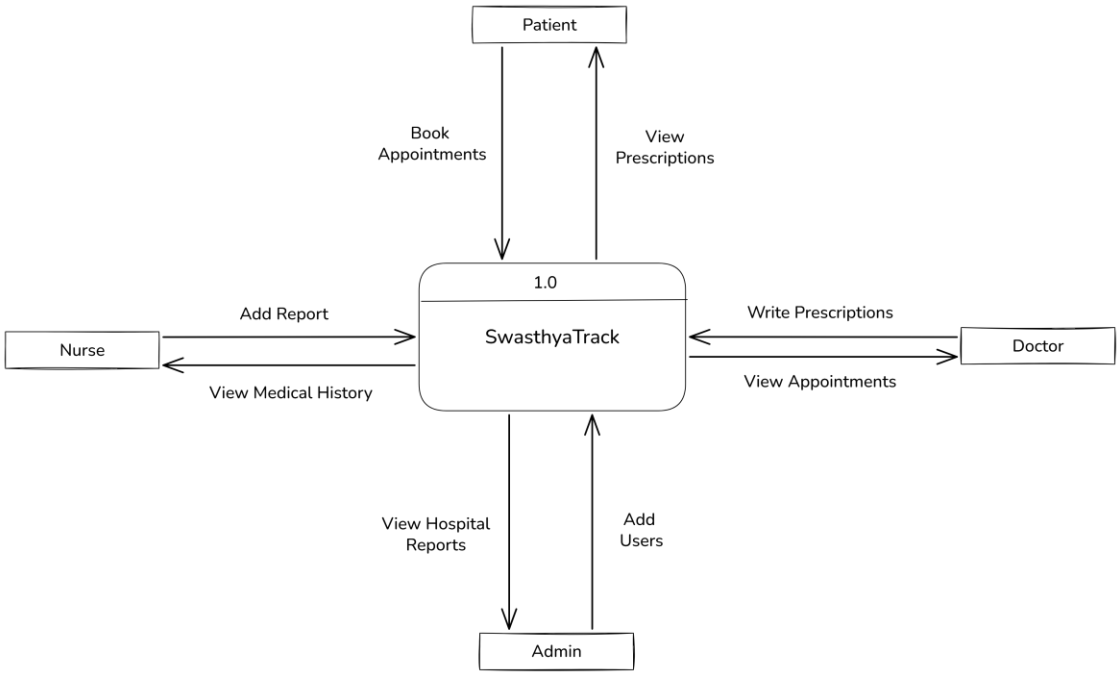


Figure 5.3 DFD Level-0

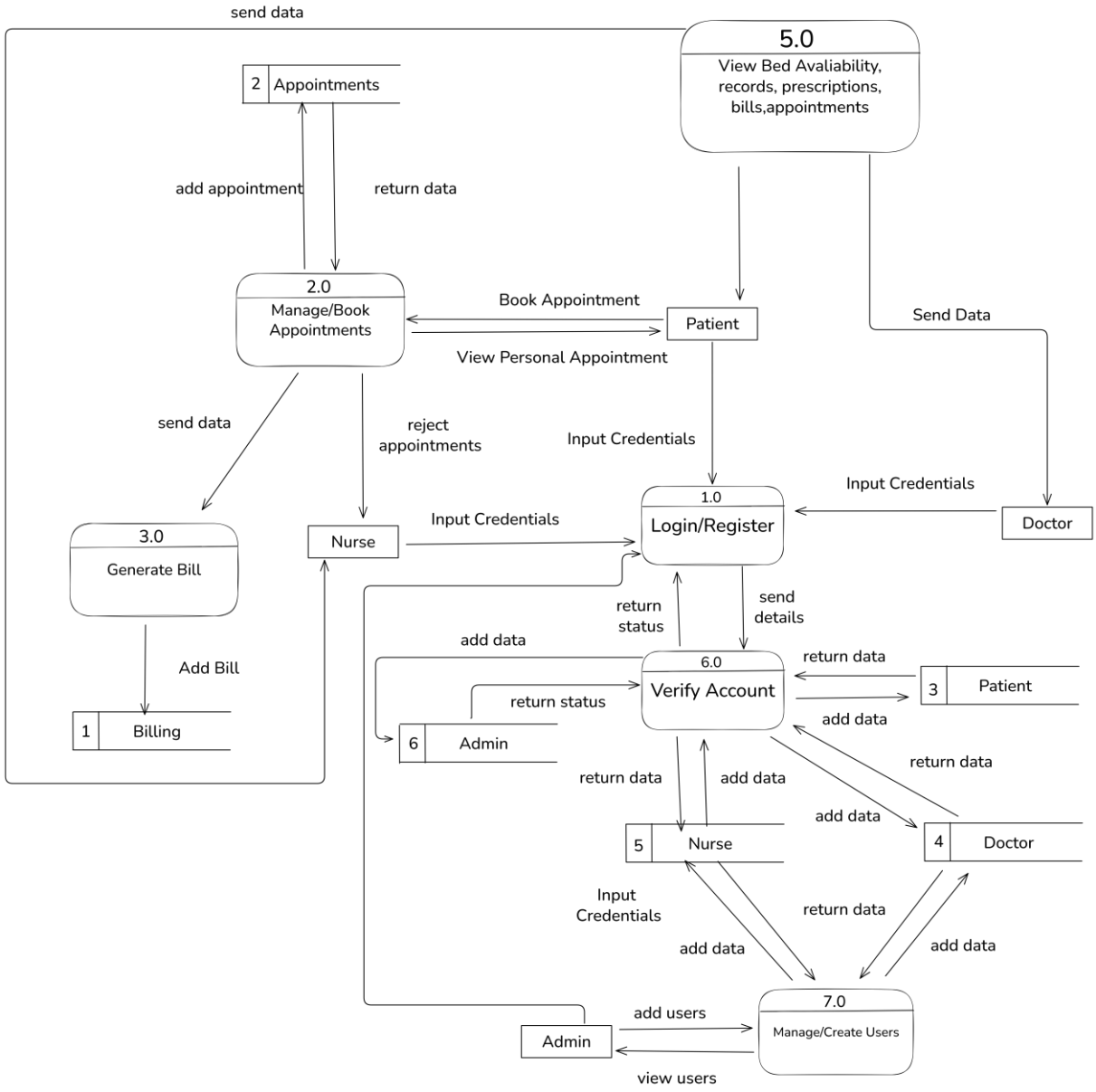
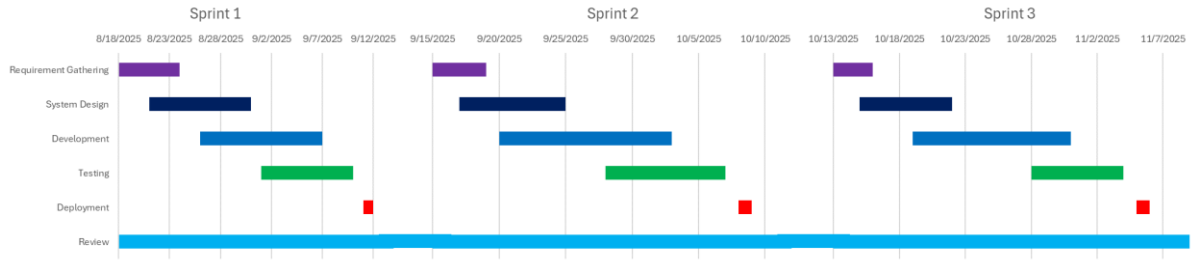


Figure 5.4 DFD Level-1

CHAPTER 6: GANTT CHART

The development schedule spans 12 weeks starting the 3rd week of August 2025. Major tasks by week are shown in the table:

Table 6.1 Gantt Chart



CHAPTER 7: EXPECTED OUTCOME

Upon completion, SwasthyaTrack will deliver:

- A fully functional healthcare management application meeting all specified requirements. This includes patient-facing and staff-facing modules, a secure login system, and an underlying database populated with test data.
- A centralized patient database with digital medical records, enabling doctors and nurses to view complete patient histories instantly.
- Online appointment scheduling and notifications, reducing manual workload for hospital staff.
- Automated billing and bed management features that streamline hospital operations.
- Comprehensive documentation and a user manual guiding system use.
- Improved operational efficiency: the system will eliminate most paper forms, reducing errors and paperwork. It will enable real-time data access for better decision-making
- A deployable project that can be handed off to a client or used as the basis for further development or integration with hospital systems.

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