A

Project Report

on

Integrated QR-Based Medical Inventory and Healthcare Management System

Submitted to

Sant Gadge Baba Amravati University, Amravati

Submitted in partial fulfilment of

the requirements for the Degree of

Bachelor of Engineering in

Computer Science and

Engineering

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Session 2024-2025

SHRI SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING,

SHEGAON – 444 203 (M.S.)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that **Ms. Pranita Jayesh Tondre, Ms. Bhumika Narendra Pimpalshende, Ms. Punam Prabhudas Solanke and Ms. Payal Purushottam Nannaware** students of final year Bachelor of Engineering in the academic year 2024-25 of Computer Science and Engineering Department of this institute have completed the project work entitled "**Integrated QR-Based Medical Inventory and Healthcare Management System**" and submitted satisfactory work in this report. Hence recommended for the partial fulfilment of degree of Bachelor of Engineering in Computer Science and Engineering.

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Internal Examiner
S.B. Payasi
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Dr. S.S. Arole
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Acknowledgement

It is our utmost duty and desire to express gratitude to various people who have rendered valuable guidance during our project work. We would have never succeeded in completing our task without the cooperation, encouragement and help provided to us by then. There are several people who deserve recognition for their unwavering support and guidance throughout this report.

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Abstract

Patients today have difficulty finding medications due to a lack of easy access to availability information from nearby pharmacies. Medical stores also struggle with inefficient inventory management due to outdated manual processes. Additionally, without a single system for scheduling appointments, patients are forced to use different apps for each hospital. This project aims to develop a comprehensive healthcare solution that integrates a QR-based medical inventory tracking system, an Android application for locating nearby pharmacies with real-time medicine availability, and a feature for scheduling outpatient appointments. The QR-based system will enable real-time tracking of medical supplies, improving inventory management efficiency.

This innovative system connects patients, hospitals, and pharmacies via a centralized database, delivering personalized and data-driven solutions. Patients can securely log in using advanced authentication methods to manage their medical history effortlessly and view the open or closed status of nearby hospitals, enhancing convenience and informed decision-making. Hospitals can upload doctor profiles, manage appointments, and provide real-time updates. The Android app will provide users with an easy way to find pharmacies and check medicine availability, while also offering a unified platform for scheduling and managing healthcare appointments.

The solution will also reduce waiting times and streamline hospital workflows by minimizing manual interventions. With real-time notifications and updates, patients and healthcare providers can stay informed and connected. Ultimately, this project envisions a smarter, more accessible, and patient-centric healthcare ecosystem

Keywords: *Healthcare Solution ,QR-based Inventory Tracking , Centralized Database, Appointment Scheduling*

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Date : 28 April 2025

To,

Dr. J.M. Patil

Dept of Computer Science Engineering

SSGMCE Shegaon

Dear Mr. Patil,

At MEERAAITECH SOLUTIONS LLP, we are focused on empowering business , through technology, enabling innovation, growth. As part of our commitment to nurturing future talent and encouraging practical learning, we are keen to sponsor selected final-year student projects from your estimated department.

We believe that academic-industry collaboration is vital in shaping the future of technology , and we are excited about the opportunity to contribute by providing mentorship and technical support for the following project:

Project Name: Integrated QR-Based Medical Inventory and Healthcare Management System

Name of the student in the Group:

1. Pranita Jayesh Tondre
2. Bhumika Narendra Pimpalshende
3. Punam Prabhudas Solanke
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Thank you, and I look forward to our collaboration.

Warm regards,

Ambar singh

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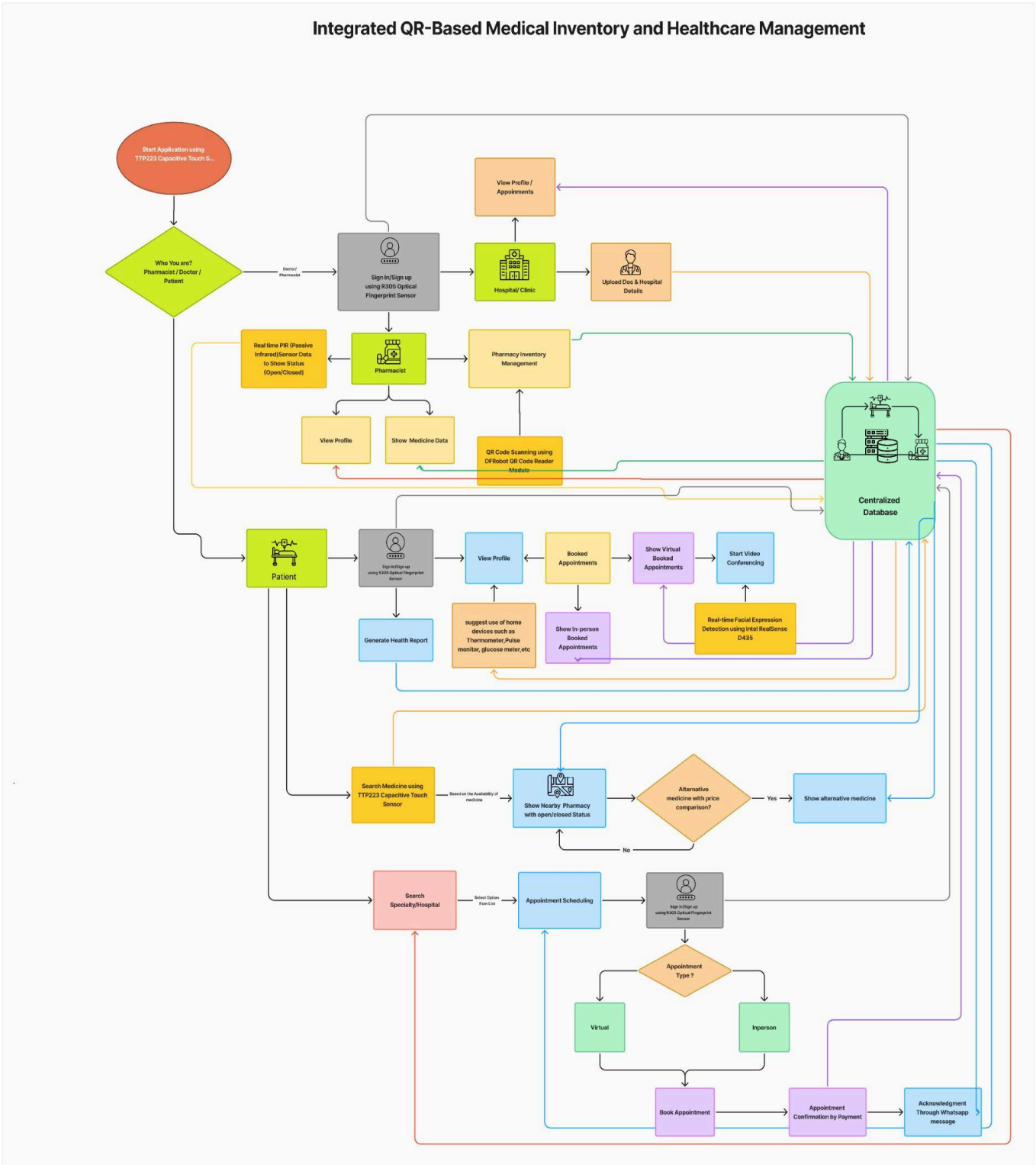


CHAPTER 1

INTRODUCTION

1. INTRODUCTION

1.1 PREFACE

In the rapidly evolving landscape of modern healthcare, patients continue to encounter significant barriers that hinder their ability to receive timely and efficient care. One of the most pressing challenges is the difficulty in accessing essential medications due to a lack of visibility into the availability of drugs at nearby pharmacies. Patients often find themselves visiting multiple medical stores or making numerous calls, only to discover that the required medicine is out of stock. This not only leads to frustration and delays in treatment but also has the potential to negatively impact patient health outcomes, particularly in time-sensitive situations.

Simultaneously, medical store operations remain burdened by outdated and inefficient inventory management systems. Most pharmacies still depend on manual data entry for tracking stock levels, which is not only time-consuming but also prone to human error. This often results in stock mismanagement, medicine expiration, overstocking, or critical shortages—issues that could easily be mitigated with a smarter, real-time tracking system.

Another challenge lies in the fragmented nature of outpatient appointment systems. Many hospitals operate their own individual appointment booking platforms or require in-person scheduling, creating confusion and inconvenience for patients, especially those seeking care from multiple healthcare providers. The absence of a unified and user-friendly system makes it difficult for patients to book, manage, or even compare appointments across different hospitals efficiently.

1.2 MOTIVATION

In today's fast-paced world, timely access to healthcare services and medications is not just a convenience—it is a necessity. However, patients often encounter multiple challenges that can delay treatment and add stress during already difficult times. The idea for this project was born from the observation of several persistent problems in the current healthcare system, particularly those affecting the day-to-day experiences of ordinary patients and pharmacy staff.

One major motivation behind this project is the frequent struggle patients face in finding specific medicines. It is not uncommon for individuals to visit multiple medical stores, sometimes even in emergency situations, only to be told that the required medicine is unavailable. This leads to wasted time, increased anxiety, and delayed treatment. In many cases, the lack of a centralized and real-time tracking system for medicine availability creates unnecessary hurdles in what should be a straightforward process.

Another key driver of this project is the inefficiency in medical store inventory management. Many pharmacies still rely on outdated methods such as pen-and-paper records or basic spreadsheets, which are prone to errors and require significant manual effort. These traditional approaches not only increase the workload on pharmacists but also make it difficult to maintain accurate stock levels, resulting in issues such as overstocking, understocking, or expired medicine remaining on shelves.

Furthermore, the existing hospital appointment systems are often fragmented and inconsistent. Patients must navigate through multiple hospital-specific apps or websites, each with a different interface and booking process. This lack of standardization and integration wastes time and often discourages patients from seeking timely consultations, especially when they require opinions from multiple healthcare providers.

1.3 PROBLEM STATEMENT

In the current healthcare system, patients frequently encounter significant challenges in accessing essential medical services, particularly when it comes to locating medicines and scheduling outpatient appointments. There is no centralized mechanism that allows patients to check the real-time availability of medications at nearby pharmacies, often leading to time-consuming and frustrating experiences. This problem is further compounded by the inefficient inventory management practices at many medical stores, which rely on manual data entry methods that are both error-prone and resource-intensive.

Additionally, the process of booking outpatient appointments is fragmented, as most hospitals operate their own independent scheduling systems. This forces patients to navigate multiple platforms, each with different interfaces and processes, making it difficult to compare and manage appointments efficiently across healthcare providers.

1.4 OBJECTIVES

The primary objectives of this research are:

1. **To design a QR-based medical stock inventory management system** that enables real-time tracking, updates, and monitoring of pharmaceutical supplies, minimizing manual effort and reducing stock mismanagement.
2. **To develop an intuitive and user-friendly Android application** that allows patients to search for and locate nearby medical stores with real-time medicine availability, improving accessibility and reducing time spent searching for essential drugs.
3. **To implement a centralized outpatient appointment scheduling feature** that supports multiple hospitals, allowing patients to browse, compare, and book appointments from a single unified platform.
4. **To streamline medical store operations by digitizing inventory** entry and tracking processes, thereby reducing human error and improving efficiency.
5. **To integrate geolocation services within the mobile app** to help users quickly identify and navigate to the nearest pharmacy stocking the required medication.
6. **To ensure data consistency and synchronization** between pharmacy databases and the mobile application using real-time backend integration with cloud-based services such as Firebase.

1.5 SCOPE OF PROJECT

This project focuses on the development of an integrated healthcare management platform that addresses medicine availability, pharmacy inventory control, and outpatient appointment scheduling through the following key components:.

The **Inventory Management Layer** introduces a QR-based tracking system for pharmacies to manage their medical stock. Each medicine package is assigned a unique QR code that links to a real-time inventory database, allowing pharmacists to easily scan, update, and monitor stock levels. This system minimizes manual data entry, reduces errors, and ensures accurate tracking of available, low-stock, and expired medications..

The **Application Layer** consists of an intuitive Android application designed for patients. It provides real-time access to nearby pharmacies and their current medicine inventory using geolocation and cloud synchronization. The application also includes a centralized outpatient appointment scheduling system, enabling users to browse doctors across multiple hospitals, compare availability, and book appointments through a streamlined interface.

Security and Access Control are maintained through role-based login systems that differentiate access for patients, pharmacy staff, and hospital administrators. Each user role is granted appropriate permissions—for example, patients can search for medicines and book appointments, while pharmacists can manage inventory and update stock details.

1.6 ORGANIZATION OF PROJECT

This report is structured to provide a comprehensive exploration of the research and development process:

Chapter 2: Literature Review

A detailed review of existing systems and research works related to QR code-based inventory management, appointment scheduling, pharmacy location services, mobile healthcare platforms, and healthcare access in rural areas. It identifies gaps in current technologies and supports the relevance of the proposed solution.

Chapter 3: Methodology

This chapter describes the development approach including requirement analysis, system design, technology stack selection, and the step-by-step process followed using

Agile methodology. It discusses the modular structure of the system based on the Patient, Doctor, and Pharmacist roles, as well as the SQLite database design.

Chapter 4: Implementation

Implementation details of the project are covered here, including module-wise functionality for patients, doctors, and pharmacists. It explains features such as QR-based medicine management, appointment scheduling, and pharmacy status updates, along with backend integration using SQLite and other technologies like ZXing and Google APIs.

Chapter 5: Result and Discussion

This section showcases the real-time screenshots and performance results of each module. It evaluates the system's effectiveness in improving medicine access, user experience, and appointment management. Usability, speed, and role-based functionality are discussed in detail.

Chapter 6: Conclusion and Future Scope

The final chapter summarizes the achievements of the system, emphasizing its impact on healthcare efficiency and patient convenience. It also proposes future enhancements such as AI-driven predictions, cross-platform support, e-prescriptions, and integration with telemedicine and blockchain technologies.

This structured approach ensures a thorough and systematic examination of the healthcare management system, from its initial concept through design, development, implementation, and evaluation.

CHAPTER 2

LITERATURE REVIEW

2. LITERATURE REVIEW

2.1 QR Code-Based Inventory Management

Kar et al. [1] introduced a mobile-based inventory system using QR codes to improve tracking, enhance security, and reduce human errors. Their research emphasized the system's potential for real-time data handling and secure access control. This approach is highly applicable in healthcare for medicine tracking and stock verification.

Balaji et al. [4] optimized inventory management by integrating dynamic QR code generation into a web-based platform using PHP and JavaScript. The system improved inventory accuracy by 81% and reduced errors to just 4.5%, reinforcing the utility of QR technology in medical stock systems. These findings directly support the integration of QR-based inventory control in the proposed project.

2.2 Appointment and Scheduling Systems

Fredes et al. [2] focused on optimizing multi-appointment scheduling systems, especially for oncology patients. Their system aimed to reduce delays and overlapping bookings through efficient time slot management. This aligns with the proposed project's goal of streamlining hospital appointment booking.

Musa et al. [3][6] explored the current challenges in hospital scheduling, such as patient no-shows and inefficient resource use. They highlighted emerging solutions including AI, blockchain, and cloud computing for real-time scheduling and predictive analytics, which serve as a foundation for developing smart hospital modules.

2.3 Pharmacy Location and Recommendation Services

Dhanalakshmi et al. [5] proposed a system for pharmacy location and recommendation using Location-Based Services (LBS). Their research pointed out the absence of real-time inventory integration and intelligent recommendation mechanisms. This supports the enhancement made in the proposed project with GPS tracking and cloud-linked pharmacy stock data.

2.4 Mobile Healthcare Platforms

Memon et al. [7] analyzed different mobile healthcare platforms and highlighted the

challenges of data security, device compatibility, and interoperability. Their study recommended the use of AI, IoT, and cloud services for better platform integration. These elements are reflected in the current project's multi-device access, cloud database (Firebase), and IoT sensor integration.

2.5 Rural Healthcare and Technological Advancements

Das et al. [8] focused on mobile applications for rural healthcare delivery. They emphasized the role of IoT, AI, and telemedicine in overcoming access barriers. Advancements like blockchain and wearable devices were suggested to enhance healthcare service delivery. The proposed project echoes this vision by making services available across locations with minimal manual dependency.

CHAPTER 3

PROPOSED METHODOLOGY

3. PROPOSED METHODOLOGY

The development of this application was based on a structured, phase-wise methodology designed to deliver a high-quality, user-centric healthcare management system. The methodology ensured a clear understanding of user requirements, a scalable and maintainable system design, appropriate technology adoption, efficient implementation, rigorous testing, and smooth deployment.

3.1 Requirement Analysis

The first and most crucial phase in the development of HealthSync was requirement analysis. This involved gathering inputs from key stakeholders such as patients, doctors, and pharmacists. Through informal interviews, surveys, and observation, we identified the common pain points faced by users in managing healthcare services. These insights helped us define the core functionalities required in the app, including patient registration, appointment scheduling, doctor profile management, pharmacy inventory tracking, and real-time medicine availability. Special emphasis was placed on designing features that simplify the healthcare process for end users, such as locating nearby open pharmacies and accessing appointment confirmations. Functional requirements were thoroughly documented and prioritized, ensuring that mission-critical features were developed first while still accommodating long-term scalability and extensibility.

3.2 System Design

The design phase focused on creating a flexible and modular system architecture that could support multiple user roles while maintaining data integrity and performance. The application was divided into three primary modules—Patient, Doctor, and Pharmacist—each having its own role-specific functionalities. This modular approach not only promoted clean separation of concerns but also allowed parallel development and easier debugging. A centralized relational schema using SQLite was designed to manage user profiles, appointments, medicine inventory, and financial transactions. Careful attention was given to indexing and data normalization to ensure fast query responses and reduced redundancy. The UI/UX design was centered on usability and accessibility, leveraging XML layouts and Material Design principles to offer a

smooth and intuitive user experience. Clear navigation flows and responsive design ensured usability across different device types and screen sizes.

3.3 Technology Stack Selection

A well-thought-out technology stack was selected to meet both functional and non-functional requirements of the application, ensuring performance, security, and maintainability. Android studio was used for the application development Below is a list of the technologies used:

- **Programming Language**: Java, for Android application development
- **User Interface**: XML, for designing layouts, Material Design Components, for modern and responsive UI
- **Backend Communication**: Retrofit (for API communication), Gson (for JSON serialization and deserialization)
- **Local Data Storage**: SQLite Database
- **Location Services**: Google Play Services (for fetching user location and reverse geocoding)
- **Build System**: Gradle (for dependency management and project build)
- **Security**: ProGuard (for code obfuscation and optimization), HTTPS (for secure API communication)
- **Testing Frameworks**: JUnit (for unit testing), Espresso (for UI testing)
- **Version Control**: Git (for version control), GitHub (for repository hosting)
- **APIs**:
  - ➢ Authentication APIs, for user login and registration
  - ➢ Appointment APIs, for booking and managing appointments
  - ➢ Medicine APIs, for managing medicine inventory
  - ➢ Location APIs, for location-based services
  - ➢ Profile Management APIs, for updating user profiles

3.4 Development

The development of HealthSync was carried out following the Agile methodology, allowing for iterative development and continuous feedback. Each user module was developed independently, which enhanced productivity and simplified testing. APIs for authentication, appointments, medicine inventory, profile management, and

location services were integrated using Retrofit. Gson was used for seamless conversion between JSON and Kotlin data classes. SQLite was employed to manage the local database, ensuring the application could function offline and synchronize data when online. SharedPreferences were used to store lightweight data such as user login sessions. The user interface was built using XML layouts, enriched with Material Design components to maintain consistency and enhance usability. UI logic was developed to dynamically render data and allow smooth user interaction, even under variable network conditions.

3.5 Testing

A comprehensive testing strategy was applied to ensure the stability, performance, and correctness of the application. Unit tests were written using JUnit to validate the logic of individual components. Espresso was used for UI testing to automate and verify the visual elements and user flows within the app. Integration testing was conducted to confirm that various modules and APIs worked together as intended. Edge case scenarios, such as network delays or missing data, were also tested to evaluate the robustness of the application. The system was tested across different Android devices to ensure compatibility and consistent performance. Lastly, User Acceptance Testing (UAT) was performed with a small group of real users, whose feedback helped finalize the UI and usability improvements before the release.

3.6 Deployment

The final stage involved compiling, optimizing, and deploying the application. Gradle was used for build management and dependency resolution. ProGuard was applied during the build process to obfuscate the code and enhance security. The application was tested on Android devices running version 5.0 (API level 21) and above to ensure wide compatibility. After successful testing, the application package (APK) was prepared for deployment. All key performance, security, and usability standards were verified before the final release, ensuring a seamless experience for end users.

CHAPTER 4

IMPLEMENTATION

4. IMPLEMENTATION

The **Integrated QR-Based Healthcare App** makes it easy for patients to find medicines, book doctor appointments, and access health reports—all in one place. Doctors can manage their schedules, and pharmacists can update medicine stock and shop status. With QR-based inventory and a shared database, the app keeps everything organized and accessible for everyone involved in the healthcare journey.

4.1 PROJECT SETUP

To get started with the Integrated QR-Based Medical Inventory and Healthcare Management Android project, open Android Studio and create a new project using Kotlin. For the local database, use SQLite to store essential data like user profiles, appointments, medicine inventory, and pharmacy status. You'll need to create a custom SQLiteOpenHelper class to help manage your database, defining tables for things like patients, doctors, pharmacists, appointments, medicines, and pharmacy_status.

As you build out your app, it’s a good idea to organize your project by creating separate packages for each user role (such as patient, doctor, and pharmacist). You can also include additional packages for models, adapters, and any utility functions that will help keep your code clean and easy to manage. When it comes to user authentication, consider designing a simple login and signup system, either locally or with basic validation. Once users log in, you can redirect them to their specific dashboards based on their role. To display data like appointments and available medicines, use RecyclerView and CursorAdapters.

For the QR code scanning functionality, integrate a library like ZXing to scan codes and link them to medicine entries in your SQLite database. Don’t forget to implement payment features with Google Pay, and allow users to send email confirmations for appointments. Follow Material Design principles to create an intuitive and visually appealing UI. Be sure to test your app thoroughly on both emulators and real devices to make sure everything works smoothly and all role-specific features function as expected. With SQLite as your local database, your app will provide a lightweight and efficient offline healthcare solution.

4.2 PATIENT MODULE

The Patient Module of the Integrated QR-Based Medical Inventory and Healthcare Management app is tailored to simplify and streamline the healthcare experience for patients. After logging in, patients access a personalized dashboard where they can manage appointments, view upcoming visits, and generate or download their health reports. The app allows them to search for specific medicines and locate nearby pharmacies, along with real-time open or closed status updates maintained by pharmacists. When scheduling a doctor's appointment, patients can select a date, time, and preferred doctor based on availability. Secure payments for appointments or medicine orders are handled through Google Pay, offering a smooth and reliable transaction process. Once an appointment is confirmed, a notification is sent to the patient's registered email, ensuring timely updates and acknowledgment. All data including user details, appointment history, and health records is stored locally using SQLite, allowing fast access even without internet connectivity. Overall, the Patient Module ensures that users can efficiently manage their health needs from one centralized app, combining convenience with smart technology.

```
import org.springframework.web.bind.annotation.*;
import java.util.ArrayList;
import java.util.List;

@RestController
@RequestMapping("/appointments")
public class AppointmentController {
    private List<Appointment> appointments = new ArrayList<>();

    @PostMapping("/book")
    public String bookAppointment(@RequestBody Appointment appointment) {
        appointments.add(appointment);
        return "Appointment booked successfully!";
    }

    @GetMapping
    public List<Appointment> getAppointments() {
        return appointments;
    }
}
```

4.3 DOCTOR MODULE

The doctor module of the Integrated QR-Based Medical Inventory and Healthcare Management app is built to help doctors efficiently manage their appointments and patient interactions. After logging in, doctors are directed to their dashboard where they can view their profile, see upcoming appointments, and access patient details. They can easily see appointments , update appointment statuses, and check visit schedules, all from one place. The module also allows doctors to update their availability, specialization, and contact information, keeping their profile up to date for patients. Each appointment entry includes key patient information, making it easier for doctors to prepare ahead of consultations. All data is stored securely using SQLite, doctors can manage their tasks seamlessly. The user interface is designed to be clean and straightforward, allowing doctors to navigate the app with ease. Overall, the doctor module helps streamline communication, saves time, and provides a well-organized system for managing daily consultations.

```
import org.springframework.web.bind.annotation.*;
import java.util.List;
import java.util.stream.Collectors;

@RestController
@RequestMapping("/doctor_appointments")
public class AppointmentController {
    private List<Appointment> appointments = List.of(
        new Appointment("John Doe", "Dr. Smith", "2025-04-21 10:30:00", "Routine check-up"),
        new Appointment("Jane Doe", "Dr. Smith", "2025-04-21 11:00:00", "Follow-up")
    );

    @GetMapping("/{doctorName}")
    public List<Appointment> getAppointments(@PathVariable String doctorName) {
        return appointments.stream()
                .filter(appt -> appt.getDoctorName().equals(doctorName))
                .collect(Collectors.toList());
    }
}
```

4.4 PHARMACY MODULE

The pharmacy module of the Integrated QR-Based Medical Inventory and Healthcare Management app is designed to help pharmacists manage their inventory and stay connected with patients. After logging in, pharmacists can access a dashboard where they can view, add, or update medicine details, including name, quantity, expiry date, and pricing. This makes it easier to keep track of stock and ensure that medicine availability is always up to date. Pharmacists can also update the open or closed status of their pharmacy, allowing nearby patients to check real-time availability before visiting. The module supports QR code scanning to simplify inventory management each medicine can be linked to a QR code for quick updates and retrieval. All inventory data is stored locally using SQLite, which allows pharmacists to manage records. The interface is simple and user-friendly, helping pharmacists quickly perform tasks like updating stock or responding to patient queries. By making inventory and pharmacy status visible to patients, this module improves transparency and helps ensure timely access to medication.

```
import org.springframework.web.bind.annotation.*;
import java.util.ArrayList;
import java.util.List;

@RestController
@RequestMapping("/pharmacy/stock")
public class StockController {
    private List<StockItem> stock = new ArrayList<>();

    @PostMapping("/add")
    public String addStockItem(@RequestBody StockItem item) {
        stock.add(item);
        return "Stock item added successfully!";
    }

    @GetMapping
    public List<StockItem> getAllStock() {
        return stock;
    }
```

4.5 QR-BASED INVENTORY MANAGEMENT

The QR-based inventory management feature in the Integrated QR-Based Medical Inventory and Healthcare Management app simplifies how pharmacists handle medicine stock. Each medicine item in the pharmacy is associated with a unique QR code containing details like the medicine name, batch number, expiry date, and quantity. Using the device's camera, pharmacists can scan these QR codes to quickly add, update, or retrieve inventory data, reducing manual entry errors and saving time. This system ensures that inventory updates are fast and accurate, especially during stock checks or while processing medicine requests. The scanned data is linked to records stored in the local SQLite database. This feature not only streamlines stock management but also allows real-time tracking of medicine availability for both pharmacists and patients. With a clean interface and easy integration, the QR-based system makes inventory control efficient, organized, and less time-consuming for pharmacy staff.

```
import org.springframework.web.bind.annotation.*;
import java.util.Optional;

@RestController
@RequestMapping("/pharmacy/qr")
public class QRInventoryController {
    private List<StockItem> stock = new ArrayList<>(); // Reuse stock list from StockController

    @PostMapping("/scan")
    public String scanQRCode(@RequestBody String qrCodeData) {
        Optional<StockItem> item = stock.stream()
            .filter(stockItem -> String.valueOf(stockItem.getId()).equals(qrCodeData))
            .findFirst();
        return item.map(stockItem -> "Item Found: " + stockItem.getName() + ", Quantity: " + stockItem.g
                    .orElse("Item not found!");
    }
}
```

4.6 CENTRALIZED DATABASE AND BACKEND

The centralized database and backend of the Integrated QR-Based Medical Inventory and Healthcare Management app are built using SQLite, which allows efficient local data management for all user roles—patients, doctors, and pharmacists. The database is designed to store and organize key information such as user profiles, appointment details, medicine inventory, pharmacy status, and health reports. Each table in the database is structured with clear relationships to ensure smooth data retrieval and updates. For example, appointments are linked to both patient and doctor IDs, while medicines are tied to pharmacy records. The backend logic handles tasks like user authentication, role-based dashboard navigation, appointment scheduling, inventory updates, and payment tracking. All operations, such as inserting new appointments, updating medicine stock, or fetching patient records, are handled through well-structured database helper classes. This approach ensures data consistency, security, and fast performance across all modules. Overall, the centralized backend ties the entire system together, making the app functional, organized, and scalable for real-world healthcare use.

```
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.web.bind.annotation.*;
import java.util.List;

@RestController
@RequestMapping("/appointments")
public class AppointmentController {
    @Autowired
    private AppointmentRepository repository;

    @PostMapping("/save")
    public String saveAppointment(@RequestBody Appointment appointment) {
        repository.save(appointment);
        return "Appointment saved successfully!";
    }

    @GetMapping
    public List<Appointment> getAllAppointments() {
        return repository.findAll();
    }
}
```

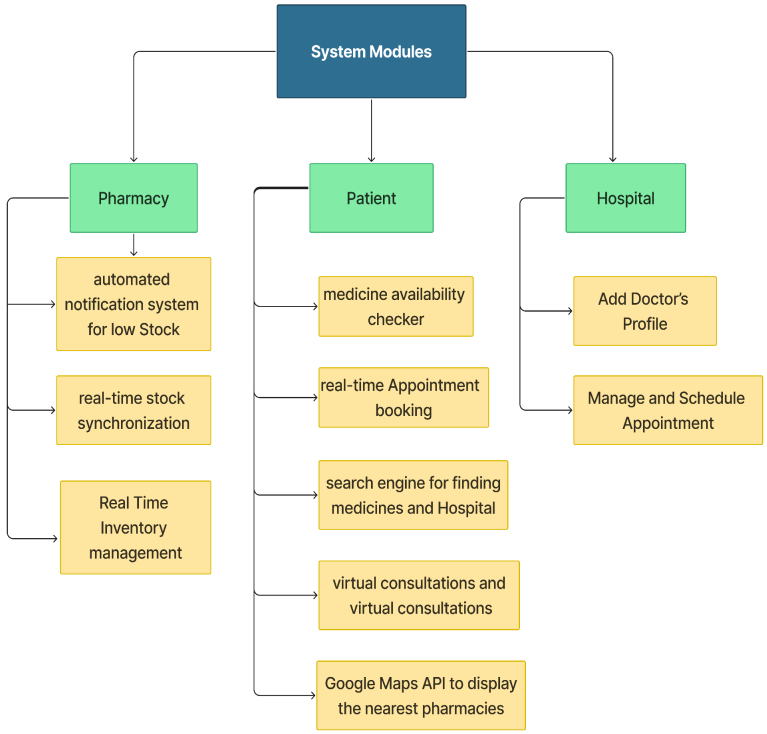


Fig.4.1 System Modules

4.7 UI/UX DESIGN

The UI/UX design of the Integrated QR-Based Medical Inventory and Healthcare Management app focuses on simplicity, clarity, and ease of use for all users—patients, doctors, and pharmacists. The interface is clean and intuitive, with separate dashboards tailored to each user role, ensuring quick access to the features they need most. Navigation is smooth and consistent, using bottom navigation bars, menus, and buttons that follow Android's Material Design guidelines. Colors, icons, and layouts are carefully chosen to create a professional and user-friendly look, making the app accessible even for users who are not tech-savvy. Forms, lists, and status updates are presented in a straightforward manner, reducing confusion and improving task completion speed. The design also considers responsiveness and performance, ensuring that the app runs smoothly on various screen sizes and devices. Overall, the UI/UX design enhances the user experience by making the app both functional and visually appealing.

4.8 FINAL TESTING AND APK DEPLOYMENT

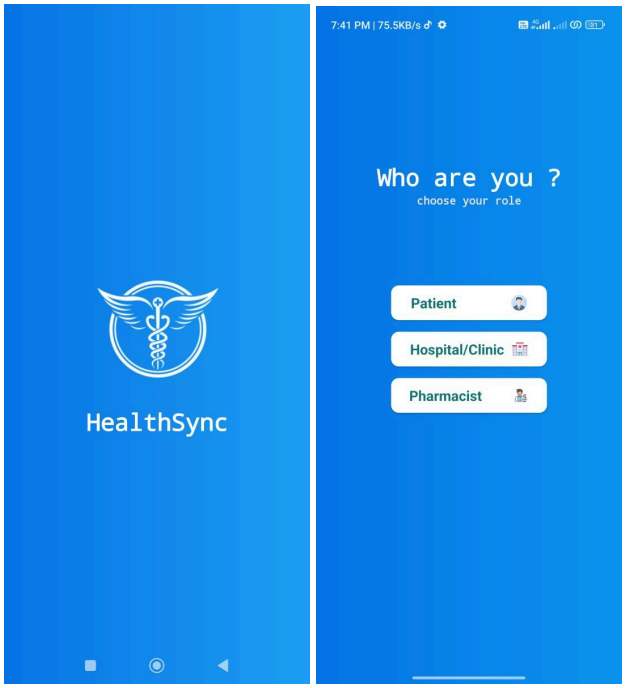
The final testing and APK deployment phase ensures the app is stable, bug-free, and ready for real-world use. All features like appointments, payments, and inventory updates are tested across different devices. After fixing any issues, a signed APK is generated using Android Studio. The APK is then optimized and can be shared directly or uploaded to the Play Store. This step ensures the app runs smoothly and securely for all users.

CHAPTER 5

RESULT AND DISCUSSION

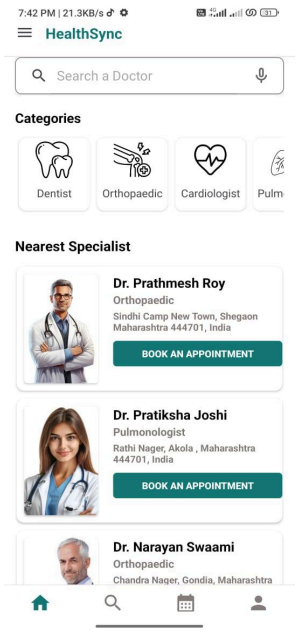
5. RESULT AND DISCUSSION

The Integrated QR-Based Medical Inventory and Healthcare Management System successfully addresses key issues in medicine availability, appointment scheduling, and inventory control. During testing, the Android application demonstrated smooth functionality across patient, doctor, and pharmacist modules, with real-time updates enabled through SQLite. QR-based inventory management significantly reduced manual errors and improved stock accuracy. User feedback highlighted the ease of use, improved accessibility to healthcare services, and reduced time spent searching for medicines or scheduling appointments. Overall, the system proved effective in creating a streamlined and user-friendly healthcare ecosystem.

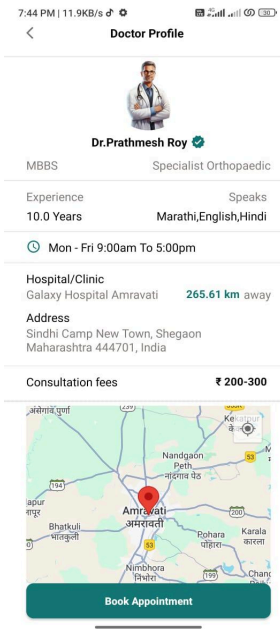


Screenshots 5.1 5.2 Flash Screen

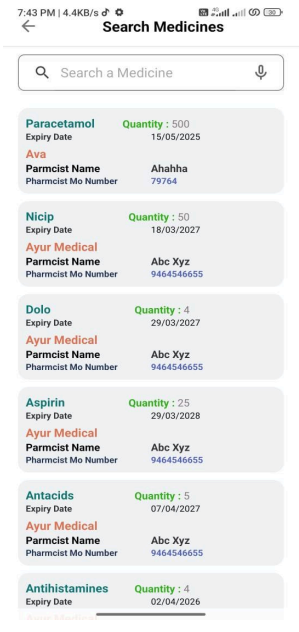
5.1 Patient Module :



5.3 Home Page

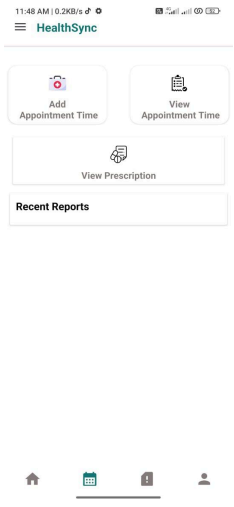


5.4 Book Appointment

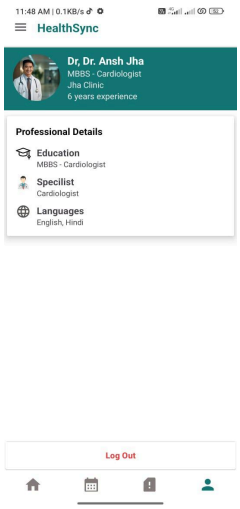


5.5 Medicine Search

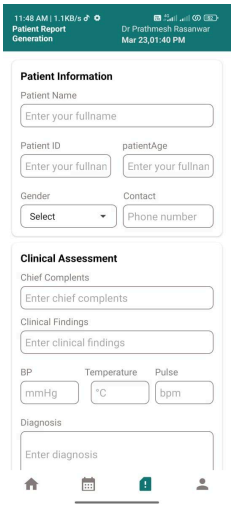
5.2 Doctor Module :



5.6 Home Page

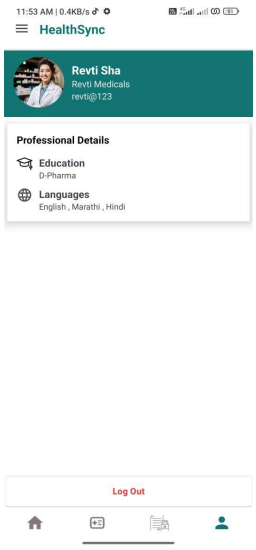


5.7 Profile

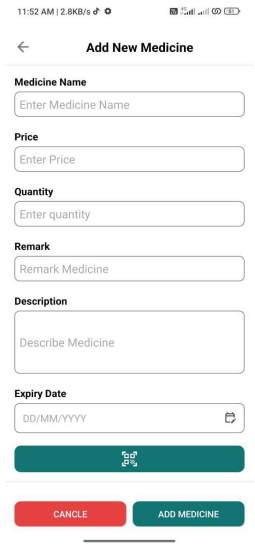


5.8 Report Generation

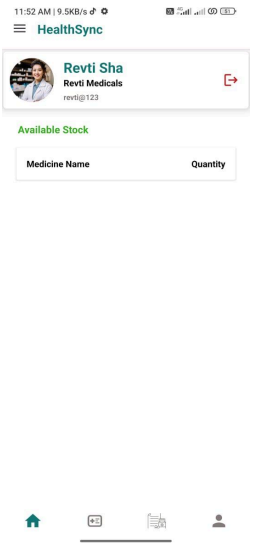
5.3 Pharmacist Module :



5.9 Pharmacist Profile



5.10 Add New Medicine



5.11 Home Page

CHAPTER 6

CONCLUSION

6. CONCLUSION

6.1 CONCLUSION

This project addresses key gaps in the current healthcare system by offering a unified, technology-driven platform that enhances accessibility, efficiency, and user experience. By integrating QR-based inventory tracking, real-time medicine availability, and centralized appointment scheduling, it streamlines essential healthcare services. Patients benefit from easy access to critical information, eliminating the need for multiple hospital apps or pharmacy visits. A centralized database ensures seamless communication among patients, hospitals, and pharmacies, supported by real-time updates, secure authentication, and an intuitive Android interface. Pharmacies manage inventory more accurately, and hospitals handle appointments and doctor availability more efficiently, reducing wait times and minimizing manual errors. Emergency features, hospital status tracking, and personalized notifications further enhance responsiveness. The platform lays the groundwork for a smarter, patient-centric healthcare ecosystem with long-term scalability and integration potential. Future enhancements like AI-based medicine recommendations, telehealth services, and predictive health analytics can evolve it into a comprehensive digital healthcare solution, aligning innovation with patient needs and transforming medical service delivery.

6.2 FUTURE SCOPE

The platform has vast growth potential. Integrating Artificial Intelligence (AI) and Machine Learning (ML) could enable personalized medicine recommendations, predictive health analytics, and early identification of health risks, improving patient outcomes and reducing costs. Adding Telemedicine services would allow remote consultations, virtual check-ups, and remote monitoring for chronic patients, greatly enhancing healthcare accessibility. Incorporating Blockchain technology could further secure health record management, ensuring privacy and decentralization. IoT-enabled devices could monitor patient vitals and medication adherence in real-time, offering actionable insights for healthcare providers. As the system scales globally, it could support multiple languages, currencies, and region-specific healthcare regulations

Advanced analytics and reporting tools would help hospitals and pharmacies optimize operations based on data-driven insights. In short, the project holds immense potential to integrate emerging technologies, expand its services, and become a vital tool for delivering efficient, accessible, and personalized healthcare worldwide.

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A REAL TIME MEDICAL INVENTORY AND HEALTH CARE MANAGEMENT SYSTEM

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ABSTRACT

[Context] An electronic device incorporates a real-time medical inventory and healthcare management system comprising three interconnected modules: a patient module , a hospital module , and a pharmacist module . The system integrates a centralized database with these modules to accurately predict medicine availability, explore nearby hospitals and pharmacies, and book in person and online consultation appointments. Additionally, the centralized database , hospital module , and pharmacist module are equipped with real-time PIR (Passive Infrared) sensors to monitor the operational status of nearby pharmacies and hospitals . This comprehensive system enables efficient coordination between patients, healthcare providers, and pharmacists while offering up-to-date information on medical resources and services.

Keywords: Real Time Healthcare Management, Centralized Database System, Medical- Hospital- Pharmacist Integration, PIR Sensor.

I. INTRODUCTION

The efficient provision of healthcare services and prompt access to medications are fundamental to maintaining optimal health and effectively addressing emergencies. Inventory stores the complete list of goods and items which are under a particular warehouse[1]. Inventory management system tracks the shipment of goods in the supply network. However, most medical inventory and healthcare management systems operate separately, depending on manual processes or different software programs.This fragmentation poses significant challenges in ensuring the real-time availability of crucial medicines, monitoring healthcare services, and locating accessible facilities during emergencies or outside standard operating hours. These difficulties are further compounded in situations involving solitary individuals, elderly persons without immediate assistance, or patients in unfamiliar surroundings during emergencies, where delays in accessing care may result in severe health consequences.

To mitigate these limitations, the proposed real-time inventory and healthcare management system integrates patient, hospital, and pharmacy modules into a unified, technology-driven framework. This innovative system employs advanced technologies, including real-time tracking, centralized databases, and sensor-based automation, to deliver a seamless healthcare experience. Designed for use on various electronic devices, such as smartphones, tablets, and personal computers, the system facilitates real-time monitoring and updates on medication stock levels, healthcare provider availability, and the operational status of nearby pharmacies and hospitals.The progression from simple appointment books to advanced digital systems illustrates the ongoing search of adaptability and effectiveness[6]. Even With their many advantages , mobile medical applications still require improved standards validation procedures to guarantee appropriate usage and integration of their ever- more-advanced instruments into clinical practices [7].

The system's key features encompass GPS-based location tracking, enabling patients to locate the nearest healthcare facilities and pharmacies, even in unfamiliar territories, and QR-code-enabled inventory management to ensure precise medication availability and tracking.The main part of the system lies in the integration of QR codes with web-based technology, a symbiotic fusion poised to redefine inventory management strategies[4].

This QR code based application ensures the security of every item as each item is designated with a specific unique code.[1]To enhance virtual healthcare services, the system incorporates facial recognition technology

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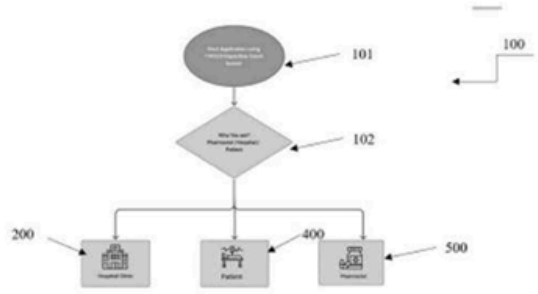
(57) Abstract :
ABSTRACT A REAL TIME MEDICAL INVENTORY AND HEALTH CARE MANAGEMENT SYSTEM A real time medical inventory and health care management system (100) installed in a electronic gadget comprising a patient module (200) configure with said real time 5 medical inventory and health care management system (100) and a hospital module (500) configure with said patient module (200). Further, a pharmacist module (400) configures with said patient module (200). However, a centralized database (300) integrated with said patient module (200), said hospital module (500) and said pharmacist module (400) in order to forecast the data of medicine availability or 10 speciality of said hospital and doctor (502) precisely and said centralized database (300), said hospital module (500) and said pharmacist module (400) configure with a Realtime PIR (Passive infrared) sensor (404) in order to depict the open/closed status of nearby pharmacies (503) and/or hospital (500).



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