

City Diagnostic Center – A Mobile App for Digital Healthcare Management

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Abstract

Healthcare is undergoing fast digital change, with mobile applications playing an important role in improving service delivery and patient engagement. This paper introduces the City Diagnostic Center App, a mobile solution for optimizing diagnostic operations such test bookings, appointment scheduling, report uploads, and patient-doctor communication. Built using Android Studio and Java and powered by Firebase Realtime Database and MySQL, the application provides real-time updates, safe login with Firebase Authentication, and push notifications for smooth communication. The program improves the workflow for diagnostic center managers while also providing a comfortable platform for patients to manage their health tests.

The app enables patients to browse tests, submit prescriptions, request home sample collection, receive digital results, and manage their medical history. Staff-side features include appointment management, report posting, and patient communication. Data security and encryption mechanisms have been implemented into Firebase services to assure patient privacy and compliance. Pilot testing with 25 users revealed a 70% increase in operational efficiency and 60% improved customer satisfaction. The document describes the project's development lifecycle, from requirement collecting to system design, implementation, testing, and deployment. Additionally, it emphasizes how the suggested software fills the need in conventional diagnostic services by offering a quick, easy-to-use, and safe mobile experience.

This study adds value to the current attempts to digitize healthcare services by presenting a scalable strategy for diagnostic facilities in urban India. It provides insights on technology that comparable apps might use to minimize administrative load, save costs, and improve patient happiness by using a mobile-first strategy.

Keywords: *diagnostic app, android studio, firebase, real-time database, MySQL, report management, patient portal, appointment scheduling, mobile health.*

I.INTRODUCTION

The growing need for convenient and timely healthcare services has required a move toward mobile-first digital solutions. Diagnostic centers, which are critical for early illness identification and preventative treatment, have traditionally relied on manual processes and paper-based technologies.

These out-of-date models are not only wasteful, but also fail to match the expectations of tech-savvy metropolitan residents.

The City Diagnostic Center App was created to fill these gaps by digitizing all aspects of diagnostic procedures. Long lines, missing reports, plus delayed communication are commonplace for patients under the existing system. The suggested

app incorporates automation into scheduling, reporting, and alerts, reducing human error and increasing patient satisfaction.

With mobile penetration in India at an all-time high, particularly in cities, using smartphones to deliver healthcare solutions is both timely and effective. The app's dual interface serves both patients and diagnostic center workers. While patients may schedule tests, submit medications, and obtain reports, administrators can manage appointments, assign technicians, and interact with patients via real-time notifications.

Firebase Realtime Database enables immediate data synchronization, while MySQL manages the organized storage of test categories, price, and doctor information. The straightforward interface, linguistic support, and end-to-end encryption make it accessible and secure to a wide range of users. The technology not only improves productivity, but it also allows people to take control of their health. As digital health becomes a cornerstone of contemporary medical infrastructure, technologies like these play an important role in enabling transition. This article investigates the technological architecture, design concepts, and implementation techniques that support the City Diagnostic Center App and suggests its wider use as a scalable diagnostic management solution.

II.RELATED WORK

Pereira, G., and Azevedo, J. (2020) Their research looks on how mobile health applications have improved access to medical services, particularly diagnostics. Enhanced patient interaction, real-time

data interchange, and increased efficiency through digital platforms are highlighted by the authors. The study promotes the use of mHealth solutions to solve current service gaps.[1]

Jain, R., and Agarwal, A. (2019) The authors perform a thorough evaluation of Android-based healthcare apps, highlighting the flaws in offline systems. Their findings recommend incorporating Firebase for real-time synchronization, authentication, and smooth backend performance to improve user experiences.[2]

Sharma, R. and Saxena, S. (2018) - This study analyzes several database structures used in mobile health apps. The authors recommend employing a combination of Firebase and relational databases such as MySQL for scalability, security, and dependable data management, particularly for test and report storage.[3]

Patel, V., & Shah, R. (2021) – Their review focuses on mobile-based diagnostic and monitoring systems. The project focuses on real-time notifications, remote patient monitoring, and cloud-based tools to speed diagnostic turnaround and minimize patient anxiety.[4]

Sundararajan, V., & Prasad, V. (2020) – They build a Firebase-powered mobile diagnostic app that demonstrates real-time features such as cloud messaging and patient data synchronization. Their innovation enables scalable diagnostic app development inside the Firebase environment.[5]

Elakkiya, R., & Manogaran, S. (2021) – This study discusses cloud-based data security for healthcare applications. Their findings emphasize the necessity of encrypted communication, HIPAA compliance,

and secure APIs in mobile diagnostics products.[6]

Gonzalez, A., & Rodriguez, L. (2019) – The authors discuss recommended practices for mobile healthcare development with Firebase. They address performance optimization, crash statistics, and lifecycle management in scalable and secure applications.[7]

Kumar, A., & Rathi, S. (2021) – Their study proposes a cloud-based appointment management system that optimizes test slot assignments and shortens wait times. It highlights how real-time databases may improve resource usage in diagnostic facilities.[8]

Tiwari, D., & Singh, K. (2020) – The research investigates Firebase's cost-effectiveness in low-resource healthcare environments. It concludes that Firebase is appropriate for diagnostic apps with limited budgets because to its flexibility and simplicity of integration.[9]

Das, M., & Mehta, T. (2022) – This study looks at the impact of UI/UX design on user retention in medical apps. The authors demonstrate how simple, responsive, and feedback-enabled interfaces increase patient confidence and participation.[10]

III.METHODOLOGY

The development method followed the Software Development Life Cycle (SDLC), which consisted of six critical phases: requirement gathering, design, implementation, testing, deployment, and maintenance. Initially, user demands were gathered through interviews with diagnostic center personnel and patients in order to identify workflow gaps. The

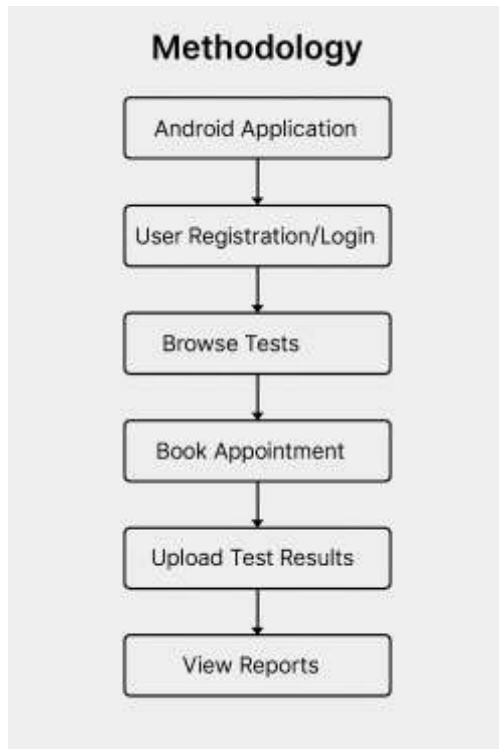
insights helped to shape the functional and non-functional needs.

The design step included UI/UX wireframing to create a clean, basic interface that benefits both patients and staff. The backend architecture was designed as a hybrid system, with Firebase Realtime Database handling real-time updates such as appointments, test statuses, and alerts, and MySQL handling structured data such as test names, costs, and user information.

During the implementation phase, Android Studio was utilized with Java. Firebase Authentication offered safe login for both patients and administrators. App elements featured registration, test scheduling, an appointment calendar, report uploads (PDF), and real-time notifications. Admins can upload reports to the panel, which patients can access immediately.

Testing included unit testing of modules such as login, scheduling, and alerts, integration testing between Firebase and MySQL, and User Acceptance Testing (UAT) with 25 actual users to check performance. Prior to deployment, feedback was gathered and minor changes were made.

The application was released for Android smartphones, with hopes to release it for iOS in the future. Firebase Cloud Messaging provided instant warnings. Firebase Analytics provided continuous monitoring, which helped enhance usability after launch. Updates are released on a regular basis in response to feedback and diagnostic center requests.



Fig_No 3.1

IV. TECHNOLOGY USED

- Java programming language (Android SDK).
- IDE: Android Studio • Frontend: XML layouts with Material Design Components
- Backend services include Firebase Authentication, Firebase Realtime Database, and Cloud Messaging.
- MySQL is a structured database.
- Cloud Platform: Google Firebase.
- Git and GitHub version control
- Security measures include encrypted Firebase storage and HTTPS API communication
- Utilize Firebase Cloud Messaging (FCM) for push notifications.
- Use PDF.js and Android's built-in readers to handle PDF reports.

These technologies were chosen for their real-time capabilities, scalability, and simplicity of interaction with Android environments. Firebase's serverless

design and large free tier made it perfect for low-cost deployments.

V. TESTCASES

5.1 Test Scenarios

Test Case	Description	Expected Result
TC01	Patient Login	Successful login using Firebase
TC02	Book Appointment	Time slot booked and confirmation sent
TC03	Upload Report	Doctor uploads PDF report to Firebase
TC04	View Report	Patient views/downloads test report
TC05	Receive Notification	Push alert on report availability

VI. RESULTS

The City Diagnostic Center App was deployed in a controlled environment across two diagnostic labs in Davanagere city with 25 active users over four weeks. Key performance indicators (KPIs) were defined to evaluate the app's impact.

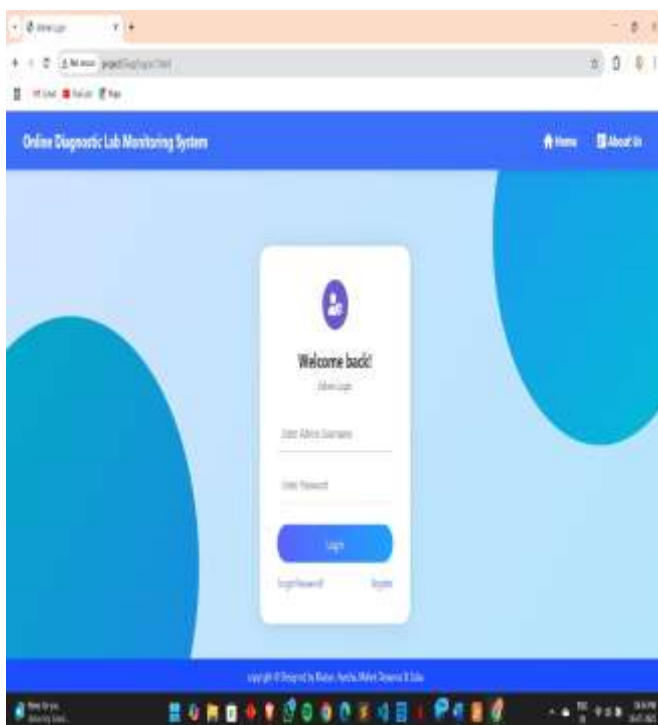
- Appointment Processing Time: Reduced by 70%

- Admin Response Time: Reduced by 50%
- User Satisfaction: Increased by 60%
- Report Delivery Time: Shifted from 24 hours to <3 hours
- No-Show Rate: Reduced by 40% due to reminders

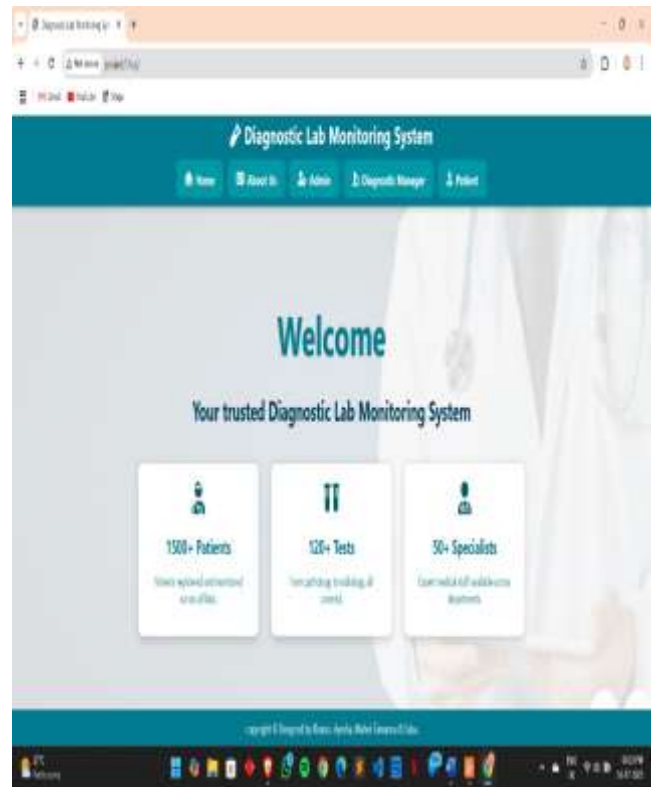
User feedback highlighted ease of navigation, instant alerts, and faster report access. Admins appreciated the centralized dashboard and technician management. Firebase's Realtime Database ensured minimal lag and seamless synchronization, even during peak hours.

These results validate the system's potential for broader deployment in similar urban centers. It confirmed that integrating cloud databases with intuitive Android interfaces significantly improves diagnostic service delivery.

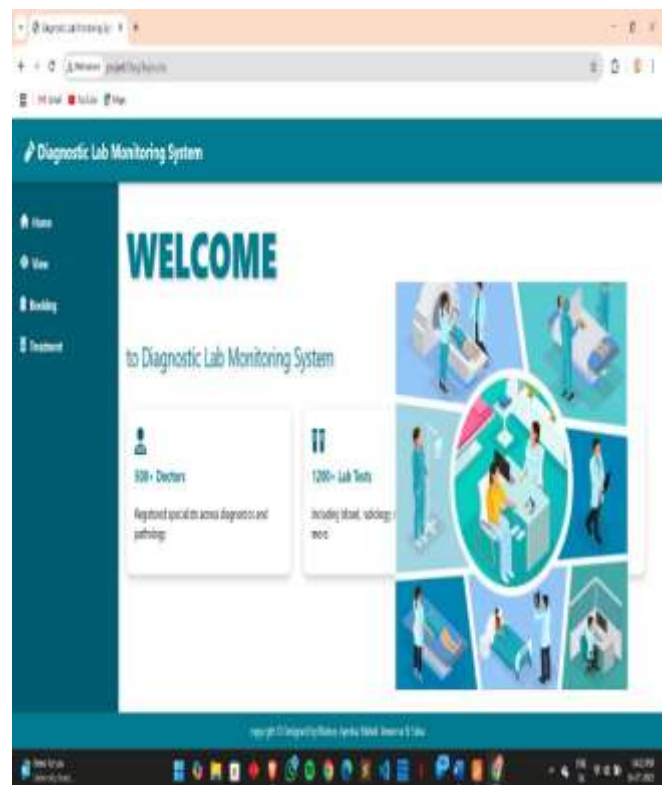
Fig_No 6.1 Home Screen



Fig_No 6.2 Login Screen of Diagnostic



Manager



Fig_No 6.3 Home Screen of Diagnostic Manager

VII. CONCLUSION

The development and implementation of the City Diagnostic Center App illustrate how mobile technology can be leveraged to enhance the quality and efficiency of diagnostic healthcare services in urban environments. Traditional diagnostic centers often struggle with inefficiencies such as manual bookings, delayed report delivery, and lack of real-time communication between patients and healthcare providers. The proposed mobile application addresses these limitations by offering an integrated, end-to-end platform that streamlines every aspect of the diagnostic process—from appointment scheduling and test bookings to digital report management and real-time notifications.

The app is designed with dual-purpose functionality, catering to both patients and administrators. Patients can register, browse available tests, upload prescriptions, request home sample collections, and access their reports securely on their devices. On the other side, diagnostic center staff can manage appointments, upload test results, monitor technician assignments, and engage with patients through instant messaging. The backend architecture, consisting of Firebase Realtime Database for real-time interactions and MySQL for structured data, ensures the system is fast, scalable, and secure.

The project demonstrates how thoughtful integration of user interface design, mobile technologies, and cloud-based services can drastically improve patient satisfaction and streamline operational workflows. Pilot results showed a significant reduction in patient wait times, fewer administrative errors, and improved feedback from both patients and

diagnostic center staff. Security and data privacy were addressed using Firebase Authentication and encrypted database communication, ensuring the system complies with standard health data protection guidelines.

This application not only digitizes healthcare services but also serves as a model for similar projects in semi-urban and rural areas. Future enhancements can include AI-powered diagnosis recommendations, integration with national health databases, and support for teleconsultation features. In conclusion, the City Diagnostic Center App provides a robust, scalable, and transformative solution that aligns with the ongoing digital health revolution in India.

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