




Fahad Naseer

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E-Vaccine

Final Year Project Report Session 2020-2024

A project submitted in partial fulfilment of the
The University of Faisalabad Degree
of
Bachelor of Science in Software Engineering



Department of Computer Science
The University of Faisalabad, Amin Campus
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Project Details

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We here by declare that the content of this project report title “**E-Vaccine**” submitted to the “**DEPARTMENT OF COMPUTER SCIENCE**”, is a documentation of a unique work we created under the supervision of Supervisor “**Miss Amina Iqbal**” and that no part has been plagiarized (except the references, some standard mathematical or genetic models/questions/protocols, etc.). Additionally, this project is presented in partial completion of the degree requirements for a Bachelor of Science in Software Engineering. The University may take action if the above statement is found inaccurate at any stage.

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Abstract

The sole purpose of this project is to provide an application to make it easy for parents to get their children vaccinated. This application is designed to streamline and enhance the process of managing child vaccinations, ensuring timely and accurate administration of vaccines. It provides the people with location of vaccine centres and provides a chart which vaccine is needed when and the amount of dosage for the age group of 1-9 years old. So, in the heart of Pakistan, where the land owns rich culture and prestigious soil, a silent battle unfolds. Where many preventable diseases come across to nation's child. The major reason for these preventable diseases is untimely vaccinations, it has become a challenge that echoes through the corridors of public health. According to the surveys, 66% nation's children are vaccinated of aged 12-13 months but remaining 44% has not received their vaccination. The genesis of the "E-Vaccine" project stems from the recognition of this challenge. In the backdrop of these challenges the vision of E-Vaccine took route. Inspired by the transformative potential of technology, we envisioned a mobile application that transcends traditional barriers, offering a lifeline to parents and guardians striving to secure the best possible health outcomes for their children. The aim of this project is to outline the comprehensive plan for the development and implementation of the E-Vaccine for children, focusing on children aged 1st day to 9 years. This project seeks to address gaps in immunization coverage, improving health-care access, and ultimately enhance the overall health and well-being of the target population. By harnessing the power of technology, data, and community engagement, this project aspires to make a significant impact on childhood vaccination rates, thereby reducing the burden of preventable diseases and fostering a stronger foundation of our children's lifelong health and nourishment.

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CHAPTER 1: INTRODUCTION

1.1 Introduction

The purpose of this project is to provide an application to make it easy for parents to get their children vaccinated. This application is designed to streamline and enhance the process of managing child vaccinations, ensuring timely and accurate administration of vaccines. It provides the people with location of vaccine centers and provides a chart which vaccine is needed when and the amount of dosage for the age group of 1-9 years old. Our mobile application serves as a one-stop solution, providing essential vaccine-related information, access to online pediatricians, and convenient location tracking for nearby vaccine centers. By integrating features such as baby vaccine records and vaccination schedules, the application empowers parents to stay informed and proactive about their child's immunization journey. Through this project, we aspire to contribute to the well-being of children by providing a valuable tool that simplifies the vaccination experience, fosters informed decision-making, and ultimately helps protect the most vulnerable members of our society.

1.2 Aim & Objectives

The aim of this project is to outline the comprehensive plan for the development and implementation of the E-Vaccine for children, focusing on children aged 1st day to 9 years. This project seeks to address gaps in immunization coverage, improving health-care access, and ultimately enhance the overall health and well-being of the target population. By harnessing the power of technology, data, and community engagement, this project aspires to make a significant impact on childhood vaccination rates, thereby reducing the burden of preventable diseases and fostering a stronger foundation of our children's lifelong health and nourishment. However, navigating the world of vaccines can be daunting for parents, especially for those with young children. To address this challenge, our project aims to develop a comprehensive mobile application tailored for children vaccination.

1.3 Problem Statement

This project aspires to make a significant impact on childhood vaccination rates, thereby reducing the burden of preventable diseases and fostering a stronger foundation of our children's lifelong health and nourishment. In this project we will have to overcome the language and literacy barriers to spread awareness about our application and how important vaccines are for children. Parents and guardians do not have much information about vaccine centers they mainly rely on government vaccine services due to which sometimes the vaccines not provided by the government gets missed out. Due to improper details of vaccines, we cannot determine what vaccine is needed, how much dosage is needed, and which vaccines are more suited to which age group.

1.4 Proposed System

The E-Vaccine Project which targets children of 1st day to 9 years old is aimed to address several critical problems related to childhood vaccinations. It resolves missed vaccines by sending automated reminders to reduce the number of missed vaccines. It resolves incomplete records or track by digitally maintained records. It focuses on reducing health inequities by identifying under-served areas and implementing strategies to make health-care better. Incomplete vaccination can lead to different health issues which we tackle by up-to-date data and information. The project also addresses concern related to the security and privacy of health information. It aims to improve vaccination rates and reduce the burden of unpreventable diseases among children, ultimately promoting their health and well-being. Our project includes child's hospitals and pediatricians for dealing with any health issues.

1.5 Project Scope

The "E-Vaccine" mobile application aims to assist parents, guardians, and healthcare professionals in tracking and managing child vaccinations. The application will provide a user-friendly interface to schedule, record, and monitor vaccine doses, as well as offer educational resources related to vaccinations.

1.6 Assumptions & Constraints

1.6.1 Assumptions:

User Adoption:

Assumption: Users will adopt and engage with the "E-Vaccine" application willingly.

Rationale: The assumption is based on the premise that parents and guardians value the convenience and benefits offered by the application for managing child vaccinations.

Internet Connectivity:

Assumption: Users will have regular access to the internet for real-time updates and notifications.

Rationale: The application relies on internet connectivity for features such as push notifications, real-time updates, and accessing educational resources.

Health-care Guidelines:

Assumption: The vaccine information and schedules provided by the application align with local and international health-care guidelines.

Rationale: The assumption is based on the collaboration with reputable healthcare organizations and the use of accurate vaccine databases.

Device Compatibility:

Assumption: The "E-Vaccine" application is compatible with a wide range of mobile devices.

Rationale: Development and testing efforts are undertaken to ensure compatibility with popular Android devices. However, there might be limitations on very old or uncommon devices.

Regulatory Compliance:

Assumption: The development and deployment processes comply with relevant data protection and healthcare regulations.

Rationale: The assumption is based on the understanding of regulatory requirements and adherence to best practices in data security and privacy.

User Data Accuracy:

Assumption: Users provide accurate information when creating and updating child profiles.

Rationale: The application's effectiveness relies on the accuracy of user-provided data for generating personalized vaccine schedules and maintaining vaccine records.

1.6.2 Constraints:

Limited Device Resources:

Constraint: The application should operate efficiently on devices with varying levels of processing power and memory.

Rationale: Not all users will have high-end devices, so optimization for performance is essential.

Privacy Concerns:

Constraint: Strict adherence to data privacy regulations, limiting the collection of sensitive information.

Rationale: Privacy concerns are paramount, especially when dealing with health-related data of children. The application should prioritize user privacy and data security.

Budgetary Constraints:

Constraint: Development and maintenance budgets are limited.

Rationale: Resource constraints may impact the scope of features, development timelines, and ongoing support and updates.

Dependency on External Data Sources:

Constraint: The accuracy and availability of vaccine information depend on external databases.

Rationale: The application relies on external sources for vaccine data, and any discrepancies or changes in these sources may affect the application's functionality.

Regulatory Changes:

Constraint: Changes in healthcare regulations or data protection laws may require adjustments to the application.

Rationale: Ongoing monitoring of regulatory changes is necessary to ensure ongoing compliance.

User Education:

Constraint: User engagement and understanding of the application depend on effective educational resources within the app.

Rationale: The success of the application relies on users' comprehension of vaccination-related information and the application's features.

1.7 Social Benefits

1.7.1 Increased Vaccination Rates:

By providing easily accessible vaccine information, schedules, and reminders, the application can help improve vaccination rates among children. This, in turn, contributes to community immunity and reduces the spread of vaccine-preventable diseases, benefiting society.

Health Equity: The application can help bridge gaps in healthcare access by providing essential vaccination resources to underserved communities or regions with limited healthcare infrastructure. This promotes health equity by ensuring that all children, regardless of socioeconomic status or geographical location, have access to life-saving vaccines and preventive care.

1.7.2 Empowering Parents:

By empowering parents with knowledge and tools to make informed decisions about their child's health, the application fosters a sense of confidence and self-efficacy. This can lead to positive health outcomes for children and families, as parents feel empowered to prioritize preventive care and advocate for their child's well-being.

1.7.3 Reduced Healthcare Burden:

By promoting proactive vaccination and preventive care, the application can help alleviate the burden on healthcare systems, particularly during times of high demand or public health emergencies. By reducing the incidence of vaccine-preventable diseases, healthcare resources can be redirected towards addressing other pressing health needs.

1.8 Community Engagement:

The application can serve as a platform for community engagement and education on vaccination-related topics. By fostering dialogue and sharing reliable information, it

helps build trust between healthcare providers, parents, and communities, ultimately strengthening public health efforts and promoting a culture of health and well-being.

1.8.1 Data-driven Public Health Initiatives:

By collecting anonymized data on vaccination rates, trends, and user interactions, the application can contribute valuable insights to public health authorities and policymakers. These data can inform targeted interventions, vaccination campaigns, and policy decisions aimed at improving population health outcomes and addressing disparities in immunization coverage.

1.9 Business Plan

1.9.1 Business Model Canvas

Business Model Canvas				E-Vaccine
Key Partners	Key Activities	Value Proposition	Customer Relationships	Customer Segments
Healthcare Organizations: Collaboration for accurate vaccine information. App Platforms: Partnership with google for app distribution.	Develop and refine AI algorithms. Marketing and promotional activities. User engagement strategies.	Convenience: Simplifying vaccine management for parents and guardians. Accuracy: Providing a digital record for administrated vaccine. Education: Offering informational resources about vaccine.	User-friendly interface. Promotional E-Mails and notifications Responsive customer support for queries. Updates and improvements based on user feedback.	Parents/Guardians: primary users managing child vaccination. Healthcare Professionals: Accessing and updating patient vaccine records. Administrators: manging user accounts and system configurations.
	Key Resources Technology: Development and maintenance of mobile application. Data Security: Protection of user data.		Channels Mobile Appstore: Distribution through google play. Online Marketing: Social marketing, Content marketing, and Partnerships with healthcare organization.	
Cost Structure			Revenue Streams	
Marketing expenses: Advertising, content creation.			Partnership: Collaborating with healthcare providers and others Ads: using ads on our application Freemium features: free trials and in-app purchases for premium features.	

Figure Business Canvas Model 1.9.1

1.9.2 Problem

Parents often struggle to keep track of their child's vaccination schedule and may miss important vaccine doses, leading to potential health risks. Traditional record-keeping methods are prone to errors, and there is a lack of centralized digital solutions for vaccine management.

1.9.3 Solution

"E-Vaccine" addresses this problem by providing a user-friendly mobile application that generates personalized vaccine schedules, sends reminders, and maintains a digital record of administered vaccines. It offers convenience, accuracy, and educational resources, empowering parents to prioritize their child's health.

1.9.4 Customers

Primary Customers: Parents and guardians of children.

Secondary Customers: Health-care professionals and administrators.

1.9.5 Competitors

Traditional Methods: Manual record-keeping, paper-based systems.

Other Apps: Existing mobile applications with similar features.

1.9.6 Marketing Plan

Product:

Unique Selling Proposition (USP): Comprehensive vaccine management with personalized schedules and educational resources.

Promotion:

Online Marketing: Social media campaigns, influencer partnerships, and content marketing.

Partnerships: Collaborations with healthcare providers for joint promotions.

Distribution:

App Stores: Leveraging the reach of Google Play.

Healthcare Partnerships: Integration with healthcare providers for wider distribution.

Sales Strategy:

Educational Events: Partnering with healthcare organizations for events.

1.9.7 Revenue

Ads: Using ads on our application.

Partnership Revenue: Collaborations with healthcare providers for specialized services.

1.9.8 SWOT (Strength Weakness Opportunities Threats) Analysis

Strengths

User-friendly interface.

Comprehensive vaccine database.

Push notification system for reminders.

Weaknesses

Dependency on external vaccine databases.

Initial user adoption may be slow.

Opportunities

Growing awareness of vaccine importance.

Expansion into international markets.

Threats

Competition from established healthcare apps.

Changes in healthcare regulations affecting data handling.

1.9.9 FAB (Features, Attributes, Benefits) Analysis

Features

Personalized vaccine schedules.

Digital record-keeping.

Educational resources.

Advantages

Convenient vaccine management.

Increased accuracy and data accessibility.

Empowered and informed parents.

Benefits

Timely administration of vaccines.

Improved child health outcomes.

Peace of mind for parents and healthcare professionals.

CHAPTER 2: LITERATURE REVIEW/BACKGROUND AND EXISTING WORK

2.1 Background

In the heart of Pakistan, where the land owns rich culture and prestigious soil, a silent battle unfolds. Where many preventable diseases come across to nation's child. The major reason for these preventable diseases is untimely vaccinations, it has become a challenge that echoes through the corridors of public health. According to the surveys, 66% nation's children are vaccinated of aged 12-13 months but remaining 44% has not received their vaccination. The genesis of the "E-Vaccine" project stems from the recognition of this challenge. In the backdrop of these challenges the vision of E-Vaccine took route. Inspired by the transformative potential of technology, we envisioned a mobile application that transcends traditional barriers, offering a lifeline to parents and guardians striving to secure the best possible health outcomes for their children.

2.2 Literature Review

2.2.1 Introduction

Childhood vaccination is a cornerstone of public health, serving as a powerful tool in the prevention of communicable diseases. In the context of Pakistan, where the burden of preventable diseases remain significant, innovative solutions are imperative to enhance vaccination coverage. This literature review explores the landscape of child vaccination in Pakistan and examines the potential impact of our project "E-Vaccine" in addressing existing challenges.

2.2.2 Current State of Child Vaccination in Pakistan

Existing literature highlights persistent challenges in child vaccination programs in Pakistan. Factors such as insufficient awareness, logistical barriers, and the absence of streamlined information system contribute to suboptimal vaccinations coverage. Studies indicate the need for interventions that not only address these challenges but also empower parents and healthcare providers with accessible tools for better immunization management.

2.2.3 Role of technology in healthcare and vaccination

Many studies emphasize the transformative role of technology in healthcare, particularly in low and middle-income countries. Mobile health applications have shown promise in healthcare delivery, increasing accessibility, and enhancing patient outcomes. The utilization of mobile technology in the context of child vaccination aligns with global efforts to leverage digital solutions for public health challenges.

2.2.4 Mobile application in vaccination programs

The literature underscores the emergence of mobile application design to support vaccination programs. This application often focusses on aspects such as appointment reminders, educational content, and digital record keeping. Successful implementations in diverse settings demonstrate the potential of mobile applications. To bridge gaps in healthcare delivery, particularly in the context of child immunization.

2.2.5 E-Vaccine:

Addressing challenges and enhancing vaccination coverage the literature on E-Vaccine outlines its unique features designed to overcome challenges in Pakistani context. The applications emphasize on improving awareness to educational content, streamlining appointment scheduling, real time vaccine availability, and digital immunization records align with recommendation from global health organization. These features are poised to empower parents and enhance the efficiency of healthcare providers in delivering timely vaccination.

CHAPTER 3: REQUIREMENTS ANALYSIS

3.1 Stakeholders List (Actors)

3.1.1 Parents and Guardians:

Role: End-users who will be utilizing the application to manage their child's vaccinations.

Interest: Convenient access to vaccine schedules, reminders, and educational resources.

3.1.2 Children (if age-appropriate):

Role: End-users who might use the application as they grow older to track their own vaccination history.

Interest: Ensuring a seamless and user-friendly experience as they transition to managing their vaccinations independently.

3.1.3 Healthcare Professionals:

Role: Doctors, nurses, and healthcare providers involved in administering vaccinations.

Interest: Access to accurate vaccine records, efficient communication with parents, and integration with healthcare systems.

3.1.4 Application Developers:

Role: Developers and programmers responsible for creating and maintaining mobile applications.

Interest: Meeting technical requirements, delivering a robust and secure application, and ensuring compatibility with various devices.

3.1.5 Regulatory Bodies:

Role: Government health departments or regulatory bodies overseeing healthcare applications.

Interest: Ensuring compliance with health and data protection regulations.

3.1.6 Educational Institutions:

Role: Schools and educational institutions where vaccination records might be required for enrollment.

Interest: Ensuring accurate and easily accessible vaccination records for compliance with school health policies.

3.2 Requirements Elicitation

3.2.1 Functional Requirements

User Registration and Authentication

Registration

Users should be able to create an account by providing essential information.

Registration should include email verification or alternative secure authentication methods.

Login

Registered users should be able to log in securely using their credentials.

Biometric authentication (fingerprint, facial recognition) should be supported.

Child Profile Management

Add Child Profile

Users should be able to add profiles for multiple children.

Each profile should include details such as name, date of birth, and relevant medical history.

Edit and Delete Child Profile

Users should have the ability to edit and update information in a child's profile.

There should be an option to delete a child's profile if needed.

Vaccine Schedule

Generate Schedule

The application should generate a personalized vaccine schedule based on the child's profile and regional vaccination guidelines.

View Schedule

Users should be able to view the upcoming and overdue vaccine doses in a clear and accessible format.

Reminder Notifications

Push Notifications

The application should send push notifications to remind users of upcoming vaccine appointments and doses.

Users should have the option to enable or disable these notifications.

Vaccine Record Keeping

Record Administration

Users should be able to record the administration of vaccines with details such as date, type of vaccine, and administering healthcare professional.

View Vaccine History

Users should have access to a digital record of administered vaccines for each child.

The history should be organized chronologically and be easily accessible.

Educational Resources

Informational Content

The application should provide educational resources about vaccines, their importance, and common misconceptions.

Content should be presented in an engaging and informative manner.

Administrator Features

User Management

Administrators should have the ability to manage user accounts, including adding, modifying, and deactivating accounts. User roles and access levels should be defined.

Vaccine Database Management

Administrators should be able to update and maintain the vaccine database to ensure accuracy and compliance with health guidelines.

User Interface

Intuitive Design

The user interface should be intuitive, user-friendly, and consistent across iOS and Android platforms.

Navigation should be easy and logical.

Accessibility

The application should be accessible to users with disabilities, complying with accessibility standards.

Security

Data Encryption

User data, especially personal and health-related information, should be stored securely, and communication should be encrypted.

Authentication Security

Robust security measures should be implemented to protect user accounts from unauthorized access.

3.2.2 Non-Functional Requirements

Performance

The application should respond to user interactions within 2 seconds and handle concurrent user loads without significant degradation in performance.

Security

User data, especially personal and health-related information, will be stored securely, and communication between the application and external services will be encrypted.

Reliability

The application should be available 99% of the time, with minimal downtime for maintenance.

Scalability

The system should be designed to accommodate a growing user base and increasing data volume.

Usability

The application should be easy to navigate, and features should be self-explanatory, minimizing the need for user training.

Compliance

The application should comply with relevant data protection regulations and health guidelines.

3.2.3 Requirements Traceability Matrix

Table Requirements Traceability Matrix 3.2.1

Requirement	Feature	Functional Requirement
Display vaccine information	Vaccine Information Module	- Display detailed information on various vaccines recommended for children aged 1 st day to 9 years old.
		- Provide descriptions of vaccine-preventable diseases and their corresponding immunization schedules.
Integrate online pediatrician consultation	Online Pediatrician Consultation	- Implement a platform for parents to consult with pediatricians remotely for vaccine-related queries or general child health concerns.
		- Include real-time messaging or video call functionality for direct communication with healthcare professionals.
Utilize geolocation for vaccine center locator	Vaccine Centre Locator	- Utilize geolocation services to identify and display nearby vaccine centers on a map.
		- Provide information on operating hours, contact details, and available services for each vaccine center.
Create and manage baby vaccine records	Baby Vaccine Record Management	- Create digital records for individual children to track their vaccination history.
		- Store essential details such as vaccine names, dates of administration, and dosage information.
Generate and manage vaccination schedules	Vaccination Schedule Management	- Generate personalized vaccination schedules based on the child's age, medical history, and local immunization guidelines.
		- Send reminders and notifications for upcoming vaccinations to help parents stay on track.
Design intuitive user	User Interface and	- Design an intuitive and child-

interface	Experience	friendly interface with colorful visuals and engaging animations.
		- Ensure seamless navigation and user interactions for accessibility across multiple mobile platforms.
Implement security and privacy measures	Security and Privacy Measures	- Implement robust security protocols to safeguard user data and maintain confidentiality.
		- Ensure compliance with regulatory requirements and industry standards for handling sensitive medical information.
Design for scalability and future enhancements	Scalability and Future Enhancements	- Design the application architecture to accommodate potential expansion and scalability for future features.
		- Incorporate user feedback mechanisms and analytics tools to gather insights and drive continuous improvement.
		- Incorporate user feedback mechanisms and analytics tools to gather insights and drive continuous improvement.

3.3 Software Development Life Cycle Model

The Waterfall Software Development Life Cycle (SDLC) model is a linear and sequential approach where each phase must be completed before the next one begins. While Agile is often favored for its flexibility, the Waterfall model can still be beneficial for certain projects, including the development of the "E-Vaccine" mobile application. Here's how the Waterfall model can be useful for your project:

3.3.1 Clear and Well-Defined Requirements:

The Waterfall model is well-suited for projects with clearly defined and stable requirements. For "E-Vaccine," if the requirements are well-understood and unlikely to change frequently, the Waterfall model provides a structured and systematic approach.

3.3.2 Single, Well-Defined Goal:

Waterfall works well when the project has a single, well-defined goal. The primary objective of "E-Vaccine" is to provide a reliable and user-friendly platform for managing child vaccinations. The sequential nature of Waterfall ensures a focused approach toward achieving this specific goal.

3.3.3 Document-Driven Approach:

Waterfall emphasizes extensive documentation at each phase. This can be beneficial for regulatory compliance, as child vaccination applications may need to adhere to specific healthcare regulations. Documentation provides clarity and a reference for future development, maintenance, and audits.

3.3.4 Stability in Technology and Tools:

If the technology stack and tools for the project are stable and well-established, the Waterfall model can be efficient. This is suitable when there are no plans for frequent technology changes during the project.

3.3.5 Predictable Project Timeline:

Waterfall provides a structured timeline, making it easier to predict the project's completion date. This predictability can be advantageous for planning releases, especially if there are regulatory milestones or external deadlines.

3.3.6 Early Planning for Security and Compliance:

The Waterfall model's sequential nature allows for early planning and implementation of security measures and compliance requirements. This is critical for an application like "E-Vaccine," which deals with sensitive health-related information.

3.3.7 Simplified Project Management:

With a linear and sequential structure, project management in Waterfall is relatively straightforward. This simplicity can be beneficial for smaller teams or projects with clear scope and requirements.

3.3.8 Minimal Changes in User Requirements:

If there are minimal anticipated changes in user requirements throughout the project, the Waterfall model ensures that the requirements are frozen at the beginning, providing a clear scope for development.

3.3.9 Potential Challenges and Mitigations:

While the Waterfall model has its advantages, it's essential to be aware of potential challenges:

Limited Flexibility for Changes:

In a rapidly evolving environment, any unforeseen changes may be challenging to incorporate. It's crucial to perform thorough requirement analysis and consider potential changes during the planning phase.

Late User Feedback:

User feedback is typically collected at the end of the project. To address this, periodic reviews and validations with stakeholders can be scheduled to ensure alignment with user expectations.

Risk of Delivering an Outdated Product:

If market conditions change during development, there's a risk of delivering a product that may no longer meet current needs. Periodic market analysis and a flexible approach to changes can help mitigate this risk.

Extended Time to Market:

Due to the sequential nature of Waterfall, the time to market may be longer compared to Agile models. Effective project planning and execution can help manage timelines.

3.4 Specific Requirements (Hardware and Software Requirements)

3.4.1 Hardware Requirements

Smartphones/Tablets:

Compatible with Android devices.

Minimum screen size for optimal user experience.

Storage:

Adequate device storage for the application installation.

Additional storage space for storing vaccine records and data.

Internet Connectivity:

Wi-Fi or mobile data connectivity for real-time updates and notifications.

Offline functionality for limited connectivity scenarios.

3.4.2 Software Requirement

Operating System:

Android: Support for a range of Android versions, ensuring compatibility with popular devices.

Application Dependencies:

Compatibility with common system libraries and frameworks on Android platforms.

Security Software:

Integration with device security features for secure user access.

CHAPTER 4: SOFTWARE DESIGN SPECIFICATION

4.1 Work Breakdown Structure

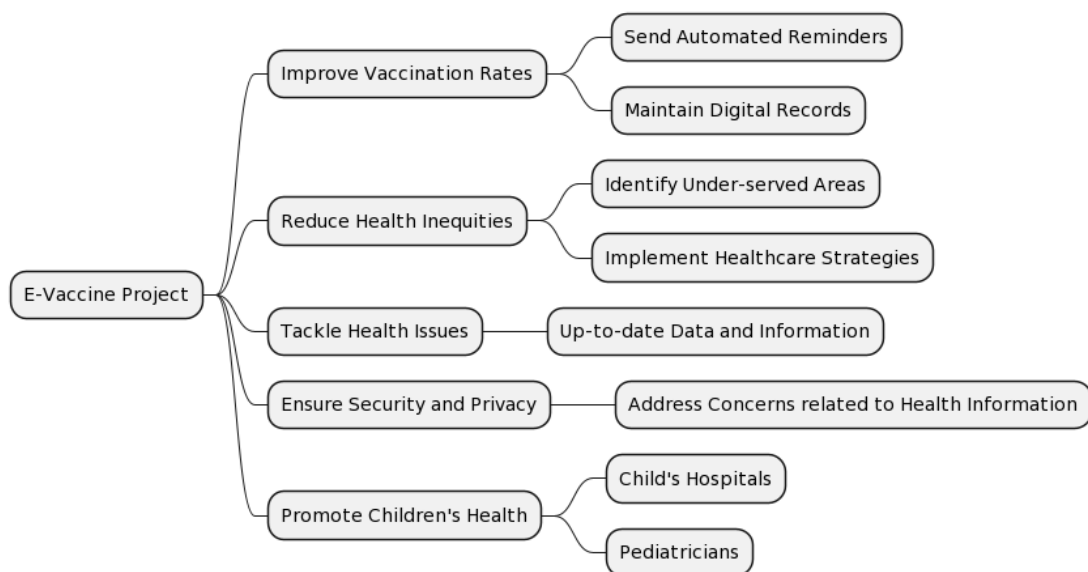


Figure Work Breakdown Structure 4.1.1

4.2 System Architecture

The "E-Vaccine" Android project adopts a client-server architecture, where the Android app serves as the client interfacing with a backend server for data storage, processing, and communication. Core functionalities include scheduling vaccination appointments, tracking charts, and maintaining child vaccine records. A geolocation service enhances accessibility by providing real-time information on nearby hospitals and vaccine centers. Emphasizing secure data handling, encryption protocols are employed, and seamless integration with external databases ensures a wealth of vaccine-related data. The user interface, guided by wireframes and mockups, prioritizes intuitive design, making the system scalable, responsive, and user-friendly for streamlined child vaccination management.

4.3 Block Diagram

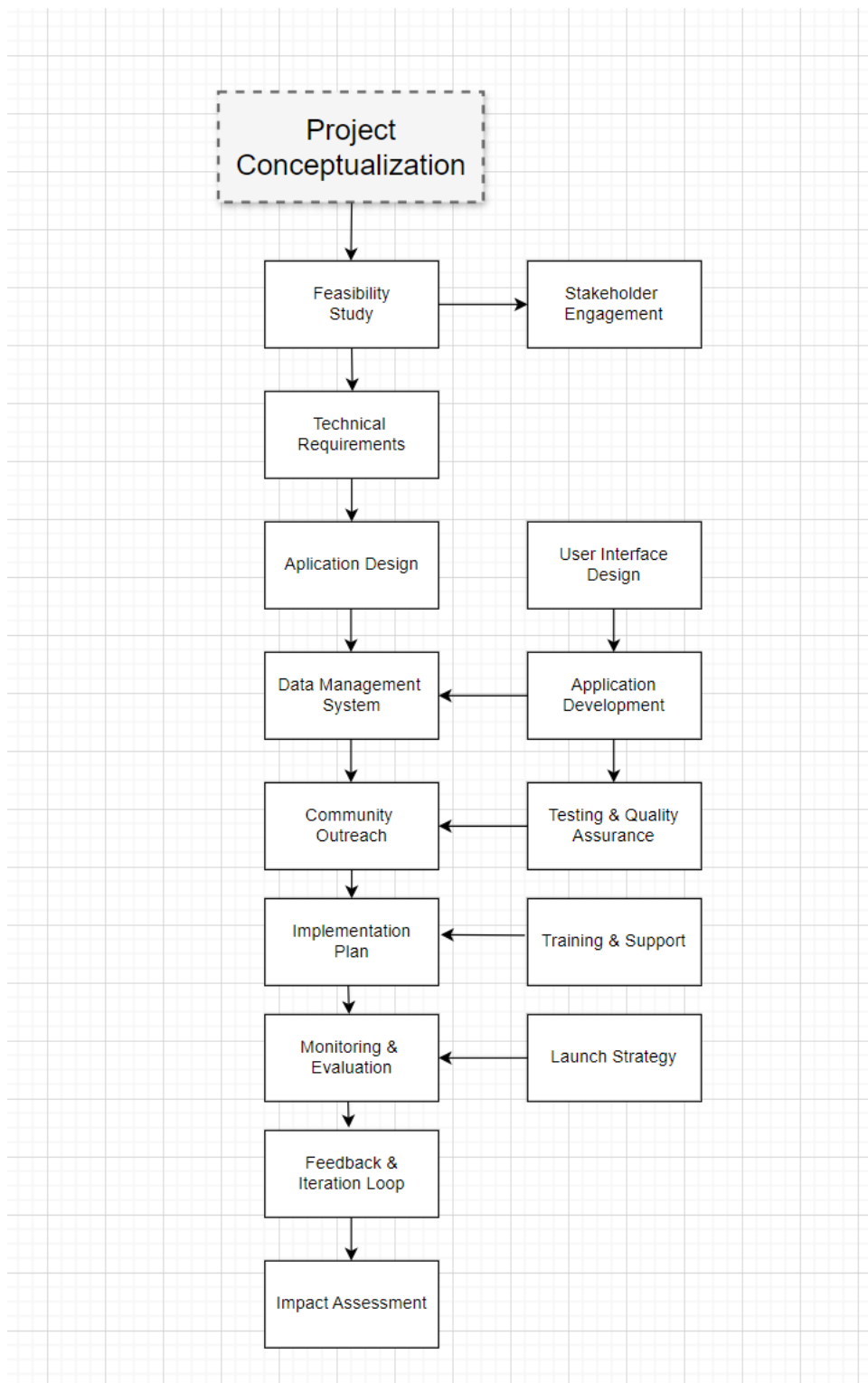


Figure Block Diagram 4.3.1

4.4 Software Architecture Diagram

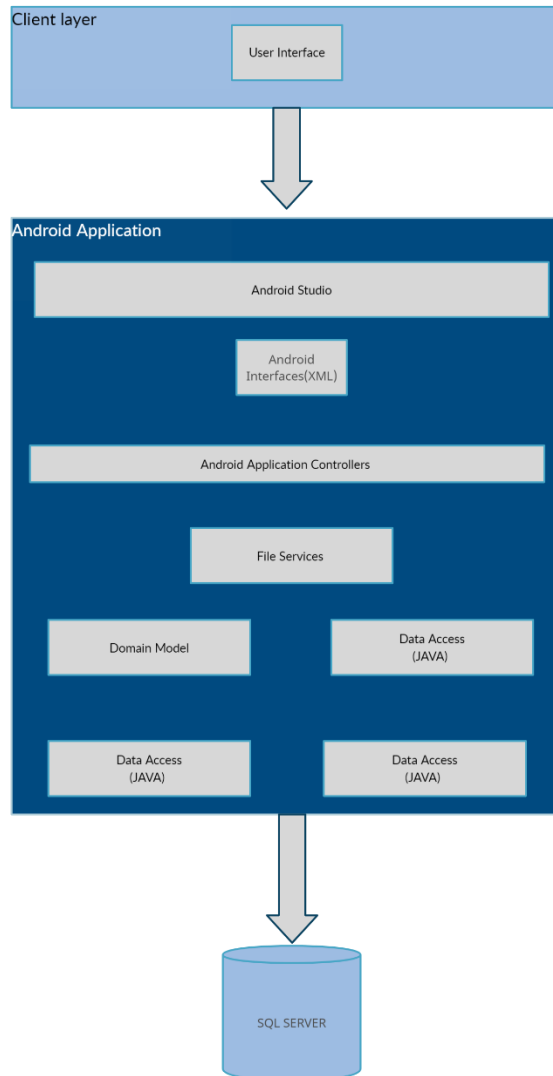


Figure Software Architecture Diagram 4.4.1

4.5 Entity-Relationship Diagram (ERD)

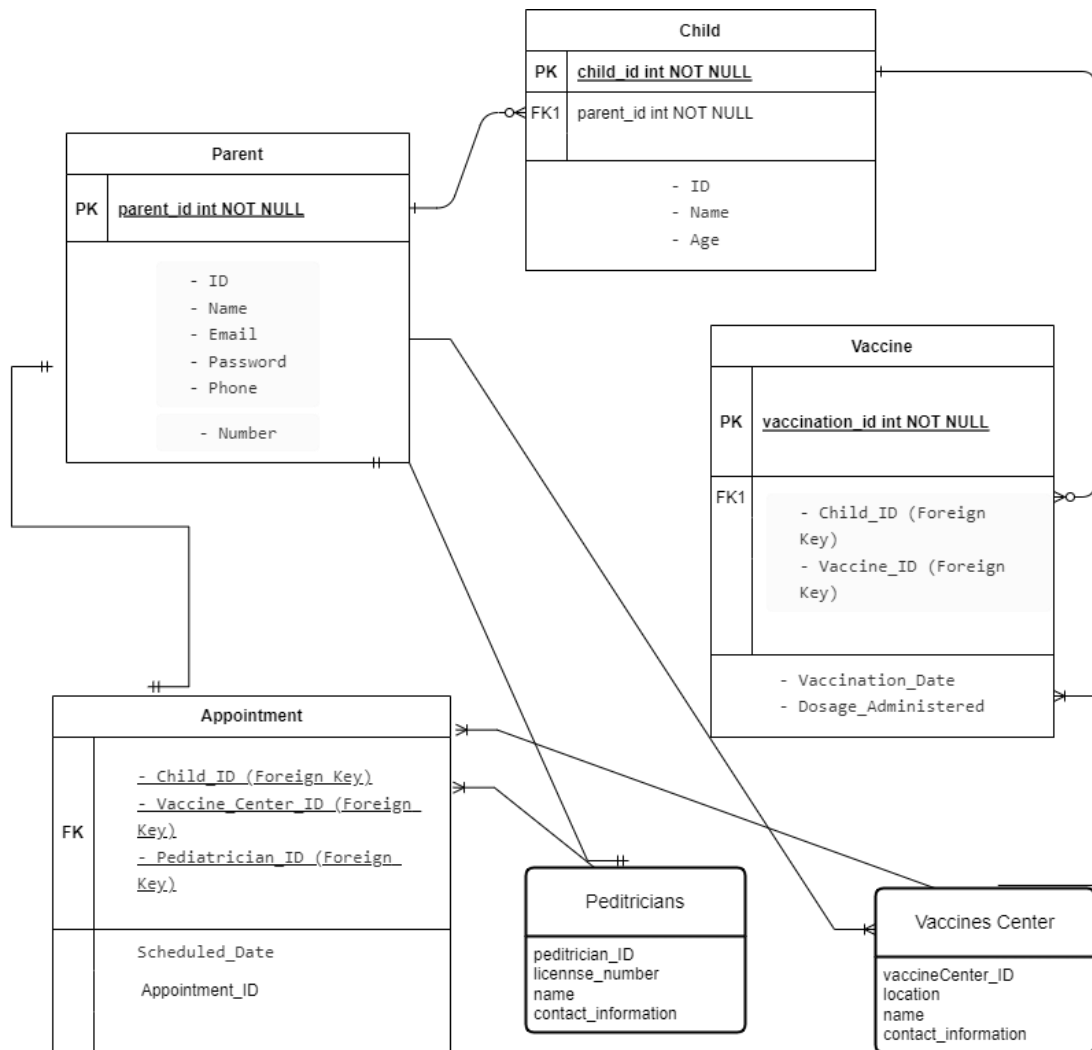


Figure Entity-Relationship Diagram 4.5.1

4.6 Flowchart

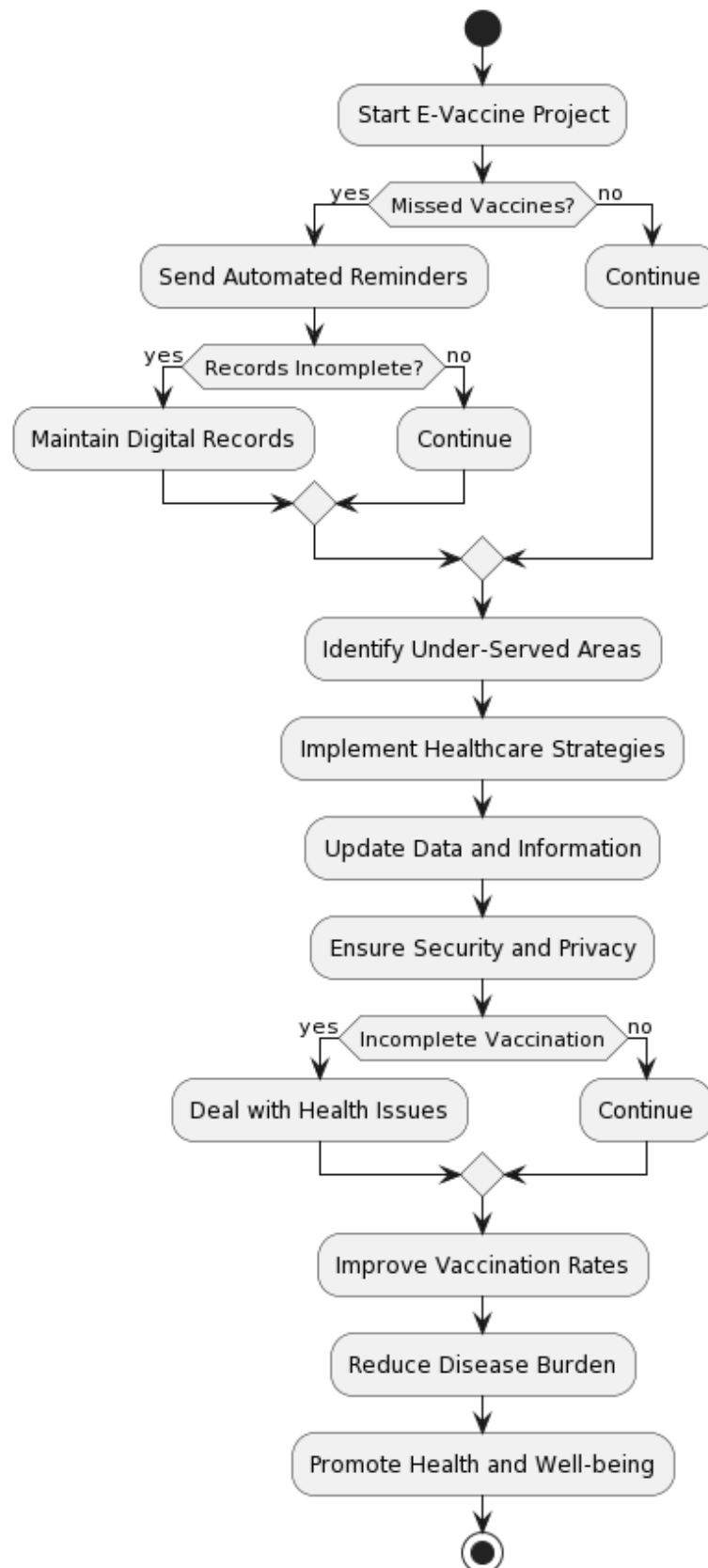


Figure Flowchart 4.6.1

4.7 Sequence Diagram

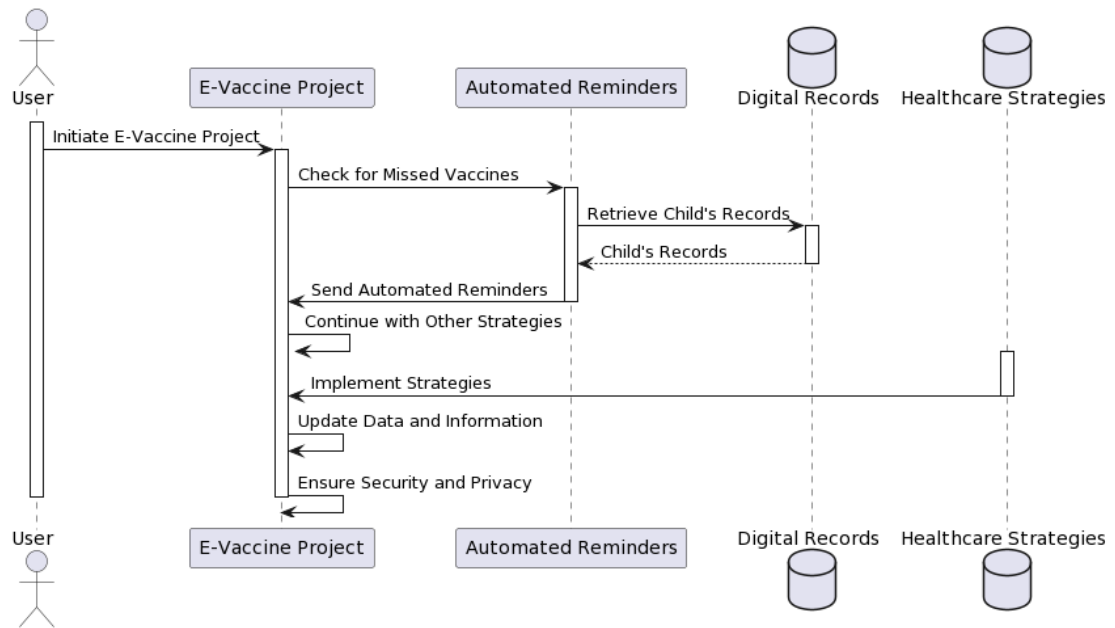


Figure Sequence Diagram 4.7.1

CHAPTER 5: IMPLEMENTATION

5.1 User Interface

The user interface for this mobile application is designed to provide parents with easy access to vaccine-related information and support for children aged 1st day to 9 years old. Upon launching the app, users are greeted with a login/registration screen, followed by a home screen serving as the central hub for accessing various features. These features include a comprehensive vaccine information module, pediatrician consultation service, vaccine center locator, baby vaccine records management, vaccination schedule management, and settings/account management. The user interface prioritizes intuitive navigation, visual clarity, and user-friendly interactions, ensuring a personalized and engaging experience for users seeking reliable vaccine resources and support for their children's health.

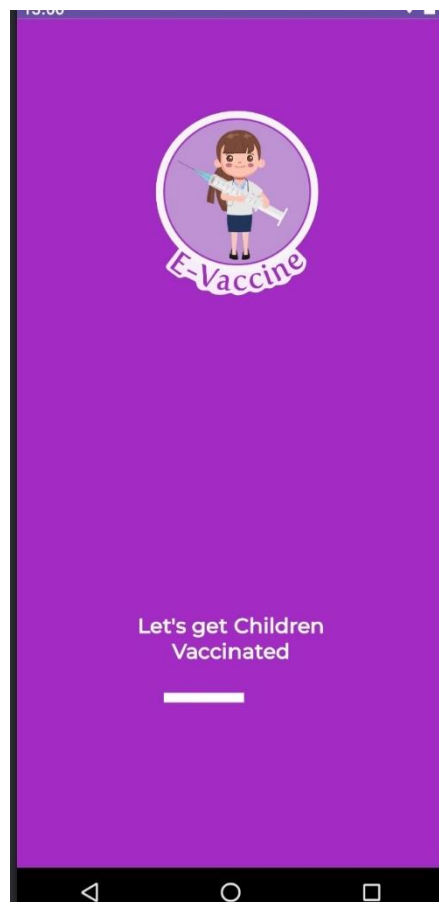


Figure Splash Screen UI 5.1.1

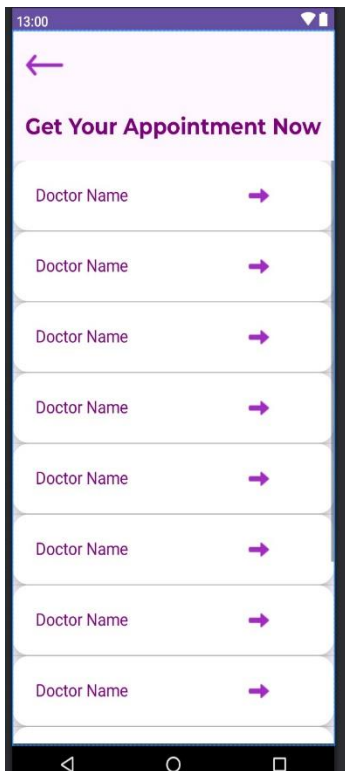


Figure Appointment UI 5.1.2

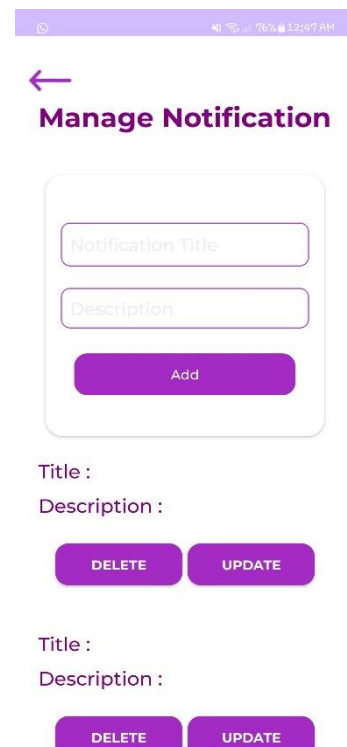


Figure Manage Notification UI 5.1.3

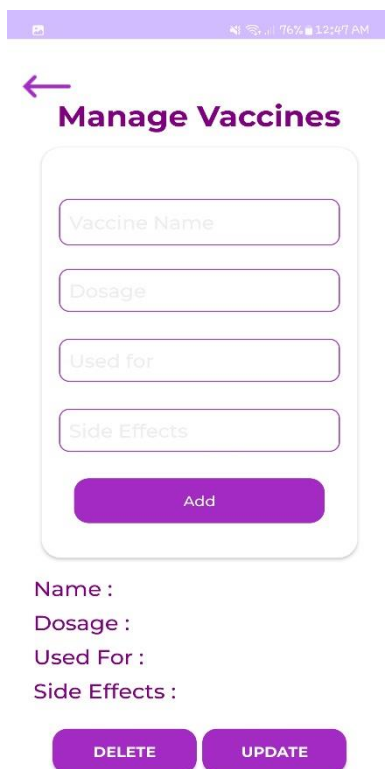


Figure Manage Vaccines UI 5.1.5

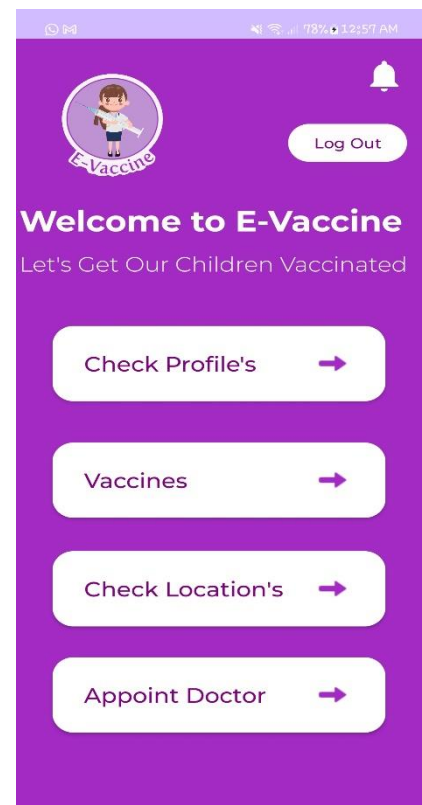


Figure User Panel UI 5.1.4



Vaccine Record

Vaccines done

Vaccines to be done

Figure Vaccine Record UI 5.1.7

E-Vaccine

Baby Page

Name

Date of Birth

B-For

Vaccination Card

Gender

☐ Boy

☐ Girl

Next

Figure Baby Page UI 5.1.6

E-Vaccine

Login Page

Email

Password

LOGIN

[Forget Password?](#)

[Create Account](#)

You can login now

Figure Login Page UI 5.1.8



User Profile

Name

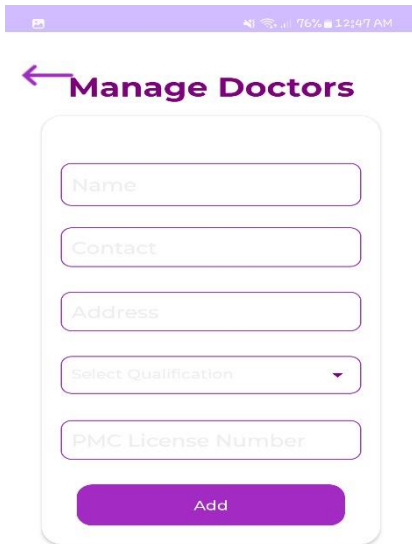
Email

Parent/guardian

PhoneNumber

Address

Figure User Profile UI 5.1.9



Manage Doctors

Name

Contact

Address

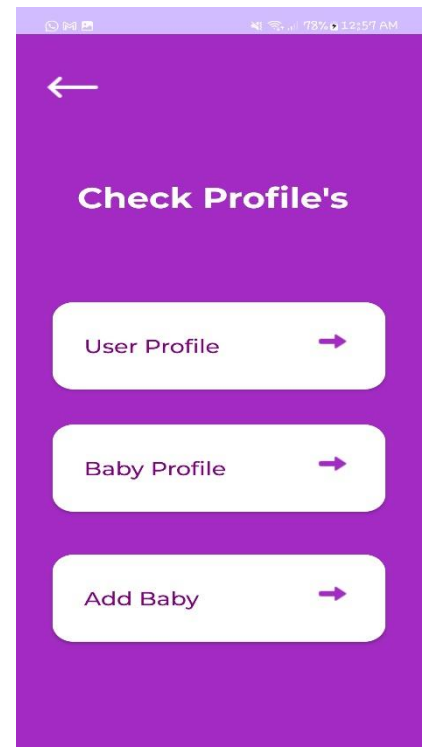
Select Qualification

PMC License Number

Add

Name : null
 Contact : null
 Address : null
 Qualification : null
 License No. : null

Figure Manage Doctors UI 5.1.10



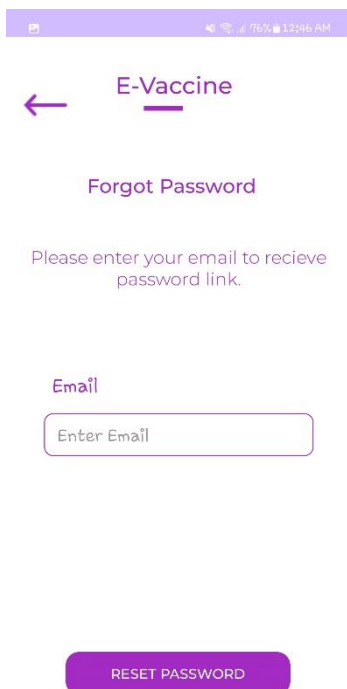
Check Profile's

User Profile

Baby Profile

Add Baby

Figure Check Profiles UI 5.1.11



E-Vaccine

Forgot Password

Please enter your email to receive password link.

Email

Enter Email

RESET PASSWORD

Figure Password Reset UI 5.1.12



Log Out

Welcome to E-Vaccine

Let's Get Our Children Vaccinated

Manage Doctors

Manage Vaccines

Manage Notificaton

Figure Admin Panel UI 5.1.13

CHAPTER 6: SYSTEM TESTING

6.1 Manual Testing

Manual testing in the project E-Vaccine is important to ensure the reliability, functionality, and usability of the proposed system. Manual testing plays a key role in identifying and resolving issues. It also helps in validating the user experience and ensuring that the system meets the specified requirements without any unexpected issues.

6.2 Unit Testing

6.2.1 Login/Signup

Table Login/Signup Testing 6.2.1

ID	Test Case Name	Description	Test Steps	Expected Results	Actual Results	Status
01	Correct Details	Allow user to login or register with correct user details. Unit testing of login, register was simply done by checking database table that the data becomes in database or not.	Provide Accurate Details to System	Login/signup Successful	Login/signup Successful	Pass
02	Invalid Details	Allow user to login or register with invalid user details	Provide Incorrect Details to System	Login/Signup Failed	Login/Signup Successful	Pass

6.2.2 Forms

Table Forms Testing 6.2.2

ID	Test Case Names	Description	Test Steps	Expected Results	Actual Results	Status
03	Parent Form	Name, address, phone number, gender, Parent/Guardian, Email, CNIC	Fill each field with correct data.	Person gets registered as a parent/guardian of the child.	Successful registration	Pass
04	Baby form	Name, age, DOB, Gender, vaccine card, Form-B	Fill each data with correct data.	Child gets registered in the system against his/her parent or guardian.	Successful registration.	Pass

6.2.3 UI Testing

Table UI testing 6.2.3

ID	Test Cases name	Description	Test Steps	Expected Results	Actual Results	Status
05	Login/Signup screen	Upon opening the app login/signup page should appear	Open app.	Login/signup page should be displayed.	Login/signup page displayed.	Pass
06	Parent form screen	After login parent form should appear	Open parent form.	Parent form should be displayed	Parent form displayed.	Pass
07	Baby form screen	After scrolling through parent form baby form should be displayed	Open baby form.	Baby form should be displayed.	Baby form displayed.	Pass
08	Vaccination information screen	Vaccination screen providing vaccine information	Open vaccine information.	Vaccination information should be displayed.	Vaccine data has to be received yet.	Pending
09	User Main Activity	Main Activity should display all its components and working.	Open Main Activity	Components should be displayed and on work.	Components are displaying and working.	Pass
10	Admin Login	Specific email and password should login to admin dashboard	Enter login credentials.	If specific login credentials are right it should open admin dashboard	Credentials are right and admin dashboard is working	Pass
11	CRUD operation	All CRUD operation in admin dashboard should be working.	CRUD operation are to be applied	CRUD should work.	Only Create from CRUD is working because other's are to be implemented.	Pending

6.3 Tool Used

Tools used for the development of this app are Figma, Android Studio, Firebase, Mockups, and Adobe Illustrator.

CHAPTER 7: CONCLUSION

7.1 Problems Faced and Lessons Learned

The main problem faced in developing this project earlier was connecting activities with each other but later that problem was found. On that moment now the problem we are facing is retrieving the data from database and soon we will find that issue and will resolve that issue.

7.2 Conclusion

In the conclusion this may affect the vaccination rate and may lead to more immunization coverages so many children get immunizations in time and stay healthy and safe. Our project is just a simple prototype that how can technology effects the immunization. Using Immunizations chart, Food and Nutrition charts and different vaccines related information so parents shouldn't let their child unimmunized for longer periods.

7.3 Future Work

In future work we will try to cover all the problems we are facing. We will try to remove maximum defects we can. In future we are aiming to start from Faisalabad and will try to spread that awareness and campaign for our application to go nationwide. We will add more pediatricians and Vaccination Centers and Children Hospital. Will try to make our User Interface better and easier to use. Will remove language barriers.

References

References to any book, journal paper, or website should properly be acknowledged,
For example:

- [1] <https://epi.gov.pk/immunization-schedule/> (**Website**)
- [2] <https://www.sciencedirect.com/science/article/pii/S266699192200207X>
(**Paper on web**)
- [3] <https://publications.aap.org/pediatrics/article-abstract/114/1/187/64736/Children-Who-Have-Received-No-Vaccines-Who-Are>
(**Paper on web**)
- [4] <https://immunizationdata.who.int/pages/schedule-by-country/pak.html>
(**website**)

Pseudo Code

START E-Vaccine Mobile Application Development

Initialize Project Variables:

- TargetAge: 1st day to 9 years
- Purpose: Improve immunization coverage and access to healthcare
- Objectives: Enhance overall health and well-being of children
- Technologies: Mobile app development tools, databases, APIs

DEFINE Function Main():

- DisplayWelcomeMessage()
- PromptUserToStart()
- IF UserChoosesToStart THEN
 - DisplayProjectOverview()
 - DisplayDevelopmentSteps()
 - DisplayImplementationPlan()
- ELSE
 - DisplayExitMessage()
- ENDIF

DEFINE Function DisplayWelcomeMessage():

- Display "Welcome to E-Vaccine Mobile Application Development!"
- Display "This project aims to improve immunization coverage and access to healthcare for children aged 1st day to 9 years."
- Display "Let's work together to make a significant impact on childhood vaccination rates."

DEFINE Function PromptUserToStart():

- Display "Would you like to start the project?"
- Prompt user for input (Y/N)

DEFINE Function DisplayProjectOverview():

- Display "Project Overview:"
- Display "The E-Vaccine mobile application will provide comprehensive vaccination tracking and reminders for children aged 1st day to 9 years."

- Display "Key features include vaccination schedule, personalized reminders, access to vaccination records, and educational resources."

DEFINE Function DisplayDevelopmentSteps():

- Display "Development Steps:"
- Display "1. Conduct research on vaccination schedules and requirements for children aged 1st day to 9 years."
- Display "2. Design user interface (UI) for the mobile application."
- Display "3. Develop backend database to store vaccination records securely."
- Display "4. Implement vaccination tracking functionality and reminder system."
- Display "5. Integrate external APIs for real-time vaccination information and resources."
- Display "6. Conduct thorough testing and debugging."
- Display "7. Prepare for app deployment on relevant platforms (App Store, Play Store)."

DEFINE Function DisplayImplementationPlan():

- Display "Implementation Plan:"
- Display "1. Assemble development team with expertise in mobile app development, UI/UX design, and healthcare."
- Display "2. Assign roles and responsibilities to team members."
- Display "3. Set timeline and milestones for each development phase."
- Display "4. Regularly review progress and adjust plans as needed."
- Display "5. Collaborate with healthcare professionals and community stakeholders for feedback and support."
- Display "6. Launch pilot testing with target users to gather feedback and iterate on improvements."
- Display "7. Prepare for full-scale deployment and marketing strategies."

DEFINE Function DisplayExitMessage():

- Display "Thank you for considering the E-Vaccine Mobile Application Development project. Goodbye!"

CALL Function Main()

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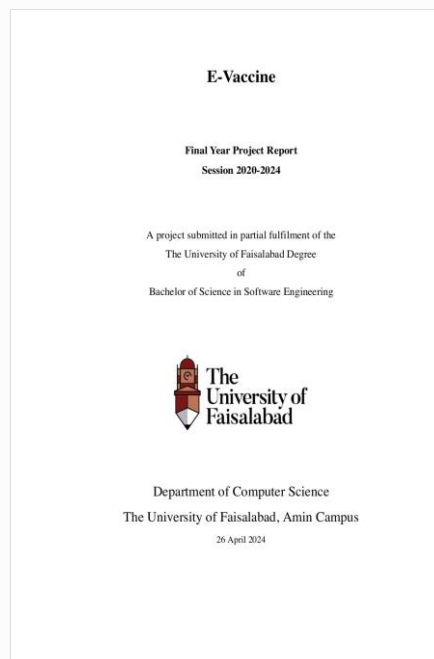


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