Healthcare Management System Application (Smart - Mobile App & Web Application)

A Project Proposal

Submitted to

Department

of

Information Technology

VR Siddhartha Engineering College

1   Objectives

- Develop web application and mobile application to serve health care services remotely

- Apply Authentication & Security in Web application and Mobile application

- Identify and handle OWASP API Security Top 10 Vulnerabilities 2019 in APIs exposed by the web application

- Implement TLS v1.2 in APIs for securing data transfer between web server and mobile/web application

- Implementation of logging and registration for all users in the proposed system

- Design registrations, schedules, calendars, e-prescription through dashboard

- Design spot consultation and live consultation in Text based, Video Call based and Voice Call based in Web application and Mobile application

- Adopt accurate & reliable algorithms for selection of doctor specialization, symptom based, searching nearby laboratories with GPS

- Integrate the system with leading payment gateway for accepting payments

- Define reminders and notifications through sms or email wherever necessary

- Track users, app usage, to check if they are online or offline

- Generate Reports of the users/services in different dimensions

2   Outcomes

- Develop fully functionally, automated and quality health care system to be operated under two platforms :
    - ✓ Mobile App, for Android and iOS devices
    - ✓ Web Application
- Remote access of developed digital platform to meet health care services
- Deployment of Web application on cloud platform with the following :
    - ✓ Built-in with MVC architecture (clear separation in presentation layer, business layer and data layer)
    - ✓ Shall provide APIs to be consumed by mobile applications
    - ✓ Scalability to add more features in future based on requirement
- Deployment of Mobile application on smart phones with touch screens
    - ✓ Availability in Google play store or Apple store for downloading and installation
    - ✓ Offer login credentials (registered phone number) to differentiate users
    - ✓ Accessibility of same app by doctors, patients, system/lab admin.
    - ✓ App completely user friendly, ea$_2$sy to navigate with support on varied screen sizes.

✓ Shall provide APIs consumed by Web application.

✓ Support multiple users (family members) under one registered phone number and email Id.

3   Hardware and Software Technologies

Web Application	Front End : REACT JS
	BackEnd : Node.JS, Express.JS
	Database Layer : MongoDB
	Architecture : MVC Architecture
	Platform : WINDOWS/LINUX
Mobile App	IoS, Android, REACT NATIVE

4   Time Frame

The entire project is planned to achieve various milestones in the span of **15 Months** . The approximated time frame required to analyze the various modules is illustrated below:

Phase I : 07 Months

- Detailed study of Web / Mobile App , Constraints, Assumptions, Dependencies, Operating Environment, REST APIs, Database, MVC architecture, Android and iOS Programming   *02 Months*

- **Development of Interfaces in Web Application:** *02 Months*

    User interface (Login, Registration pages - Doctor / Patient / System Admin, Lab Admin)

    ✓ Dashboard – Doctor, Patient, System Admin / Lab Admin.

    ✓ Functions include - Doctor selection (with respect to symptom), Adding/updating the mapping of symptom to specialization (if any)

    ✓ Scheduling : Booking Slots, Doctor calendar generation

    ✓ Consultation : Text based, Video call based and Voice call based

    ✓ Prescription : e-Prescription, Patient case study, booking for lab tests

    Implementation of system features like Authentication & Security, User registrations

- **Development of Interfaces in Mobile Application** *03 Months*

    User interface (Login, Registration pages - Doctor / Patient / System Admin, Lab Admin)

    ✓ Dashboard – Doctor, Patient, System Admin / Lab Admin.

    ✓ Functions include - Doctor selection (with respect to symptom), Adding/updating the mapping of symptom to specialization (if any)

- ✓ Scheduling : Booking Slots, Doctor calendar generation

- ✓ Consultation : Text based, Video call based and Voice call based

- ✓ Prescription : e-Prescription, Patient case study, booking for lab tests

Implementation of system features like Authentication & Security, User registrations

Deployment in IoS and Android platforms

- Updating Web Application : Implementation of other system features like :
  - ✓ Online consultation
  - ✓ Reminders
  - ✓ Patient case study
  - ✓ Booking for Lab Tests
- Updating Mobile App : Implementation of other system features like :
  - ✓ Online consultation
  - ✓ Reminders
  - ✓ Patient case study
  - ✓ Booking for Lab Tests

Updating Web Application - Implementation of other system features like :

- ✓ Reports
- ✓ Logging
- ✓ Doctor ratings

Updating Mobile Application -Implementation of other system features like :

- ✓ Reports
- ✓ Logging
- ✓ Doctor ratings

- Reports and Documentation

Table 1 depicts the details of the timeframe.

Table 1 : Proposed Healthcare System - Time Frame

Phases	Time Frame	Details - Plan for Implementation	Deliverables
I	07 Months	*First 02 Months –* Detailed study of Web Application and Mobile App Development, Constraints, Assumptions, Dependencies, Operating Environment, REST APIs, Database, MVC architecture, Android and iOS Programming	UI/UX Design shall be followed Web Application with the following : ▪ Authentication & Security ▪ User Registration
		Next 05 Months – Design of Web Application and Mobile App with the following functioning's: • Authentication and Security Mobile number and OTP are used for Auth Once authenticated, Home screen/dashboard is displayed with different types of users(Doctor, Patient, Lab Admin, Pharmacy, System Admin) • User Registration Registration/Login Page for all types of users (Doctor, Patient, Lab admin, Pharmacy, System admin) A. Doctor : Following links are to be provided in Home screen for Doctors after login:	Mobile app availability in Play store and App store Mobile Application with the following modules: ▪ Authentication & Security ▪ User Registration

Todays consultations, Previous consultations, Calendar

- The system shall provide a facility for registration of users.

- The system shall provide all required fields for registration of a doctor

- The system shall display dashboard for each user upon login
  1. Today's consultations
  2. Previous consultations
  3. Reports
  4. Patients' summary

- This process involves selection of doctors based on specialization or based on symptoms. After selection of doctor, appointments can be scheduled.

B. Patient

Registration of Patient

Addition of multiple profiles for family members

Patient Dashboard Display Consists of :
1. Consult online
2. Book a lab test
3. Previous consultations
4. Reports

C. Lab admin

Registration of Lab admin with required fields

| | | The system shall provide a facility to add multiple tests during laboratory registration

Lab admin Dashboard Consists of : Todays appointments, Previous appointments, Upload reports

D. Pharmacy

Registration with required fields

Dashboard consisting of :

  1. Orders in queue for review of prescription and approval

  2. Approved orders in queue for dispatch

  3. Orders out for delivery

  4. Orders delivered

  5. Analysis Reports

E. System admin

Registration

Deployment of web application in cloud

Deployment of Mobile App in Ios and Android | |
| II | 03 Months | Development of Interfaces in **Web and Mobile Application** :

A.   **Online consultation**

After consultation, the doctor may prescribe medicines or | Updated Interfaces in **Web and Mobile Application** :

▪ Online consultation

▪ Reminders |

		tests. If tests are prescribed, the system shall automatically redirect to the nearest laboratories for scheduling appointments. After getting reports from the laboratory, follow-up consultation may take place.	▪ Lab Tests
		B. Book online consultation :	
		Display of registered profiles for consultation.	
		User choose a profile (self or other family member) and go ahead with consultation	
		Filtering is required (Languages known,Yrs of experience, Specialization, Consultation fee, Location, Rating of doctor)	
		The system shall display the following :	
		Symptoms category wise and accept multiple symptoms for selection	
		Recommend and display doctors based on selected symptoms. The list shall implement accurate & reliable algorithm for selection of specialization based on selected one or more symptoms	
		Spot consultation	
		Available slots for consultation	
		Defining consultation times for Doctors.	
		The system shall keep track of doctors to see if they are online or offline	
		The system shall provide a facility to select a time slot for consultation	
		Make payment for consultation	

		Schedule consultation after getting acknowledgement from the payment gateway.	
		Update dashboard with new schedule	
		Through Consult button with a timer displayed on it with remaining time for consultation.	
		The system shall provide a facility for text, audio and video based consultation	
		Create a consultation room when doctor taps on Start Consultation button, join the consultation room started by doctor	
		Implement adaptive video compression based on available bandwidth	
		Record complete consultation room	
		Attach a new report in consultation room	
		Facility to doctor for entering case study and attach to the consultation room	
		End consultation room, cancel the consultation, change the date & time and doctor of consultation	
		Facility to add prescription to the consultation	
		Display prescription to patient	
		Share the prescription through whatsapp and other data sharing apps.	
		Display the list of laboratories for scheduling appointments	

		Assign a unique alpha numeric word for identifying each consultation	
		Attach reports for prescribed tests manually	
		Send a message to doctor seeking any additional info	
		The system shall display received message from patient and he/she shall be able to reply for the same	
		The system shall display response received from doctor	
		The system shall store patient details, prescriptions, messages etc locally on the device also(cloud)	
		C. Reminders and Notifications	
		Medicine reminder facility	
		Generate reminders for medicines	
		Modify/Delete reminders.	
		Display short message and play audio tone for notifications	
		Generate notifications for all events (Doctor Ready, Patient joined, Lab reports uploaded etc)	
		D. Lab Tests	
		The system shall provide a facility to add multiple profiles for lab admins	
		Each lab operator shall have unique pin	
		Laboratory dashboard consisting of :	
		Display scheduled appointments with display a list with	

		accept/modify/cancel options	
		laboratory operator can accept/reject/modify the scheduled appointment	
		For sample collection, the details of the expert shall be notified to patient along with name, mobile number and time of collection	
		Update the status of lab test to patient email-id and sms	
III	03 Months	Development of Interfaces in **Web and Mobile Application** : A. Family Doctor Patient heath history to family doctor upon approval Periodical Appointments/Reminders Notifications through SMS, email and Whatsapp Updation of Doctors calendar B. Pharmacy Periodical updation of Orders placing and placed, Orders approved / rejected, Orders in transit, Orders delivered Stock availability for each medicine Sales billing report for every transaction Invoice for sales bill Support of multiple stores under one pharmacy registration	Updated Interfaces in **Web and Mobile Application** : Family Doctor Pharmacy

		Add received stock to store.	
		Deduct stock from available stock after every sale invoice.	
		Stock notification based on threshold	
		Online ordering of medicines	
		Apply discounts while billing	
		Notification for near expiry medicine	
		Reordering the medicine	
		Notification to remind the patient for taking medicine	
IV	02 Months	Updates, Testing, Validations, Reporting and Documentation C. Reports	▪ Reports ▪ Complete Web Application ▪ Complete Mobile App in Google Playstore and Apple Playstore

5 Resources

List of Faculty and Students of IT Department, VRSEC shall work in collaboration to meet the requirements of the project on COE as stated by the industry

- Number of Faculty Involved : 04

    - ✓ Dr S Suhasini, Associate Professor, Department of Information Technology, VRSEC

    - ✓ Dr M Suneetha, Professor, Department of Information Technology, VRSEC

    - ✓ M Ramesh, Assistant Professor, Department of Information Technology, VRSEC

    - ✓ Y Kalyan Chakravarthy, Assistant Professor, Department of Information Technology, VRSEC

- Number of Staff Involvement : 01

    - ✓ S Balaji, Technical staff, Department of Information Technology, VRSEC

- Number of Student Interns : 04

- Number of Student Batches : 04

- Qualification of Student Interns / Batches : III/IV B.Tech (IT)

- Expected tenure for faculty and interns to work in the project **:** 15 Months

6 Key Assumptions and Constraints

#	Assumptions and Dependencies
1	List of common symptoms available in the system. Admin users shall be able to add additional symptoms in the system.
2	Symptom based specialization shall be predefined in the system. This list is expandable and the system shall allow adding or updating the mapping of symptom to specialization.
#	**Operating Environment**
1	The web application shall be accessible on any browser which supports HTML 5.
2	The mobile application shall be portable on any android or iOS mobile phones.
#	**Constraints**
1	Adaptability: The application shall be easy to use and adopt by users. The navigation from one screen to another screen shall be self explanatory and requires minimum user inputs required to access any feature.
2	Scalability: The application shall be scalable to add any new feature in future
3	Accuracy: The suggestions based on symptoms shall be made at 100% accuracy as it is a healthcare application.
4	Reliability: The application shall be reliable and free of errors.

7   Overview

The Healthcare application is proposed to develop under the following platforms:

Web application - main application to be modeled in MVC architecture with required APIs for accessibility, meet various operational requirements

Mobile application – to be available in Google play store or Apple store and must be operable in Android and IOS environments. The app consists of doctor dashboard, patient dashboard and laboratory. Design similar APIs like web application for accessibility and meet various operational requirements

✓ Supported with backend - for storing user data, transactional data, reports and case studies. The system shall have sufficient storage for retention of data for at least 10 years.

It is proposed to implement the web based and mobile system with five types of users differentiated based on registered mobile number.

✓ User 1 - Doctor : The doctor user shall have access to appointment list, calendar, prescriptions and lab reports etc

✓ User 2 – Patient : This user shall have access to schedule of appointments, scheduling lab tests, online consultations, consultation room, prescriptions, lab reports, reminders etc.

✓ User 3 – Lab Admin : Lab admin shall have very limited access to appointments, uploading lab reports only.

✓ User 4 – Pharmacy operator : Pharmacy operator shall be able to generate bills, add stock, update stock etc.

✓ User 5 - System User : The system user shall have complete access to all modules and the user can configure system level settings and module level settings.

8   Detailed Scope of Work

- Apply the following on COE (Company Operating Environment) to meet the project objectives with respect to meet all needed user interface requirements, functional requirements, interface requirements, software requirements etc.

- The Healthcare Management System facilitates patient module for tracking their health, online doctor consultations, booking appointments for lab tests etc. It provides a one stop solution for complete healthcare services starting from booking specialist doctor appointments to medicine reminders.

- Manage complete health care from home or anywhere
- Application accessibility using computers and mobile devices, such as tablets and smart phones
- No involvement with respect to wrong medication (testing, diagnosis)
- Very supportive for elderly people who stay lonely and children stay far off
- Shields 80% of instant general diagnosis with medication

9 Deliverables

- The system shall be deliverable with these main features.
  - ☐ Authentication & Security
  - ☐ User registration
  - ☐ Online consultation
  - ☐ Reminders
  - ☐ Lab Tests
  - ☐ Reports
  - ☐ Logging
  - ☐ Family Doctor
  - ☐ Pharmacy management
- Accessibility of web application on any browser which supports HTML 5
- Accessibility of mobile app in Google play store or Apple store for downloading and Installation
- Database interface for all transactional data, user data, reports and logs maintenance
- Implementation of Application Home Page consisting of all types of users

8.1 Authentication & Security

Each user is identified by a unique mobile number. Users shall be authenticated before accessing any feature in mobile app or in web application. The authentication shall be based on a registered mobile number and OTP. After successful authentication, the app shalldisplay a home screen or dashboard. The app shall identify the type of user (doctor, patient orlab operator) based on login mobile number as shown in Table 2.

Table 2. Auth and Security Module

User Interface		
Associated Functions and its details for implementation	The web application and mobile application shall authenticate users based on registered mobile number	If entered mobile number is already registered, the app shall display dashboard. If entered mobile number is not registered, the app shall display registration page
	The web application shall generate a unique OTP for login	The OTP shall be sent to the registered mobile number. The web application shall forward OTP to SMS gateway for forwarding to mobile number
	The APIs exposed by the web application shall handle OWASP API Security Top 10 Vulnerabilities 2019	
	The application shall identify each user based on registered mobile number	Five types of users shall be supported: ☐ Doctors ☐ Patients ☐ Laboratory admin ☐ Pharmacy ☐ System Admin
	The application shall display dashboard based on logged in user type	For Doctors following links shall be provided in Home screen: ☐ Today's consultations ☐ Previous consultations ☐ Calendar For Patients, following menu shall be available in dashboard (Home screen) ☐ Online consultation ☐ Follow-up consultation ☐ Schedule lab test ☐ Previous consultations ☐ Profile management

		For Laboratory Admin, following menu shall be provided: □ Today's appointments □ Previous appointments □ Upload reports
	The APIs shall be use at least TLS v1.2 for securing data transfer between web server and mobile/web application	

8.2 User Registration

The user registration process involves the addition of different types of users. The users are classified as system admins, doctors, patients, laboratories and pharmacy as in Table 3.

Each user will have different fields. One patient may register one or more family members. Each user shall have a relevant dashboard for ease of navigation.

Table 3 . User Registration Module

User Interface : Each user registers using unique mobile number. System stores all user data and makes it ready for future access.		
Associated Functions and its details for implementation	The system shall provide a facility for registration of users.	Users are classified into five types: □ Doctor □ Patient □ Laboratory Admin □ Pharmacy □ System admin
	The system shall provide all required fields for registration of a doctor	The doctor registration shall include but not limited to the following fields: □ Photo □ Education □ Specialty □ Yrs of exp □ Languages known □ Current working location □ Current location □ Rating of doctor □ Registration Number □ Authority of registration

		☐ Consultation fee
		☐ Validity of consultation
	The system shall provide all required fields for registration of a patient	The patient details shall include the following: ☐ Photo (with capture or assign from gallery) ☐ Full Name ☐ Gender ☐ DOB ☐ Height ☐ Weight ☐ Email ID ☐ Medical history (if any). Attachments shall be supported. ☐ Address (with GPS location)
	The system shall provide addition of multiple profiles for family members	The details shall be stored separately for each profile
	The system shall provide all required fields for registration of a Laboratory	The Laboratory details shall include the following: Photo Name Address Registration Number Tests provided
	The system shall provide a facility to add multiple tests during laboratory registration	Each test shall have two options: ☐ Test Name ☐ Test Cost ☐ Sample collection at home possible ☐ Typical report generation time
	The system shall display dashboard for each user upon login	The dashboard of Doctor shall include but not limited to: ☐ Today's consultations ☐ Previous consultations ☐ Reports ☐ Patients' summary The dashboard for Patient shall include but not limited to: ☐ Consult online ☐ Book a lab test ☐ Previous consultations ☐ Reports

		The dashboard for Laboratory shall include but not limited to:
		☐ Today's appointments
		☐ Reports
		The dashboard for Pharmacy shall include but not limited to:
		☐ Orders in queue for review of prescription and approval
		☐ Approved orders in queue for dispatch
		☐ Orders out for delivery
		☐ Orders delivered
		☐ Analysis Reports
	The system shall provide all required fields for registration of a pharmacy	The fields shall include:
		☐ Pharmacy Name
		☐ Registration number
		☐ Contact person
		☐ Phone number
		☐ Email Id
		☐ Address
		☐ Location (Google location)

8.3 Online Consultation

This process involves selection of doctors based on specialization or based on symptoms. After selection of doctor, appointments can be scheduled. After consultation, the doctor may prescribe medicines or tests.

If tests are prescribed, the system shall automatically redirect to the nearest laboratories for scheduling appointments.

After getting reports from the laboratory, follow-up consultation may take place.

Implementation of Online consultation as in Table 4.

Table 4 : Online consultation subsystem

Online Consultation	- User requests for viewing consultation. - System displays options for doctor selection or symptom selection. - System displays available slots for the doctor based on availability. - User selects a slot and consults doctor online.	
Associated Functions and its details for implementation	The system shall provide a facility to book online consultation	• The system shall display registered profiles for consultation. User shall choose a profile (self or other family member) and go ahead with consultation.
	The system shall display all registered doctors to the user for selection	Filtering shall be provided based on following conditions: ☐ Languages known ☐ Yrs of experience ☐ Specialization ☐ Consultation fee ☐ Location ☐ Rating of doctor
	The system shall display symptoms category wise	The list shall be categorized. The system shall accept multiple symptoms for selection
	The system shall recommend, and display doctors based on selected symptoms.	The list shall implement accurate & reliable algorithm for selection of specialization based on selected one or more symptoms
	The system shall provide a facility for spot consultation	Sometimes patients may need immediate consultation. In this scenario, the system shall the availability of doctors and provide theuser with list of available doctor. The listshall be populated based on current location of the patient
	The system shall display doctor details for quick reference and review by patients	The details shall include: ☐ Name ☐ Photo ☐ Education ☐ Specialty ☐ Yrs of exp ☐ Languages known

		☐ Consultation fee
		☐ Rating of doctor
	The system shall display available slots for consultation	
	The system shall provide a facility to doctors for defining consultation times	The doctor shall be able to block time slots, dates for avoiding consultations.
	The system shall keep track of doctors to see if they are online or offline	The system shall monitor app usage and record last access time. Based on app access time, the app shall decide whether the doctor is offline or online
	The system shall provide a facility to select a time slot for consultation	The consultation fee may vary based on selected time slot
	The system shall provide a facility to make payment for consultation	The system shall be integrated with leading payment gateway for accepting payments.
	The system shall schedule consultation after getting acknowledgement from the payment gateway.	The payment gateway transaction number and status shall be recorded for future reference.
	The system shall add scheduled consultation to the dashboard	The same shall be displayed to doctor and patient
	The system shall provide a Consult button with a timer displayed on it with remaining time for consultation.	If user taps on Consult button before timer gets finished, the system shall send a notification to doctor that the patient is ready for consultation
	The system shall create a consultation room when doctor taps on Start Consultation button	The consultation room shall provide following information to doctor for prior information: ☐ Patient Name ☐ Patient Photo ☐ Patient Age ☐ Height

		□ Weight
		□ Existing diseases (if any)
		□ Existing reports (if any)
		□ Blood Pressure (if measured)
		□ Glucose levels (if measured)
		□ Other reports if any
	The system shall provide a facility to join the consultation room started by doctor	
	The system shall provide a facility for text, audio and video based consultation.	The default consultation is video call based
	The system shall implement adaptive video compression based on available bandwidth	If video quality is very poor, the system shall stop video and voice shall continue
	The system shall record complete consultation room	The video/audio/messages shall be stored and shall be available for future review by doctor or patient
	The system shall provide a facility to attach a new report in consultation room	The doctor may ask patients to attach any diagnostic test report if available. The system shall provide option to take a photo of the report or to attach report from gallery
	The system shall provide a facility to doctor for entering case study and attach to the consultation room	The case study shall be available to both doctor & patient
	The system shall provide a facility to end consultation room	The consultation room may be ended by patient or doctor
	The system shall provide a facility to cancel the consultation	The consultation amount shall be returned to the patient based on cancellation policy
	The system shall provide a facility to change the date & time and doctor of consultation	If patient wants to change doctor, difference amount shall be payable
	The system shall provide a facility to add prescription to the consultation	The doctor may prescribe medicines or diagnostic tests. The selection shall be easy and user friendly. The system shall provide quick suggestions based on entered characters for reducing the drafting time. While entering medicines, the system shall also indicate

			dosage and special instructions (if any).
		The system shall display prescription to patient.	If diagnostic tests are prescribed, the system shall display Search Lab button.
		The system shall provide a facility to share the prescription through whatsapp and other data sharing apps.	The report shall be exported to PDF and shared
		The system shall display list of laboratories for scheduling appointments.	The laboratories shall be selected based on their nearest location. Samples can be collected at home for a few tests. The system shall indicate for some tests samples can be collected at Home
		The system shall assign a unique alpha numeric word for identifying each consultation	
		The system shall provide a facility to attach reports for prescribed tests manually	The system shall provide a facility to attach from gallery or capture photo
		The system shall provide a facility to send a message to doctor seeking any additional info	The system shall check if consultation period is active. If active, the system shall send the message to doctor otherwise, the system shall indicate the patient to pay for consultation fee. In general, the consultation period is 6 or 7 days from the date of making payment. This duration shall be defined by doctor
		The system shall display received message from patient and he/she shall be able to reply for the same.	The system shall indicate to patient the following states: □ Sent □ Delivered □ Read
		The system shall display response received from doctor	The doctor may prescribe further medicines or diagnostic tests. Similar process shall be followed for updated prescription as well.
		The system shall store patient details, prescriptions, messages etc locally on the device also	This content is very crucial and shall be available even if internet is not available. This information will be stored locally on cloud

8.4 Reminders and Notifications

Implementation of Reminders and Notifications module as shown in Table 5, involves configuring and providing reminders & notifications for taking medicines, consultations and appointments. Reminders will help users to take actions at correct time. The notifications shall be displayed in the notification area in both web & mobile applications

Table 5 : Reminders/Notifications Module

System generates a notification for taking medicine, scheduled consultation, appointments for lab tests, reports availability etc. User taps on the notification area to check the message. System displays the message		
Associated Functionalities and its details for implementation	The system shall provide a facility to add reminders for taking medicine	The medicine reminder shall include the following: ☐ Medicine ☐ Time of reminder ☐ Message to display ☐ Day selection with everyday option ☐ Reminder audio tone
	Reminders - The system shall generate reminders for medicines	The system shall play audio tone as per configuration The events shall include but not limited to the following: ☐ Consultation started ☐ Doctor ready ☐ Patient joined ☐ Lab reports uploaded ☐ Message from doctor ☐ Message from patient ☐ Message from laboratory
	Notifications : The system shall generate notifications for all events	The notifications shall be displayed to all corresponding users. For eg: Consultation started shall be provided to both doctor and patient Doctor Ready notification shall be provided patient Patient joined notification shall be provided to doctor. Lab reports uploaded notification shall be provided to patient. Message from laboratory shall be displayed to patient
	The system shall display short message and play audio tone for	

	notifications	
	The system shall provide two options to	
	The system shall provide a facility to modify/delete reminders.	

8.5 Lab Tests

Implementation of this process involves accepting lab test appointments and uploading reports. Laboratory Admin may accept the appointment. Laboratory operator collects the samples. After completion of the test, the Laboratory Admin uploads the reports in system as in Table 6.

Table 6 : Lab Tests Module

User schedules lab tests. System provides notification to laboratory. Lab operator collects samples and Laboratory admin uploads reports		
Associated Functions and its details for implementation	The system shall provide a facility to add multiple profiles for lab admins	In laboratory user login, the app shall ask for profile Each lab operator shall have unique pin
	The system shall display scheduled appointments in Laboratory dashboard	The dashboard shall display a list with accept / modify / cancel options
	The system shall provide a facility to laboratory operator for accept/reject/modify the scheduled appointment	
	The system shall provide a facility to assign sample collection to some expert	The details of the expert shall be notified to patient along with name, mobile number and time of collection
	The system shall provide a facility to update the status of labtest	The status shall include but not limited to following: ☐ Sample collection scheduled ☐ Expert assigned ☐ Sample collected ☐ Diagnosis in progress ☐ Diagnosis completed. ☐ Report generated

	After completion of diagnosis, the system shall provide a facility to update the status of the test	
	The system shall provide a facility to upload completed report	The report shall be attached to the patient's account
	The system shall generate an SMS to indicate the user that the reports are ready	
	The system shall send generated report to patient's registered email ID	
	The system shall provide a facility to send messages to Laboratory seeking information on lab tests	
	The system shall display the message and provide a facility to the lab operator for replying to the message	
	The system shall display the response received from Lab to the patient	

8.6   Reports

This process involves logging of all transactions and generating reports. System generates reports for each type of user as in Table 7.

Table 7 : Reports Module

User requests for generation of report System generates reports and displays to users		
Associated Functions and its details for implementation	The system shall log all previous consultations, previous lab tests, prescriptions, reports and payment history etc.	All this information shall be stored in a database and this information shall be transferred to users based on request.
	The system shall filter patient data	The filter selection for patient reports shall

	based on different selections.	include but not limited to following: ☐ Doctor ☐ Dates ☐ Profile Id
	The system shall filter doctor data based on different selections.	The filter selection for doctor reports shall include but not limited to following: ☐ Patient Id ☐ Dates The report shall display total number of consultations for selected period and total payments in the reports
	The system shall filter laboratory data based on different selections.	The filter selection for laboratory reports shall include but not limited to following: ☐ Patient Id ☐ Doctor Id ☐ Dates ☐ Test ID The report shall display total number of tests conducted for selected period and total payments in the reports
	The system shall provide a facility to get the details of selected report from server	
	The system shall provide a facility to generate different logsgenerated in the system	The logs shall be categorized into following types: ☐ Application logs ☐ Debug logs

8.7 Logging

This process involves logging of all transactions being performed in the system. The logs shall include system generated logs, user logs and debug logs. The logs shall be stored with a timestamp and user Id

Table 8 . Logging Module

The system logs all transactions and generates reports on request.		
Associated Functions and its details for implementation	The system shall log all application related events in database	Each log record shall be stored with timestamp
	The system shall log all transactions in database for future reference	The transactions shall be logged with respect to user ID.
	The system shall log all debug logs for troubleshooting	The logs shall be stored with respect to timestamp

8.8   Family Doctor

A family doctor is one who takes care of the whole family. Many doctors train in a specialty area of medicine. However, family doctors are trained in all areas of medicine. Family doctor care for individuals physical, mental, and emotional health. Family doctors get to know their patients. They build a caring relationship with the patient and his/her family. They listen and document patient's health history. This helps them better understand how to help make good decisions about health.

Family doctors are responsible for diagnosing and treating acute and chronic illnesses. They also provide routine health screenings and counseling on lifestyle changes. This helps prevent health issues before they develop. If you require care from a specialist, your family doctor will refer you to a specialist. He or she will help coordinate all aspects of your care. This process involves selecting a doctor as a family doctor. All details of the patient shall be made available to the family doctor.

Table 9 . Family Doctor Module

The user selects a doctor as a family doctor. System sends a request to the doctor. Doctor approves/rejects the request.		
Associated Functions and its details for implementation	The system shall provide a facility to select a doctor as family doctor.	The list of doctors shall be displayed with all details like education, current hospital, location etc.
	The system shall send a request to the doctor for approval	The doctor may approve or reject the request.
	The system shall provide complete patient heath history to family doctor upon approval	The health history shall include the following: ☐ All previous health reports ☐ All previous consultations (with any doctor)

		□ Previous medications
	The system shall provide a facility to configure reminders for appointment with family doctor periodically	The periodicity shall be selectable as follows: □ Quarterly □ Half-yearly □ Annually □ Selected date every month
	The system shall generate an appointment based on selected schedule	The system shall generate scheduled appointment notification and display in dashboard. The same notification shall be sent through SMS, email and Whatsapp
	The system shall display doctor's calendar with available slots for booking appointment upon clicking on notification	The system shall prefill all required fields and user shall select only time of the day for appointment.

8.9   Pharmacy Management

- Implementation of Pharmacy management Module consisting of ordering system, inventory management and reporting is as shown in Table 10.

Table 10 : Pharmacy Management Module

Registration	The system shall support multiple stores under one pharmacy registration. The fields shall include: - Pharmacy Name - Registration number - Contact person - Phone number - Email Id - Address - Location (Google location)	
Dashboard	The dashboard for pharmacy shall include but not limited to: - Orders in queue for review of prescription and approval - Approved orders in queue for dispatch - Orders out for delivery - Orders delivered - Analysis Reports	
Ordering system	Stimulus / Response Sequence	• The user selects ePharmacy module from Dashboard or Buy option from the ePrescription page. • The system navigates to ePharmacy module and displays the selected medicine with qty and price. • User places the order by choosing the

		payment option(online or COD (cash on delivery)) • The pharmacist reviews the order and approves the order and assigns it to a delivery agent. • The delivery agent will collect the order and deliver it to user.
	The system shall display a dashboard with list of orders after login The	The list shall include the following: ☐ Orders placed ☐ Orders approved ☐ Order rejected ☐ Orders in transit ☐ Orders delivered The list shall be updated periodically.
Inventory Management	The system shall display selected order details	Each order shall include but not limited to: Order Date Ref doctor Prescription ID Customer Ph Number Customer email ID Medicine 1 – QTY Medicine 2 – QTY . . . Medicine n – QTY
	The system shall provide a facility to order medicines over the counter	Order shall include all the above
	The system shall provide a facility to indicate the available stock for each medicine	The system shall provide alerts if any medicine is out of stock or required quantity is not available
	The system shall generate an sales billing report for every transaction	The bill shall include patient name, age, bill no (autogenerated), date, consultant doctor, medicine details which includes name of the medicine, quantity, HSN code, Expiry date, price, subtotal, grand total and applicable tax (GST – CGST/IST)
	The system shall generate a print of the invoice for sales bill	
	The system shall provide a facility to add received stock to store.	While adding stock, the system shall provide a facility to segregate the medicines based on bin no.
	The system shall indicate out of stock items based on configured threshold	The configuration of out-of stock notification shall be done based on medicine
Reporting	The system shall provide a facility to import medicine details from an excel sheet in	The excel file template shall be defined during design

	predefined format	
	The system shall provide a facility to add medicine to item history.	Each medicine shall have following details: □ Name □ Image □ Composition □ Category □ Manufacturer □ Storage temperature □ Alternative brands □ Uses □ Additional information □ Bin no □ Price per unit
	The system shall display details of medicine in online ordering screen	The information recorded shall be displayed to users to give them idea of what the medicine is and dosage and side effects
	The system shall generate various reports related to pharmacy management	The reports shall include: □ Billing per day □ Billing per selected period □ Billing as per selected medicine □ Consolidated billing □ User access report
	The store operator shall be allowed to apply discounts up to max configuration while billing The	The max discount shall be defined by the system user. The same discount shall be applicable for all medicines under the category
	The system shall provide a notification for near expiry medicine which are available in store for disposal or returning to supplier	The system shall display these notifications on dashboard and email.
	The system shall indicate when the stock reaches a minimum level and provide a facility to re-order the same	
	The system shall provide a facility to send notification to remind the patient for reordering the medicine before the prescription runs out	This will enhance the patient relationship with pharmacy

9 Online User Documentation and Help System Requirements

Context help should be provided, User manual and Operational Manual User manual should contain how to use the application with required navigation and concept behind each feature. Operation manual includes trouble shooting, any system related activities and Solutions to dynamic errors

10 Budget

Totally the budget breakdown is done for three years consisting of 04 phases. Phase I to Phase IV budgets are quoted with 07, 03, 03, 02 months duration.

Table 11,12 and 13 specifies the details of expected expenditure required to execute the proposed project. Table 11 details the budget summary for the entire project with inclusion of manpower. Table 12 is tabulated with project development cost and executions in different environments.Table 13 depicts the budget payment required for manpower – student interns.

Budget Summary (ACTUALS)

Table 11 : Details of Overall Budget Proposal Actuals (in Indian Rupees)

Budget Estimates	Phase I 07 Months	Phase II 03 Months	Phase III 03 Months	Phase IV 02 Months	Total *Time Duration - 15 Months*
Development Cost	2,70,000	1,35,000	1,35,000	1,35,000	6,75,000
Manpower(04 Students –each 5000 pm)	1,40,000	60,000	60,000	40,000	3,00,000
Overhead	80,000	40,000	40,000	40,000	2,00,000
Consumables	Shall be paid by VR Siddhartha Through Avantel. Anything will be paid to external is consumable.				
				Total Expenditure Proposed :	**11,75,000/-**
				In words : Thirteen Lakhs Fifty Five Thousand Only	

A. Budget Breakdown

Table 12 : Details of Budget Proposal for Payment of Project Development & Testing (in Indian Rupees) (Without Interns)

Budget Estimates	Phase I 07 Months	Phase II 03 Months	Phase III 03 Months	Phase IV 02 Months	Total 15 Months
Development Cost	2,70,000	1,35,000	1,35,000	1,35,000	6,75,000
Overhead	80,000	40,000	40,000	40,000	2,00,000
Total	3,50,000	1,75,000	1,75,000	1,75,000	**8,75,000/-**
In words : Eight Lakhs Seventy Five Thousand Rupees only					

B. Budget towards FOUR Student Interns (@5000 per month)

Table 13 : Details of Budget Proposal for Payment of Student Internship (in Indian Rupees)

Budget Estimates	Phase I 07 Months	Phase II 03 Months	Phase III 03 Months	Phase IV 02 Months	Total 15 Months
Man Power	1,40,000	60,000	60,000	40,000	3,00,000
				Total	**3,00,000/-**
				In words :Three Lakhs Rupees only	

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