Software Requirements Specification

for

Virtual Clinic - An Integrated Care System

Version 1.6 approved

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Revision History

Name	Date	Reason For Changes	Version
Virtual Clinic	19/02/2018	Initial Version	1.0
Virtual Clinic	21/02/2018	Added Introduction and Overall Description for the project	1.1
Virtual Clinic	22/02/2018	Added External Interface Requirements, System Features	1.2
Virtual Clinic	23/02/2018	Added Non-functional Requirements	1.3
Virtual Clinic	24/02/2018	Updated Use Case(added more use cases)	1.4
Virtual Clinic	25/02/2018	Added Acronyms, abbreviations, revised SRS	1.5
Virtual Clinic	26/02/2018	Revised SRS,added summary ,updated software interfaces, hardware interfaces	1.6

1. Introduction

1.1 Purpose

This document details the Software Requirements Specifications for “Virtual Clinic - An Integrated Care System” for Padhmavati Hospital in Mangalore, Karnataka. Virtual Clinic aims to automate the health-care system of the modern world. The primary aim of the document is to detail out/ describe the whole system and clearly lists all its functionalities.

1.2 Document Conventions

The font that is followed in this document is arial and its size is 11. Special highlighting is done by making the text bold so that important keywords can easily be differentiated. Every requirement stated in this document has its own unique priority and every functionality is equally important.

1.3 Intended Audience and Reading Suggestions

This document is meant for staff of Padhmavati Hospital mainly the Doctors and the Administration Staff who will maintain/ operate the system. It is also meant for authorized Chemists and Labs who are associated with the Hospital. Lastly, it is also meant for Patients/ general public at large who will register themselves and request for appointments/ consultations. In lieu of Patients, it is expected that Hospital Staff will identify the information acquired from Patients, Chemists and Labs. They are the ones who will state the requirements of the software and their feedback will also be needed to modify the existing requirements.

This document shall also serve as the reference document for Project Management and Development team (Mishal and Samyak) who will Analyze, Design and Implement the System, They will coordinate every activity that take place in the Software Engineering process and will be guided by Prof. Chandrasekaran and other esteemed staff of NITK Computer Science & Engineering Department under development.

1.4 Product Scope

Padmavathi is a Multi-speciality Hospital in the Surathkal suburb of Mangalore. The Chairman of Padmavathi Hospital has created a vision to provide 24/7 Primary Care at Doorstep of Patients using a panel of high quality doctors within a 25 Square Kilometers of Hospital (specified Pincode(s) - also termed as Zone). Further, the Hospital has decided to provide quality medicines vide authorized Chemists located within the zone at the door-step at discounted prices as well as give door-step Laboratory services wherever possible vide specimen collection. The aim is to help elderly and inform people as well as people who need regular monitoring services to get access to quality healthcare services at affordable prices at the Door-step. It is envisaged that preventive and regular monitoring services can reduce the hospital admissions and reduce the suffering in General.

1.5 References

The document refers to the following assignments submitted:

- Assignment 1-Lab Report-1
- Assignment 2-Lab Report-2

1.6 Scope of the document

This document details the Software Requirement Specifications for Virtual Clinic - An Integrated Care System. The main purpose of this document is to describe the features and behavior of a system. It includes a variety of elements that attempts to define the intended functionality required by the customer to satisfy their different users. In addition to specifying how the system should behave, the specification also defines at a high-level the main business processes that will be supported, what simplifying assumptions have been made and the design limitations and constraints. Each of these is described in more detail along with the Product Functions, User Classes, Operating Environment, All interfaces (User, Hardware, Software, Communication), System features and functional requirements and Non-functional requirements along with business rules.

1.7 Definitions, acronyms, and abbreviations

Table 1-Definition

Term	**Full Description**
Admin	Someone who controls and operates the entire system
Doctor	a person who is qualified to treat people who are ill
Patient	a person receiving or registered to receive medical treatment
Chemist	a shop where medicinal drugs are dispensed and sold, and in which toiletries and other medical goods can be purchased.
Lab	Lab is a place where tests are usually done on clinical specimens in order to obtain information about the health of a patient as pertaining to the diagnosis, treatment, and prevention of disease.
DFD	Data Flow Diagram
EIS	External Interface Specifications
ERD	Entity Relationship Diagram
NITK	National Institute of Technology, Surathkal, Karnataka

SRS	Software Requirement Specifications
UIS	User Interface Specifications
URS	User Requirement Specifications
Padmavathi	Padmavathi Hospitals, Surathkal, Mangalore, Karnataka
Zone	Set of Specified PinCodes where the Virtual Clinic Functionality would be available

1.8 Overview

The remaining part of the document comprises of 4 sections as follows:

- **Section-2** - It describes the product perspective, its functions, stakeholders involved in the system, its operating environment, design and implementation constraints, user documentation and assumptions and dependencies.
- **Section-3** - It describes all the Interfaces comprising of User Interface Specifications, Hardware interfaces, Software interfaces and communication interfaces.
- **Section-4 -** It describes all the functional requirements of the systems along with a Requirements Table.
- **Section-5 -** It describes all the non-functional requirements of the system.
- **Section-6 -** it describes the summary of the document.

2. Overall Description

2.1 Product Perspective

“Virtual Clinic” is based on the concept of integrated care system. Stakeholders for the system are Doctors, Patients, Labs and Chemists. As shown in the below diagram a patient makes his/her consultation request to the system by entering the symptoms, the system forwards the consultation request to a doctor of the concerned speciality. Doctor generates a prescription comprising of Diagnosis, Medicines and Lab Requests(if needed) based on the symptoms provided by the patient. The prescription is received by patient, nearest local chemist and nearest local lab. Using the prescription Chemist provides medicines to the patient via offline delivery. Labs, too, use the same prescription to collect specimen from patient and make the delivery of lab reports based on lab tests and also update the report on the system to view for the patient anytime. For Chemists and Labs, only need to know information will be displayed thereby protecting the Patient’ confidentiality.

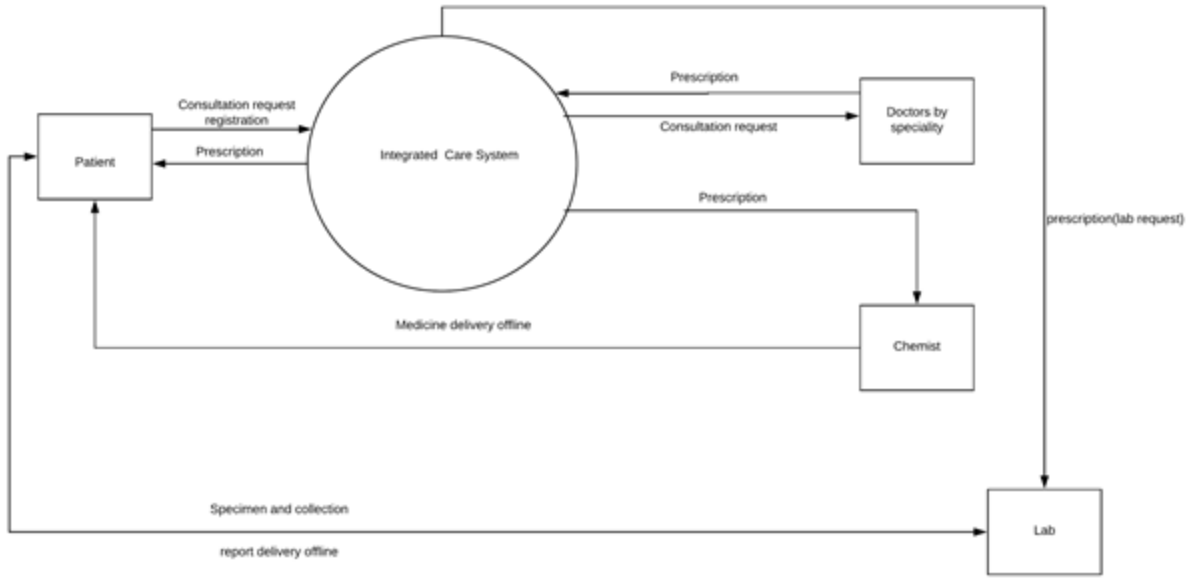

Figure 1-Context Diagram

2.2 Product Functions

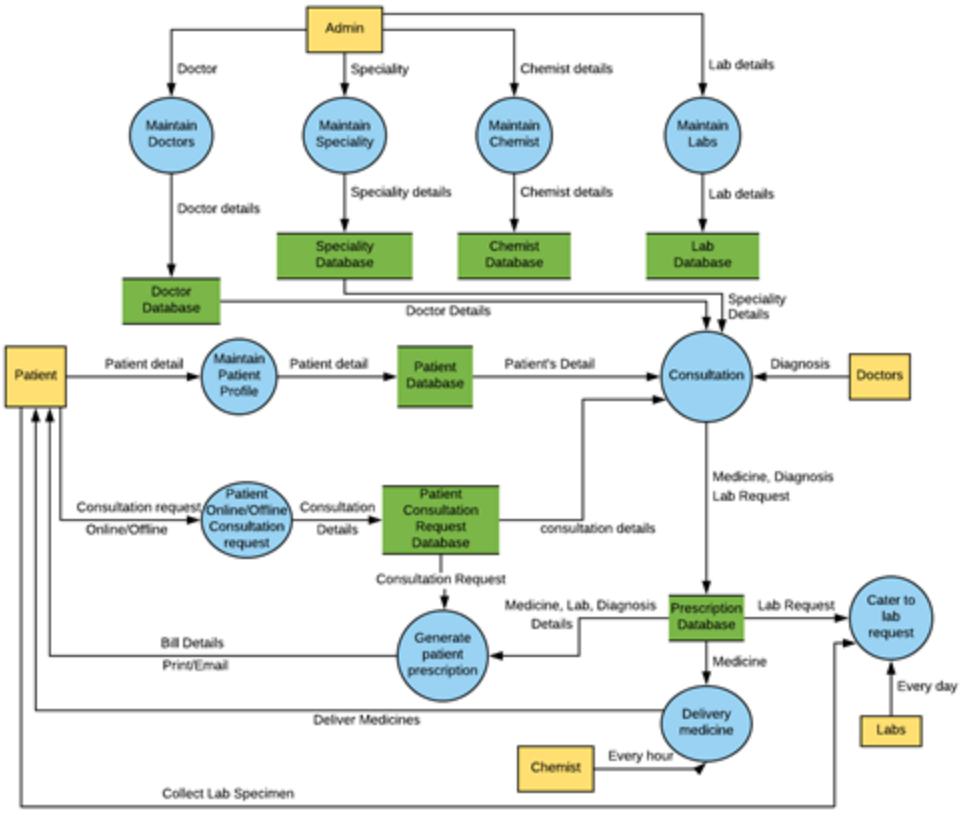

Figure 2-DFD

The above DFD clearly shows various processes associated with the project and how data flows between an entity and database via a specific process

Admin populates speciality database based on various specialities present in the medical domain. Then it links the specialities to the doctors and populates the doctor database. It takes information from labs and chemists to populate their databases.

Patient registers into the system by filling his/her details. When patient generates a consultation request then doctor sees that request and gives the diagnosis. The prescription generated by doctor is sent to patient,chemist and labs.

Chemist use this prescription to deliver the desired medicines to the patient. Labs too use the prescription to collect specimen from the patient and deliver lab report to the patient and update the report into the system for future reference for the patient.

Non - Functional Features:

The system should be able to scale to 10,000+ users concurrently and shall have a response time of <=2 seconds for critical functionality, for other functions the response time shall be less than <=4 seconds during peak period. Further the system should have 99.999% Availability (10 mts outage per month on every 4th Sunday night between 12:00 AM – 12:10 AM) and very high reliability and stability.

2.3 User Classes and Characteristics

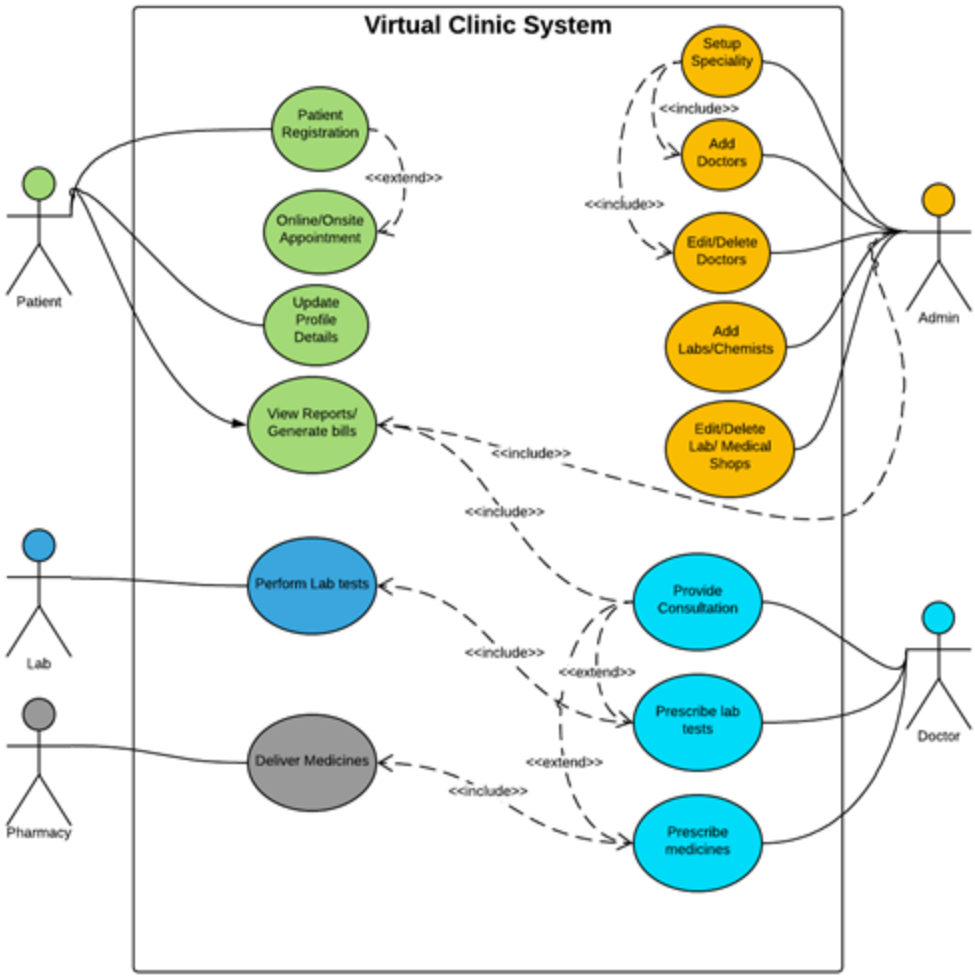

Figure 3-Use-case diagram

The actors and use cases are clearly shown in above USE-CASE diagram.

The following are the Stakeholders/ Actors who perform the functions/ use cases as stated above:

Table 2-Use cases

S. No	Actor Name	Description/ Actor's Role
01	Admin	● Setup Speciality ● Add Doctors ● Add Labs/Pharmacy ● Edit Doctors Information (Update/ Delete) ● Edit Labs/Pharmacy Details (Update/ Delete)
02	Patient	● Registration ● Update Profile ● Make Appointments/ Submit Online Consultation Request ● View/Generate Prescription Reports/Invoices
03	Doctor	● Provide Consultation ● Prescribe Medicine ● Prescribe Lab Tests
04	Lab Incharge	● Performs Lab test and updates the reports (offline & online) - Sets the flag in prescription
05	Chemist	● Delivers the medicine to concerned patient (offline) - Sets the flag in prescription

The following section describes the Use Cases with Pre-and Post Conditions:

Table 3: Pre-Post Conditions of use cases

S.No	Use Case Name	Description	Pre-Condition	Post-Condition
UC-01	Patient Registration	Registrant will provide personal, medical and general information upon registering and become a patient	System is setup and configured System is running and open for registrations Registrant has accessed website via URL	Patient is successfully registered
UC-02	Speciality Setup	Admin will add the specialties of doctor for which the hospital will give the treatment	System is setup and configured. System is running and open for registrations Registrant has accessed website via URL. Admin account is created Default admin is logged into the system.	New Specialities will be added into the system.
UC-03	Doctor Registration	Admin will have the option to register doctors into the system.	System is setup and configured. System is running and open for registrations Registrant has accessed website via URL. Admin account is created Default admin is logged into the system.	New accounts for doctors is created via the admin account.

UC-04	Labs and Chemist Registration	Admin will have option to add labs and Chemist into the system	System is setup and configured. System is running and open for registrations Registrant has accessed website via URL. Admin account is created Default admin is logged into the system.	New accounts for labs and Chemist is created via admin account.
UC-05	Update Doctor Information	Admin will have the option to update doctors information into the system.	System is setup and configured. System is running and open for registrations Registrant has accessed website via URL. Admin account is created Default admin is logged into the system. Account for Doctor is created	Doctors profile information will be updated via admin.
UC-06	Update Lab/Chemist Details	Admin will have option to update labs and Chemist into the system	System is setup and configured. System is running and admin has accessed website via URL. Admin account is created Default admin is logged into the system. Account for Lab/ Chemist is created	Lab/Chemist information will be successfully updated via admin.

UC-07	Update Patient Profile Information	Patient can update their personal details	System is setup and configured. System is running and patient has accessed website via URL. Patient account is created Patient is logged into the system.	Patients details will be successfully updated
UC-08	Create Appointment	Patient can create appointment to visit the doctor (future date)	System is setup and configured. System is running and patient has accessed website via URL. Patient account is created Patient is logged into the system.	Appointment is created and can be viewed in appointments tab vide Patient Appointment File
UC-09	Provide Consultation	Doctor can easily view the appointments/ consultation request pending in his list and provide consultation	System is setup and configured. System is running and doctor has accessed website via URL. Doctor account is created Doctor is logged into the system.	Consultation is provided by the doctor and prescription is generated.

UC-10	Prescribe Lab Tests	Doctors while providing consultation can prescribe lab tests	System is setup and configured. System is running and doctor has accessed website via URL. Doctor account is created Doctor is logged into the system. Doctor is looking into the patient.	Lab Test for the patient is created and lab is requested to perform the lab test.
UC-11	Prescribe Medicines	Doctors while providing consultation can prescribe medicines	System is setup and configured. System is running and doctor has accessed website via URL. Doctor account is created Doctor is logged into the system. Doctor is looking into the patient	Medicines for the patient are requested to the concerned Chemist for delivery.

UC-12	Perform Lab Tests and update the reports.	Lab tests are performed and reports for corresponding patient are updated (Offline)	System is setup and configured. System is running and doctor has accessed website via URL. Lab account is created Lab incharge is logged into the system. Lab specimen for the patient is collected(offline)	Lab report for the patient is released to view (Offline)
UC-13	Deliver medicines to the patient	Medicines are delivered as prescribed by the doctor (offline)	System is setup and configured. System is running and doctor has accessed website via URL. Pharmacy account is created Chemist is logged into the system.	Successfully medicines are delivered to the patient (offline)
UC-14	View/Print Reports, Invoice	Admin, Patient can view the invoice and reports for the appointment.	System is setup and configured. System is running and doctor has accessed website via URL. Admin/Patient account is created They are logged into the system. Previous appointment is made by patient	Easily invoice and prescription reports can be printed anytime and stored for further need.

2.4 Operating Environment

The system shall be deployed on a Heroku platform which is a service providing platform to host with Ver. 5.7.21 MySQL Database to maintain the databases. The system shall be accessed vide the Hospital' website which runs on multiple browsers e.g. Google Chrome, Mozilla Firefox etc. The Operating System on the front-end PCs/Laptops can be MS Windows, Unix, Linux or Apple Mac.

The system will be built with the help of following software:

Table 4-Environment for development

Sr No	**System**	**Environment for development**	**Description**
1.	Software used to develop	Backend: Django 2.0	Django is a high-level Python Web framework that encourages rapid development and clean, pragmatic design.
		Database: MYSQL	MySQL is an open-source relational database management system(RDBMS).

		Frontend: HTML, JavaScript, jQuery, AngularJS	HTML: is the standard mark-up language for creating web pages and web applications JavaScript: As a multi-paradigm language, JavaScript supports event driven functional, and imperative (including object-oriented and prototype based) programming style. jQuery is a cross-platform JavaScript library designed to simplify the client-side scripting of HTML AngularJS: The AngularJS framework works by first reading the HTML page, which has additional custom tag attributes embedded into it. Angular interprets those attributes as directives to bind input or output parts of the page to a model that is represented by standard JavaScript variables
		Styling: CSS, Bootstrap	Cascading Style Sheets (CSS) is a style sheet language used for describing the presentation of a document written in a mark-up language. Bootstrap is a free and open-source front-end web framework for designing websites and web applications.
		IDE: PyCharm (student version)	It provides code analysis, a graphical debugger, an integrated unit tester, integration with version-control systems (VCSes), and supports web development with Django.

		Version Control: Git, GitHub	GIT is a version-control system for tracking changes in computer-files and coordinating work on those files among multiple people.
		Text Editor: - Sublime	Sublime Text is a cross-platform source code editor with a Python Application programming interface(API)
		Usage of system library for unit testing: Django- unittest JavaScript/jQuery: assert	The preferred way to write tests in Django is using the unittest module built in to the Python standard library.
5.	Server hosting/ Installation (user testing)	Heroku If bugs are found again, coding and unit testing tools will be used along with latest version of software from Git.	Heroku is a cloud Platform as a Service (PaaS) supporting several programming languages. that is used as a web application deployment model.

2.5 Design and Implementation Constraints

The following Design and Implementation Constraints are applicable for the System:

a) The System needs to designed to prevent full scan of Patient Consultation Request Entity for identifying the Appointments for next day/ day range. For this, a derived Entity called as Patient Appointment file shall be designed.
b) To prevent multiple doctors of the same speciality to log-in onto same Patient Consultation Request, a workflow system needs to be designed which routes the Patient Consultation Requests to Doctors. Similarly once the doctor has completed the prescription, the workflow should be routed to the right Chemist (based on Patient and Chemist Pincode) and /or Labs (based on Patient and Lab PinCode).
c) In order to Assist Doctors, a Machine learning algorithm will be designed and trained on a training data-set to predict diseases based on Patient Symptoms, this algorithm will continue to be trained on emerging data sets to improve the quality of predictions.

d) The database shall be maintained by the Administration and Patients who have not consulted for last 3 years would get archived onto a parallel database. Restoring of old Patients data is beyond the scope of the project and would need to be managed by Admin.
e) The system is expected to generate approximately 25,000 Consultation Requests per week, translating to 1.3 Million Consultation Requests per year. A 3 year database would constitute 4.0 Million Consultation requests.System needs to be designed to cater to the same. In all, approximately 250,000 unique Patients are expected to be provisioned.
f) Though initially only 3 Specialities are supposed to be enabled, given the system performance it is expected that the number of specialities may grow to 5 by end of year 3, this may mean further addition of 50,000 unique patients and another 500,000 Consultation Requests. The system has to be designed keeping the future growth in mind.
g) Initially the system would be available on PCs, laptops, but the system should be capable of running on a mobile platform in future (android) - this will mean designing of user interfaces keeping adaptive response in mind.
h) As the system is supposed to be used by Elderly and infirm people as well, care needs to be taken from a usability perspective in terms of font sizes and ease of system usage. It is anticipated that even people with no computer background should be able to use the system relatively easily. For this the system should be designed to keep the system navigation very simple and intuitive. A normal Consultation Request should get filled in less than 5 minutes (Minimal and only relevant questions)

2.6 User Documentation

The following documents shall be prepared:

1. Installation Guide
2. User Manual for end users

2.7 Assumptions and Dependencies

The Key Assumptions are:

- The services shall be offered in and around Padmavathi Hospital within a radius of 25 sqkm/ or a set of specified PinCodes. Patients residing in this Zone can only register and apply for Appointments/ Consultation Requests
- There will be 1 Authorized Chemist per Pincode (24/7 Operations). All Prescription requests shall be routed to the Chemist after matching the Patient Pincode (from Address) to Chemist Pincode. Chemist are supposed to deliver the medicines through Offline delivery and collect payments from Patients. They shall mark the Prescription on completion of delivery. There will be no systemic matching done to figure out efficiency of the Chemist.
- There will be 1 Authorised Laboratory per Pincode or there will be 1 Laboratory for the entire Zone. All Lab requests shall be routed to the Laboratory after matching the Patient Pincode. Lab personnel shall make appointments and perform home collection of specimen. This will be offline, also, they will email or send the reports to Patients directly.

- Patients shall have the facility to upload upto 5 reports (upto 1 MB size) per Consultation
- Each Patient Consultation request shall be routed to 1 Doctor of a Speciality
- A Machine Learning Algorithm to assist doctors will be implemented to predict diseases based on Symptoms. This is just a tool, Doctors can accept or modify the diagnosis. The responsibility shall be with Doctor to perform Diagnosis. The Machine Learning algorithm shall be trained using a training data set initially - post that the training set and the live data shall be combined to improve the quality of prediction. It is expected that after a period of 1 year, the prediction from Machine Learning Algorithms will be approximately 50-60%
- In future, based on data, further analysis in terms of Seasonal Disease Predictions, Disease out-break due to demographic profile - patient segmentation based on age and gender shall be done to improve quality of Healthcare.
- The system will have no provision to create a doctor roster or availability schedule, also the patient appointment requests with date/time would be recorded, but no analysis done to validate if the doctor has the slot empty or there are multiple appointments made for the same time i.e Doctor appointment schedule is beyond the scope of the current project
- The system shall interface with a payment gateway for making Payments - the interface definition is beyond the scope of the current project. For patients preferring Appointments, a Cash mode of payment shall also be available at the Hospital, for Offline Consultation, payments shall be vide. Credit/ Debit/ Net Banking enabled thru a Payment Gateway.

3. External Interface Requirements

3.1 User Interfaces

The User Interface section defines the way the various stakeholders interact with the System. All screens will be developed to work on a PC/Laptop. Error messages will appear at the bottom and shall be self descriptive - The maximum size of error messages will be 80 Characters. Buttons will be used to make the navigation simpler. In order to increase Usability of screens, Patient Registration and Consultation Requests screens will have bigger font size to aid Elderly people.

Table 5-User Interfaces

Sl No	**User**	**User Interface Name/ Number**	**User Interface Description**
1	All	Login	This is a login Screen - Each user needs a valid login id/ username and password to access the System. User id/login id and passwords will be maintained by Administrator

2	Administrator	VCMMNU01	Virtual Clinic Main Menu - Comprising of a) Maintain Speciality b) Maintain Doctors c) Maintain Chemist & Labs d) Maintain Symptoms
3	Administrator	VCMSYS01	Administrators System Administrator Screens for a) Set-up Users/ Passwords b) Set-up Control File (for Pincode) c) Create Appointment File d) View/ Print Invoice e) Back-ups f) Archive Patient Profiles
4	Administrator	VCSYSS02	Administrator Screen to Create Users a) Doctor(s) b) Chemists and Labs
5	Administrator	VCMSP01	Administrators Menu Screen to Maintain Speciality a) Add Speciality b) Edit/Update Speciality
6	Administrator	VCMSP02	Add Speciality Screen - Speciality Id, Speciality Name, Speciality Description
7	Administrator	VCMSP03	Edit/ Update Speciality Screen - Query on Speciality Id, Speciality Name, Speciality Description will be displayed and can be modified or deleted. If Speciality does not exist with Speciality Id, an exception error message will be displayed “Speciality does not exist”
8	Administrator	VCMDR01	Administrators Menu Screen to Maintain Doc a) Add Doctors b) Edit/Update Doctors
9	Administrator	VCMDR02	Add Doctor Screen - Doctor Id(generated), Doctor Name, Age, Sex, Qualification & Experience
10	Administrator	VCMDR03	Edit/ Update Doctors Screen - Query on Doctor Id, Doctor Name, Age, Sex, Experience and Qualification will be displayed and can be modified or deleted. If Doctor does not exist with Doctor Id, an exception error message will be displayed “Doctor does not exist”. For Deleting Doctor Details a check will be made from Patient Consultation Request to ensure that there are no open requests - if so, an exception error message will be displayed “Doctor has open Consultation Requests - cannot delete”
11	Administrator	VCMCL01	Administrators Menu Screen to Maintain Chemist & Labs a) Add Chemist / Labs b) Edit/Update Chemist/ Labs
12	Administrator	VCMCL02	Add Chemist/ Lab Screen - Chemist/Lab Id (generated), Chemist/Lab Flag, Chemist Lab Name, Chemist Lab Address and Chemist Lab Contact

			Details
13	Administrator	VCMCL03	Edit/ Update Chemist/ Labs Screen - Query on Chemist/Lab Id, Chemist/Lab Name, Address and Contact Details will be displayed and can be modified or deleted. If Chemist/Lab does not exist with Chemist/Lab Id, an exception error message will be displayed “Chemist or Lab does not exist”. For Deleting Chemist or Lab Details a check will be made from Prescriptions to ensure that there are no open requests - if so, an exception error message will be displayed “Chemist or Lab has open Prescription Requests - cannot delete”
14	Administrator	VCMSYM01	Administrators Menu Screen to Maintain Symptoms a) Add Symptom Code b) Edit/Update Symptom Codes
15	Administrator	VCMSYM02	Add Symptom Code Screen - Symptom Code, Symptom Description
16	Administrator	VCMSYM03	Edit/ Update Symptom Screen - Query on Symptom Code,Symptom Description will be displayed and can be modified or deleted. If Symptom does not exist, an exception error message will be displayed “Symptom does not exist”. For Deleting Symptoms a check will be made from Patient Consultation Requests to ensure that there are no usages of Symptom Code - if so, an exception error message will be displayed “Symptom Code used, cannot be deleted”
17	Patient	VCMPA01	Patients Menu Screen a) Update Patient Profile b) Raise Consultation/ Appointment Request c) View/Generate Prescription Reports/Print Invoice
18	Patient	VCDPA02	Patient Registration Screen - Patient Id (generated), Name, Age, Sex, Address and Contact details are captured. This screen comes-up when a new Patient registers after creating a valid username/ password
19	Patient	VCDPA03	Patient Profile Update Screen - Query on Patient Id, Patient details are displayed and can be modified. Patient pin-code cannot be modified to be outside the Zone
20	Patient	VCDPA04	Patient Consultation Request Screen - Query on Patient Id, to display Patient details and then enter details like Speciality (List of values), Symptoms(List of values), Consultation request/ Appointment,

			Appointment date etc. Creates an entry into Patient Appointment file if the Appointment Request is for next day
21	Doctor	VCDDR01	Doctor dashboard (by Speciality) - Doctor sees all the workflow consultation requests and selects them one by one to provide Consultation
22	Doctor	VCDDR02	Doctor sees the Patient Consultation Requests and enters Diagnosis, Prescribes medicines (max 8) and requests for lab tests (optional) max(5)
23	Chemist	VCDCM01	Chemist sees all the workflow consultation requests and selects them one by one to provide Medicines
24	Chemist	VCDCM02	Chemist sees the Prescription, dispenses medicines and marks the flag in Prescription
25	Labs	VCDLB01	Lab sees all the workflow consultation requests and selects them one by one to note down the Lab Requests
26	Labs	VCDLB02	Lab sees the Prescription, notes the lab tests to be done and the Patient details and marks the flag in prescription and also adds the report
27	Administrator	VCSYSS03	Reports Menu a) Speciality wise - Number of Consultations by Doctor (Month/ Quarter/Year) b) Speciality wise - Revenue Earned per Month/ Quarter/ Year c) Patient History File (based on Patient Id)

3.2 Hardware Interfaces

The System shall be deployed on Heroku Platform. All the Stakeholders are supposed to log-in into the Virtual Clinic website where there will be a specific URL to access the System.
Hardware Requirements for stakeholders:

- Pentium 4 processor or higher
- Approximately 100 MB of free harddrive space
- Minimum 128 MB RAM

Hardware Requirements for hosting:

- Minimum 1GB database space
- Minimum 2GB RAM

3.3 Software Interfaces

The System is self contained and no data is supposed to be shared with any third party - Chemists and Labs are supposed to log-into the system to access the Prescriptions, so are the Patients. Only emails will be sent to Patients including the full prescription and Invoice. There will be an interface with the current standard Payment Gateway available with the Hospital. A button will be enabled to securely accept the payments vide Debit/Credit Cards and Net banking.
Software Requirements for Hosting:

- Django 2.0
- MySQL

Software Requirements for Stakeholders:

- Browser (Google Chrome, Mozilla Firefox, Safari etc.)
- Operating System supporting the above browsers.

3.4 Communications Interfaces

The System will be available on hospital Padmavathi website as a URL and will be operational using standard web-browsers (Safari, Google Chrome and firefox). Patients, Chemists and Labs will connect through a secured encrypted connection over internet (https://). Since the data communicated over internet is confidential it is imperative that encrypted protocols are used to prevent data leakages. E-mails shall be used to send the Prescription and Invoice to the Patients after Consultation.

4. System Features

4.1 System Feature Priority Matrix

The following section describes the System features and their Priorities:

Table 6-Priority Matrix

Sl No	Feature	Priority
1	Maintain Speciality	High
2	Maintain Doctors	High
3	Maintain Chemist and Labs	Medium
4	Maintain Symptoms	High
5	Maintain Patient Profiles	High
6	Create Consultation Requests	High
7	Provide Consultation	High
8	Deliver Medicines	Medium
9	Perform Lab Tests	Medium
10	View/ Generate Prescription/ Print Invoice	Medium
11	Housekeeping Patient Profiles and Consultation	Medium
12	Daily Back-ups	Low
13	Reports	Low
14	Maintain Users	High

4.2 Functional Requirements

The following section describes the Functional Requirements - Each Requirement has been tagged by a Requirement Number (Convention Used is Req-x and Req-x/x)

Table 7-Functional Requirements

Requirement #	**Functional Feature**	**Remarks**
Req-1	Maintain Specialities	This functionality will Maintain different types of Specialities
Req-1/1	Add Speciality	Add a new (unique) Speciality
Req-1/2	Edit Speciality	View and Update the details of an existing Speciality
Req-1/3	Delete Speciality	Delete the Speciality - A Speciality can be deleted only if no doctors are attached to it
Req-2	Maintain Doctors	This functionality will Maintain Doctors and Associate them with the Speciality
Req-2/1	Add Doctor	Add a new (unique) Doctor - Name, Age,Sex, Qualification, Experience, Speciality
Req-2/2	Edit Doctor	View and Update the details of an existing Doctor - Speciality cannot be updated i.e. a doctor cannot move from one speciality to another
Req-2/3	Delete Doctor	Delete the Doctor Details - A doctor can be deleted if and only if no new Patient Consultation Request is pending
Req-3	Maintain Chemist & Labs	This functionality will Maintain Chemist and Lab Details
Req-3/1	Add Chemist / Lab	Add a new Chemist or a Lab - There can be ONLY 1 lab in a Pincode
Req-3/2	Edit Chemist/Lab	View and Update the details of an existing Chemist/ Lab - Pincode cannot be updated
Req-3/3	Delete Chemist/ Lab	Delete the Chemist / Lab Details - A Chemist or a Lan can be deleted if and only if no new Prescription is pending
Req-4	Maintain Symptoms	This is a master list of Symptoms that can be selected by Patient during Consultation Request

Req-4/1	Add Symptom	Add a new Symptom
Req-4/2	Edit Symptom	View and Update the details of an existing Symptom i,e. description
Req-4/3	Delete Symptom	Delete the Symptom Details - A Symptom can be deleted if and only if no Consultation request ever raised has used this symptom
Req-5	Maintain Patients Profile	This is Patient Registration Functionality
Req-5/1	Create Patient Profile	Register a new Patient
Req-5/2	Edit Patient Profile	View and Update the details of an existing Patient. Only latest details shall be maintained by the system
Req-5/3	Delete Patient Profile	Delete the Patient Details - A Patient cannot be deleted if there is one or more Consultation Requests in last 3 years
Req-6	Consultation Request	Registered Patients shall have the ability to raise Consultation Requests - 2 Modes would be available - Appointment and Offline Consultation
Req-6/1	Create Consultation Request	Patient creates a Consultation Request by entering the Symptoms, uploads reports, if any and defines the mode of request (Offline/Appointment)
Req-6/2	Create Appointment-Online	For Appointment Requests, an entry shall be created in the Patient Appointment File if the appointment is for next day
Req-6/3	Create Appointment - Batch	This is batch program that will be run by Administration every night to create Appointment File for next 5 days. It will purge the existing files
Req-7	Predict Disease	This is a batch program ? that will run periodically on new Consultation Requests to predict diseases based on machine learning Algorithm and prioritize the Requests (Critical/ Medium/ Low)
Req-8	Provide Consultation	Doctors shall see the prioritized consultation requests and provide diagnosis, prescribe medicines and suggest lab requests, if any
Req-9	Deliver Medicines	Chemist shall be able to view the open prescriptions assigned to them (based on

		Pincode) and have the facility to update the status. Medicines shall be delivered offline to Patient by Chemist
Req-10	Perform Lab Tests	Lab In-charge shall be able to view open lab-requests and have the facility to update the status- Actual Sample Collection and lab tests shall be offline. Labs shall also submit reports to Patient offline
Req-11	View/Generate Prescription/ Print Invoice	Patient shall have the facility to view the Prescription and print the invoice. Alternately, Admin can print and email the Prescription and Invoice
Req-12	Housekeeping Patient Profiles and Consultation Requests	Quarterly all Patient Profiles which have not raised any Consultation Request for last 3 years will be archived. Also, every quarter, Consultation Requests that are more than 3 years old shall be archived on This will improve the performance
Req-13	Daily Back-up	Every night, full back-up of the system (both Database and Code) shall be taken and sent to remote site for safekeeping. The back-ups shall be rotated every 30 days
Req-14	Learning Disease	Every Month Administration will improve the Disease Prediction Database with learning of the prior month, i.e. improve the training data-set by including the actual learning for the month
Req-15	Maintain Users (Doctors, Patients, Chemist/ Labs)	The system shall have a login functionality. Once the Doctor, Chemists and Labs have been set-up with default passwords by Admin, individual Doctors/ Chemists and Labs can change the password and log-in using their own credentials. For Patients, while registering a Patient will have to first create a User-id/ Password, which will then be used for authentication purposes.
Req-16	Reports	The System will generate following reports: a) Doctor wise Appointment file for next 5 days b) Speciality wise - Number of Consultations by Doctor per month/ quarter/ year (run on last day of the month) c) Speciality wise - Revenue Earned per month/quarter/year (run on last day of the

		month) d) Patient History File - For a patient, history of consultations done in last 3 years.

5. Other Nonfunctional Requirements

5.1 Performance Requirements

At the peak, system should be able to scale to 10,000+ users (patients) concurrently. The following processes are critical and must respond as per below

- Patient Registration <= 4 seconds
- Patient Consultation Requests <= 2 seconds
- Chemist - Prescription Requests <= 2 seconds
- Labs - Lab Requests <=4 seconds
- Patient - Prescription & Invoice Look-up <= 4 seconds

Further, since the system needs to be designed for 24/7 Operations hence the Availability should be high - 99.999% with a defined outage window of 10 mts every 2nd Sunday.

The system data shall be backed up every night (full back-up) with a cycle of 30 days. This essentially means that there will be a provision to rollback by a month. Post back-up everyday the back-up shall be restored on a dummy production system to ensure completeness and correctness of back-up. Post that the dummy production database shall be purged. Since the data is confidential, it will be maintained in Mangalore HQ in a fire proof cabinet 25 KM away from the Hospital

5.2 Safety Requirements

There are no specific Safety Requirements, however, the system shall be designed to comply with health care regulations as defined by Government of India. Further, the system shall support Hospital' and Government of India emerging needs based on the data gathered and analysed by the system.

5.3 Security Requirements

As the Patient' data is highly confidential and private care would be taken to ensure that the confidentiality is maintained. Only authorized Hospital staff i.e. Doctors will have the access to Patients Consultation requests. Also, Chemists and Labs will be shown data only on

need to know basis. Since there are no published external interfaces, there is no risk envisaged at the moment in terms of unwarranted data cascade.

5.4 Software Quality Attributes

The Key Software Quality Attributes are Availability, Reliability and Usability. As the system is expected to be 24/7 - High availability is very important. Also, since the major transaction i.e. Patient Consultation Requests has classified data/ information the system needs to be highly reliable. Lastly, the system is likely to be used by Old Age Patients more than others, hence the screens have to be designed for Usability i.e. large font size.

5.5 Software Back-ups and Redundancy

The system data shall be backed up every night (full back-up) with a cycle of 30 days. This essentially means that there will be a provision to rollback by a month. Post back-up everyday the back-up shall be restored on a dummy production system to ensure completeness and correctness of back-up. Post that the dummy production database shall be purged. Since the data is confidential, it will be maintained in Mangalore HQ in a fire proof cabinet 25 KM away from the Hospital

5.6 Business Rules

Table 8-Business Rules

Business Rule#	**Rule Description**
BR-1	System shall be available only on Specified PinCodes (Zones). These will be set-up in the Parameter Control File
BR-2	All Users shall access the system using a login/user-id and password. The login-id/password will be managed in a secured manner
BR-3	Each Speciality ‘has’ one or more Doctors linked to it.
BR-4	Each Doctor shall be mapped to ONE and ONLY ONE Speciality.
BR-5	Each Doctor shall provide Consultation to ONE or More Patient
BR-6	Each Patient has to register himself/ herself by filling Patient profile - a unique id will be generated for the Patient.
BR-7	Each Patient can request for one or more consultation Requests (linked back to Speciality).
BR-8	Each Patient Consultation Request ‘Generates’ ONE prescription. Each

	Prescription shall be mapped to ONE AND ONLY ONE Patient Consultation Request.
BR-9	Each Chemist “receives” one or more prescriptions (only required fields). Each prescription is mapped to (vide workflow using Pincode) ONE and ONLY ONE Chemist
BR-10	Each Lab “receives” one or more prescriptions (only required fields). Each prescription is mapped to (vide workflow using Pincode) ONE and ONLY ONE Labs

6. Summary

This document details the software requirement specification for the product Virtual clinic- An integrated care system for Padmavati Hospital, Mangalore. The document has 5 sections, in the first section the document describes the purpose of the document, scope of the product, conventions, and intended audience. Section 2 gives a detailed description of the product. It depicts the product perspective, product functions, user classes (5 -Actors and 14 Use Cases) and characteristics. Operating Environment is also illustrated with help of a table. Design and implementation constraints are also explained along with key assumptions and dependencies. Section 3 describes all the interfaces in details including user interfaces (27), hardware, software and communications interfaces. Section 4 describes all system features and the functional requirement of the system. Priority matrix depicting 7-High, 5-Medium and 2-Low features is illustrated to give clear idea of priority of the requirements. Functional features (16) are shown in the table using a standard convention so as to make the requirement traceable. Section 5 describes non-functional requirements of the system. It includes performance requirement, safety requirements, security requirement, software quality attributes, software back-ups and redundancy and finally a set of 10 business rules.