The Embedded Online Pharmacies Web Application

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ABSTRACT

The embedded online pharmacies system is proposed as a solution for the current medicinal drug shortage in Sri Lanka. With the current economic crisis, there is a serious issue in the society where medicine is lack and the patients do not get them in time. The proposed system consists of two major stakeholders who is the pharmacist and the candidate. It is a platform where all pharmacies are connected locally, and the candidate can search the availability of a particular medication in one go. This system helps in identifying the location of the pharmacy by correctly locating it through google maps. If a particular drug is not available in the online store or if the candidate cannot sort the issue individually, the system provides an option by providing pharmacy help service where a candidate can chat with a pharmacist or upload a prescription in correspondence to the preferred Area of the candidate. This proposed system gives a favorable solution where it connects a candidate to pharmacists around the country and it gives a vast knowledge on the availability of a drug in a particular area in a minimum amount of effort and time. Moreover, this system is a much needed, user-friendly, reliable, and efficient system.

Keywords— Pharmacy, Sri Lanka, Medicine, Pharmacist, Online

I. INTRODUCTION

A major problem in today's Sri Lankan society is the shortage of medicine due to the restrictions and tax on imports. There are many cases reported where people cannot find some essential medicines which are required for the patients as soon as possible. If the medicine which is needed is not available in the pharmacy, it takes a huge amount of time to find the products by searching on the pharmacy stores one by one physically and online.

As a solution for this major concern, the system which is the embedded online pharmacies system is proposed. It is a platform connected to a network of local pharmacies. Individuals can conveniently locate a pharmacy that sells the medication they require in a limited amount of time which is the primary focus of this research study. This procedure, which differs greatly from the current scenario, makes it possible to address the inability to find medicine due to current medication scarcity in a way that won't pose a significant threat to the Sri Lankan population.

The embedded online pharmacy system's process is based on two major stakeholders who is the pharmacist and the candidate. Candidate and the pharmacist can register and log into the system separately while they are also eligible in managing their own user profiles. The candidate can search for the products which the pharmacist has entered to the system and the candidate can view whether the product is available in one single search.

The candidate and pharmacist are connected through the chat option where the candidates can get help through chatting with the pharmacist. Also, they can manage the message they send without any hesitation. If the candidate has a prescription and he/she doesn't have an idea of the product, the candidate can upload the prescription so that the pharmacist can view the prescription and give feedback on the availability of the related drugs. In this way, pharmacists and candidates are connected and have a platform that can provide and receive services from each other, which will allow for a more efficient mechanism by reducing the drawbacks that currently exist in this field.

In this research paper, under the related work/Literature Review, a very simple comparison is made by pointing out a related published report, and through the methodology topic, a description is made about the tools and technologies related to the proposed system. Under the proposed system topic, the functions related to the system will be analyzed using UI and the user flows. Through discussion, it is focused again on the key points of this system by testing the functions with the use of SonarQube and Selenium.

II. RELATED WORK/LITERATURE REVIEW

Let's examine the research papers related to the proposed system related to the pharmacies field and how it relates to our work.

The article by Williams, M., Peterson, G.M., Tenni, P.C [1], draws attention to drug related problems. It covers how to identify medications, how to match the appropriate medication to the appropriate ailment, and the key considerations when choosing a medication. Additionally, it provides a pertinent explanation of how to administer medications using the correct amounts. Currently, the approach that proposed system have suggested will provide the pharmacist room to learn a lot through this. In terms of the roles played by pharmacists, this paper is relevant to our line of work.

The pharmacist is responsible for adding goods and managing their data in the proposed system. Viewing the prescription and recognizing the medication are also necessary. Also, the pharmacist must check the availability of drugs and give feedback. Then, by reading these articles [2] [3], it is possible to become more aware of the relevant work.

The articles [2] [3] describes on how to interact with the applicants, how to identify their requirements by being aware of the practical applications, which ultimately helps in getting a mutual understanding about the system and provide the candidate and pharmacist the chance to collaborate in the chat area with peaceful coexistence. Customers are also given the assurance and chance to adopt and maintain this system repeatedly.

I. METHODOLOGY

A. Technologies

Express Js, Node.js was used to build up on the server side, which is the backend of the system and ReactJS, Rest API was used for the client side while mongo dB was used as the database.

1) Node JS, Express

JavaScript code may be executed outside of a browser by utilizing Node JS, an open-source, cross-platform runtime environment. Express is a well-liked Node JS online application framework that is lightweight, flexible, and provides a wide variety of features for both web and mobile apps. According to the Express.js GitHub repository, TJ Holowaychuk was the creator, and the initial release took place on May 22, 2010. [4]. It may be used to develop a single-page, multi-page, or hybrid web application.

Express was invented to make establishing APIs and web - based applications simple. It still provides effective internet and mobile apps while reducing coding requirements by half. Express has the extra value of being written in JavaScript, which is straightforward to comprehend despite the fact that someone has never programmed before. [5].

2) Rest API

REST APIs have become the most popular way to connect components in microservices systems because they offer a flexible, lightweight approach to interconnect applications. A set of guidelines that control how applications and devices connect to and communicate with one another is known as an API. REST APIs are also known as RESTful APIs because they adhere to the design principles of the REST architectural style, which stands for representational state transfer.

Dr. Roy Fielding, a computer scientist, first defined it in his PhD dissertation in 2000. REST APIs have become a popular method for connecting apps and components in a microservices architecture because they give developers a fair amount of flexibility and freedom.

3) REST design principles

An API is a method that allows an end-to-end connection to be established between two separate systems. SOAP and XML-RPC, for example, impose a tight structure on developers, whereas REST APIs can be created in practically any programming language and handle a wide range of data types [6].

When deciding if a RESTful API is the right type of API for your needs, keep the following six important restrictions in mind:

a) Uniform Interface

All API queries for the same resource should seem the same, regardless of where they come from. A user's name or email address, for example, should be allocated to just one unique consistent resource identifier via the REST API (URI). Although the resources shouldn't be excessively large, they should contain all the information the client would need.

b) Client-server Decoupling

A REST API's client and server apps must be fully separate from each other. There should be no other means of communication between the client software and application server; it just must be aware of the URI of the requested resource. The client software must not be changed by a server application, other than to deliver the necessary data over HTTP.

c) Statelessness

Although REST APIs are stateless, each request should have all the requested details in order to be processed. Thus, server-side sessions are not required for REST APIs. Applications running on the server are not allowed to store any information related to client requests.

d) Cacheability

Wherever practical, resources should be client- or server-side cacheable.

e) Layered system architecture

The deployment of the APIs on server A, storage of the data on server B, and request authentication on server C are all possible with REST.

f) Code on demand

REST APIs usually return static resources, but occasionally they may also return executable code. The code should only be run under these conditions when necessary.

4) React JS

A JavaScript-based UI development library is called React. It is run by a group of open-source developers and Facebook. Even though it's a library rather than a language, web development typically uses react.

React.js is created on JSX, which is a hybrid of JavaScript and XML. Elements are produced with JSX and then rendered on your site with JavaScript. While react is difficult to master for a novice, it is quickly becoming one of the most popular and in-demand JavaScript libraries.

React is a JavaScript library rather than a framework, whereas the other solutions that is referred today are frameworks. Consider a library to be a tool that developers might utilize in any project, whereas a framework is a whole design.

Developers that know the React programming language are in high demand. This is owed in part to its flexibility and speed of development, but it is also aided by the fact that it is backed by Meta, which gives developers confidence in their decision to utilize React [7].

IV.   PROPOSED SYSTEM

The embedded online pharmacies system, which is the proposed system is an interaction between pharmacist and candidate. There are four major parts in the system namely the user profile handling, Pharmacy product handling, the pharmacy chat application and the prescription uploading part. The browser server model is used here while handling the system.

A. The User Handling

Initially the two main users of the system who is the pharmacist and the candidate should Register / Log into the system. The user flow of the login function is as follows (**Error! Reference source not found.**).
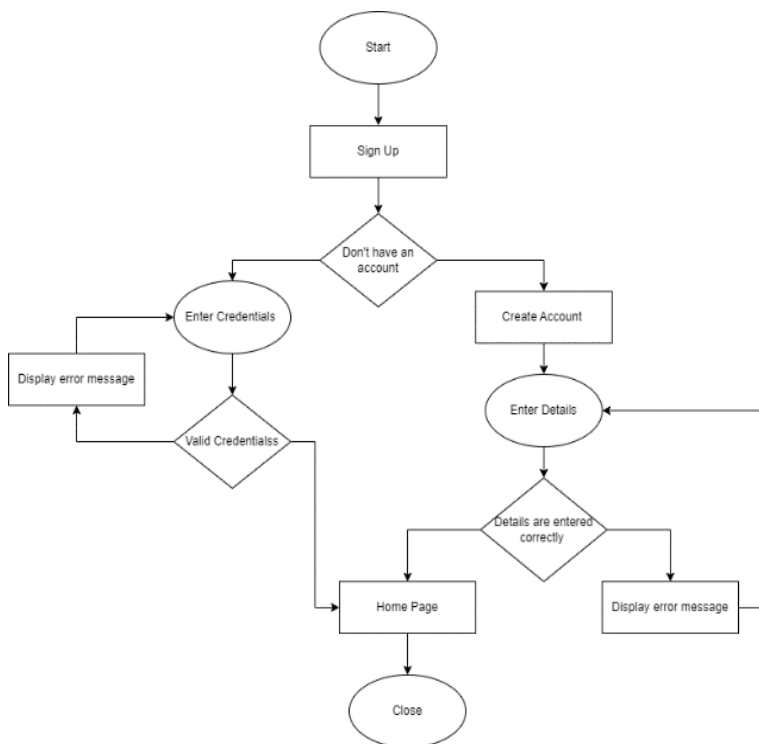

If the candidate/ pharmacist is not registered, the respective candidate should register to the system by giving the details which are required (**Error! Reference source not found.**).
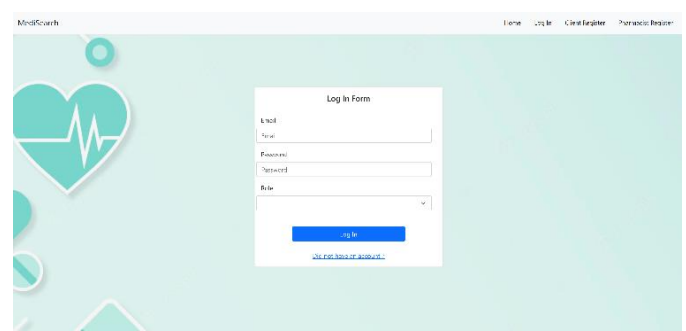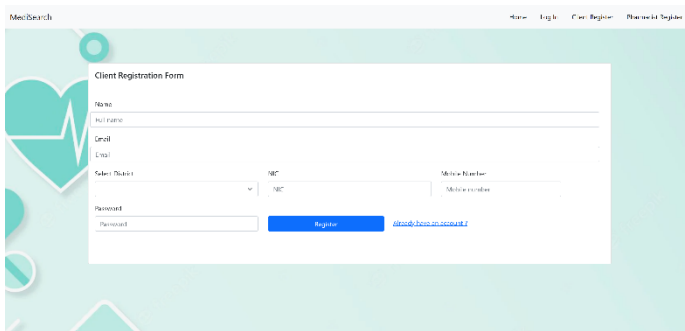
Registered candidates or pharmacists can log in to the system by entering their email, and password and selecting their role (**Error! Reference source not found.**).

The registered candidates/pharmacists are eligible to manage their user profiles by editing the personal information. Also they can delete their own user profiles. A user flow on updating the profile is as follows (**Error! Reference source not found.**).
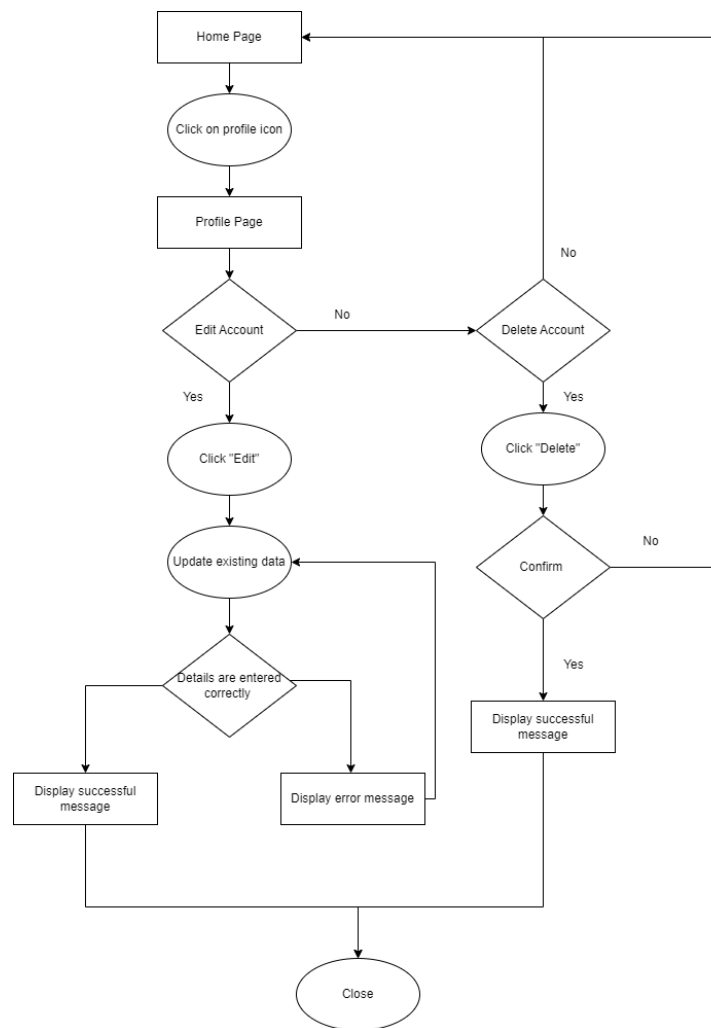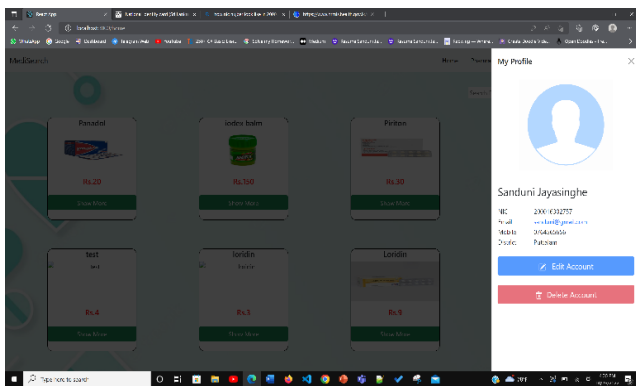
The UI of the profile is as follows (Figure 1).

Figure 1: User Profile

The candidates can search for a specific pharmacy using the name and view that specific pharmacy's details. By clicking locate button, a candidate can view the location of the pharmacy on Google Maps and by clicking the view products button he/she can view medicine details in that pharmacy. Due to the current shortage of medicines, the candidates can know in advance from which pharmacy they can get all the medicines they need without any delay or hassle (Figure 2) .
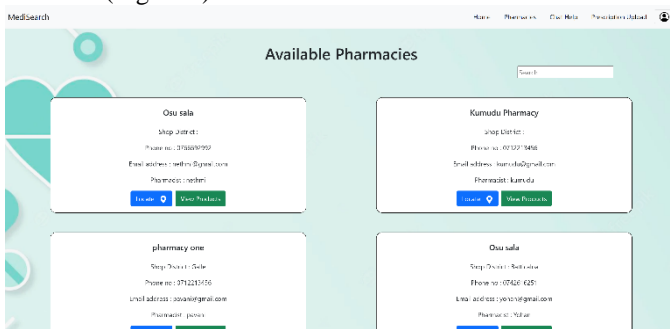
Figure 2: Available Pharmacy Details

B. The Items Handling

The pharmacist can add items to the store under pharmacy. Then a candidate can view the store of that pharmacy and can search for items. The user flow of adding the items is illustrated in the user flow of item handling (**Error! Reference source not found.**). The UI of the candidate view on the items is as follows (Figure 3).
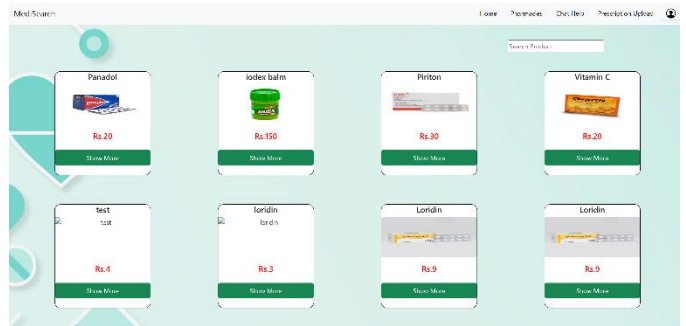
Figure 3: Add Items

If a candidate wants to know more details about the item, he/she can click on Read More(Figure 4).
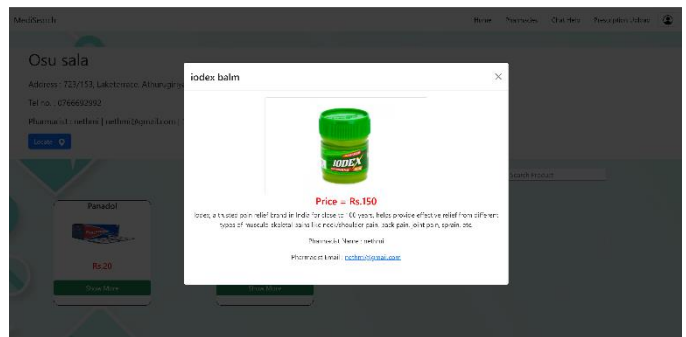
Figure 4: View Product Details

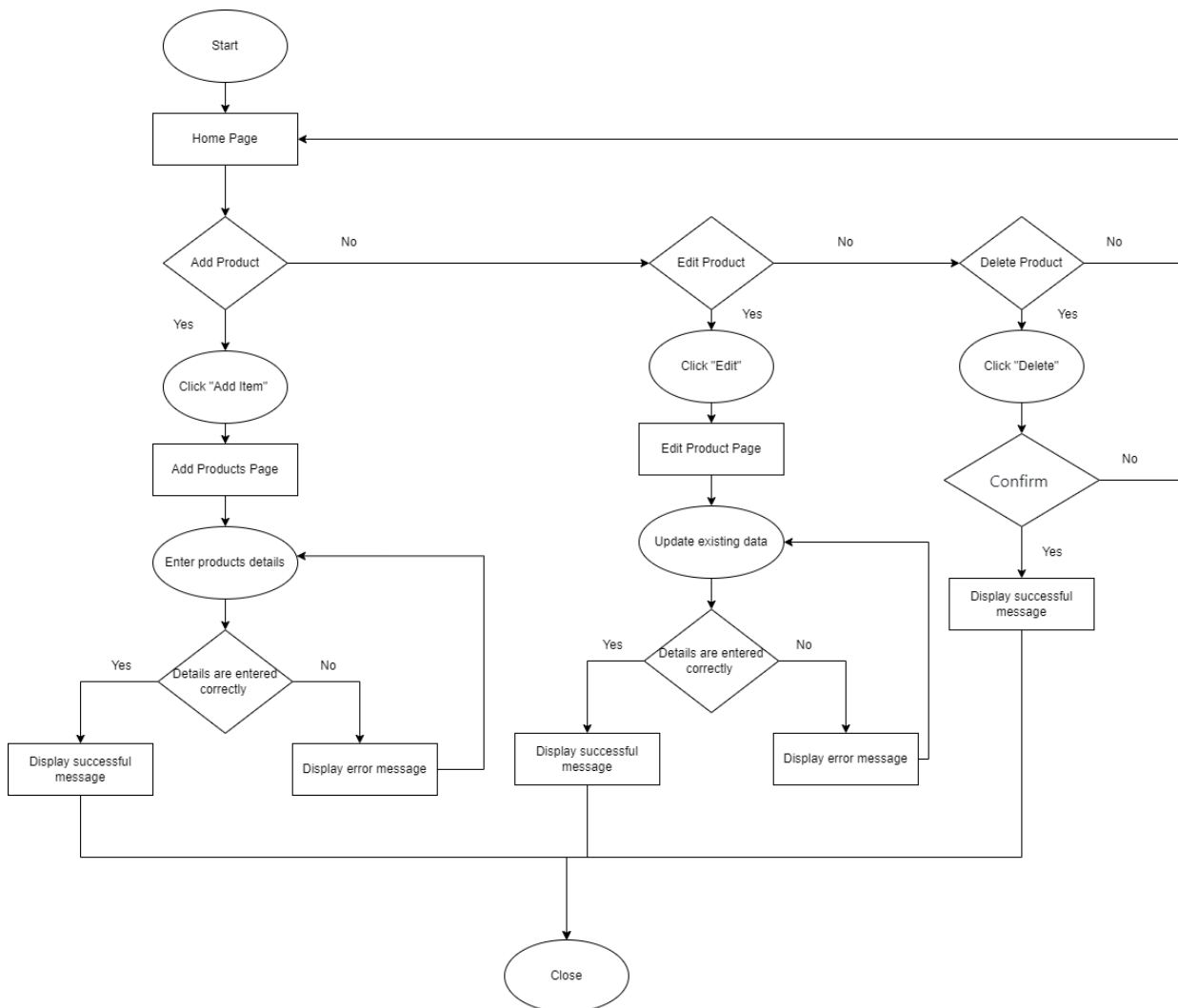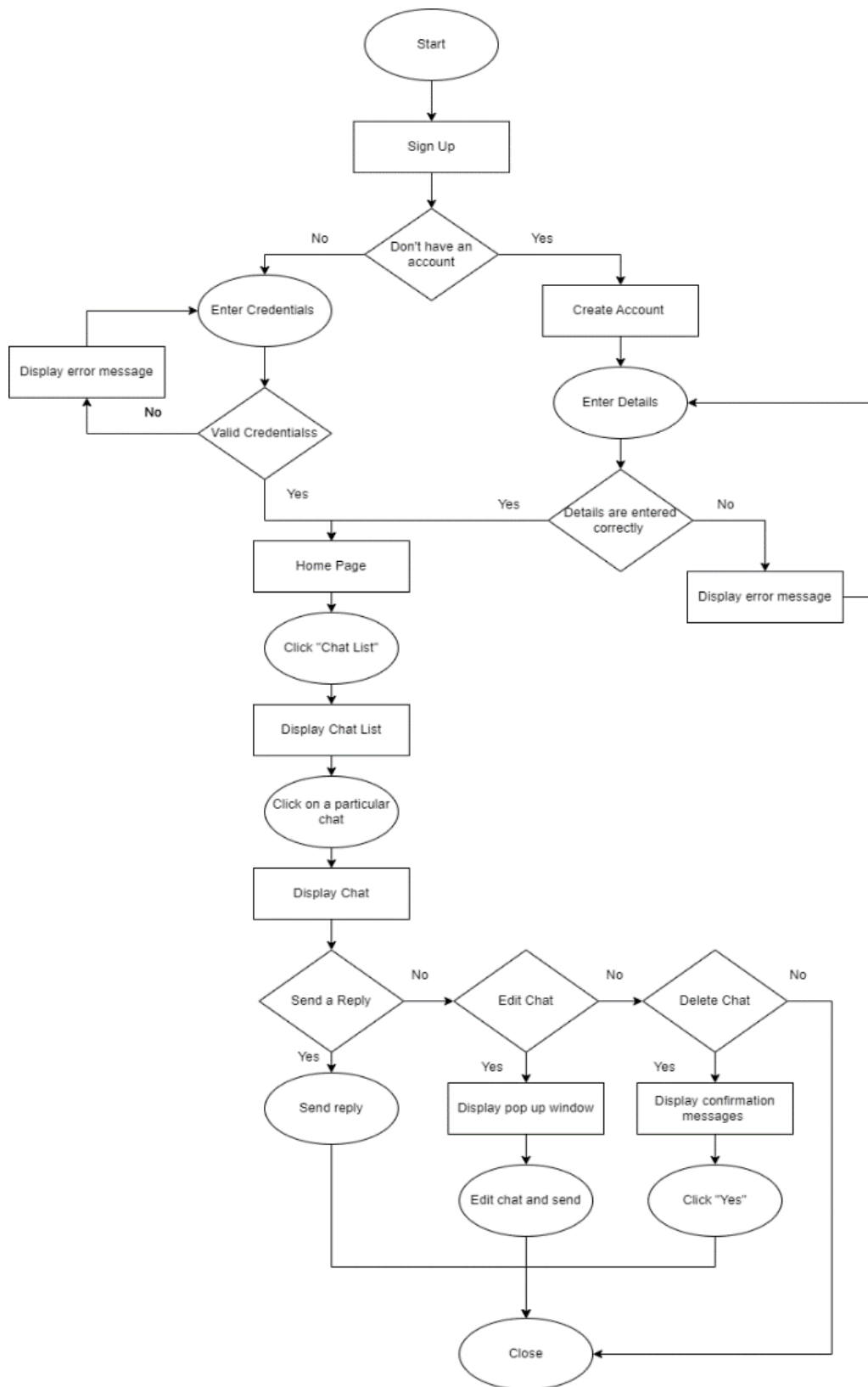If the candidate wants to locate the pharmacy, an option for that is also provided(Figure 5).
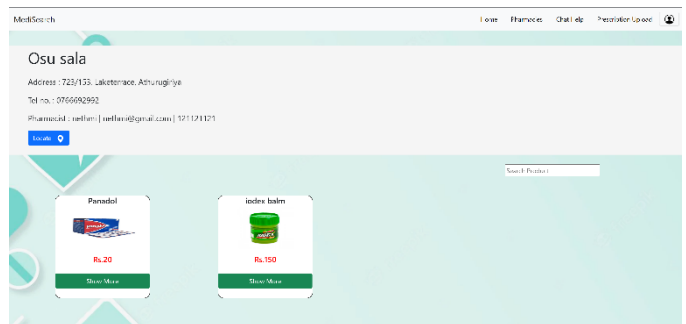
Figure 5: View and Locate pharmacy

C. The Pharmacy Chat Handling

The candidate can contact the pharmacist of the respective pharmacy through the chat section. The user flow of the function is as follows (**Error! Reference source not found.**).

The candidate can contact the pharmacist of the respective pharmacy through the chat section (**Error! Reference source not found.**).
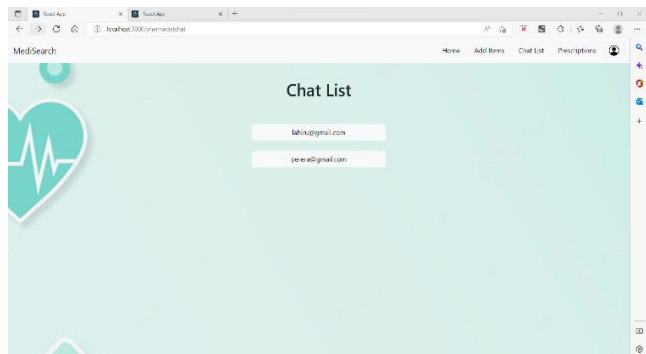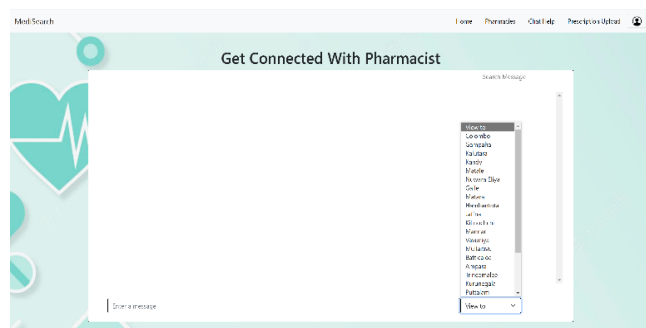

Figure 6: Pharmacist Chat List

The pharmacist can leave a reply to the relevant message and continue the chat. Both the candidate and the pharmacist can search messages in the chat (Figure 7).
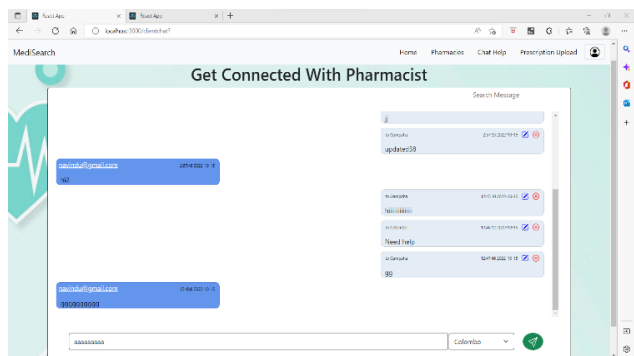
Figure 7: Real time chat

Edit and delete the sent message. Moreover, the most important thing is that the candidate can locate the pharmacy by selecting the preferred district in Sri Lanka (**Error! Reference source not found.**).

D. The Pharmacy Prescription Upload Handling

There can be candidates who cannot read and identify the name of the pharmacy product. As a solution for that the system introduces a prescription uploading part.

The user flow of the prescription uploading part is as follows (**Error! Reference source not found.**).

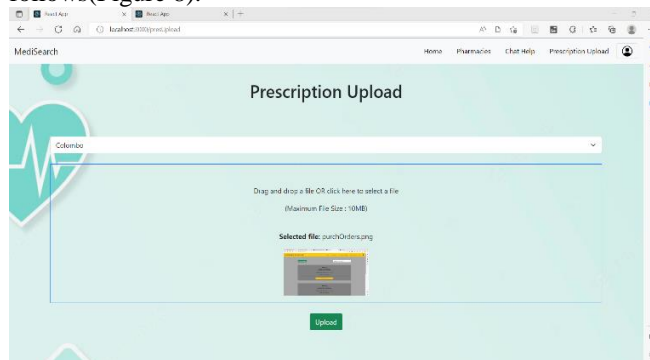The UI of the prescription uploading section is as follows(Figure 8).

Figure 8: Prescription Upload Page

The pharmacist can view the uploaded prescriptions from the "Pharmacy prescriptions Gallery "and add feedback on it stating whether the medicine is available or not. If the pharmacist wants to change the state of the added feedback the pharmacist can edit the feedback (Figure 9).
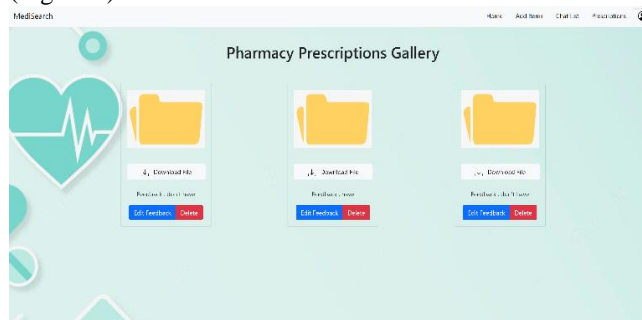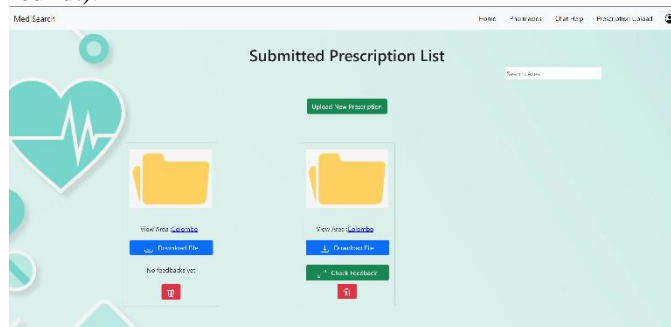

Figure 9: Pharmacy Prescription Gallery

The uploaded prescription can be viewed by the candidate where it is present in the submitted prescription list. Here the added feedback by the pharmacist will also be visible to the candidate (**Error! Reference source not found.**).

Also, the candidate and the pharmacist both can download the uploaded prescription (**Error! Reference source not found.**).

In this way, functions related to pharmacist and candidate have been built in the system, and the system can be shown more meaningfully by the combination of all those functions.
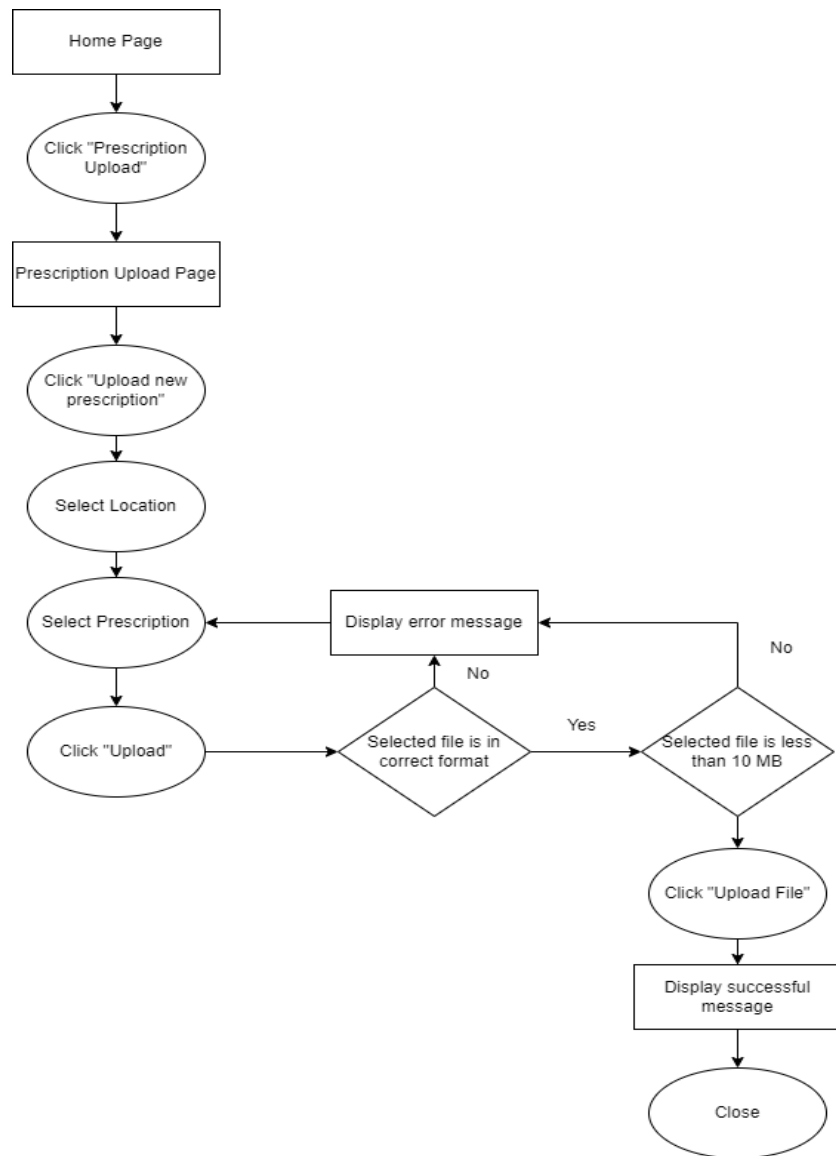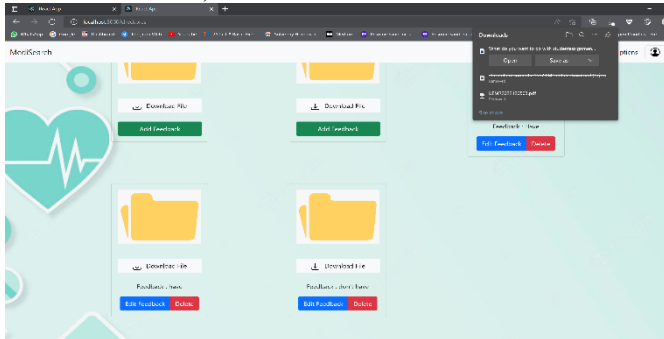
V.   DISCUSSION

This embedded online pharmacy application is the proposed system which was created as a solution for the current drug shortage which resulted in inability to find the medications. It is built using the above technologies and tools. For a project to be successful, the tools and technologies used for it are affected. This pharmacy system based on pharmacist and candidate will be easy if applied in practice. The functions were tested through selenium and SonarQube where the results were outstanding. The testing details are as follows.

A. SonarQube Testing

SonarQube is a code quality assurance tool that collects and evaluates source code and delivers reports on the overall code quality of a project. It combines static and dynamic analytic methodologies and allows for continuous quality tracking throughout time.
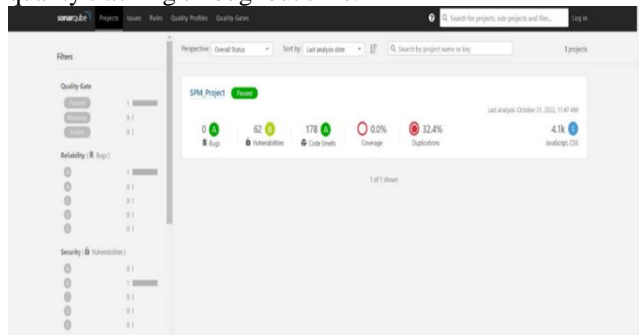

The above figure shows the overview status of analyzed project. There, bugs, vulnerabilities, code smells, duplications related to the project are shown separately (**Error! Reference source not found.**).

It can measure the quality gate, reliability, and security of the overall project.
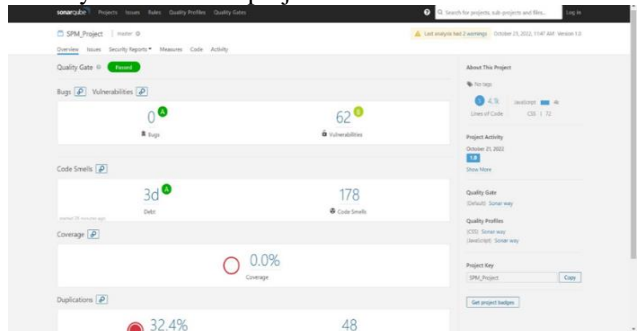

A project overview can be viewed as above. There you can take care about the project, project activity, quality gate and coverage in detail (**Error! Reference source not found.**).

The figure below shows how the SonarQube tool has checked the code quality of our project and shown the errors as project issues (Figure 23).
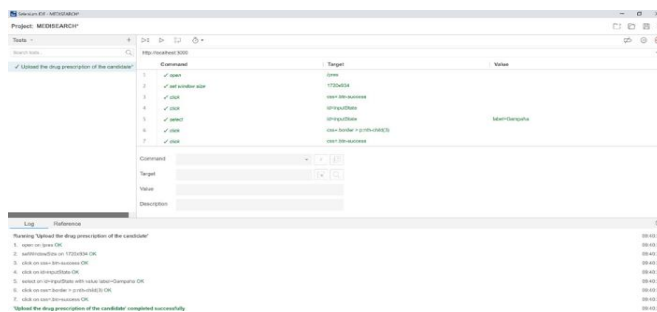

B. Selenium Testing

Selenium runs and displays our test in different web browsers, under different operating systems. Here, our test is deployed and shown under various environmental conditions under Selenium grid.
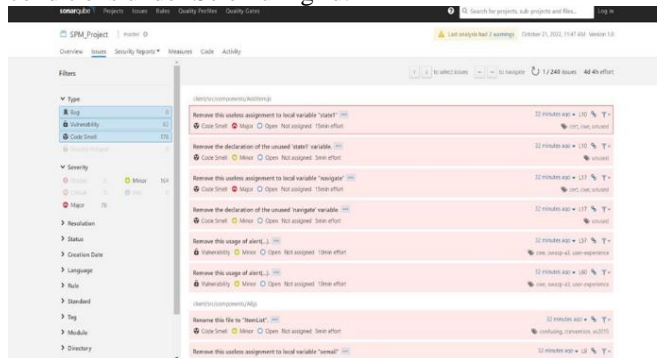
Above figure shows selenium IDE after running the test case. There it shows how the test case is run under upload the drug prescription of the candidate(Figure 23).

If the test cases are not run and an error is shown, the process will not be completed successfully.
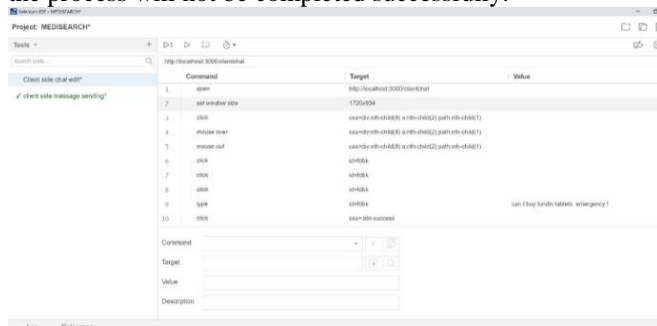
The above figure shows the automation according to a test script. It shows how to automate the test according to the command and the target URL.

VI.   CONCLUSION

The embedded online pharmacies system is suggested as a remedy for Sri Lanka's present lack of prescription and over the counter drugs. Due to the present economic crisis, there is a severe problem in society where there are a scarcity of medicine and people are unable to get it in a timely manner. It is a platform where all local

pharmacies are linked, allowing the applicant to quickly check the availability of a specific drug.

From this user friendly and effective system, the candidates can get an efficient service in a limited amount of time. When developing this application, the UI and the system outlook was thoroughly tested so that it will minimize the future drawbacks in the system.

The high technology used in this system enhances the clarity of the embedded pharmacy system. This proposed system will be a good solution for the Sri Lankan's, and it will open new doors in the pharmacy related industries

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