Napata collage

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Drugs and Pharmacy Locating System

Prepared by

1. Mohammed Jaafer Ibrahim
2. Mohammed ALwasila Ali

supervisor

Pr. Mohammed Fadalmola Abbas

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DEDICATION

Mohammed ALwasila Ali

I dedicate this project to my father ALwasila Ali who has been a great source of encouragement and support; to the man who suffered to bring me up, and raised me to the man I am today. I dedicate this project to the great woman who was there for me, in sickness and health and looked up after me in all stages of my life, my great mother that I love Rehab Shams Alden. I want to thank my colleagues, for the great team work, and the support provided by Mohammed Jaefar and his family. I want to thank my amazing supervisor D. Mohammed Fadalmola Abbas who has helped us a lot through our work, giving us ideas and opinions which has made a big impact to our project, and for always being there for us when we needed him.

Mohammed Jaafer Ibrahim

First and last belong to Allah, to the soul of all my life, I want to thank my love and my whole life a symbol of love and healing balm, to white heart ***my beloved Mother (Hajja****), who taught me that even the largest task can be accomplished if it is done one step at a time. To the great man, the men marker, the generation educator and the school of life and who taught me that the best type of knowledge to have is that which is taught for its own sake,* ***my father*** *(****Jaafer****). To the source of my happiness my brothers. To my friend and my* colleague Mohamed ALwasila Ali. *To those who were my salvation, to those who we spent the most beautiful moments with them my best friends to all of who encourage and support me, To my teachers from basic school till now, To my best teachers* ***Dr. Ysra Magzob Mahmoud, Dr. Amar Ibrahim*** .

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ABSTRACTION

The technological development that the world is witnessing today in various aspects of life has had a clear impact in many areas. Also, the rapid technological development that has appeared in smart phones has become very reliable in carrying out our daily tasks, we researchers proposed to create a two-part system, the first part, the customer part, which is It is an application that works on smart phone devices that use the Android operating system, the application provides a search for drugs to be searched, where a group of pharmacies are searched to find the required medicine, and the application also searches for pharmacies nearby of the customer on the map based on google (Api) including other (Apis) provided by Google and determine the exact location of the customer , And the second part, which is a management system for the customer's system (application), the system has been tested and made sure that the operations are done correctly and clearly so that anyone can deal with the system and use it with ease.

الملخص

التطور التكنولوجي الذي يشهده العالم اليوم في شتى مناحي الحياة كان له الاثر الواضح ف كثير من المجالات كما ان التطور التكنولوجي السريع الذي ظهر في الهواتف الذكية اصبح الاعتماد علية كبيرا جدا في انجاذ مهامنا اليومية,اقترحنا نحن الباحثون انشاء نظام من جزئين الجزء الاول جزء العميل وهو عبارة عن تطبيق يعمل علي اجهزة الهواتف الذكية التي تستخدم نظام تشغيل اندرويد , يقدم التطبيق البحث عن الادوية المراد البحث عنها حيث يتم البحث في مجموعة من الصيدليات لايجاد الدواء المطلوب ,ايضاً يقوم التطبيق بالبحث عن الصيدليات القريبة من العميل علي الخريطه بناء علي خرائط قوقل api متضمنا (Apis) اخرى موفرة من قبل قوقل وتحديد موقع العميل بصورة دقيقة, والجزء الثاني وهو عبارة عن نظام اداراة لنظام العميل (التطبيق), تم اختبار النظام والتاكد من ان العمليات تتم بصورة صحيحة وواضحة بحيث يتمكن اي شخص من التعامل مع النظام واستخدامة بكل سهولة ويسر.

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1.1 Introduction

One of The most important criteria in the evaluation of public health care systems is the availability of medicines, which is one of the most important human needs and may come before food, clothing and many other needs, Spending on medicines one of the reasons leading to poor families,citizens in cities and rural areas continue to have difficulty accessing medicines in time, Usually, when the patient or one of his relatives receives a prescription from the doctor, he or she will go to the pharmacy to receive or buy the medication. In some cases, no one or more drugs are available at the pharmacy. As the patient's need for medication is often time-sensitive, it will quickly be delivered to another pharmacy or more. It can also be purchased at a price higher than the real price. The search for medication is often time consuming and effortless. Some patients may also trust or prefer some medications instead of their counterparts which can be available at a much lower cost. In Sudan, the Federal Ministry of Health, represented in a central medical form widely known as Central Medical Supply or the National Medical Supply Fund (NMSF), pursues efforts to improve the capacity of pharmaceutical services, at the forefront of these efforts is the search for medicines through a website or phone. However, the patient still suffers a lot.

1.2 Research problem

- Difficulty in obtaining sufficient information about the availability of medication and pharmacies that contains it and contact information.
    - The drugs are not available permanently in many pharmacies.
    - Difficulty in locating the nearest pharmacies location.

1.2.1 Suggested solutions

A search application for the availability of medication and drug services through Android.

1.3 Research aims

- Make the most of Android applications to get enough information on the availability of medicines.
- Facilitate access to pharmacies and pharmaceutical services.
- Facilitate access to the nearest pharmaceutical services location and get contact information with them.

1.4 Research importance

- Make the most of GPS services.
- The importance of this study is to providing services to the community in general, by facilitating the search for medicines and the level of health services also to showing the importance of geographic information systems (GIS), taking advantage of it in creating an application with its benefit to find the nearest pharmacies.
- Save and reduce time and effort.
- Facilitate access to adequate information.
- Facilitate the search for medication.

1.5 Project Brief Description

The application first determines the location of the service applicant using **GPS** and then selects a group of pharmacies that contain the required medicine. The search of group of pharmacies is searched to determine if the medication is available ,the application saved the data for the service sites (contact information, nearest location to receive the service) and the user or service applicant enters the application and selects the purpose and locate the nearest location to receive the service on Google Maps.

1.6 Search limits

- Android application to access the drug availability information in pharmacies and the location of the nearest pharmacies.
- Works via the Internet.
- Inquiry about pharmacies locations inside Khartoum State.

1.7 Research Methodology

The descriptive and analytical approach was followed by describing and analyzing the system and then building the system.

1.8 Research Structure

In addition to this section containing the introduction, the research structure comes in five other sections, and detailed as follows:

- **Chapter2** Background and literature review.
- **Chapter3** This chapter describes Analysis and the methodology and the phases of the application creation.
- **Chpater4** This chapter contain Tools and technique used in research and Design and implementation.
- **Chpater5** In this chapter result and conclusion

2.1 Introduction

Information and communication technologies have made dramatic changes in our lives. Healthcare communities also made use of these technologies. Using computerized medical knowledge, electronic patients' information and telecommunications a lot of applications are now established throughout the world. These include better ways of information management, remote education, telemedicine and public services. Yet, a lot of people don't know about these technologies and their applications. Understanding the concepts and ideologies behind these terms, knowing how they will be implemented, what is it like to use them and what benefit will be gained, are basic knowledge steps approaching these technologies. Difficulties using these services, especially in developing countries should not be neglected or underestimated. [24]

2.1.1 Smart phones

Today almost everyone carries a smartphone. People use it for various purposes not just for calling, sending texts or accessing the Internet. The personal smartphone is not just used for staying in touch, but it is also used for performing office work. The varied uses of smartphones have been widely chronicled in literature and there is exhaustive literature listing the various benefits derived from its use. The advent of the smartphone has changed the workflow in the 21st century. It has not only ushered in globalization but also benefited from globalization.

Figure 2. 1 describe different smart phones type.

Smartphones now enable us to stay connected and work on the go, Smartphones represent the maturity stage in the product life cycle of the cellular phone and so they incorporate many innovations and features (Harrell and Taylor, 1981). Being a mature cell phone product, it appeals to an ever-changing and shifting demographic (Day, 1981). As such, there is a constant attempt to converge more and more technologies into it such as maps, GPS, e-mail, multimedia, Internet, and television.

In the 1990s, the cell phone and Internet technologies started to converge (Urbaczewski et al., 2002). Mobile personal devices have the major advantage over office devices such as PCs in that they can be used literally anywhere – as long as Internet service is available (van Biljon and Kotzé, 2007). Due to convergence in the electronics industry, it became possible to add several new functionalities to existing basic cellular service, for example, adding mobile TV or Internet service to a cell phone (O'Donnell, 2004). Several years ago, the convergence started to focus on PDAs and cell phone functionality (Jones and Wienbar, 2004), setting the stage for mobile Internet – which is any data-intensive activity that can be performed on a mobile phone and requires network access (Sugai, 2005). The mobile Internet is based on convergence of mobile communications and any wireless Internet connection including Wi-Fi, Bluetooth, WiMax, and so on (Inseong et al., 2007) [30].

2.1.2 Global Positioning System (GPS)

The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense(DoD). GPS was originally intended for military applications, but in the 1980s, the government made the system available for civilian use. GPS works in any weather conditions, anywhere in the world, 24 hours a day. There are no subscription fees or setup charges to use GPS.

GPS is a system. It's made up of three parts:

- Satellites: act like the stars in constellations—we know where they are supposed to be at any given time.
- The ground stations: use radar to make sure they are actually where we think they are.

- A receiver: it is the equipment found is phones or cars, and is constantly listening for a signal from these satellites. The receiver figures out how far away they are from some of satellites [31].

❖ How GPS Works

GPS is a system of 30+ navigation satellites circling Earth. We know where they are because they constantly send out signals. A GPS receiver in your phone listens for these signals. Once the receiver calculates its distance from four or more GPS satellites, it can figure out where you are.[31].

2.2 Android System

Android is a mobile operating system based on a modified version of the Linux kernel and other open source software, designed primarily for touchscreen mobile devices such as smartphones and tablets. Android is developed by a consortium of developers known as the Open Handset Alliance, with the main contributor and commercial marketer being Google. [1]

Initially developed by Android Inc., which Google bought in 2005, Android was unveiled in 2007, with the first commercial Android device launched in September 2008. The current stable version is Android 10, released on September 3, 2019. The core Android source code is known as Android Open Source Project (AOSP), which is primarily licensed under the Apache License. This has allowed variants of Android to be developed on a range of other electronics, such as game consoles, digital cameras, PCs and others, each with a specialized user interface. Some well-known derivatives include Android TV for televisions and Wear OS for wearables, both developed by Google.

Android's source code has been used as the basis of different ecosystems, most notably that of Google which is associated with a suite of proprietary software called Google Mobile Services (GMS), [2] that frequently comes pre-installed on said devices. This includes core apps such as Gmail, the digital distribution platform Google Play and associated Google Play Services development platform, and usually apps such as the Google Chrome web browser. These apps are licensed by manufacturers of Android devices certified under standards imposed by Google. Other competing Android ecosystems include Amazon.com's Fire OS, or LineageOS. Software distribution is generally offered through proprietary application stores like Google Play Store or

Samsung Galaxy Store, or open source platforms like **Aptoide** or **F-Droid**, which utilize software packages in the APK format.

Android has been the best-selling OS worldwide on smartphones since 2011 and on tablets since 2013. As of May 2017, it has over two billion monthly active users, the largest installed base of any operating system, and as of December 2018, the Google Play Store features over 2.6 million apps. [3]

2.3 Android History

Android Inc. was founded in Palo Alto, California, in October 2003 by Andy Rubin, Rich Miner, Nick Sears, and Chris White.[4] Rubin described the Android project as "tremendous potential in developing smarter mobile devices that are more aware of its owner's location and preferences".

2.3.1 Android Version History

The **version history of the Android mobile operating system** began with the public release of the Android beta on November 5, 2007. The first commercial version, Android 1.0, was released on September 23, 2008. Android is continually developed by Google and the Open Handset Alliance, and it has seen a number of updates to its base operating system since the initial release.

- Code Names

Android 1.0 and 1.1 were not released under specific code names, although Android 1.1 was unofficially known as Petit Four. Android code names were confectionery-themed and have been in alphabetical order since 2009's Android 1.5 Cupcake. Google ended the confectionery theming scheme in 2019 beginning with Android 10.[5] [6] the most recent version of Android is Android 10, which was released in September 2019.

Code name	Version numbers	Initial release date	API level
No codename	1.0	September 23, 2008	1
Petit Four (only internally used)	1.1	February 9, 2009	2
Cupcake	1.5	April 27, 2009	3
Donut	1.6	September 15, 2009	4
Eclair	2.0 – 2.1	October 26, 2009	5 – 7
Froyo	2.2 – 2.2.3	May 20, 2010	8
Gingerbread	2.3 – 2.3.7	December 6, 2010	9 – 10
Honeycomb	3.0 – 3.2.6	February 22, 2011	11 – 13
Ice Cream Sandwich	4.0 – 4.0.4	October 18, 2011	14 – 15
Jelly Bean	4.1 – 4.3.1	July 9, 2012	16 – 18
KitKat	4.4 – 4.4.4	October 31, 2013	19 – 20
Lollipop	5.0 – 5.1.1	November 12, 2014	21 – 22
Marshmallow	6.0 – 6.0.1	October 5, 2015	23
Nougat	7.0 – 7.1.2	August 22, 2016	24 – 25
Oreo	8.0 – 8.1	August 21, 2017	26 – 27
Pie	9.0	August 6, 2018	28
Android 10	**10.0**	September 3, 2019	29

Figure 2. 2 describe versions of android systems.

2.4 Android Applications

Applications ("apps"), which extend the functionality of devices, are written using the Android software development kit (SDK)[7] and, often, the Java programming language.[8] Java may be combined with C/C++,[9] together with a choice of non-default runtimes that allow better C++ support.[11] The Go programming language is also supported, although with a limited set of application programming interfaces (API).[12] In May 2017, Google announced support for Android app development in the Kotlin programming language.[13]

The SDK includes a comprehensive set of development tools,[8] including a debugger, software libraries, a handset emulator based on QEMU, documentation, sample code, and tutorials. Initially, Google's supported integrated development environment (IDE) was Eclipse using the Android Development Tools (ADT) plugin; in December 2014, Google released Android Studio, based on IntelliJ IDEA, as its primary IDE for Android application development. Other development tools are available, including a native development kit (NDK) for applications or extensions in C or C++, Google App Inventor, a visual environment for novice programmers, and various cross platform mobile web applications frameworks. In January 2014, Google unveiled an framework based on Apache Cordova for porting Chrome HTML 5 web applications to Android, wrapped in a native application shell.[14]

❖ Android Software Development (SDK)

Android software development is the process by which new applications are created for devices running the Android operating system. Google states that[15] "Android apps can be written using Kotlin, Java, and C++ languages" using the Android software development kit (SDK), while using other languages is also possible. All non-JVM languages, such as Go, JavaScript, C, C++ or assembly, need the help of JVM language code, that may be supplied by tools, likely with restricted API support. Some programming languages and tools allow cross-platform app support (i.e. for both Android and iOS). Third party tools, development environments, and language support have also continued to evolve and expand since the initial SDK was released in 2008. In addition, with major business entities like Walmart, Amazon, and Bank of America eyeing to engage and sell through mobiles, mobile application development is witnessing a transformation.[16]

2.5 Google Maps

Google Maps is a web mapping service developed by Google. It offers satellite imagery, aerial photography, street maps, 360° panoramic views of streets (Street View), real-time traffic conditions, and route planning for traveling by foot, car, bicycle and air (in beta), or public transportation.

Google Maps began as a C++ desktop program at Where 2 Technologies. In October 2004, the company was acquired by Google, which converted it into a web application.

Google Map Maker allowed users to collaboratively expand and update the service's mapping worldwide but was discontinued from March 2017. However, crowdsourced contributions to Google Maps were not discontinued as the company announced those features will be transferred to the Google Local Guides program. [16]

Google Maps for Android and iOS devices was released in September 2008 and features **GPS** turn-by-turn navigation along with dedicated parking assistance features. In August 2013, it was determined to be the world's most popular app for smartphones, with over 54% of global smartphone owners using it at least once.[17], in 2012, Google reported having over 7,100 employees and contractors directly working in mapping.[18], in 2017, along with several other services including YouTube, Chrome, Gmail, Search, and Google Play, Google Maps reached over 1 billion users.[19]

2.5.1 Google Maps History

Google Maps first started as a C++ program designed by two Danish brothers, Lars and Jens Eilstrup Rasmussen, at the Sydney-based company Where 2 Technologies. It was first designed to be separately downloaded by users, but the company later pitched the idea for a purely Web-based product to Google management, changing the method of distribution. In October 2004, the company was acquired by Google Inc. Where it transformed into the web application Google Maps. In the same month, Google acquired Keyhole, a geospatial data visualization company (with controversial investment from the CIA), whose marquee application suite, Earth Viewer, emerged as the highly successful Google Earth application in 2005 while other aspects of its core technology were integrated into Google Maps. In September 2004, Google acquired Zip Dash, a company that provided real-time traffic analysis. [20]

2.6 Google Maps Functionality

2.6.1 Directions and Transit

Google Maps provides a route planner, allowing users to find available directions through driving, public transportation, walking, or biking. Google has partnered globally with over 800 public transportation providers to adopt General Transit Feed Specification (GTFS), making the data available to third parties. The app will also have starred lines now to indicate users' transit route in

the latest update in October 2019. Along with this the incognito mode, eyes free walking navigation features have been released earlier [20].

2.6.2 Traffic Conditions

In 2007, Google began offering traffic data as a colored overlay on top of roads and motorways to represent the speed of traffic. Crowdsourcing is used to obtain the GPS-determined locations of a large number of cellphone users, from which live traffic maps are produced.

Google has stated that the speed and location information it collects to calculate traffic conditions is anonymous. Options available in each phone's settings allow users not to share information about their location with Google Maps. Google stated, "Once you disable or opt out of My Location, Maps will not continue to send radio information back to Google servers to determine your handset's approximate location". [20]

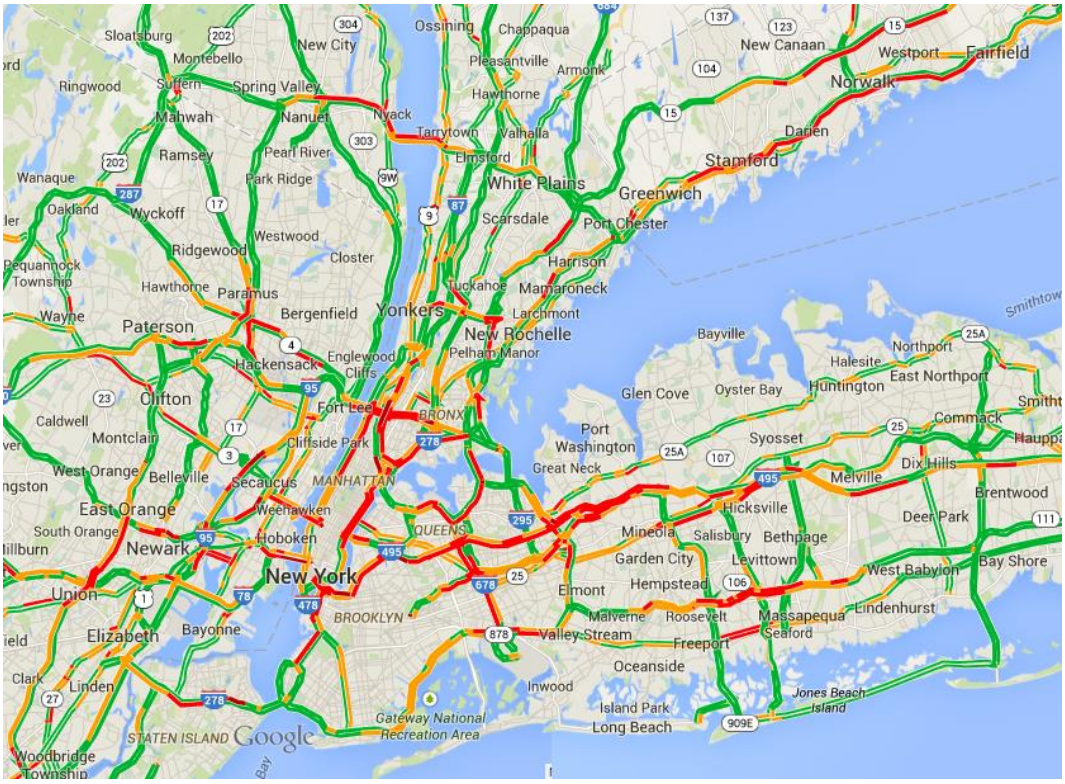


Figure 2. 3 describe google map traffic.

2.7 Google Maps Mobile app

Google Maps is available as a mobile app for the Android and iOS mobile operating systems. The Android app was first released in September 2008, though the GPS-localization feature had been in testing on cellphones since 2007. Up until iOS 6, the built-in maps application on the iOS operating system was powered by Google Maps. However, with the announcement of iOS 6 in June 2012, Apple announced that they had created their own Apple Maps mapping service, which officially replaced Google Maps when iOS 6 was released on September 19, 2012. However, at launch, Apple Maps received significant criticism from users due to inaccuracies, errors and bugs. One day later, *The Guardian* reported that Google was preparing its own Google Maps app, which was released on December 12, 2012. Within only two days, the application had been downloaded over ten million times.[20]

Figure 2. 4 describe google map direction.

2.7.1 Google APIs

Google APIs is a set of application programming interfaces (APIs) developed by Google which allow communication with Google Services and their integration to other services. Examples of these include Search, Gmail, Translate or Google Maps. Third-party apps can use these APIs to take advantage of or extend the functionality of the existing services.

The APIs provide functionality like analytics, machine learning as a service (the Prediction API) or access to user data (when permission to read the data is given). Another important example is an embedded Google map on a website, which can be achieved using the Static maps API, [32] Places API [33] or Google Earth API.[34]

2.7.2 Google maps API key

After the success of reverse-engineered mashups such as chicagocrime.org and housingmaps.com, Google launched the Google Maps API in June 2005 to allow developers to integrate Google Maps into their websites. It was a free service that didn't require an API key until June 2018 (changes

went into effect on July 16), when it was announced that an API key linked to a Google Cloud account with billing enabled would be required to access the API. The API currently does not contain ads, but Google states in their terms of use that they reserve the right to display ads in the future.

By using the Google Maps API, it is possible to embed Google Maps into an external website, on to which site-specific data can be overlaid. Although initially only a JavaScript API, the Maps API was expanded to include an API for Adobe Flash applications (but this has been deprecated), a service for retrieving static map images, and web services for performing geocoding, generating driving directions, and obtaining elevation profiles. Over 1,000,000 web sites use the Google Maps API, making it the most heavily used web application development API. In September 2011, Google announced it would deprecate the Google Maps API for Flash.

The Google Maps API is free for commercial use, provided that the site on which it is being used is publicly accessible and does not charge for access, and is not generating more than 25,000 map accesses a day. Sites that do not meet these requirements can purchase the Google Maps API for Business, as of 21 June 2018, Google increased the prices of the Maps API and requires a billing profile.[35]

2.8 E-health

EHealth is a broad term, and refers to the use of information and communications technologies in HealthCare, EHealth covers a lot of territory, which is why digital health industry experts often contest exactly what the term means – and to add to the confusion, it's also frequently used as a synonym for Health IT.

The Journal of Medical Internet Research defines eHealth as:

"...an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies, In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve healthcare locally, regionally, and worldwide by using information and communication technology."

The World Health Organization (WHO) defines eHealth as:

"...the cost-effective and secure use of information and communication technologies in support of the health and health-related fields including healthcare, health surveillance and health education, knowledge and research."

The European Commission defines eHealth as:

"...the use of modern information and communication technologies to meet needs of citizens, patients, healthcare professionals, healthcare providers, as well as policy makers." [21]

2.8.1 Sub-domains of Digital Health Such As:

- Electronic Health Records (EHR)
- Electronic Medical Records (EMR)
- Telehealth and telemedicine
- Health IT systems
- Consumer health IT data
- Virtual healthcare
- Mobile Health (mHealth)
- Big data systems used in digital health

2.8.2 Mobile Health (mHealth)

❖ MHealth

MHealth – also known as mobile health - refers to the practice of medicine and public health supported by mobile devices such as mobile phones, tablets, personal digital assistants and the wireless infrastructure.

Within digital health, mHealth encompasses all applications of telecommunications and multimedia technologies for the delivery of healthcare and health information. [22]

❖ Benefits of MHealth

For consumers, a major benefit of mHealth is its convenience. Wearable devices and other mobile technology allow users to continuously track and manage certain health data without having to see

their healthcare provider, mHealth can also help bridge gaps in care by allowing patients to communicate with their physician or care team and vice versa without meeting face to face, Secure messaging [23]

- **Disadvantages of MHealth**

One disadvantage of mHealth apps is that their privacy policies may lag behind those of other apps. Even when privacy policies are present, users may not always read them, which can lead to a lack of understanding about how vendors or other parties use their health data. Additionally, not all mHealth apps are compliant with the Health Insurance Portability and Accountability Act (HIPAA), meaning there is no guarantee that a user's health information will be protected or that users will be notified if there is a data breach. [23]

2.8.3 Telemedicine

Telemedicine defined as the use of medical data exchanged between two sites with the help of electronic communication systems to improve a patient's health status. Telemedicine includes a growing variety of services and applications using different types of telecommunication technologies such as smart phones, two-way videos, wireless tools etc. [25]

2.9 MHealth vs. Telehealth

While there can be overlap between telehealth and mHealth, the two are not interchangeable. The main difference is that mHealth is delivered exclusively via mobile devices. While telehealth can be delivered on mobile platforms, it refers to the delivery of remote care via electronic information and telecommunications technologies, Telehealth visits typically take place via videoconferencing between a physician or nurse and the patient; although, the term also includes remote patient monitoring through wireless medical devices.

2.10 Other Research

Multiple previous studies in the field of locating using the global positioning system (GPS) and its applications, such applications to locate the drug easily to the patient through a proposed application Of those studies:

2.10.1 Locating the Nearest Pharmacy with the Desired Medicine

(by Mboya, Brenda Akoth, Ashesi University,2018)

This project seeks to make locating medicine easier for patients. Through the proposed application, patients can search for medicine and the application would suggest the nearest pharmacy with the desired drug. In addition, patients can make medicine reservation and access directions to the pharmacy via google maps. The proposed application also enables pharmacists to view medicine reservation from potential clients. In addition, they can update medicine availability on their drug database. They can also access the most searched drug to make better decisions on the drugs they need to have in their pharmacies. The result of this project is that patients do not need to worry about moving from one pharmacy to the other searching for medication. Just by a click of a button, they can locate the drugs they want and make a reservation for it.

- **Consistent:**

Search for medicine and the application would suggest the nearest pharmacy and access directions to the pharmacy.

- **Inconsistent:**

Patients can make medicine reservation and access directions to the pharmacy via google maps. The proposed application also enables pharmacists to view medicine reservation from potential clients as shown in Figure :(2.5).

This system uses the google maps using web development language or in specific java script language to locate nearby pharmacies as shown in Figure: (2.6)**.**

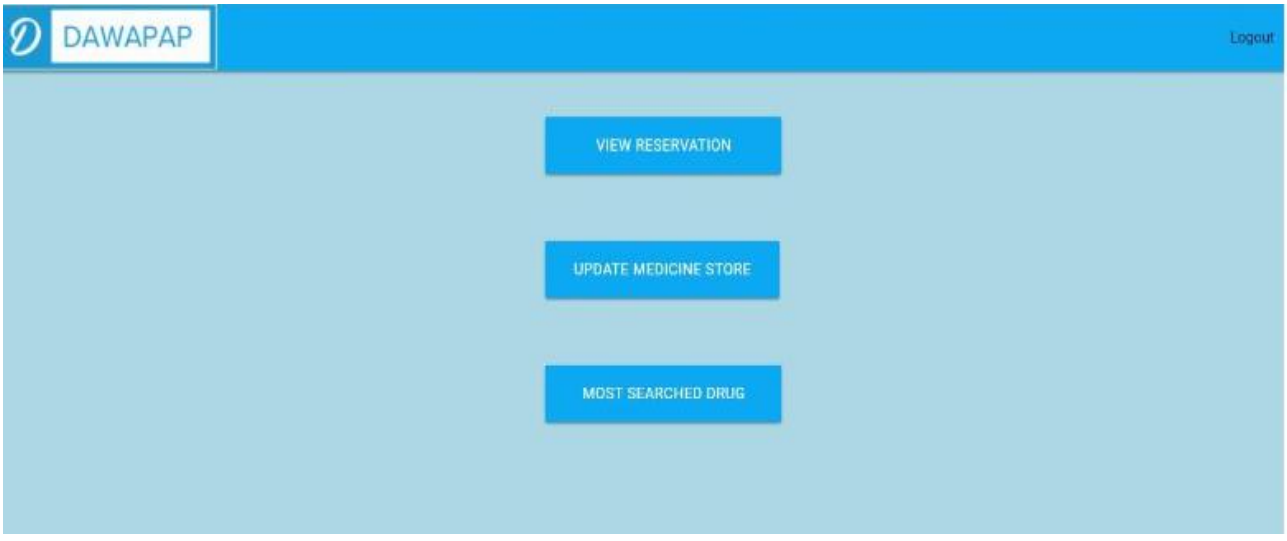


Figure 2. 5 describe dashboard of the above system.

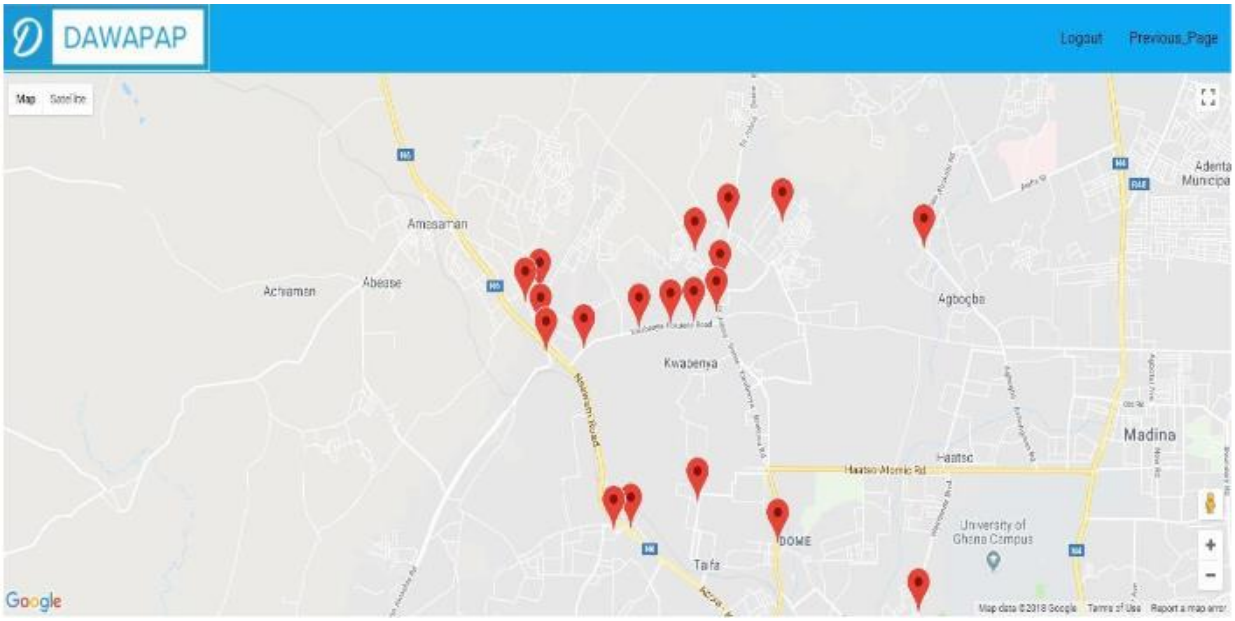


Figure 2. 6 describe nearest pharmacy.

2.10.2 Creating a Mobile Application based on a Model to Easily Locate Pharmacies in Urban Areas:

(By Liliana Enciso-Quispe1*, Elmer Zelaya2 and Pablo Alejandro Quezada-Sarmiento3)

Objectives: To develop a mobile application for the location of open pharmacies, in order to geolocalize and provide a fast and timely service in accordance with the politics in health of Ecuador. Methods/Statistical Analysis: Our proposal is to design a geolocation model for pharmacies in urban areas and test it with a prototype application that combines different technologies, such as HTML5, CSS3, JavaScript, and the Google Maps API. Findings: The proposed mobile web provides a 24/7 service for virtually any device with pre-installed GPS capacity. The application itself will help to impact the environment and to estimate the benefits according to their functionality and accessibility. Applications/Improvement: The resulting prototype includes interactivity features and automatic updates that other applications of similar characteristics, do not offer yet. Finally, it is important to mention that during the development of this model, various aspects related to the potential users and the architecture of the service was considered as well. Only to mention some: the type of mobile device that is being used, the operating system of the device, and the different software architectures available as shown in figure. [27]

❖ **Consistent:**

The system locate the location of pharmacies in order and display it on google maps in the system and show pharmacy name when click pharmacy marker.

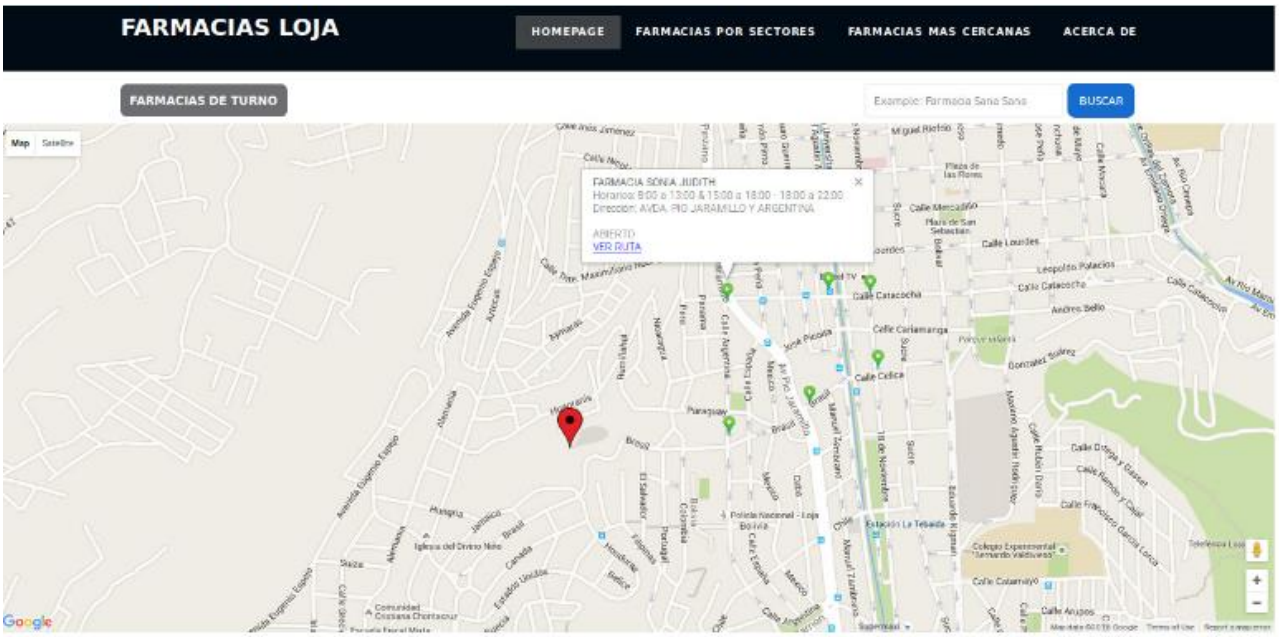


Figure 2. 7 describe locate location on google maps.

❖ **Inconsistent:**

A prototype application that combines different technologies, such as HTML5, CSS3, JavaScript, and the Google Maps API where ours system using android system.

2.10.3 Hospital Finder by Android Software

This thesis aims to make an android application that is looking for hospitals with a specific specialization and choosing the distance between the user and its location with respect to the type of the health care unit: hospital, clinic or health center. Moreover it delivers brief information about it, with the ability of showing the location on the map, and also drawing the route between the user and the health care unit. By implementing and testing the application that has been able to reduce the problem, we were facing another problem. This is missing location data and information of some health care units in Google maps. [26]

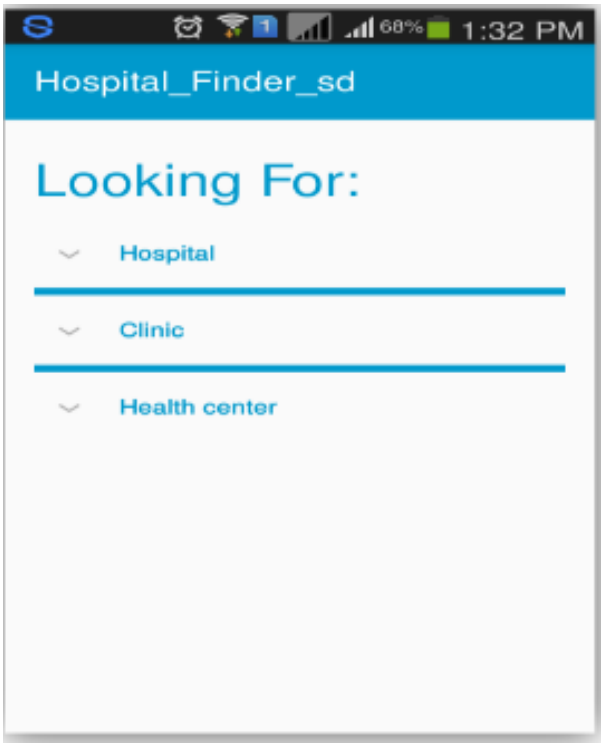


Figure 2. 8 describe route between user location and health care.

❖ **Consistent:**

It delivers brief information about health care with the ability of showing the location on the map, and also drawing the route between the user and the health care unit.

❖ **Inconsistent:**

This study search for health care location on map only but our research search for medication and location of health care (pharmacies).

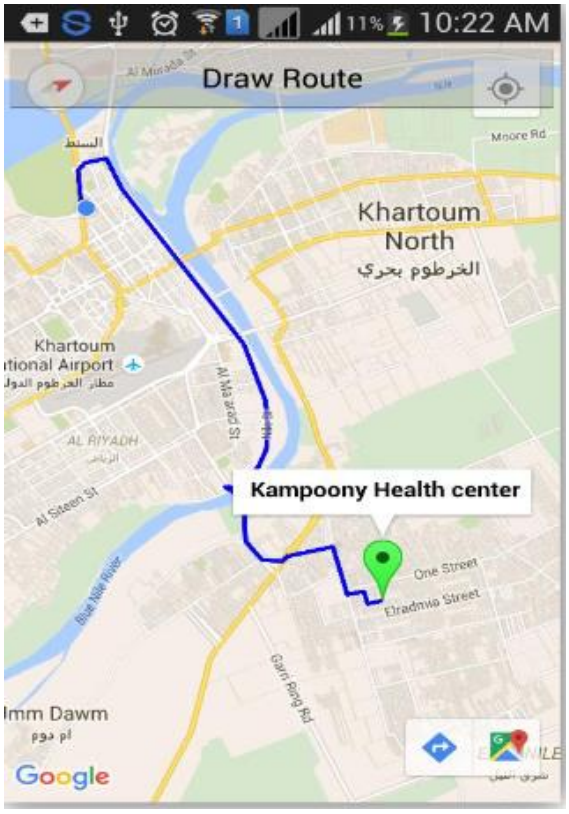


Figure 2. 9 describe what customer looking for.

3.1 Unified Modeling Language (UML)

Is a standardized general-purpose modeling language in the field of object-oriented software engineering UML includes a set of graphic notation techniques to create visual models of object-oriented software systems, UML combines techniques from data modeling, business modeling, object modeling, and component modeling and can be used throughout the software development life-cycle and across different implementation technologies. [28]

3.2 Modeling

There is a difference between a UML model and the set of diagrams of a system. A diagram is a partial graphic representation of a system's model. The model also contains documentation that drives the model elements and diagrams (such as written use cases).

UML diagrams represent two different views of a system model:

- **Static (or structural) view**

This view emphasizes the static structure of the system using objects, attributes, operations, and relationships. Ex: Class diagram, Composite Structure diagram.

- **Dynamic (or behavioral) view**

This view emphasizes the dynamic behavior of the system by showing collaborations among objects and changes to the internal states of objects. Ex: Sequence diagram, Activity diagram, State Machine diagram.

3.3 Diagrams Overview

UML 2.2 has 14 types of diagrams divided into multiple categories as shown in the figure below.

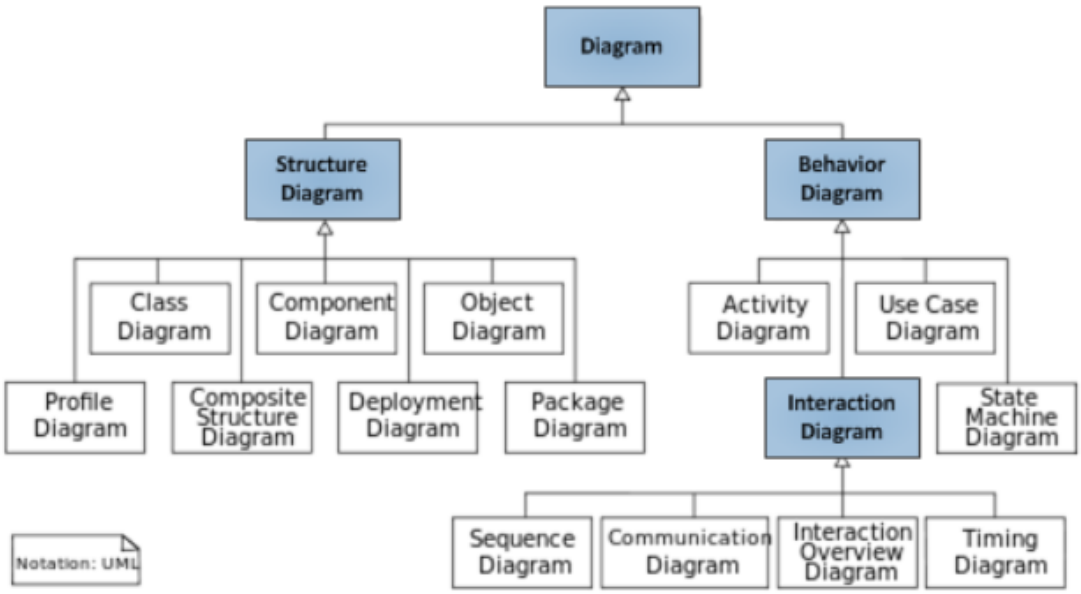


Figure 3. 1 describe structure diagram.

Structure Diagrams

These diagrams emphasize the things that must be present in the system being modeled. Since they represent the structure, they are used extensively in documenting the software architecture of software systems.

Behavior Diagrams

These diagrams emphasize what must happen in the system being modeled. Since they illustrate the behavior of a system, they are used extensively to describe the functionality of software systems.

- ***State Machine Diagram***

Describes the states and state transitions of the system.

- ***Use Case Diagram***

Describes the functionality provided by a system in terms of actors, their goals represented as use cases, and any dependencies among those use cases.

Interaction Diagrams

These diagrams are a subset of behavior diagrams, emphasizing the flow of control and data among the things in the system being modeled.

❖ *Sequence Diagram*

Shows how objects communicate with each other in terms of a sequence of messages. Also indicates the lifespans of objects relative to those messages.

3.4 Use Case Diagram

This diagram is used to explain and describe how the system works and how it is used by customers or system administrators.

3.5 System Use Case

Describe all core functionality of the system that customer and admin and pharmacist play as actor as shown in figure: (3.2).

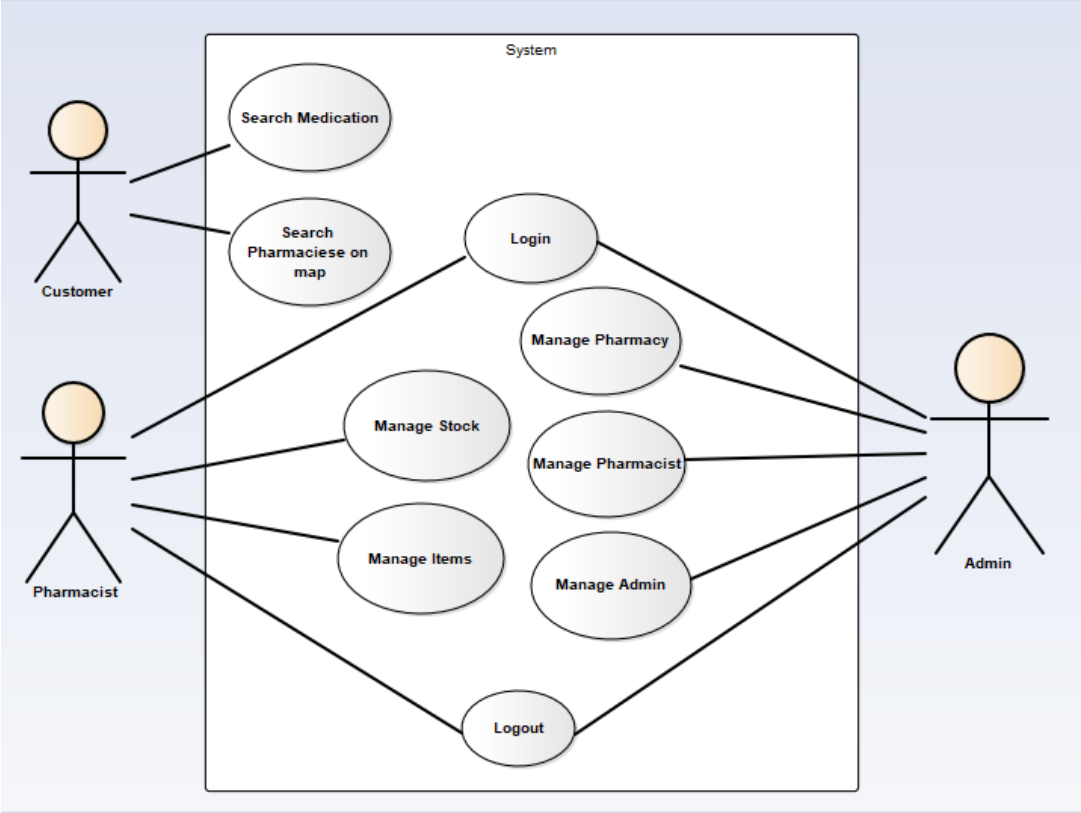


Figure 3. 2 use case diagram for whole system or app that describe all activity.

3.5.1 System Sub Customer and Pharmacist Use Case

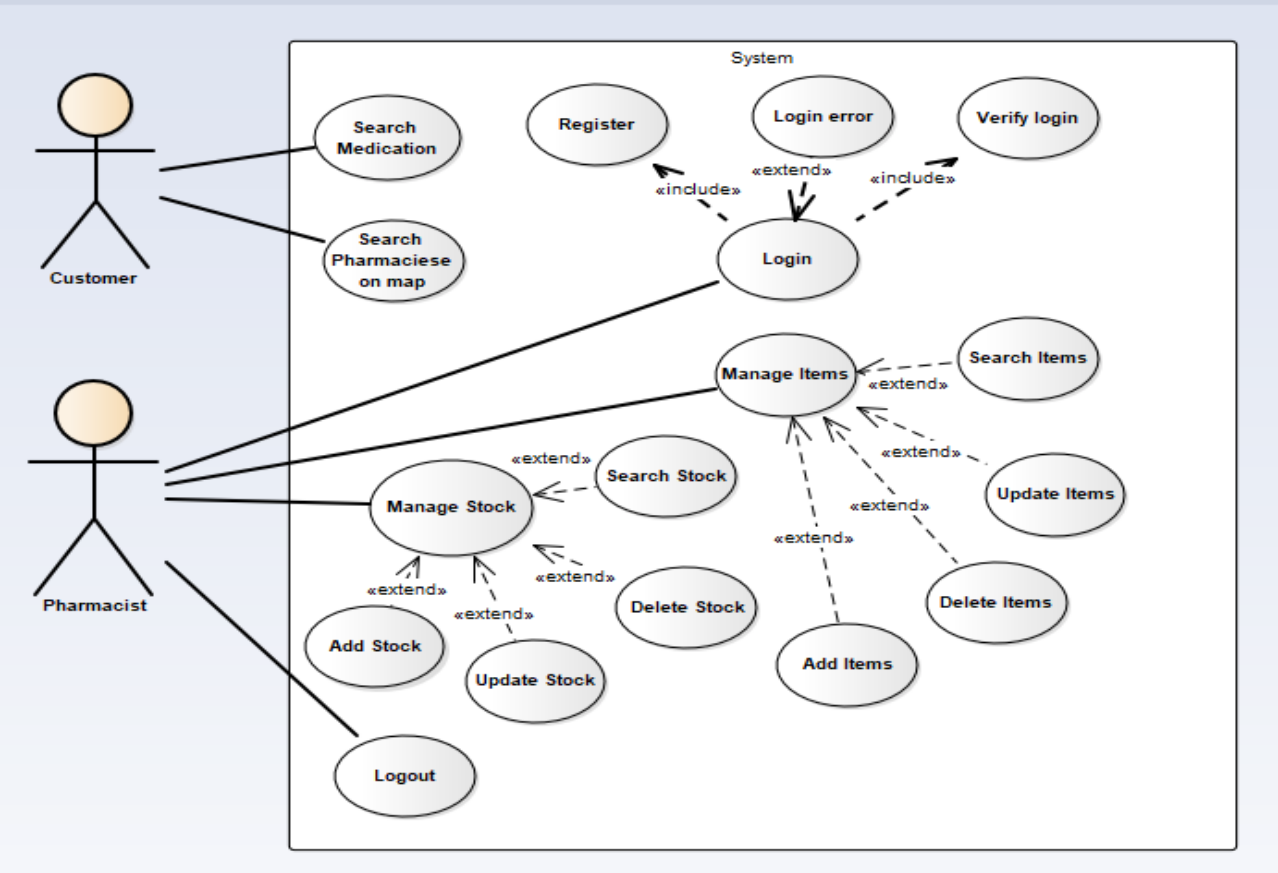


Figure 3. 3 use case diagram for sub system for customer and pharmacist that describe all activity.

3.5.2 System Sub Admin Use Case

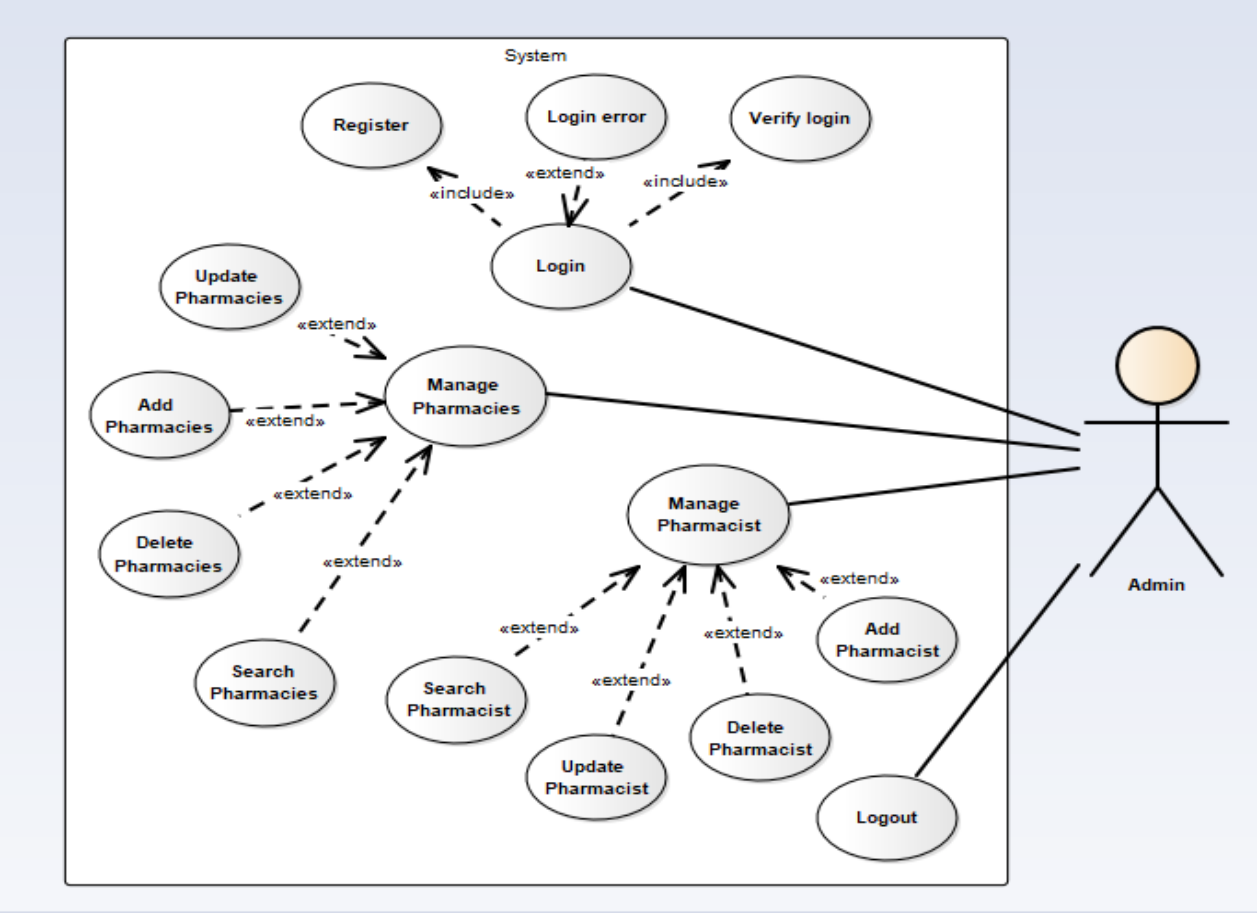


Figure 3. 4 use case diagram for sub system for customer and pharmacist that describe all activity.

3.6 Sequence Diagram

Used to show the flow of data, messages, and objects between different system components.

- The horizontal components in the figure explain the common objects in the system
- The vertical components explain the order of messages exchanged based on the order in the system.

Six sequence diagrams were used in this system, each of which shows the processes involved in each function or process provided by the system, either to the system administrator or the client.

3.6.1 Search Medicine

The user can search for a medicine and find out where the medicine is shown Figure (3.5).

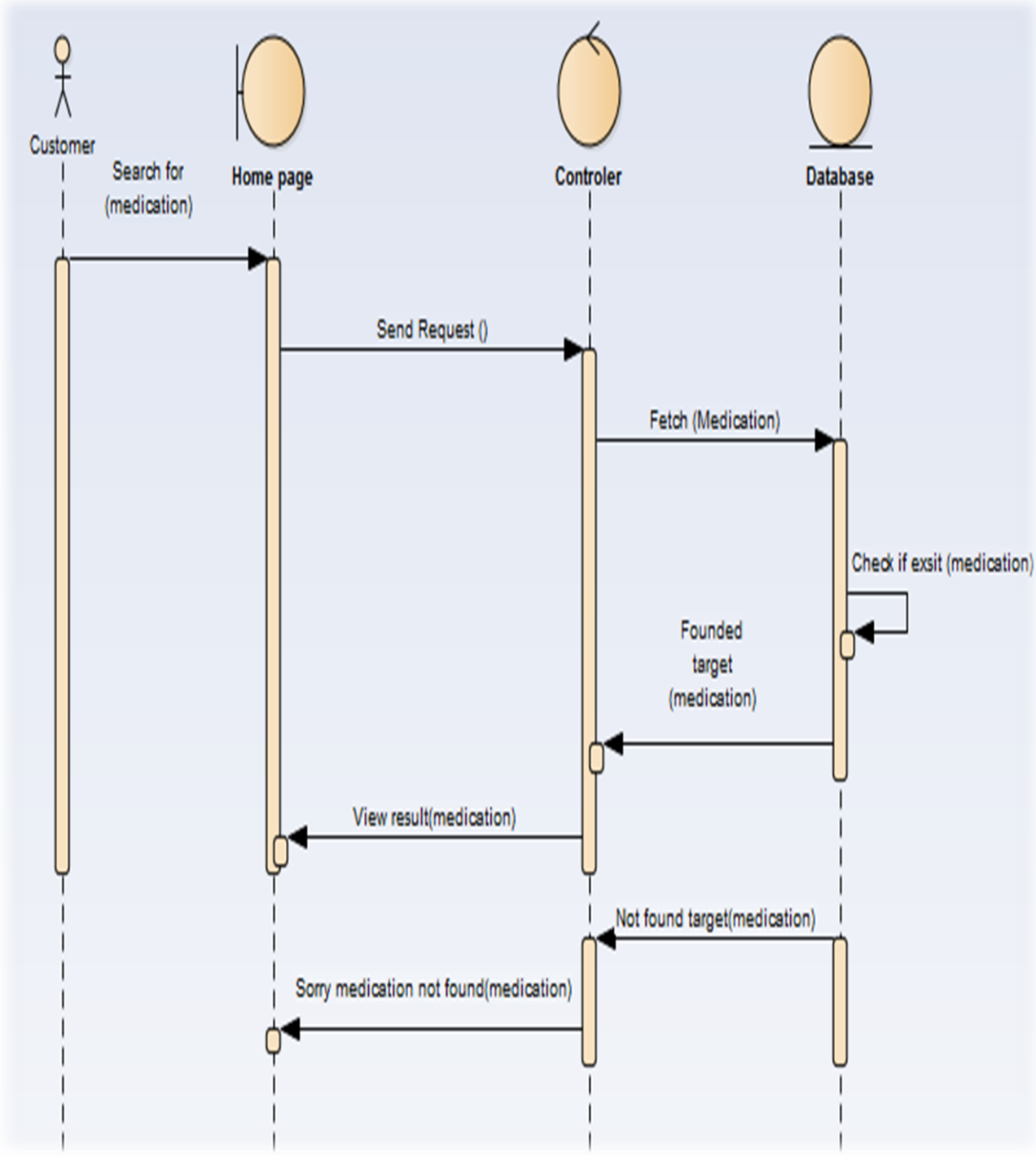


Figure 3. 5 sequence diagram that describe search activity stage.

Table 3. 1 describe search medication sequence.

Use Case Name	Search medicine
Actors	Customer
Precondition	Successfully Login
Main Flow of Event	1-The user searches for the target medicine. 2-The system check whether the medicine is available or not. 3-The system displays the search result
Post Condition	The system displays the search results for the desired drug and displays the search results

3.6.2 Search Pharmacies

The user can find the places of pharmacies close to his location by using GPS system as shown in table: (3.2).

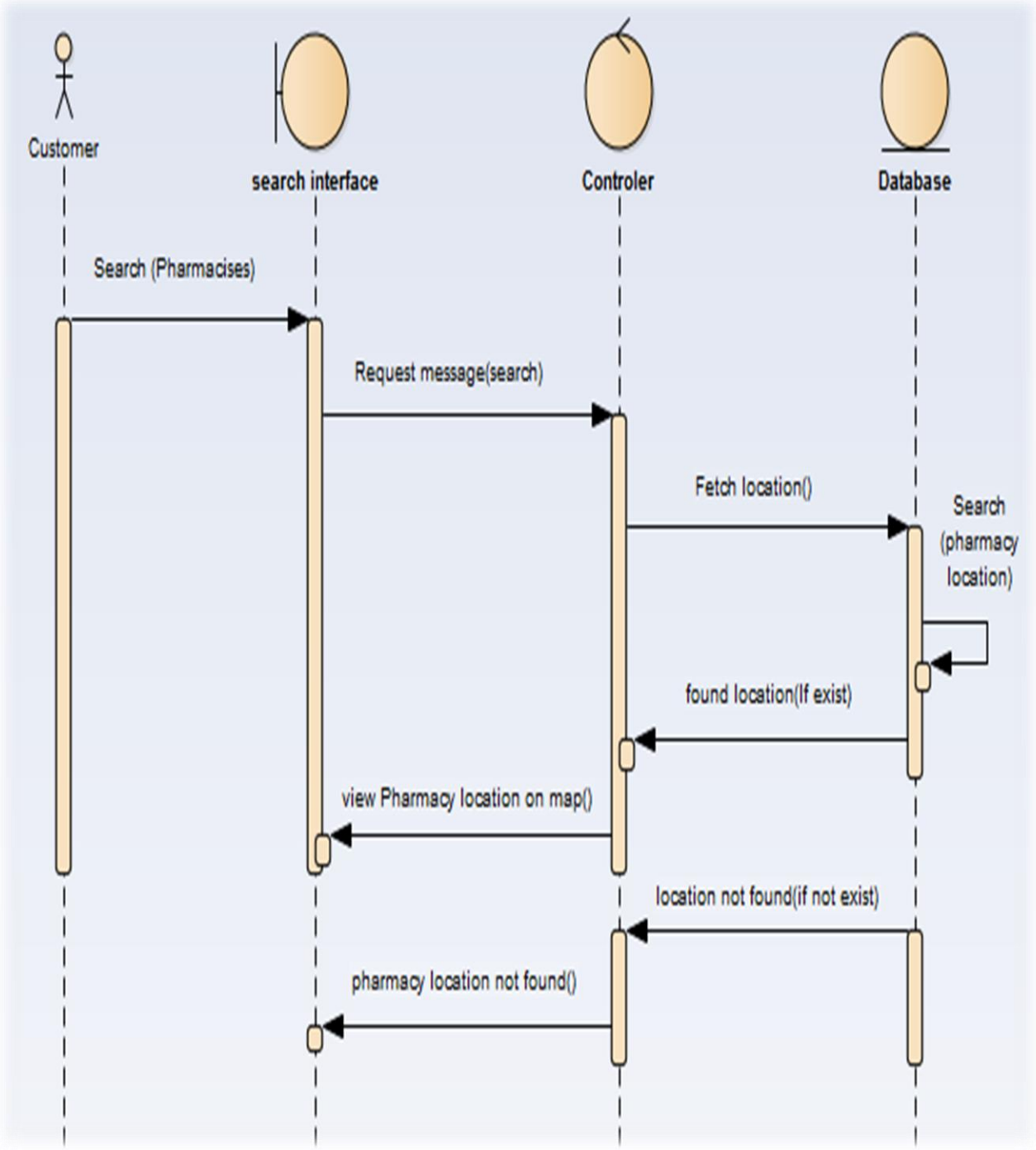


Figure 3. 6 sequence diagram that describe search neared pharmacies activity.

Table 3. 2 describe sequence of search pharmacies.

Use Case Name	Search pharmacies
Actors	Customer
Precondition	Successfully Login
Main Flow of Event	1-The user searches for pharmacies. 2-The system checks for pharmacies near the user's location using GPS. 3-The system displays the search result
Post Condition	The system displays the search results for pharmacies and displays the search results

3.6.3 Login Admin

The system asks the administrator to enter the username and password to log into the system administrator shown as Figure (3.7) below.

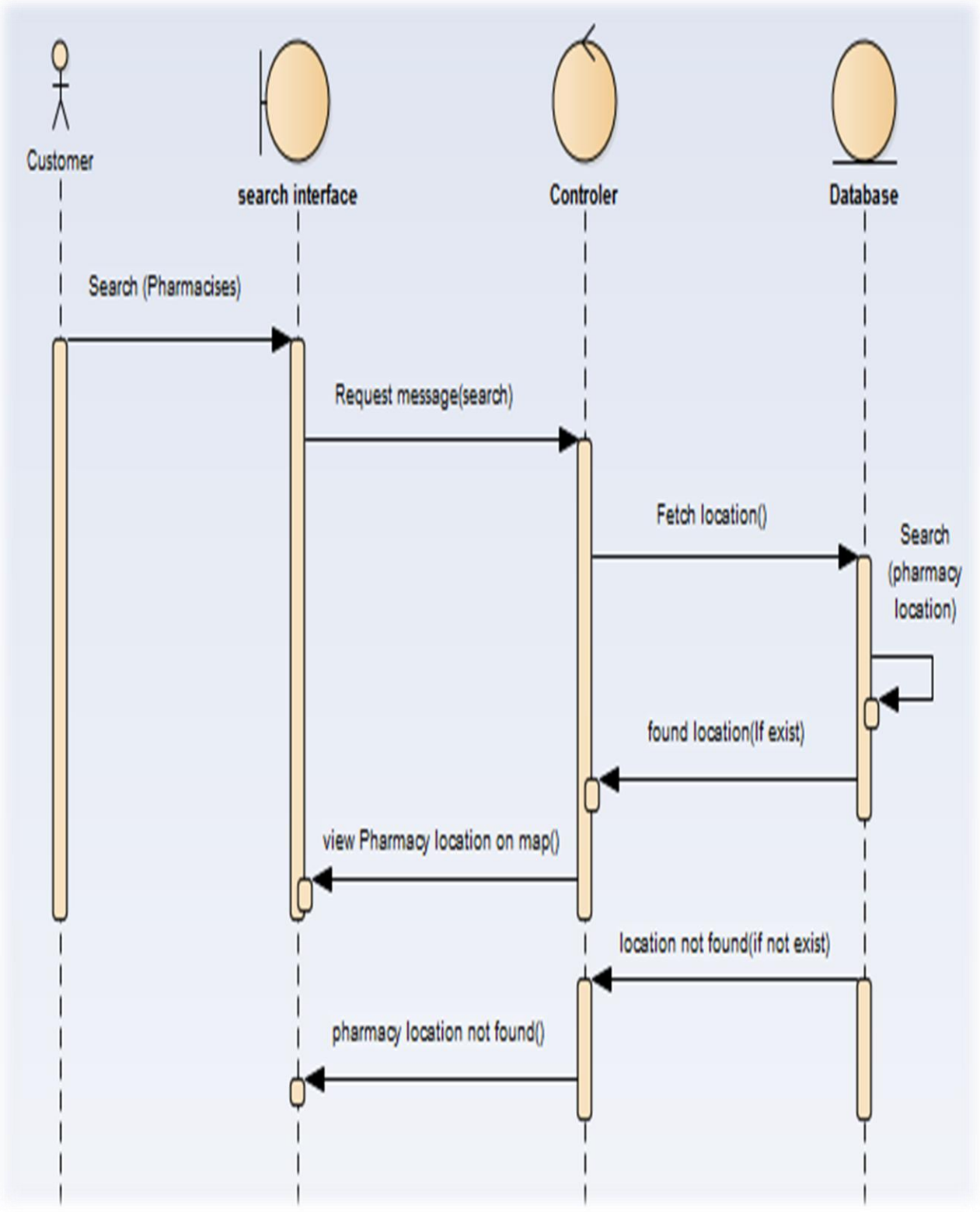


Figure 3. 7 sequence diagram that describe search neared pharmacies activity.

Table 3. 3 describe sequence of login admin.

Use Case Name	Login Admin
Actors	Admin
Precondition	None
Main Flow of Event	1-The system asks the administrator to enter the user name and password. 2-The system administrator enters the user name and password. 3-The system validates the entered information. You are logged on to the system
Post Condition	The system displays a graphical interface containing all the basic operations that the system administrator can perform

3.6.4 Add Pharmacist

Once the system administrator logs in and verifies his information, a new pharmacist administrator will be allowed to enter the system as shown in table: (3.4).

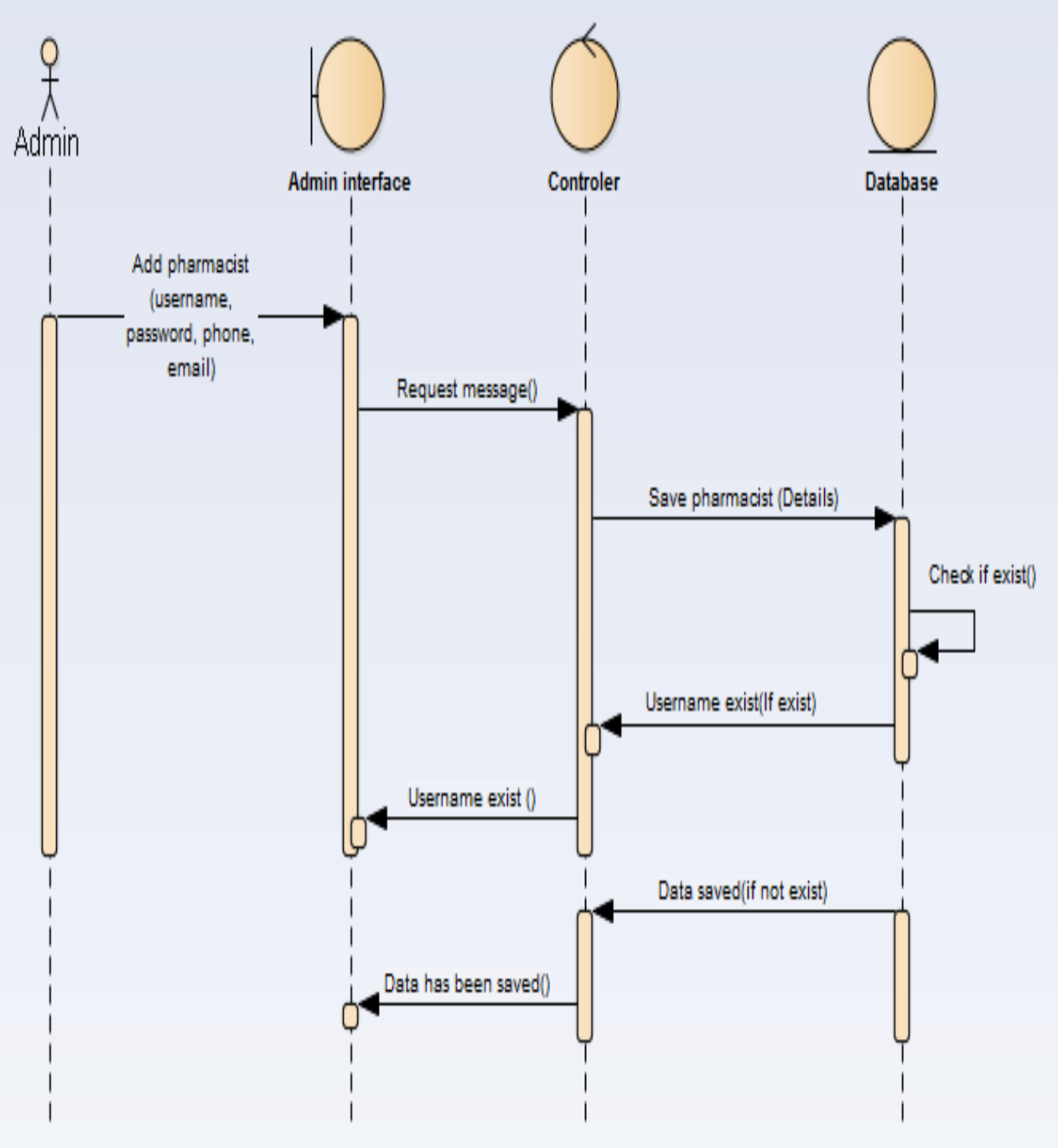


Figure 3. 8 sequence diagram for admin control when admin add new pharmacist information.

Table 3. 4 describe sequence of add pharmacist.

Use Case Name	Add Pharmacist
Actors	Admin
Precondition	Successfully Login
Main Flow of Event	1-The system administrator will enter the required data for the pharmacist to be added to the system. 2-The system checks for pharmacist identical data. 3-After confirming that there is no data similar to the pharmacist is added to the system. If you find similar data, it displays a message with identical data.
Post Condition	The system adds the pharmacist and displays a message explaining the successful completion of the process

3.6.5 Delete Pharmacist

Once the system administrator logs in and verifies his information, Allows it to delete an existing pharmacist from the system as shown in table: (3.5).

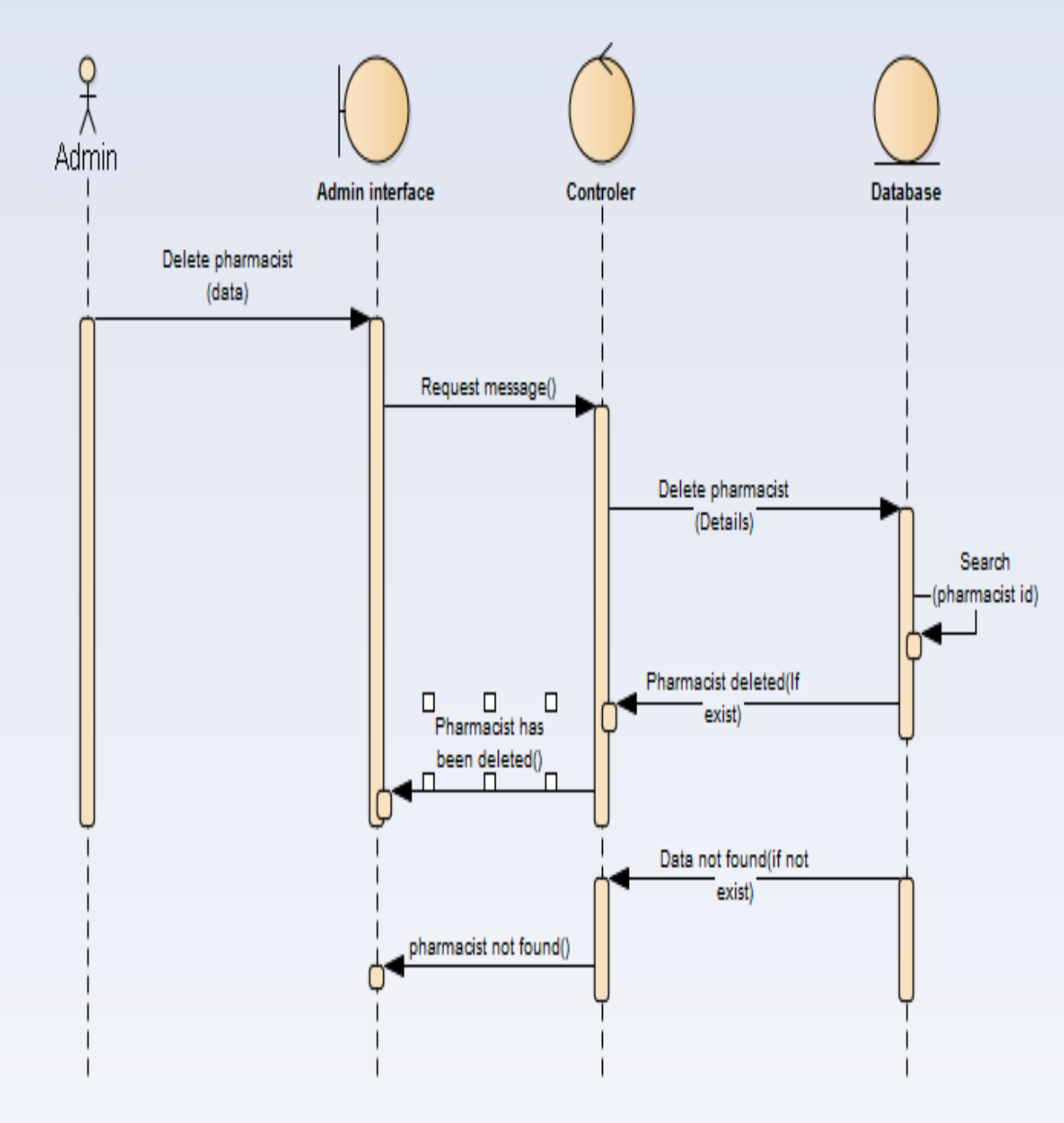


Figure 3. 9 sequence diagram for admin control when delete pharmacist.

Table 3. 5 describe sequence of delete pharmacist.

Use Case Name	Delete Pharmacist
Actors	Admin
Precondition	Successfully Login
Main Flow of Event	1-The system administrator selects the pharmacist ID to be deleted from the system. 2-The system checks for a pharmacist with the selected ID. 3-After confirming exist of the pharmacist is deleted from the system.
Post Condition	The system deletes the pharmacist and displays a message explaining the successful completion of the deletion

3.6.6 Update Pharmacist

Once the system administrator logs in and verifies his information, Allows it to update an existing pharmacist from the system as shown in table below.

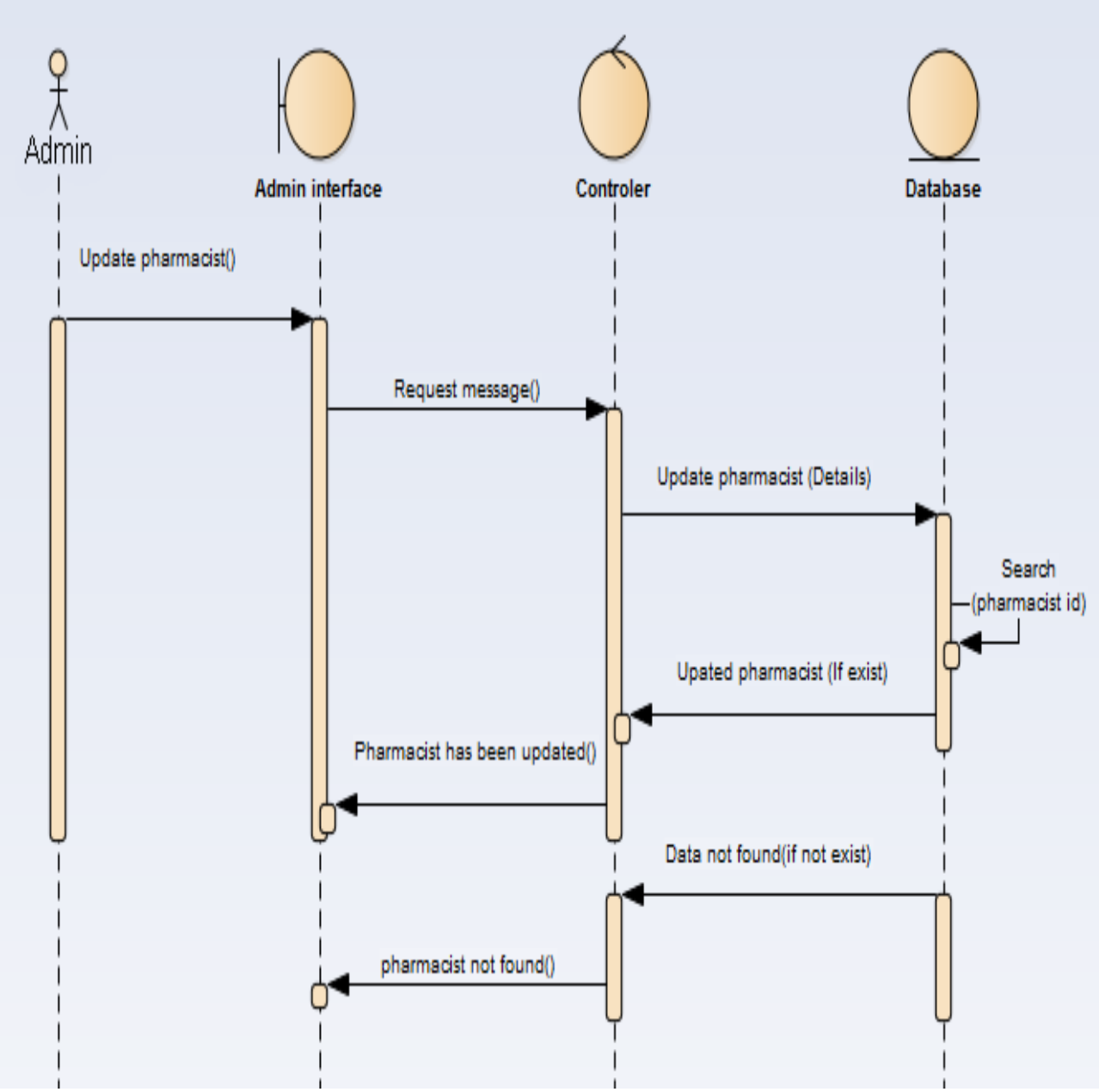


Figure 3. 10 sequence diagram for admin control when admin update pharmacist information.

Table 3. 6 describe sequence of update pharmacist.

Use Case Name	Update pharmacist
Actors	Admin
Precondition	Successfully Login
Main Flow of Event	1-The system administrator selects the pharmacist ID to be modified from the system. 2-The system checks for a pharmacist with the selected ID. 3-After confirming exist of the pharmacist, it is possible to modify the pharmacist's data in the system.
Post Condition	The system modifies the pharmacist's data and displays a message indicating the successful completion of the modification process

3.7 State Diagram

Describes the states and state transitions of the system.

3.7.1 State for Admin User

This diagram describe the state of admin user when try to enter to the system or login and system check admin type to redirect to their control panel or dashboard that shown in Figure: (3.11).

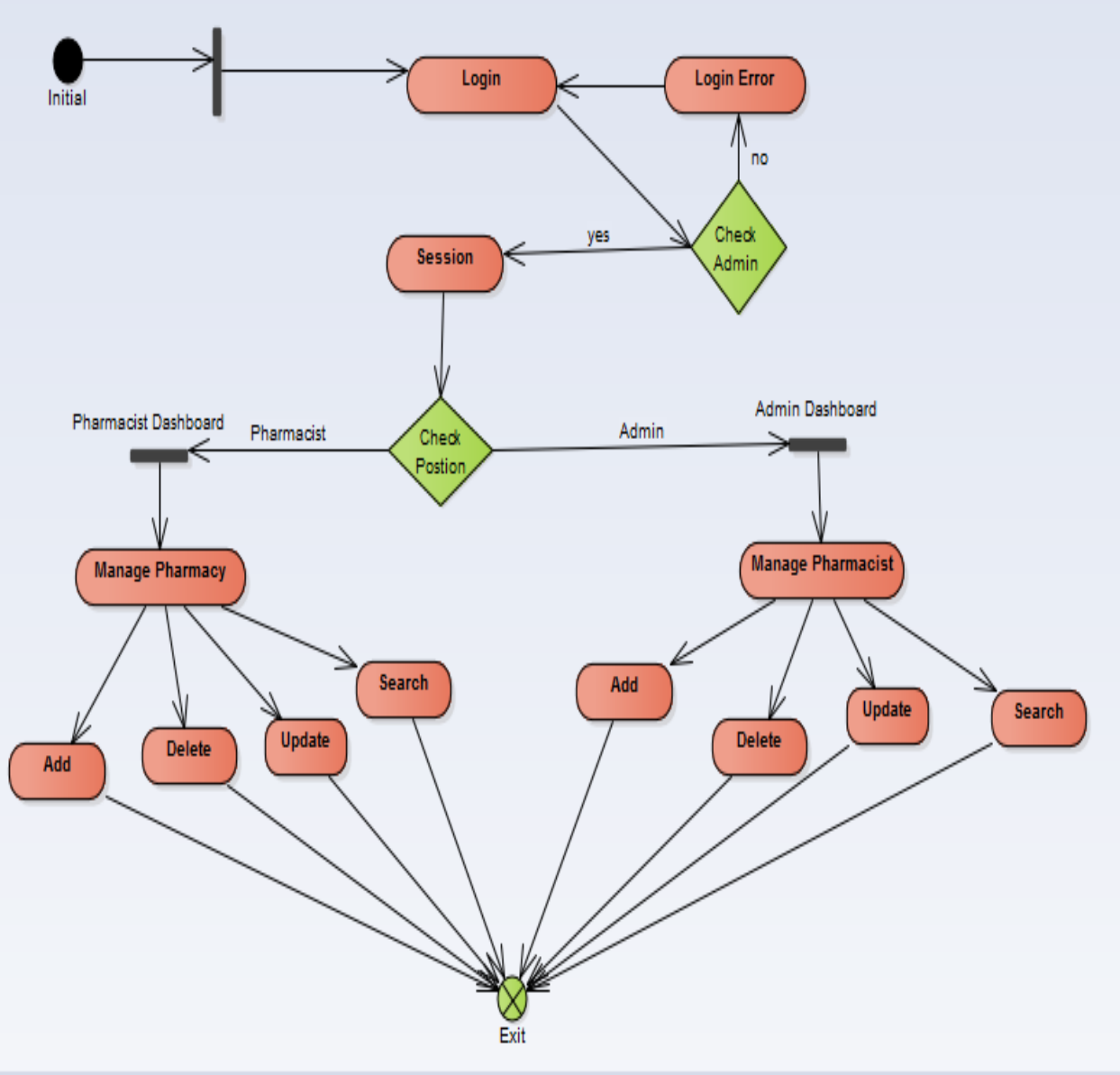


Figure 3. 11 describe state of admin.

3.7.2 State for Customer

This diagram describe the state of customer when try to enter to the system or application to provide their services shown in Figure: (3.12).

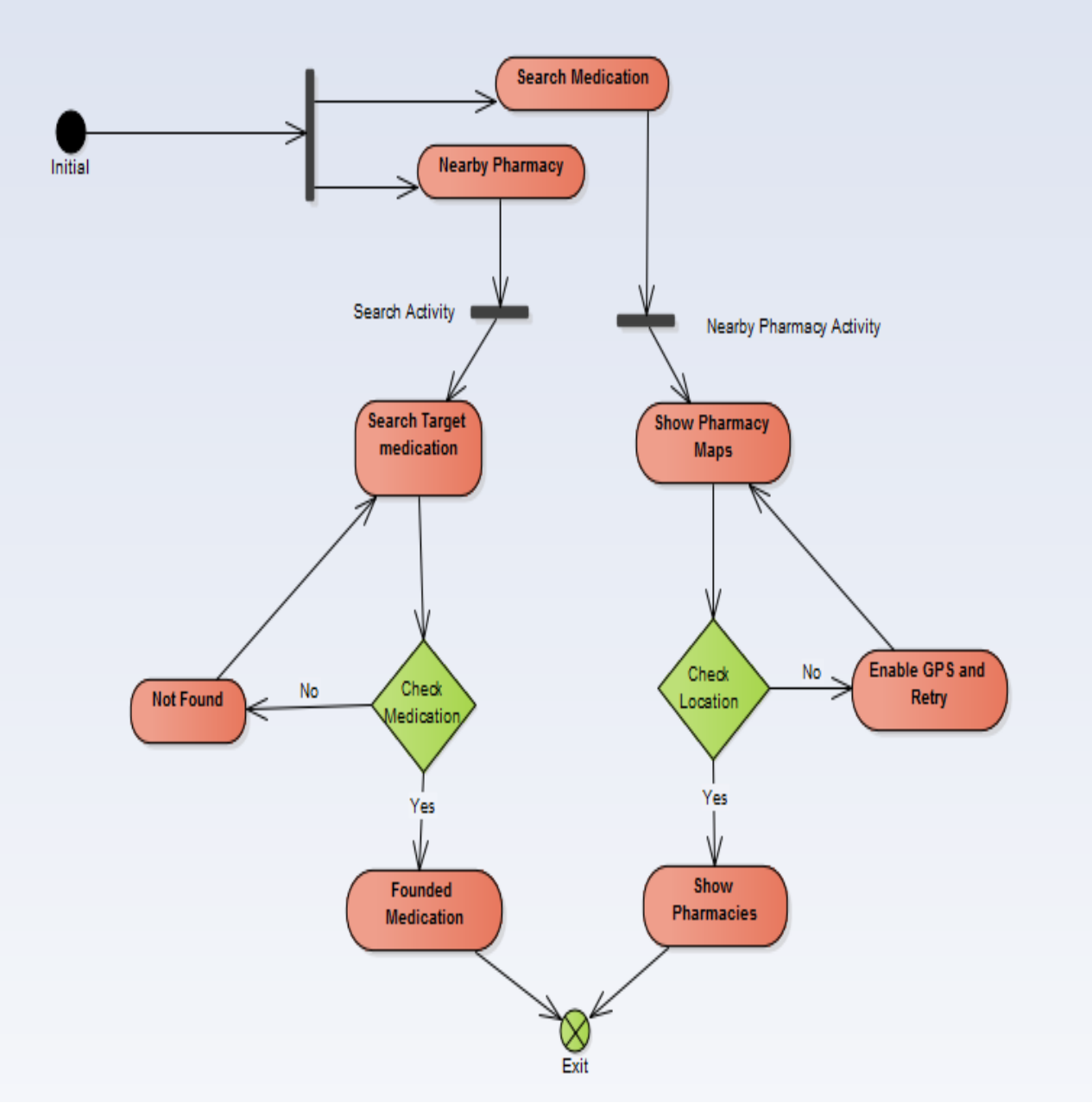


Figure 3. 12 describe state diagram of customer.

4.1 Techniques and Tools Used

The techniques and tools used in the design and implementation of the proposed system and their features will be presented.

4.1.1 HTML

HTML is a computer language devised to allow website creation. These websites can then be viewed by anyone else connected to the Internet. It is relatively easy to learn, with the basics being accessible to most people in one sitting; and quite powerful in what it allows you to create. It is constantly undergoing revision and evolution to meet the demands and requirements of the growing Internet audience under the direction of the W3C, the organization charged with designing and maintaining the language .The definition of HTML is Hyper Text Markup Language.

HTML consists of a series of short codes typed into a text-file by the site author — these are thetas. The text is then saved as an html file, and viewed through a browser, like Internet Explorer or Netscape Navigator. This browser reads the file and translates the text into a visible form, hopefully rendering the page as the author had intended. Writing your own HTML entails using tags correctly to create your vision. You can use anything from a rudimentary text-editor toe powerful graphical editor to create HTML pages.

4.1.2 CSS

Cascading Style Sheet (CSS) is a fundamental web language for describing the presentation of web pages. CSS rules are often reused across multiple parts of a page and across multiple pages throughout a site to reduce repetition and to provide a consistent look and feel. When a CSS rule is modified, developers currently have to manually track and visually inspect all possible parts of the site that may be impacted by that change. We present Sees, a system that automatically tracks CSS change impact across a site and enables developers to easily visualize all of them. The impacted page fragments are sorted by severity and the differences before and after the change are highlighted using animations.

4.1.3 Bootstrap

Is a free and open-source CSS framework directed at responsive, mobile-first front-end web development? It contains CSS- and (optionally) JavaScript-based design templates for typography, forms, buttons, navigation and other interface components.

Bootstrap is the third-most-starred project on GitHub, with more than 135,000 stars, behind only freeCodeCamp (almost 305,000 stars) and marginally behind Vue.js framework According to Alexa Rank, Bootstrap getbootstrap.com is in the top-2000 in US while vuejs.org is in top-7000 in US.

4.1.4 My SQL

Is an open-source relational database management system (RDBMS).Its name is a combination of "My", the name of co-founder Wideness's daughter, and "SQL", the abbreviation for Structured Query Language.

MySQL is free and open-source software under the terms of the GNU General Public License, and is also available under a variety of proprietary licenses. MySQL was owned and sponsored by the Swedish company MySQL AB, which was bought by Sun Microsystems (now Oracle Corporation). In 2010, when Oracle acquired Sun, Wideners forked the open-source MySQL project to create Maria DB.

MySQL is a component of the LAMP web application software stack (and others), which is an acronym for *Linux, Apache, MySQL, Perl/PHP/Python*. MySQL is used by many database-driven web applications, including Drupal, Joomla, phpBB, and Word Press. MySQL is also used by many popular websites, including Facebook, Flickr, MediaWiki, Twitter, and YouTube.

MySQL is written in C and C++. Its SQL parser is written in yacc, but it uses a home-brewed lexical analyzer. MySQL works on many system platforms, including AIX, BSDi, FreeBSD, HP-UX, eComStation, i5/OS, IRIX, Linux, macOS, Microsoft Windows, NetBSD, Novell NetWare, OpenBSD, Open Solaris, OS/2 Warp, QNX, Oracle Solaris, Symbian, SunOS, SCO Open Server, SCO UnixWare, Samos and Tru64. A port of MySQL to OpenVMS also exists.

The MySQL server software itself and the client libraries use dual-licensing distribution. They are offered under GPL version 2, or a proprietary license.

Support can be obtained from the official manual. Free support additionally is available in different IRC channels and forums. Oracle offers paid support via its MySQL Enterprise products. They

differ in the scope of services and in price. Additionally, a number of third party organizations exist to provide support and services, including Maria DB and Percona.

MySQL has received positive reviews, and reviewers noticed it "performs extremely well in the average case" and that the "developer interfaces are there, and the documentation (not to mention feedback in the real world via Web sites and the like) is very, very good". It has also been tested to be a "fast, stable and true multi-user, multi-threaded SQL database server".

4.1.5 PHP

Hypertext Preprocessor (or simply PHP) is a general-purpose programming language originally designed for web development. It was originally created by Rasmus Leadoff in 1994 the PHP reference implementation is now produced by The PHP Group.PHP originally stood for Personal Home Page, but it now stands for the recursive initialize PHP: Hypertext Preprocessor.

PHP code may be executed with a command line interface (CLI), embedded into HTML code, or used in combination with various web template systems, web content management systems, and web frameworks. PHP code is usually processed by a PHP interpreter implemented as a module in a web server or as a Common Gateway Interface (CGI) executable. The web server outputs the results of the interpreted and executed PHP code, which may be any type of data, such as generated HTML code or binary image data. PHP can be used for many programming tasks outside of the web context, such as standalone graphical applications and robotic drone control

The standard PHP interpreter, powered by the Zend Engine, is free software released under the PHP License. PHP has been widely ported and can be deployed on most web servers on almost every operating system and platform, free of charge.

The PHP language evolved without a written formal specification or standard until 2014, with the original implementation acting as the *de facto* standard which other implementations aimed to follow. Since 2014, work has gone on to create a formal PHP specification.

As of September 2019, over 60% of sites on the web using PHP are still on discontinued/"EOLed "version 5.6 or older; versions prior to 7.1 are no longer officially supported by The PHP Development Team, but security support is provided by third parties, such as Debian.

4.1.6 XAMPP

is a free and open-source cross-platform web server solution stack package developed by Apache Friends, consisting mainly of the Apache HTTP Server, Maria DB database, and interpreters for scripts written in the PHP and Perl programming languages. Since most actual web server deployments use the same components as XAMPP, it makes transitioning from a local test server to a live server possible.

XAMPP's ease of deployment means a WAMP or LAMP stack can be installed quickly and simply on an operating system by a developer. With the advantage of common add-in applications such as Word Press and Joomla! Can also be installed with similar ease using Bitnami.

4.1.7 Java

Is a programming language and computing platform first released by Sun Microsystems in 1995? There are lots of applications and websites that will not work unless you have Java installed, and more are created every day. Java is fast, secure, and reliable. From laptops to datacenters, game consoles to scientific supercomputers, cell phones to the Internet, Java is everywhere!

4.1.8 JavaScript Object Notation (JSON)

Is an open-standard file format that uses human-readable text to transmit data objects consisting of attribute–value pairs and array data types (or any other serializable value). It is a very common data format, with a diverse range of applications, such as serving as replacement for XML in AJAX systems.

JSON is a language-independent data format. It was derived from JavaScript, but many modern programming languages include code to generate and parse JSON-format data. The official Internet media type for JSON is application/json. JSON filenames use the extension .json.

Douglas Crock ford originally specified the JSON format in the early 2000s. JSON was first standardized in 2013, as ECMA-404.The latest JSON format standard was published in 2017 as RFC 8259, and remains consistent with ECMA-404. That same year, JSON was also standardized as ISO/IEC 21778:2017. The ECMA and ISO standards describe only the allowed syntax, whereas the RFC covers some security and interoperability considerations.

4.1.9 Android Studio

Is the official integrated development environment (IDE) for Google's Android operating system, built on Jet Brains' Interlay IDEA software and designed specifically for Android development? It is available for download on Windows, macOS and Linux based operating systems. It is a replacement for the Eclipse Android Development Tools (ADT) as the primary IDE for native Android application development.

Android Studio was announced on May 16, 2013 at the Google I/O conference. It was in early access preview stage starting from version 0.1 in May 2013, then entered beta stage starting from version 0.8 which was released in June 2014. The first stable build was released in December 2014, starting from version 1.0.

Since May 7, 2019, Kaitlin is Google’s preferred language for Android app development.Still; other programming languages are supported by Android Studio, such as Java and C++.

4.2 Analysis Tools

Tools make it easier for users to process and manipulate data.

4.2.1 Enterprise Architecture (EA)

Is "a well-defined practice for conducting enterprise analysis, design, planning, and implementation, using a comprehensive approach at all times, for the successful development and execution of strategy. Enterprise architecture applies architecture principles and practices to guide organizations through the business, information, process, and technology changes necessary to execute their strategies. These practices utilize the various aspects of an enterprise to identify, motivate, and achieve these changes [29].

Advantages of Enterprise Architecture:

- ✓ An effective means of making high quality reports in a way that suits the organization.
- ✓ Possibility of dealing with different programming languages.
- ✓ Be able to choose the right template for systems design because it supports a wide range of software development languages and a large number of database systems.
- ✓ Assist in collecting project issues and tasks and explain the difficulties in systems.

4.3 The System Application

System consist of two different design, back end design a front end design.

4.3.1 Back End Design

❖ Data Dictionary

Shows tables in the database for the proposed system as shown in tables below.

Table 4. 1 describe admin data dictionary.

#	Column	Type	Null	Default	Links to	Extra
1	admin_id *(Primary)*	int(11)	No			AUTO_INCREMENT
2	admin_username	varchar(50)	No			
3	admin_email	varchar(50)	No			
4	admin_password	varchar(50)	No			
5	admin_address	varchar(50)	No			
6	admin_phone	int(11)	No			

Table 4. 2 describe pharmacist data dictionary.

#	Column	Type	Null	Default	Links to	Extra
1	pharmacist_id *(Primary)*	int(100)	No			AUTO_INCREMENT
2	username	varchar(50)	No			
3	password	varchar(50)	No			
4	email	varchar(50)	No			
5	phone	int(11)	No			
6	pharmacy_id	int(255)	No		pharmacy -> pharmacy_id	
7	pharmacy_name	varchar(50)	No		pharmacy -> pharmacy_ name	
8	pharmacy_location	varchar(255)	No		pharmacy -> pharmacy_ location	
9	registration_date	Date	No			

Table 4. 3 describe pharmacy data dictionary.

#	Column	Type	Null	Default	Links to	Extra
1	pharmacy_id *(Primary)*	int(100)	No			AUTO_INCREMENT
2	pharmacy_name *(Primary)*	varchar(50)	No			
3	pharmacy_location	varchar(50)	No			
4	pharmacy_phone	int(11)	No			
5	pharmacy_worktime	int(255)	No			
6	pharmacy_email	varchar(50)	No			

Table 4. 4 describe items data dictionary.

#	Column	Type	Null	Links to	Extra
1	item_id *(Primary)*	int(255)	No		AUTO_INCREMENT
2	stock_id	int(255)	No		
3	item_brandname	varchar(50)	No		
4	item_name *(Primary)*	varchar(50)	No		
5	item_qauntaty	int(11)	No		
6	item_description	varchar(50)	No		
7	item_manufactdate	Date	No		
8	item_expirydate	Date	No		
9	item_price	int(11)	No		
10	item_supplier	varchar(50)	No		
11	item_serialnumber	varchar(50)	No		
12	pharmacy_id	int(255)	No	pharmacy -> pharmacy_id	
13	pharmacy_name	varchar(50)	No	pharmacy -> pharmacy_name	
14	pharmacy_location	varchar(50)	No	pharmacy -> pharmacy_ location	
15	stock_name	varchar(255)	No	stock -> stock _ name	
16	pharmacy_phone	int(11)	No	pharmacy -> pharmacy_ phone	

Table 4. 5 describe stock data dictionary.

#	Column	Type	Null	Links to	Extra
1	stock_id *(Primary)*	int(100)	No		AUTO_INCREMENT
2	stock_name *(Primary)*	varchar(50)	No		
3	stock_type	varchar(50)	No		
4	stock_description	varchar(50)	No		
5	pharmacy_id	int(255)	No	pharmacy -> pharmacy_ id	
6	pharmacy_name	varchar(50)	No	pharmacy -> pharmacy_ name	
7	pharmacy_location	varchar(255)	No	pharmacy -> pharmacy_ location	

❖ Class Diagram of the System

Describes the structure of a system by showing the system's classes, their attributes, and the relationships among the classes as shown in figure: (4.1).

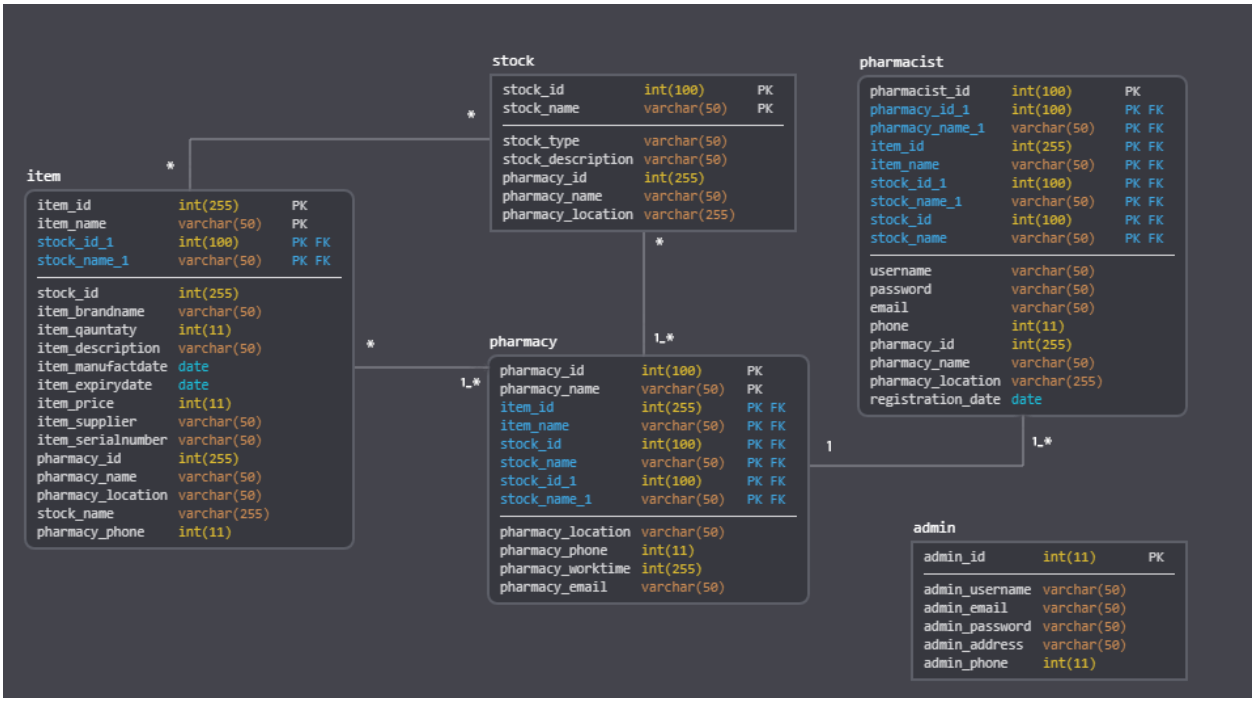


Figure 4. 1 describe the class diagram of the system.

❖ Structure Chart of the System

A **Structure Chart** (SC) in software engineering and organizational theory is a chart which shows the breakdown of a system to its lowest manageable levels. They are used in structured programming to arrange program modules into a tree. Each module is represented by a box, which contains the module's name. The tree structure visualizes the relationships between modules as shown in figure: (4.2).

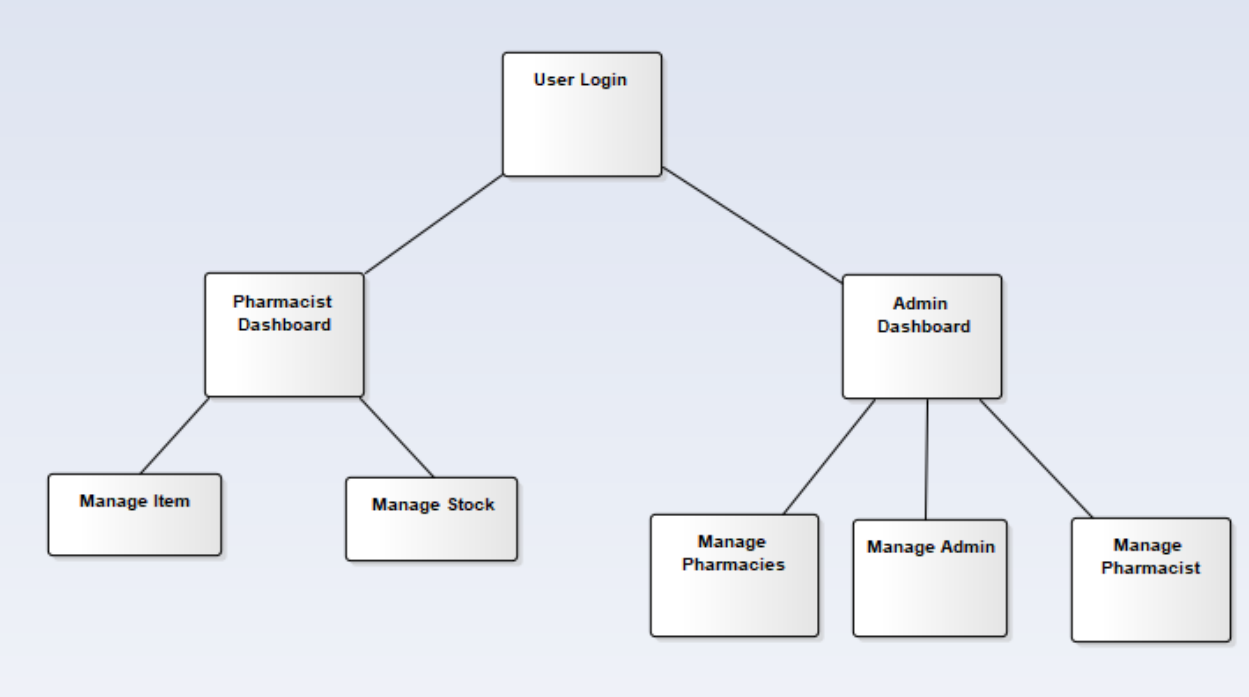


Figure 4. 2 describe structure chart of the system.

4.3.2 Front End Design

In this design have two different type of interfaces admin interface or admin dashboard designed by web development language (HTML, CSS, BOOTSTRAP, MYSQL, PHP) and other type of interface that customer seen design by (ANDROID, JAVA, PHP, MYSQL).

❖ Wireframe

A **website wireframe**, also known as a **page schematic** or **screen blueprint**, is a visual guide that represents the skeletal framework of a website. Wireframes are created for the purpose of arranging elements to best accomplish a particular purpose. The purpose is usually being informed by a business objective and a creative idea. The wireframe depicts the page layout or arrangement of the website's content, including interface elements and navigational systems, and how they work together. The wireframe usually lacks typographic style, color, or graphics, since the main focus lies in functionality, behavior, and priority of content. In other words, it focuses on what a screen does, not what it looks like. Wireframes can be pencil drawings or sketches on a whiteboard, or they can be produced by means of a broad array of free or commercial software applications. Wireframes are generally created by business analysts, user experience designers, developers,

visual designers, and by those with expertise in interaction design, information architecture and user research as shown in figure: (4.3).

✓ ***Wireframes focus on:***

- The range of functions available.
- The relative priorities of the information and functions.
- The rules for displaying certain kinds of information.
- The effect of different scenarios on the display.

Figure 4. 3 describe wire frame of the proposed application.

❖ Deployment Diagram

Describes the hardware used in system implementations and the execution environments and artifacts deployed on the hardware as shown in figure: (4.4).

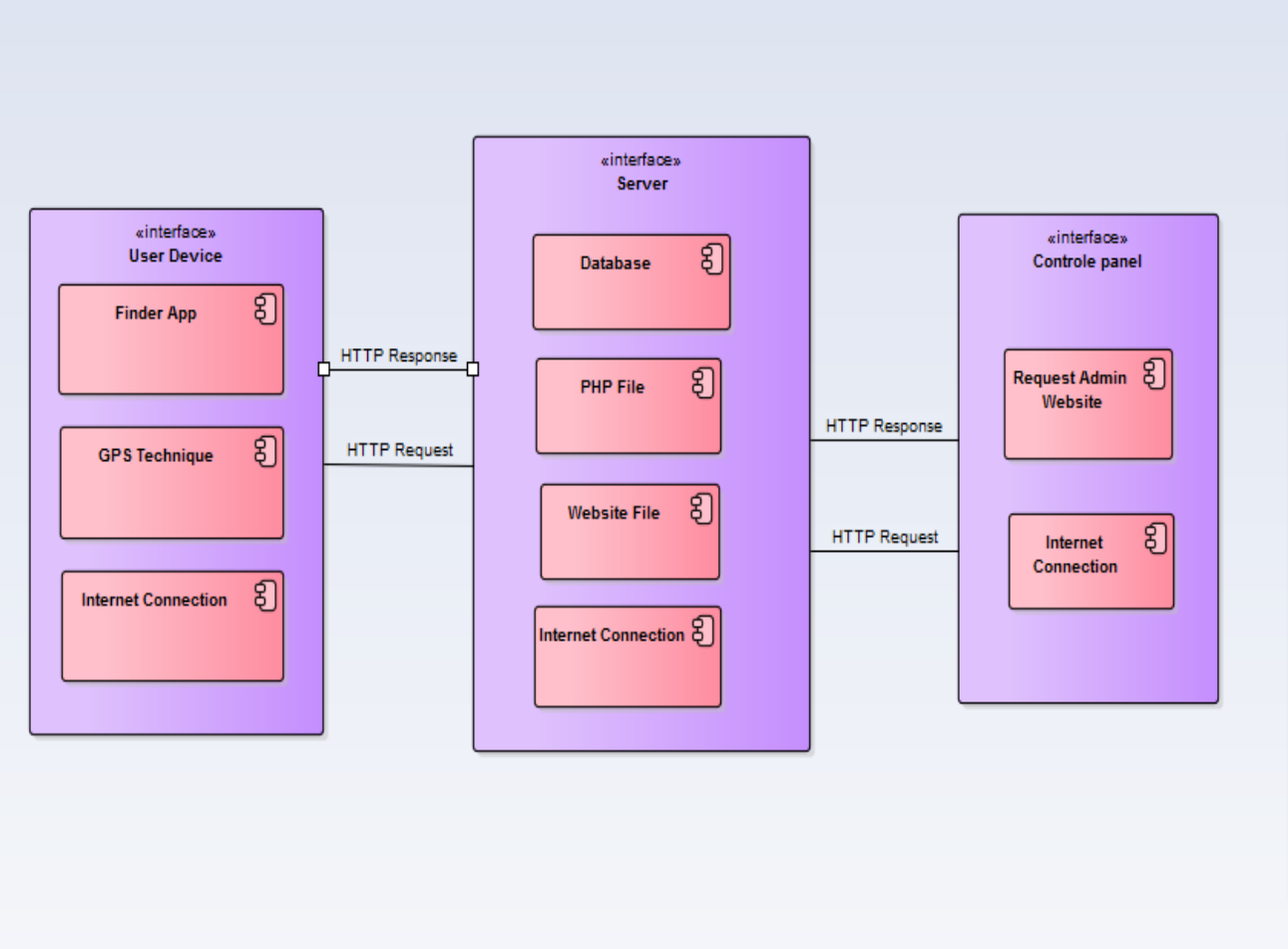


Figure 4. 4 describe deployment diagram of the system.

Login Admin Interface

Interface where admin and pharmacist login to their dashboard and enter his username and password to enter the dashboard as shown in figure: (4.5).

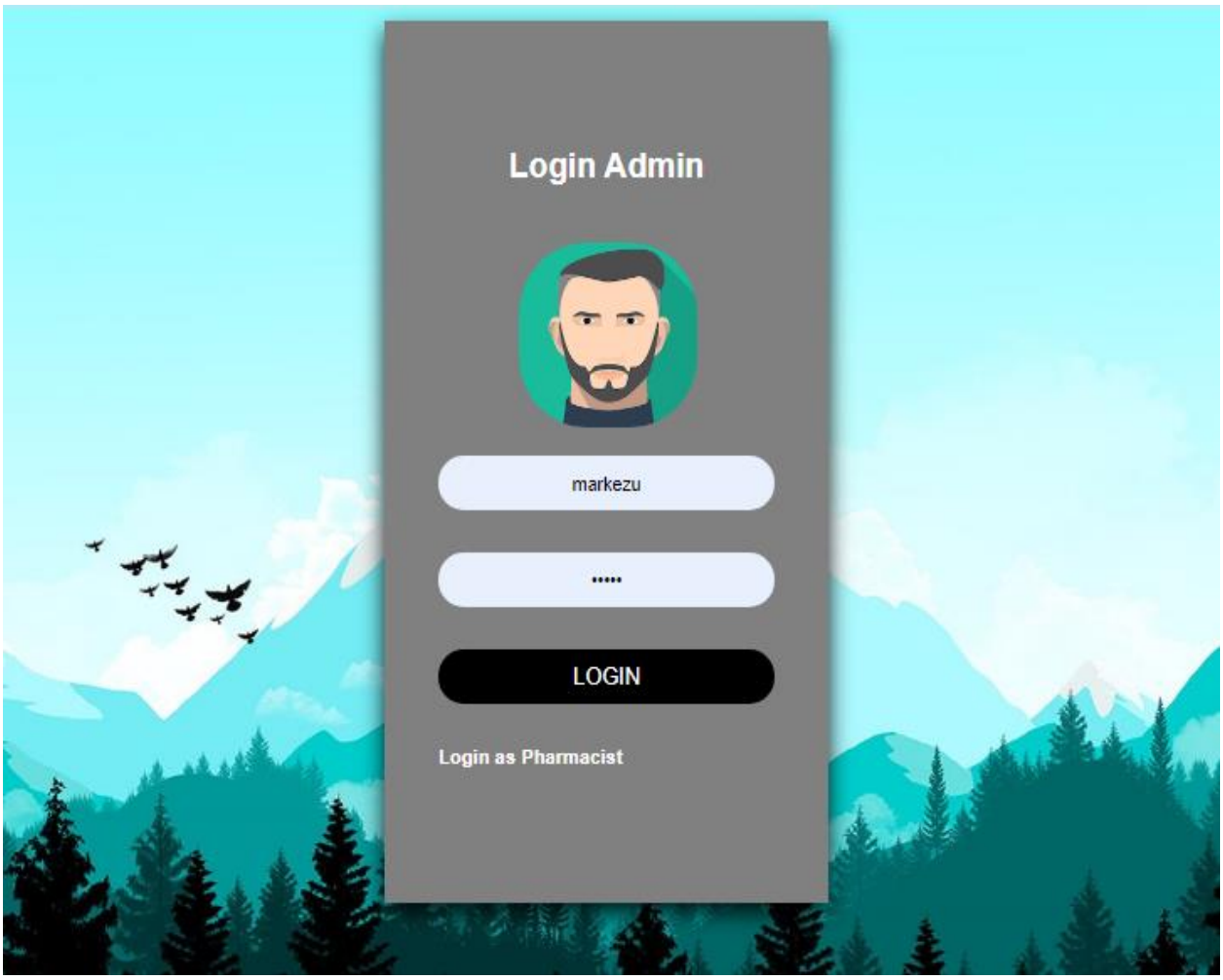


Figure 4. 5 describe admin login interface.

Login Error Interface

Interface return error message where username and password of admin is wrong and display "Invalid username and password" as shown in figure: (4.6).

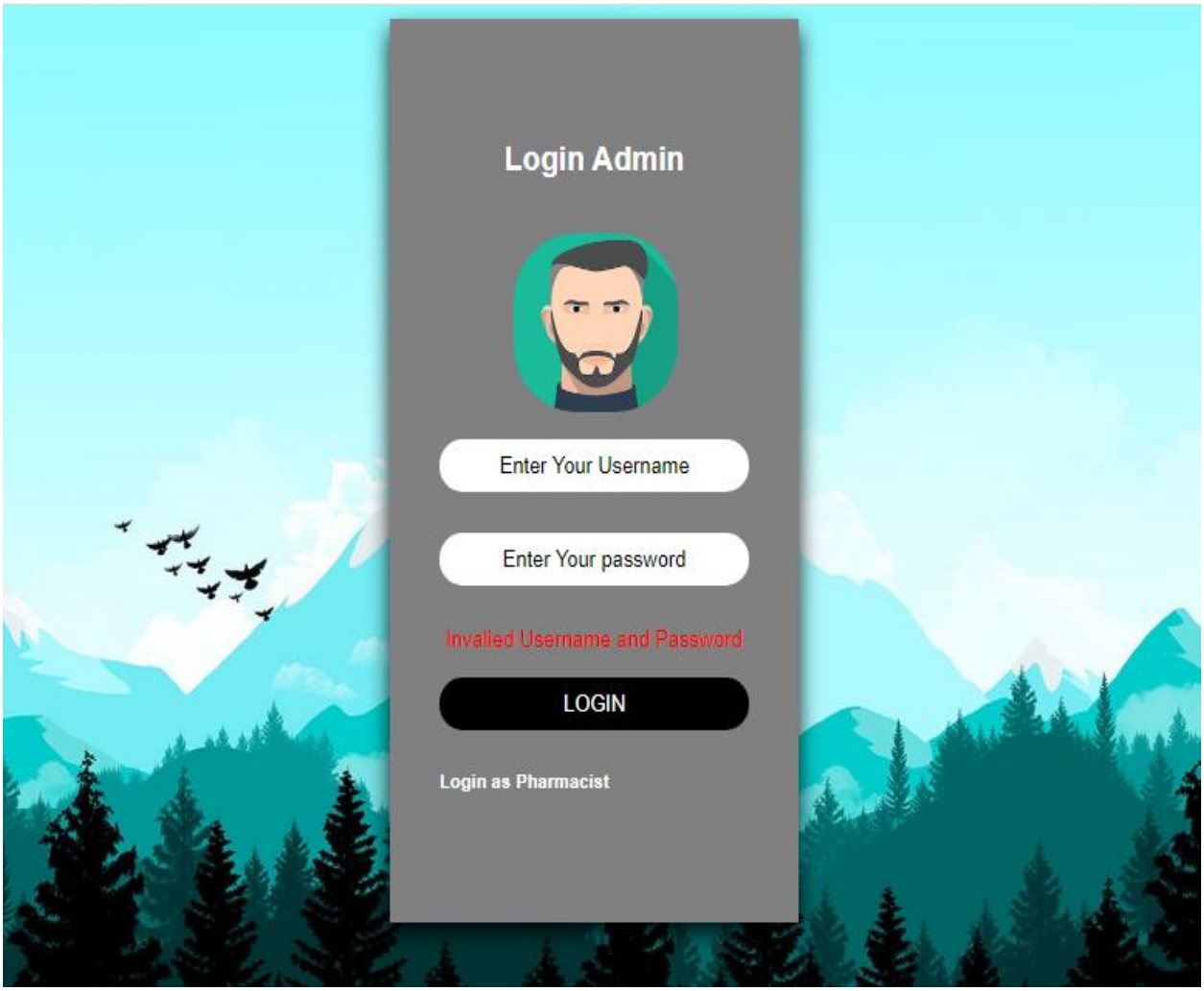


Figure 4. 6 describe admin login validation error.

Admin Dashboard Interface

After admin login to the system with their correct username and password the system redirect admin to dashboard where all operation that admin do exist.

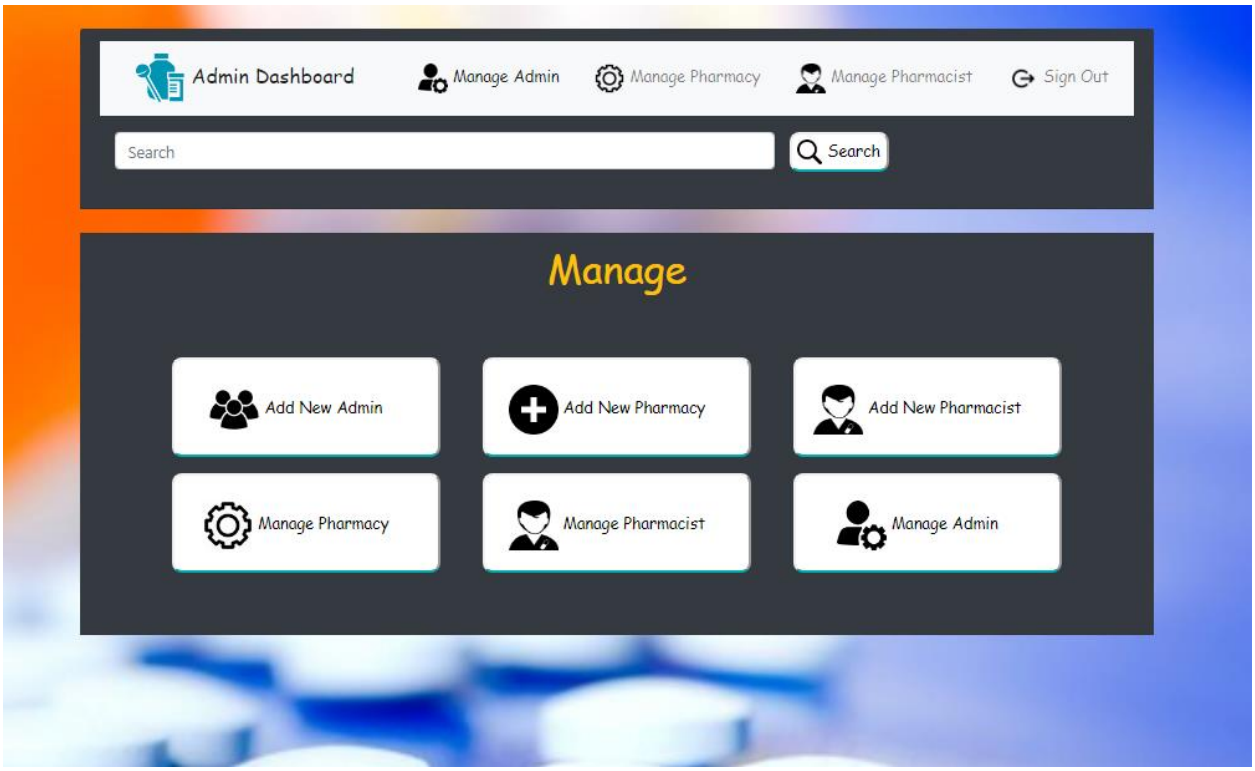


Figure 4. 7 describe admin admin dashboard control.

New Admin Interface

New admin form or page when admin try to add new admin to share the control of the system and inheritance all activity that admin do.

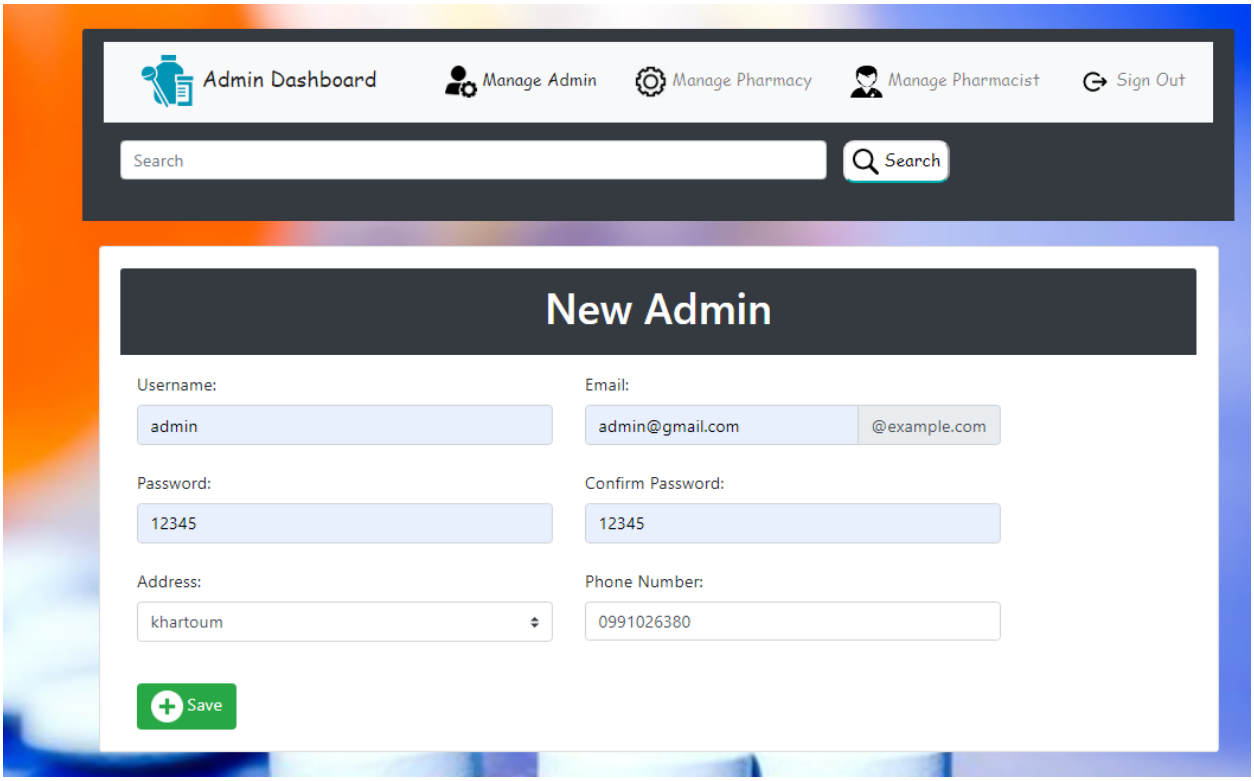


Figure 4. 8 describe add new admin form.

Validation Admin Information

When admin try to add wrong email or phone format the system do not accept email and phone that entered then alert or show message to the admin “please match the requested format”.

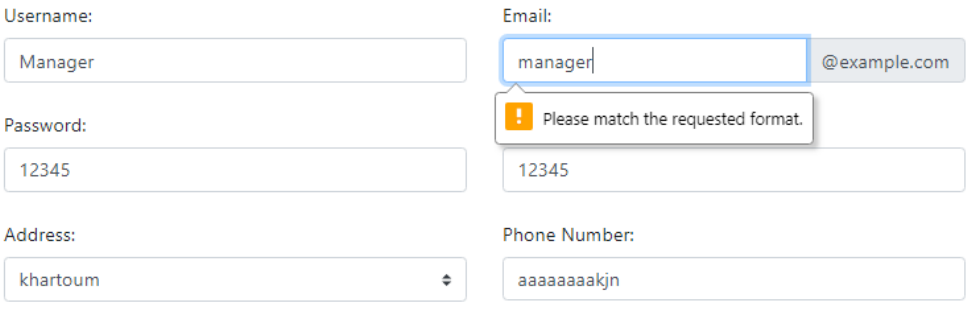


Figure 4. 9 describe admin email validation check.

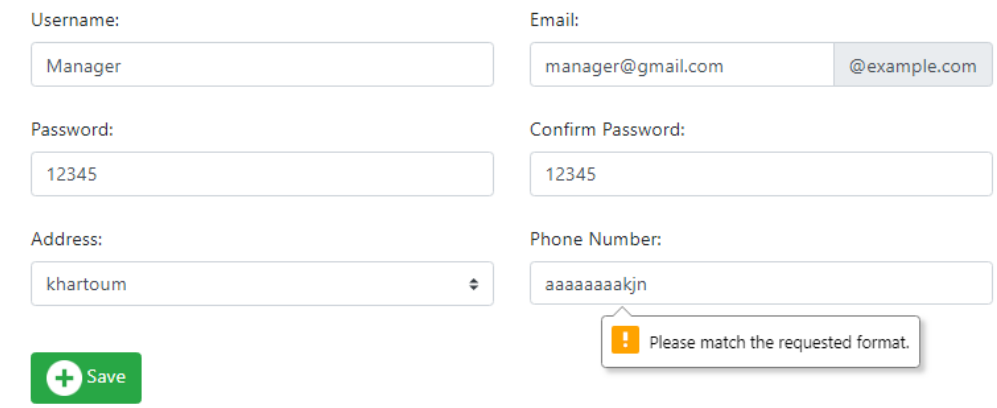


Figure 4. 10 describe phone validation check.

Manage Admin Interface

The added admin saved and redirect the admin to manage admin page that contain operation of manage admin (add, delete, search, update) for admin, also have group of links to manage pharmacy and pharmacist and logout as shown in figure: (4.11).

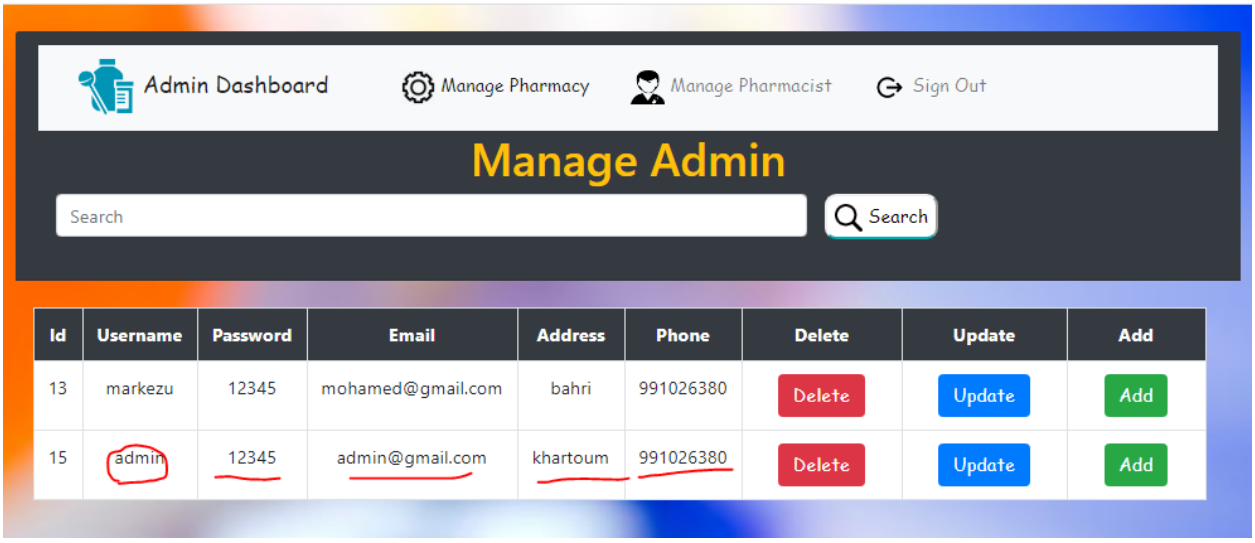


Figure 4. 11 describe manage admin interface.

New Pharmacy Interface

When admin try to add new pharmacy information and fill all information and saving it, also the interface contain all link that required to another task.

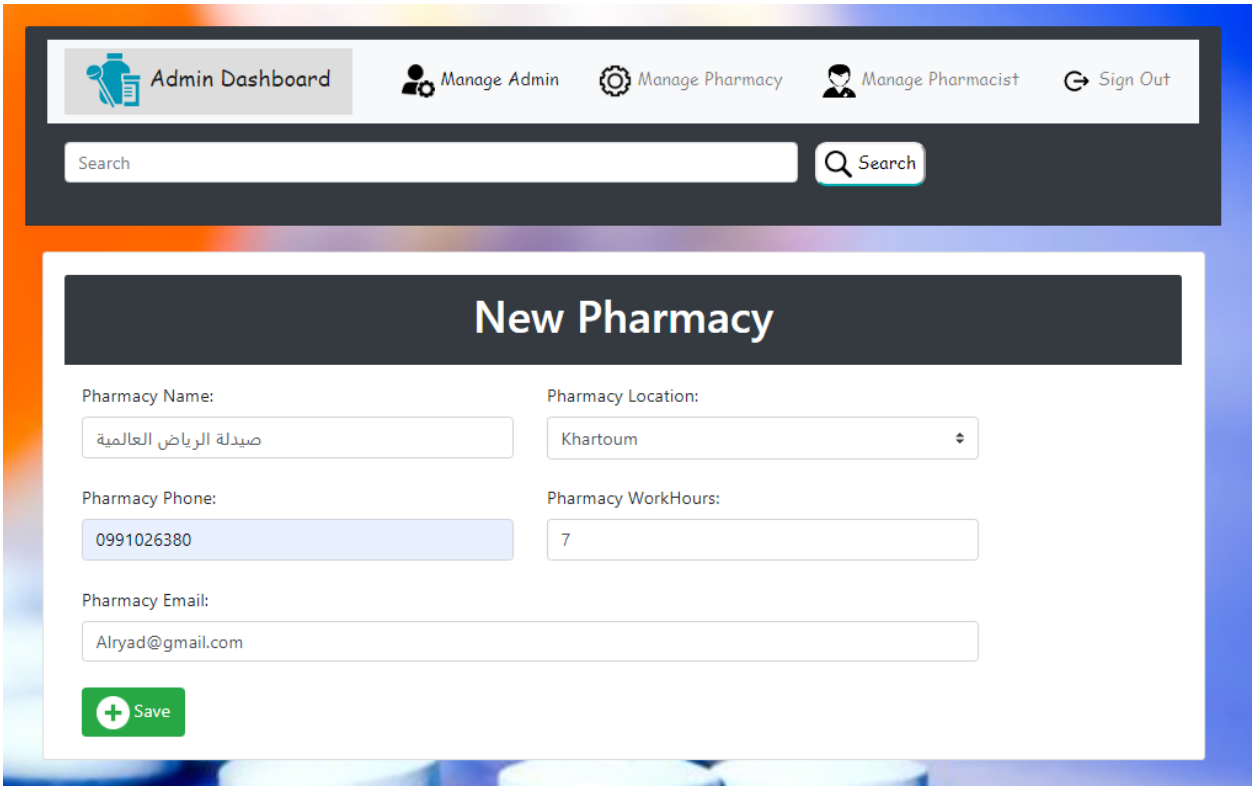
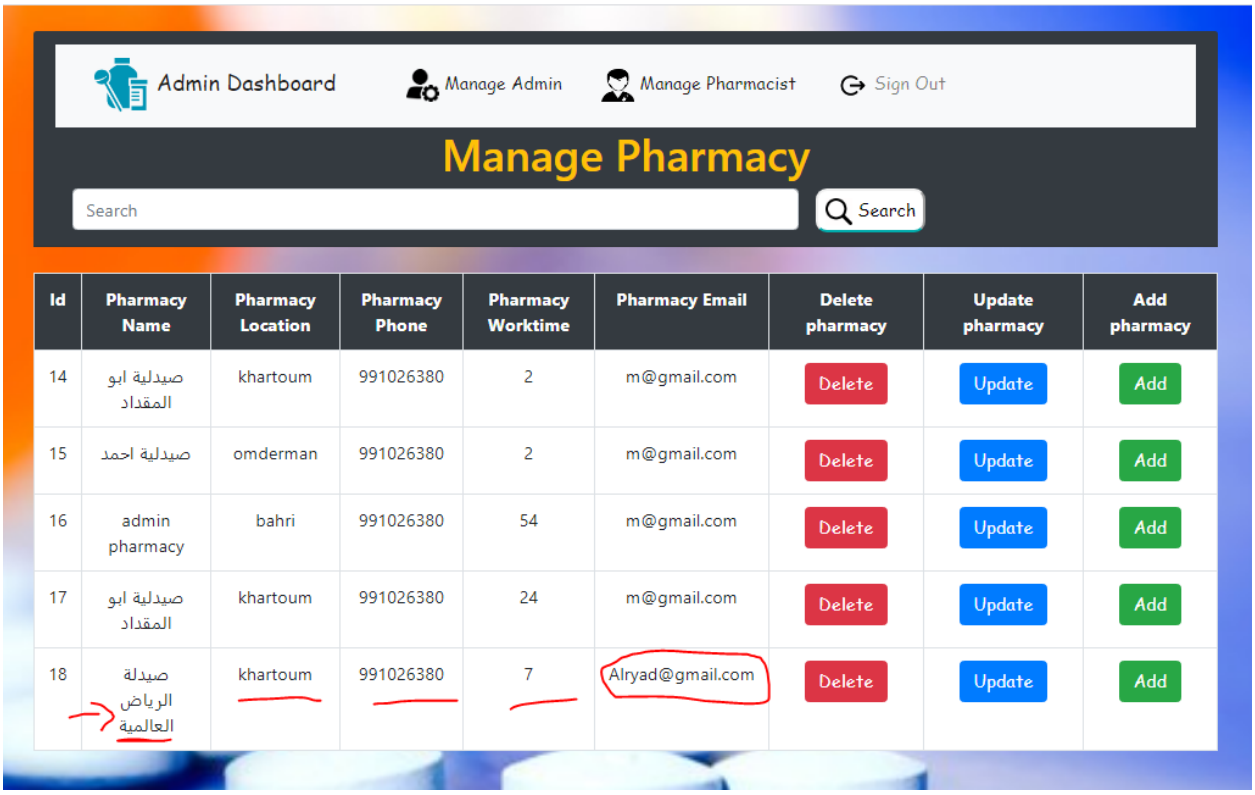


Figure 4. 12 describe add new pharmacy form.

Manage Pharmacy Interface

The added pharmacy saved and redirect the admin to manage pharmacy page and the admin can add, delete, search and update pharmacy information before add their pharmacist and give him their permission as shown in figure.



Id	Pharmacy Name	Pharmacy Location	Pharmacy Phone	Pharmacy Worktime	Pharmacy Email	Delete pharmacy	Update pharmacy	Add pharmacy
14	صيدلية ابو المقداد	khartoum	991026380	2	m@gmail.com	Delete	Update	Add
15	صيدلية احمد	omderman	991026380	2	m@gmail.com	Delete	Update	Add
16	admin pharmacy	bahri	991026380	54	m@gmail.com	Delete	Update	Add
17	صيدلية ابو المقداد	khartoum	991026380	24	m@gmail.com	Delete	Update	Add
18	صيدلة الرياض العالمية	khartoum	991026380	7	Alryad@gmail.com	Delete	Update	Add

Figure 4. 13 describe manage pharmacy page.

Update Pharmacy Interface

When admin click on update with specific pharmacy and try to update the system redirect to update with pharmacy id and keep all information of pharmacy to update it as shown below.

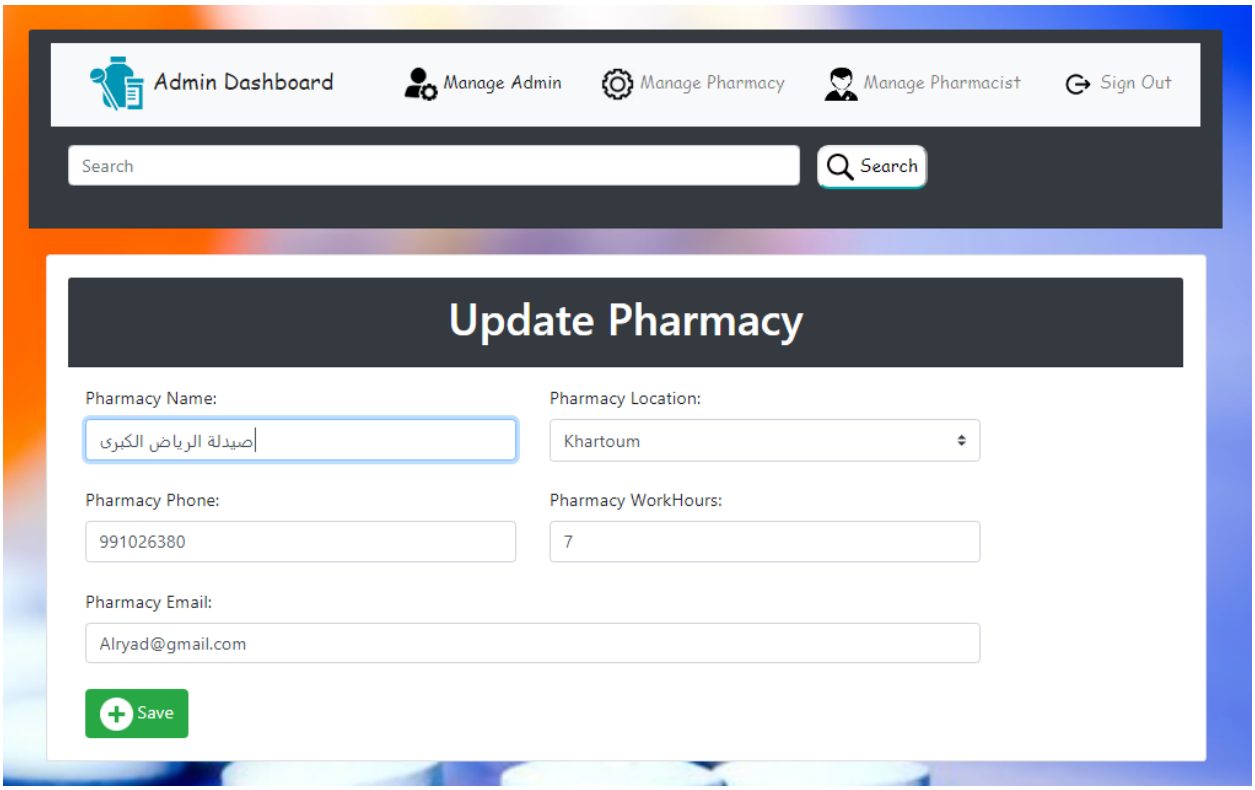
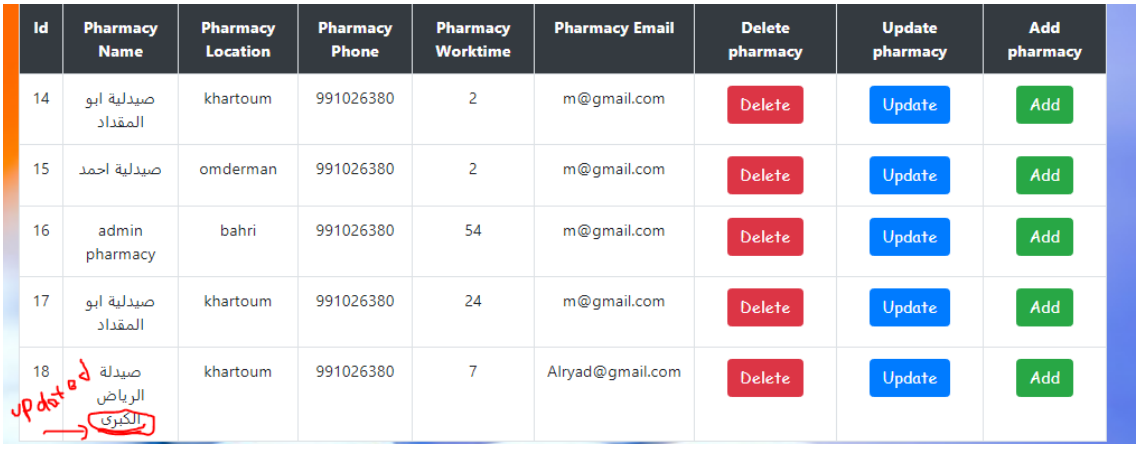


Figure 4. 14 describe update pharmacy page.



Id	Pharmacy Name	Pharmacy Location	Pharmacy Phone	Pharmacy Worktime	Pharmacy Email	Delete pharmacy	Update pharmacy	Add pharmacy
14	صيدلية ابو المقداد	khartoum	991026380	2	m@gmail.com	Delete	Update	Add
15	صيدلية احمد	omderman	991026380	2	m@gmail.com	Delete	Update	Add
16	admin pharmacy	bahri	991026380	54	m@gmail.com	Delete	Update	Add
17	صيدلية ابو المقداد	khartoum	991026380	24	m@gmail.com	Delete	Update	Add
18	صيدلة الرياض الكبرى	khartoum	991026380	7	Alryad@gmail.com	Delete	Update	Add

Figure 4. 15 describe updated pharmacy.

New Pharmacist Interface

When admin try to add new pharmacist the system redirect admin to new pharmacist form or page to fill all required information as shown below.

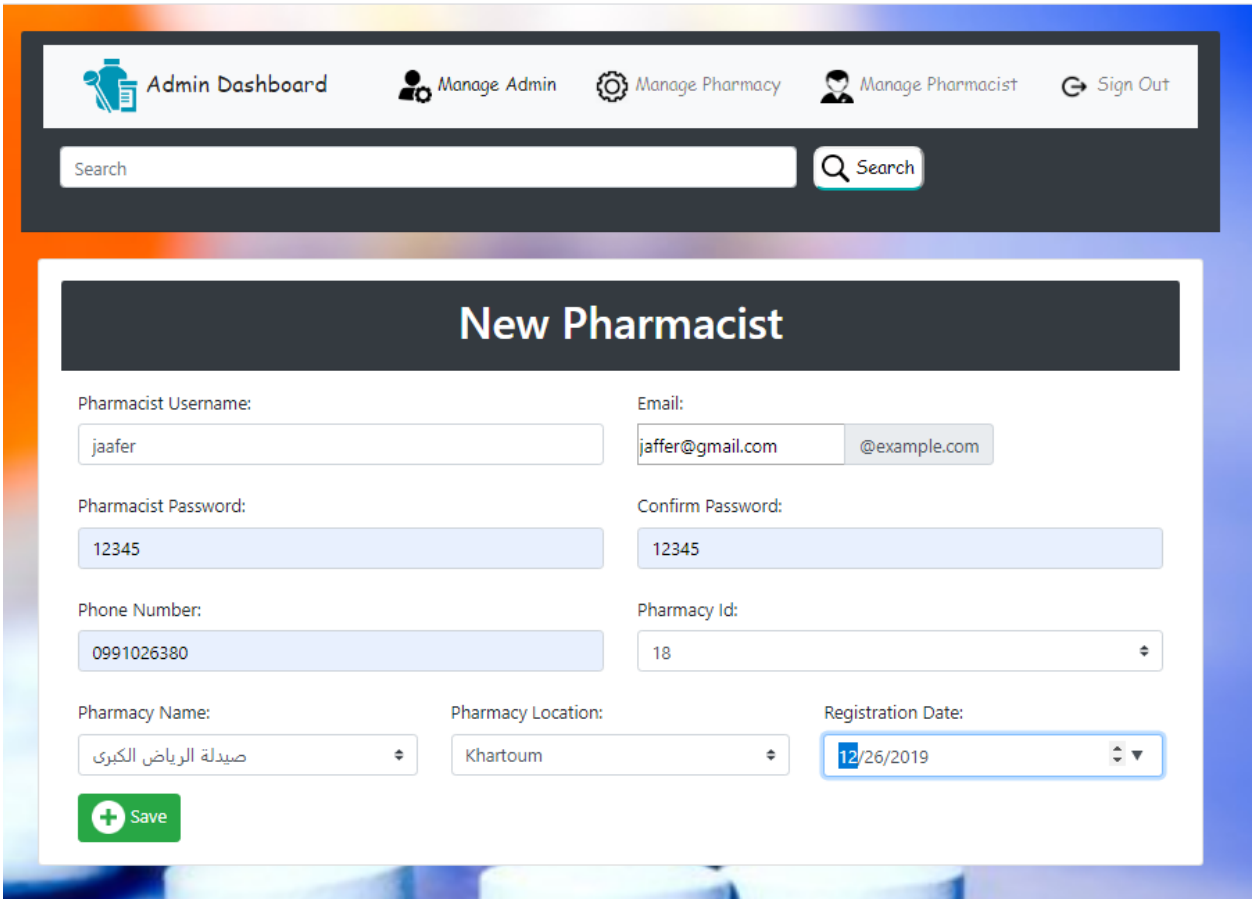
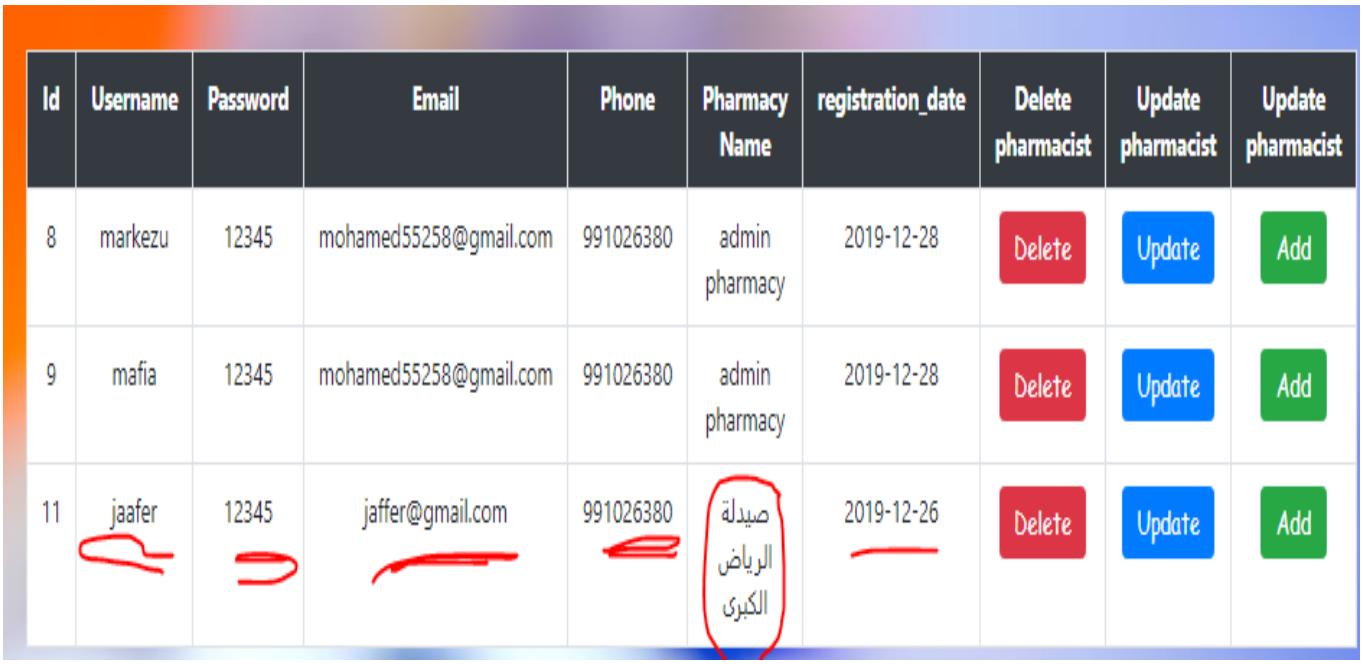


Figure 4. 16 describe add new pharmacist page.

Manage Pharmacist Interface

The added pharmacist saved and redirect the admin to manage pharmacist page where admin add pharmacist and other operation to give permission to add or manage their pharmacy data as shown in figure below.



Id	Username	Password	Email	Phone	Pharmacy Name	registration_date	Delete pharmacist	Update pharmacist	Update pharmacist
8	markezu	12345	mohamed55258@gmail.com	991026380	admin pharmacy	2019-12-28	Delete	Update	Add
9	mafia	12345	mohamed55258@gmail.com	991026380	admin pharmacy	2019-12-28	Delete	Update	Add
11	jaafer	12345	jaffer@gmail.com	991026380	صيدلة الرياض الكبرى	2019-12-26	Delete	Update	Add

Figure 4. 17 describe added pharmacist and display it in manage pharmacist page.

Login Pharmacist Interface

The system contain tow login page the administrators can switch between them the pharmacist can select login as pharmacist with their account to enter the system or pharmacist dashboard as shown in figure below.

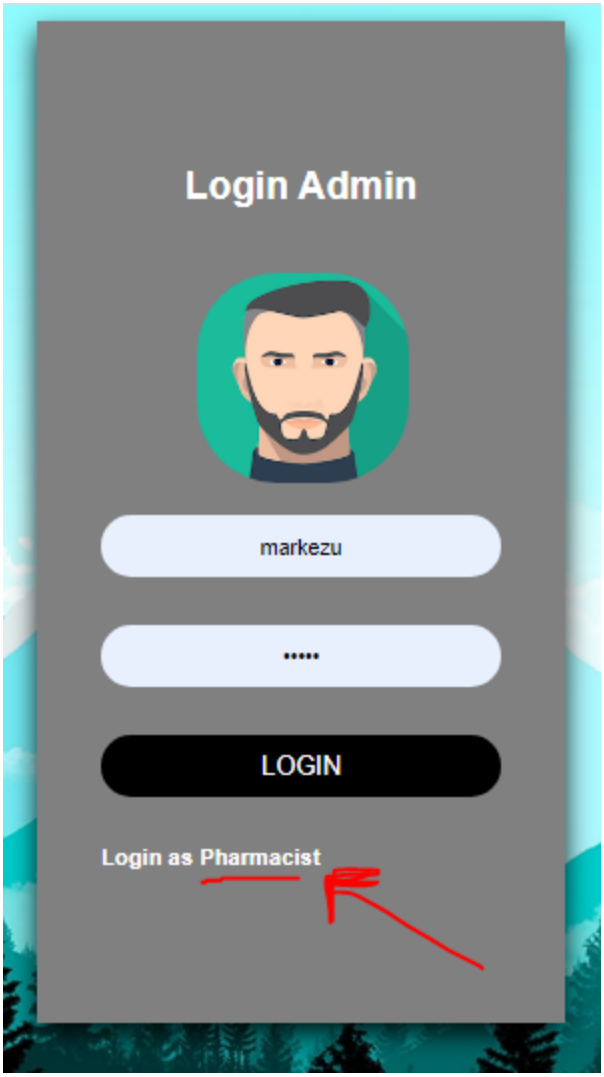


Figure 4. 18 describe where pharmacist login position in admin page.

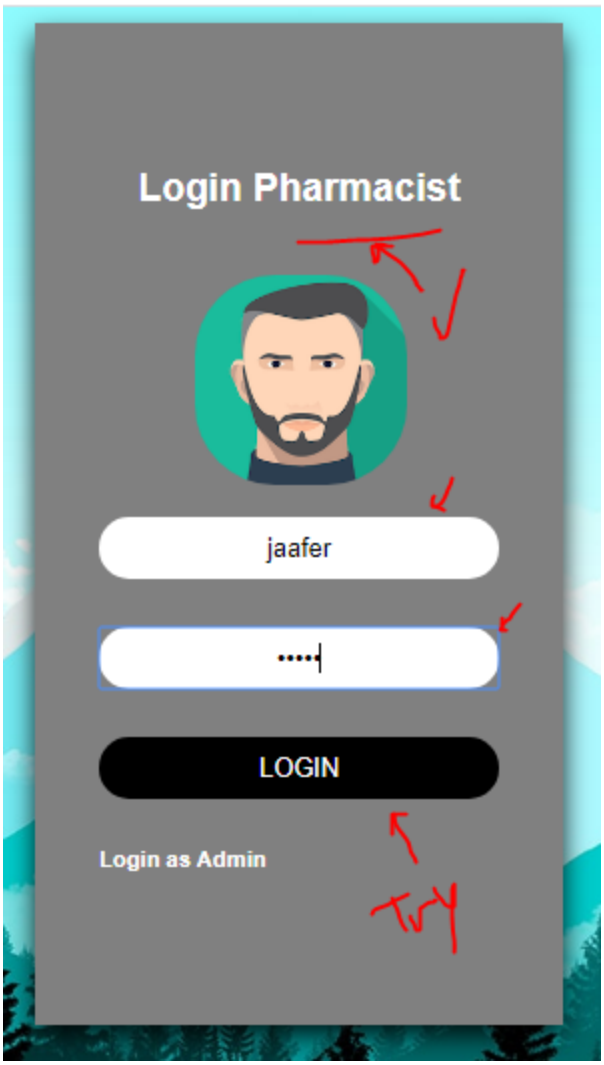


Figure 4. 19 describe pharmacist login page.

Pharmacist Dashboard Interface

The pharmacist when enter to the system can found their task add stock and manage it and add item and manage item too as shown in figure below.

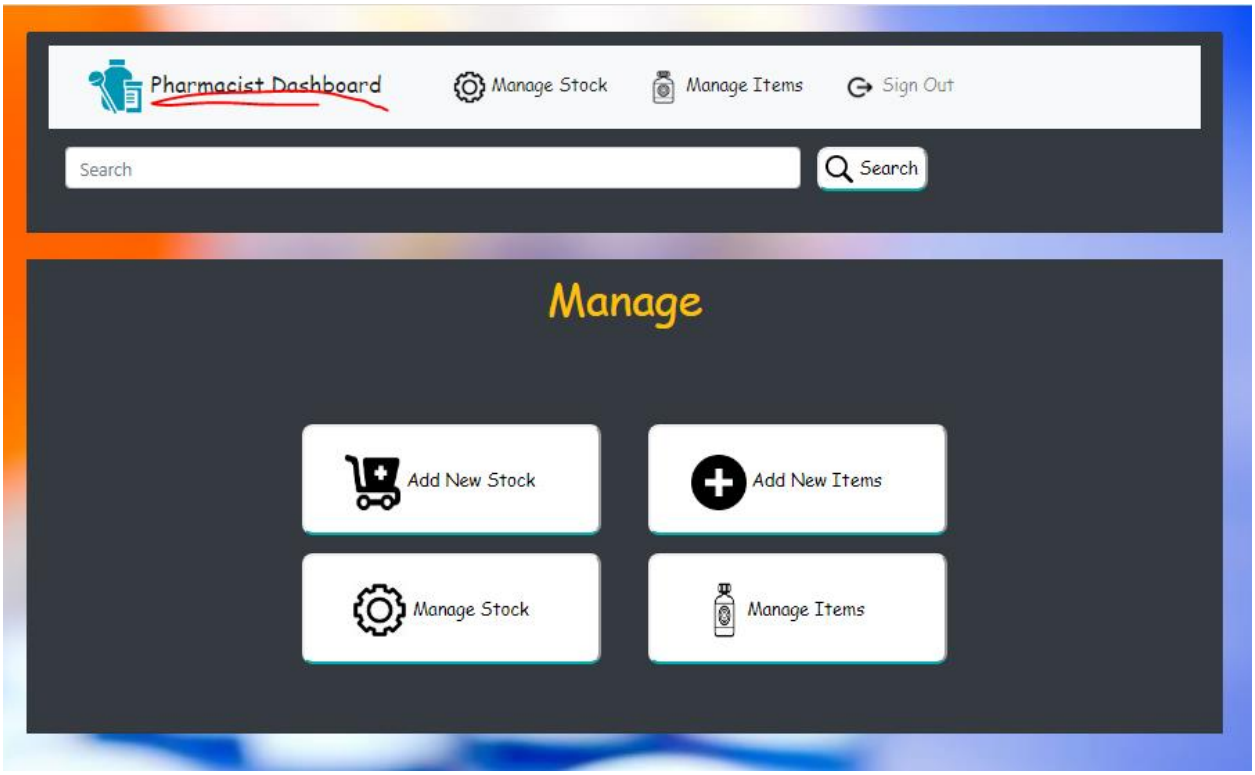


Figure 4. 20 describe pharmacist dashboard page.

New Stock Interface

New stock form or page when admin redirected by the system when admin click on new stock bottom, the form contain all necessary information and the system automatically get id and name and location of the pharmacist pharmacy as shown below.

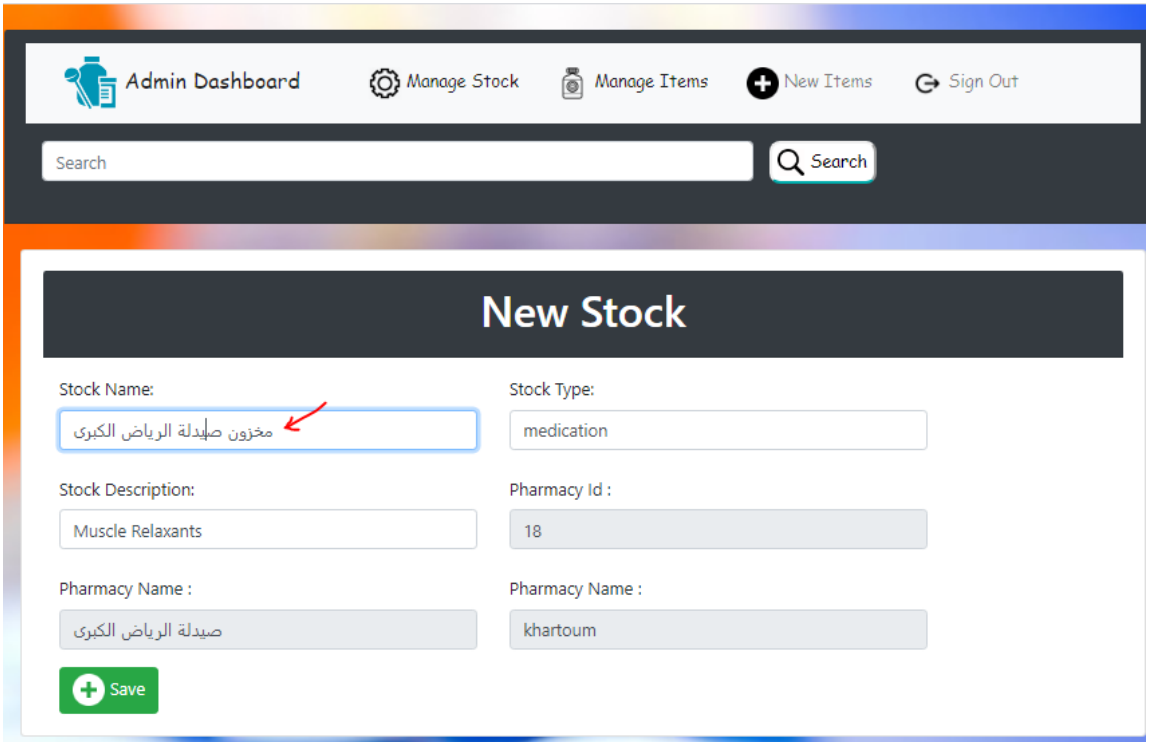


Figure 4. 21 describe add new stock page.

Manage Stock Interface

Added stock saved and redirected to manage stock Interface where pharmacist add, delete, search and update their stock information and linked to manage items interface as shown in figure.

Figure 4. 22 describe added stock and manage stock page.

New Item Interface

When pharmacist add new item information the system get pharmacy id and name and location also get all stock names of the pharmacy as shown below.

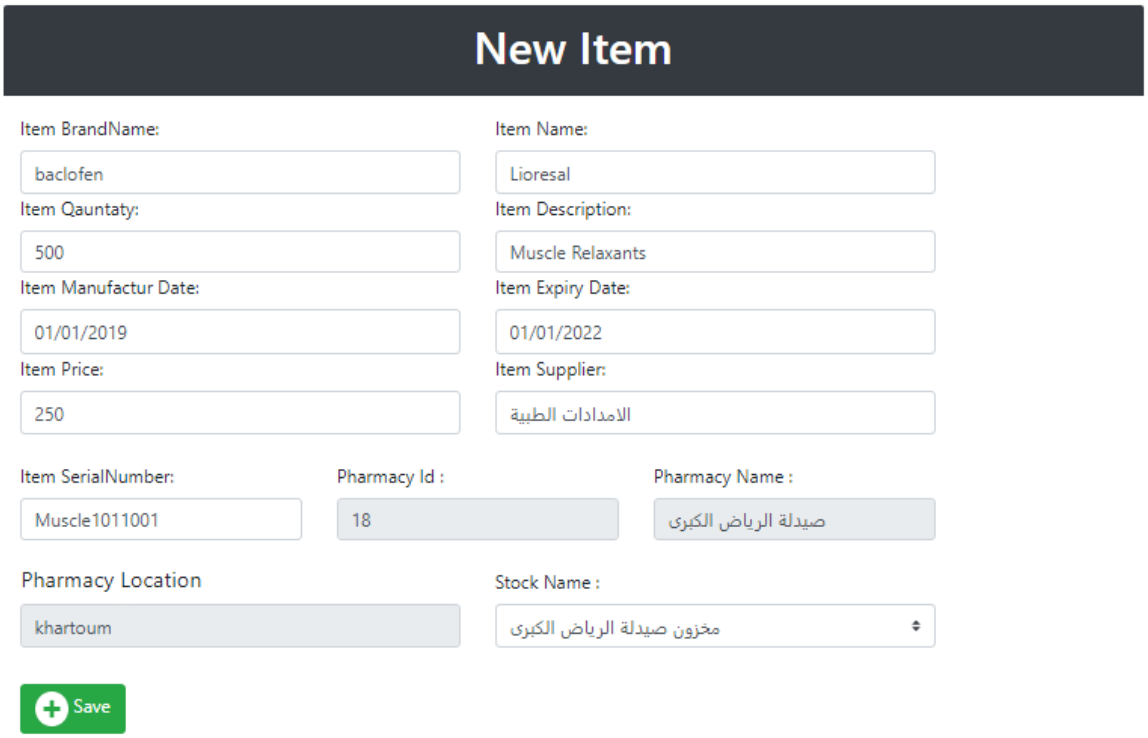


Figure 4. 23 describe add new item page.

Manage Items Interface

Item saved and redirect to manage items Interface contain all items operation from (add item, delete, update, and search) and linked to Manage stock interface as shown in figure.

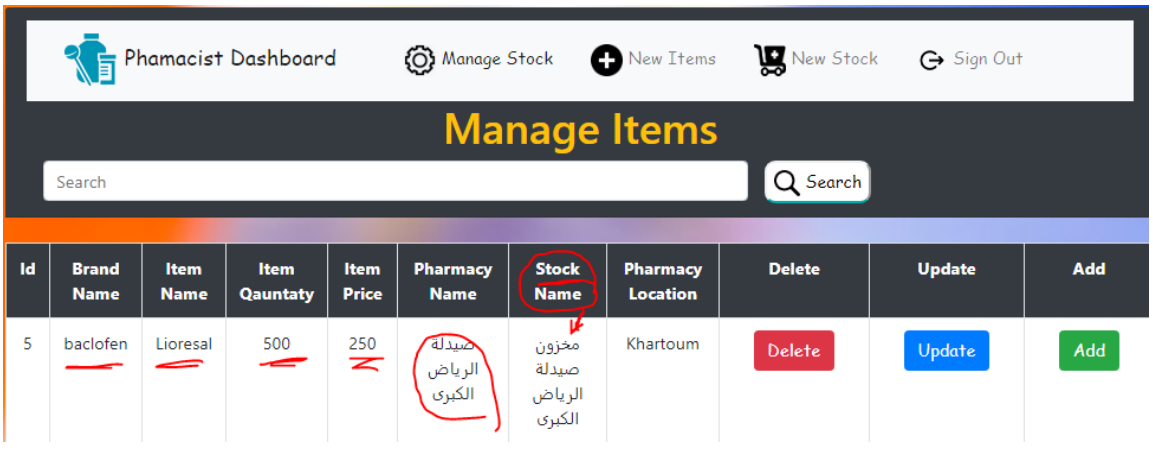


Figure 4. 24 describe added item and manage item page.

Introduction App Interfaces

This interfaces contain three different information about availability of medication and searching for medication and the important role that pharmacist play to help the customer or consumer to take their prescriptions of right medications.

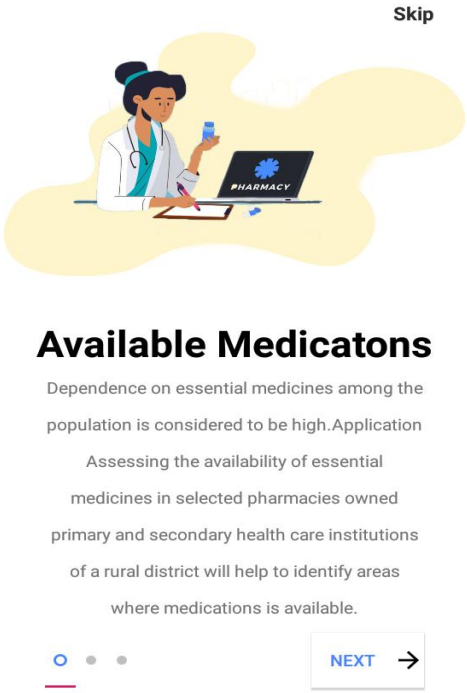


Figure 4. 26 describe first slide introduction app.

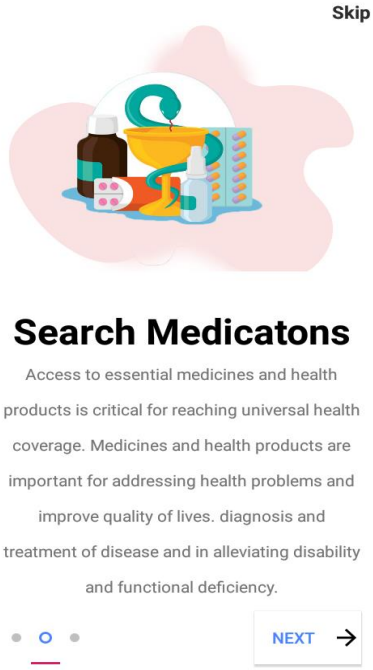


Figure 4. 25 describe second slide introduction app.

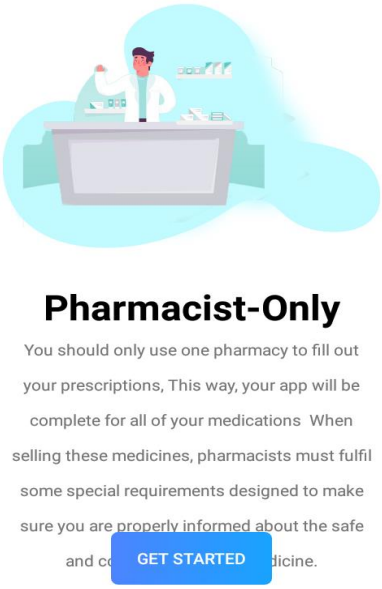


Figure 4. 27 describe third slide introduction app.

Search Home Interface

Interface where customer select purpose search for target medicine or search nearby pharmacy as shown in figure.

Figure 4. 28 describe home app interface.

Search Medication Interface

When customer select purpose search medication already application load random medication list from database in first and when search for target medicine the app filter the result also search support search by brand name and scientific name of the medications or pharmacy name and location as shown in figure.

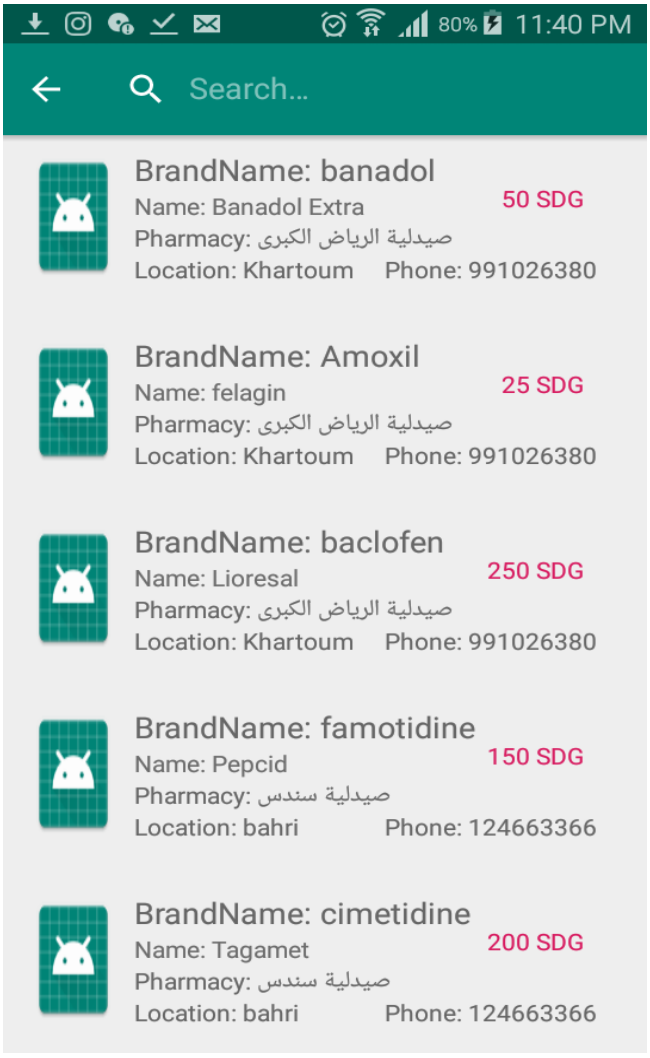


Figure 4. 29 describes search for medicine.

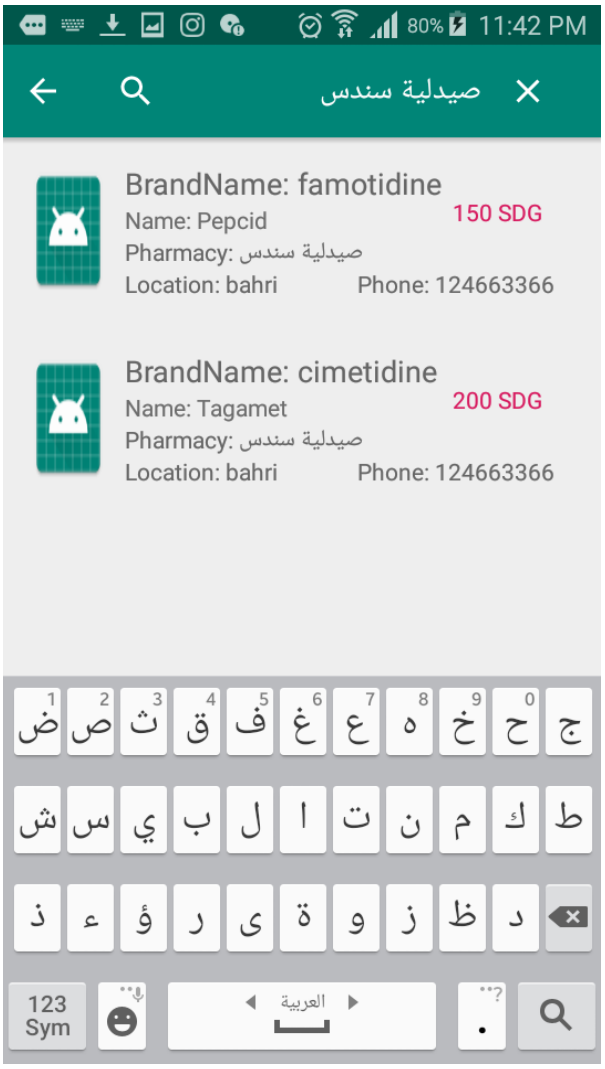


Figure 4.30 describes search for medicine by pharmacy.

Search Pharmacy Interface

When customer select search for nearby pharmacy the app shown map and current user location and search bar where search for specific one also map fragment contain button named get nearby pharmacy to show nearby pharmacies as shown in figures below.

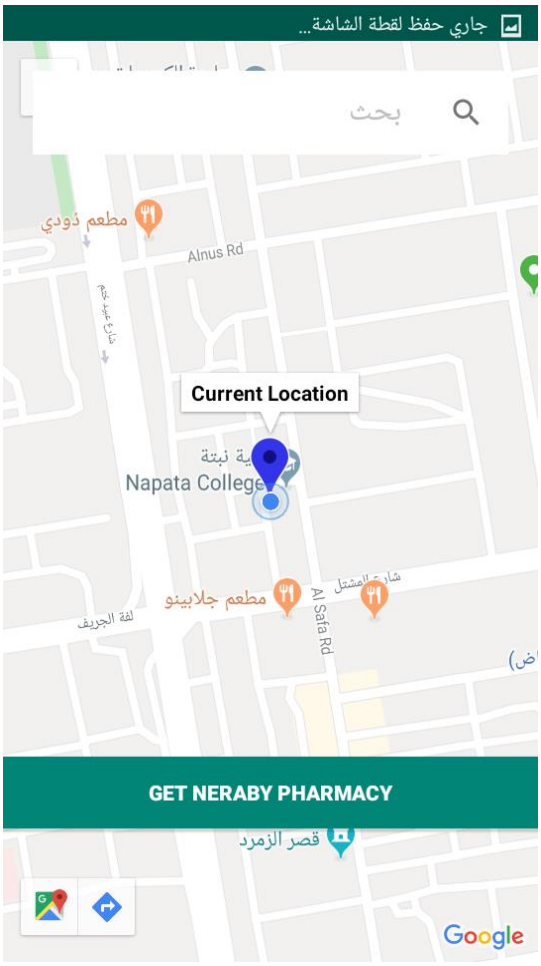


Figure 4. 30 describes current user location when click search nearby pharmacies.

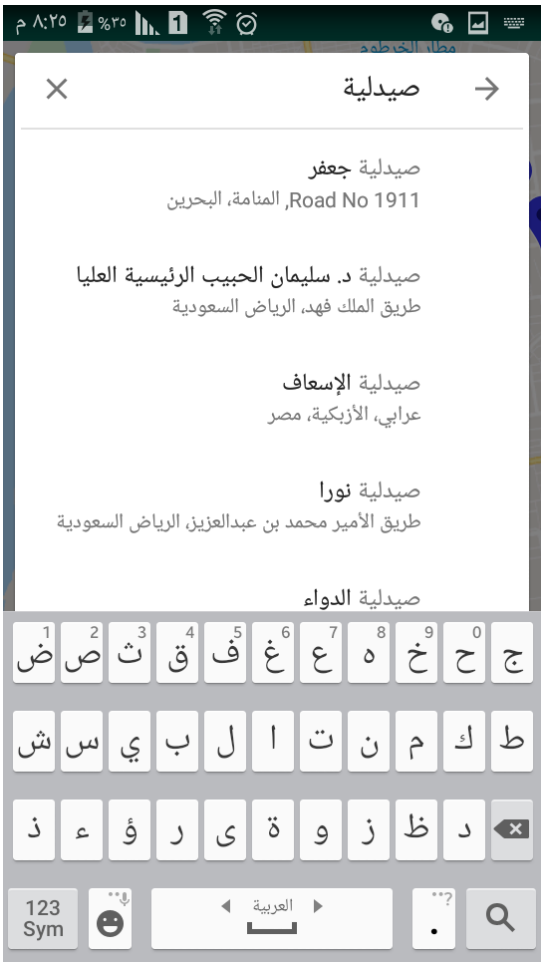


Figure 4. 31 describes suggestion when search for pharmacies.

Nearby Pharmacy Interface

When customer click on button get nearby pharmacy the app show all nearby pharmacy from google maps server to view pharmacies as shown below.

Figure 4. 32 describes marker for nearby pharmacies searched.

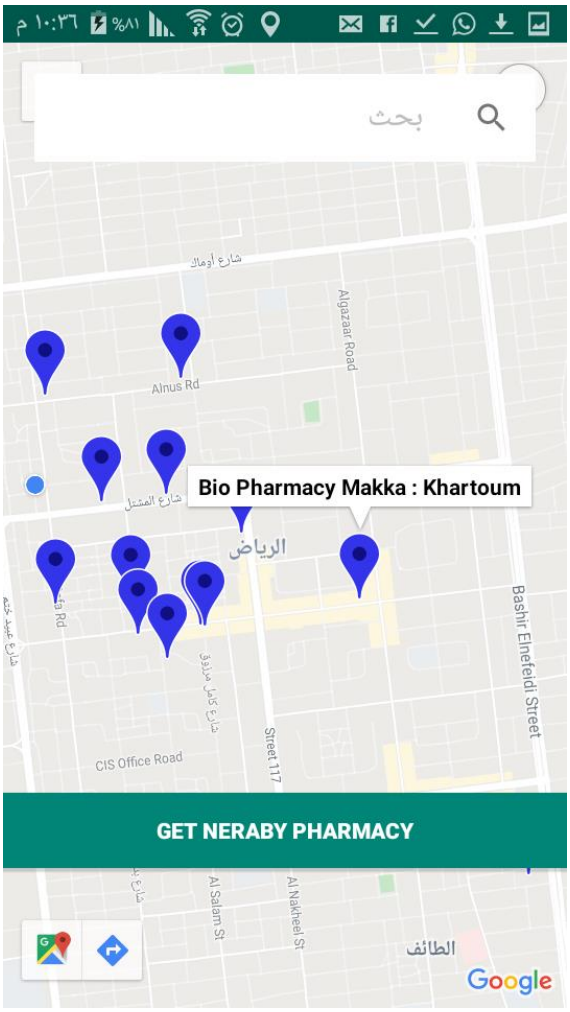


Figure 4. 33 describes nearby pharmacies searched.

Google Map Interface

When click on google direction button on bottom the app redirect the customer from search nearby pharmacy interface to google maps application to view other information for example the distance and route between user current location and pharmacy as shown in figure.

Figure 4. 34 describes when click on google direction icon below redirect to google map app.

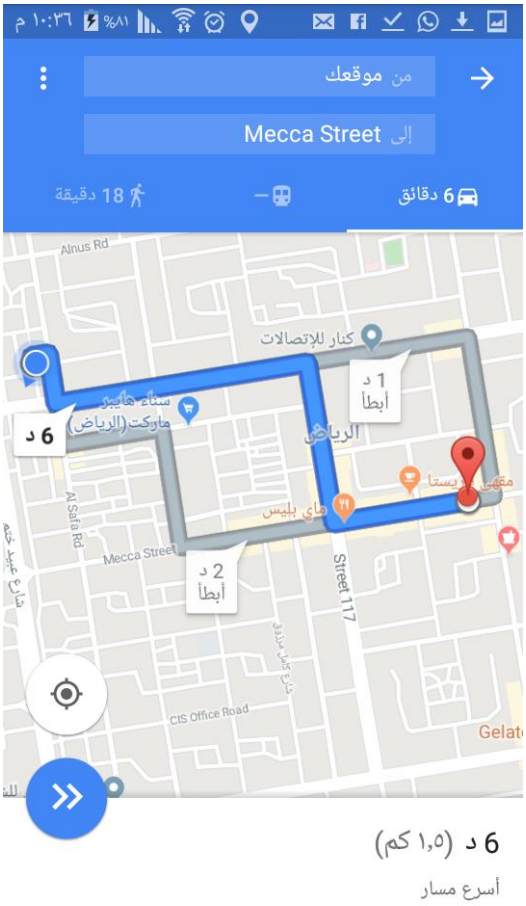


Figure 4. 35 describes direction for selected marker or pharmacy.

5.1 Results

The application is set to provide a fast, reliable and error-free way of interaction between the patient and the pharmacy, and ensures the application achieves its goals by finding the drug in an easier and faster way.

- Get the most out of Android apps to get enough information about the availability of medicines.
- Facilitate access to pharmacies and pharmaceutical services.
- Facilitate access to the nearest pharmaceutical services location and get contact numbers with them.
- Facilitate timely access to medication.
- Helping the customer in direct contact with pharmacies via the telephone guide.
- Easy to deal with the application and the possibility of working on it without training.
- A system manager's website has been created to enable the customer's system or client application to be managed.

5.2 Conclusion

There are many problems in finding medicine as quickly as possible, including lack of medicine, insufficient number of pharmacies, inaccessibility, and high drug prices. Our project aims to resolve some of these issues. By providing an easy-to-use application to find medication, increase comfort, and some formalities of a community-run system. You will be, however, require these projects for further development, support, and implementation. If this is done, we will certainly provide higher welfare for Sudanese citizens, finding the medicine easier.

5.3 Recommendation

• Developing the application to supports other languages.

• Concluding agreements with pharmacies to be able to obtain sufficient information

• Developing the system to work on other operating systems, such as iOS, to keep pace with technical development and accessibility for all users

• Using paid hosting instead of free hosting to get unlimited uptime and large storage capacity

• Developing the system to show the distance in km and the time taken to reach nearby pharmacies

• Search for medicines and pharmacies nearby using the voice search

Enabling the system to extract reports

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Appended

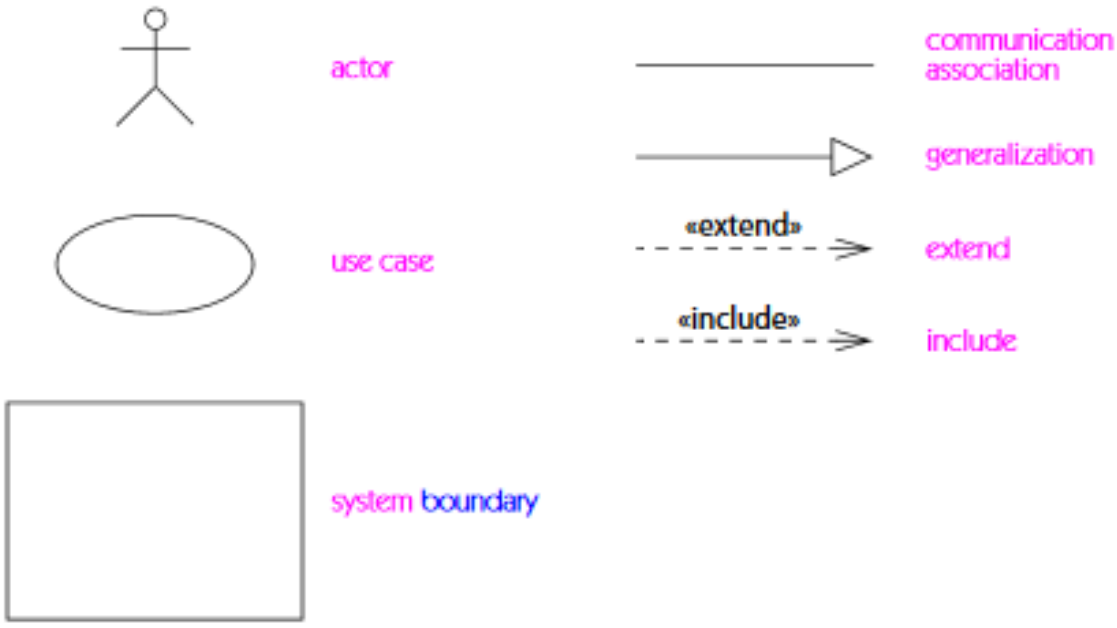


Figure 5. 1 describe relation and component of use case diagram.

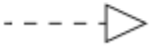
Relationship	*Function*	*Notation*
association	A description of a connection among instances of classes	
dependency	A relationship between two model elements	
flow	A relationship between two versions of an object at successive times	
generalization	A relationship between a more general description and a more specific variety of the general thing, used for inheritance	
realization	Relationship between a specification and its implementation	
usage	A situation in which one element requires another for its correct functioning	

Figure 5. 2 Figure 8 describe relationship and functionality.

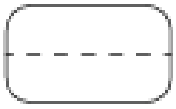
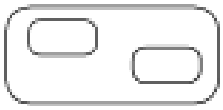
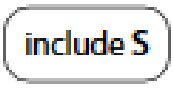
State Kind	*Description*	*Notation*
simple state	A state with no substructure	
concurrent composite state	A state that is divided into two or more concurrent substates, all of which are concurrently active when the composite state is active	
sequential composite state	A state that contains one or more disjoint substates, exactly one of which is active at one time when the composite state is active	
initial state	A pseudostate that indicates the starting state when the enclosing state in invoked	
final state	A special state whose activation indicates the enclosing state has completed activity	
junction state	A pseudostate that chains transition segments into a single run-to-completion transition	
history state	A pseudostate whose activation restores the previously active state within a composite state	
submachine reference state	A state that references a submachine, which is implicitly inserted in place of the submachine reference state	
stub state	A pseudostate within a submachine reference state that identifies a state in the referenced state machine	

Figure 5. 3 describe state kind and description.