SUDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY

COLLEGE OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

SOFTWARE ENGINEERING DEPARTMENT

CUSTOMER EXPERIENCE THROUGH GPS

(CASE STUDY MTN)

THESIS SUBMITED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS OF B.Sc. (HONOR) DEGREE IN SOFTWARE ENGINEERING

PREPARED BY:

MOHAMMED MAHMOUD AMIN

RANA ESSAM ALDEEN ALI

AISHA ADIL ABD ELGADER

SUPERVISOR: LEENA HIDER DESOQI

October 2016

بسم الله الرحمن الرحيم

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October 2016

الآية

ِ سَاجِدًا وَقَائِمًا يَحْذَرُ الْآخِرَةَ وَيَرْجُو رَحْمَةَ رَبِّهِ ۗ قُلْ هَلْ

نَ وَالَّذِينَ لَا يَعْلَمُونَ ۗ إِنَّمَا يَتَذَكَّرُ أُولُو الْأَلْبَابِ (9)"

صدق الله العظيم

سورة الحشر

الإهداء

إلىمنكللهم اللهبالهيبةوالوقار .. إلىمنعلمونا العطاءبدونانتظار ..

إلىمننحملاسمائهمبكلافتخار ..

نرجومناللهأنيمدفيأعماركملتر واثماراً قدحان

قطافهابعدطولانتظاروستبقىكلماتكمنجوماً نهتديبهااليوموفيالغد

وإلىالأبد..

آبائنا الأعزاء

إلىملائكتنافيالحياة .. إلىمعنىالحبوإلىمعنىالحنانوالتفاني ..

إلىبسمةالحياةوسرالوجود

إلىمنكاندعائهن سرنجاحناوحنانهنبلسمجراحناإلىأغلىالحبايب..

أمهاتناالحبيبات

أنتم وهبتمونا الحياة والأمل والنشأة على شغف الإطلاع والمعرفة

وإلى إخوتنا وأسرتناجميعاً ..

ثم إلى كل من علمناحرفاً أصبح سنا برقه يضيء الطريق أمامنا..

الحمد والثناء

الحمد لله أقصى مبلغ الحمد.. والشكر لله من قبل ومن بعد

الحمد لله عن سمع وعن بصر.. الحمد لله عن عقل وعن جسد

الحمد لله عن ساق وعن قدم.. الحمد لله عن كتفي وعن يدي

الحمد لله عن قلبي وعن رئتي.. الحمد لله عن كلتي وعن كبدي

الحمد لله عن أمي وعن أبتي.. والحمد لله عن أخوات ذا العبد

الحمد لله في سري وفي علني.. والحمد لله في حزني وفي سعدي

الحمد لله عمّا كنت أعلمه..والحمد لله عمّا غاب عن خلدي

الحمد لله من عمت فضائله.. وأنعم الله أعيت منطق العدد

فالحمد للهثمّ الشكر يتبعه.. والحمد لله عن شكري وعن حمدي

الشكر والعرفان

نشكر الله العلي القدير الذي أنعم علينا بنعمة العقل والدين. القائل في محكم التنزيل

وَفَوْقَ كل ذِي عِلم عَلِيمٌ "سورة يوسف آية 76 ....صدق الله العظيم.

وقال رسول الله (صلى الله عليه وسلم)"**من صنع إليكم معروفاً فكافئوه، فإن لم تجدوا ما تكافئونه به فادعوا له حتى تروا أنكم كافأتموه) .....**"رواه أبو داوود.

وفاءً وتقديراً وإعترافاً منا بالجميل نتقدم بجزيل الشكر لأولئك المخلصين الذين لم يألوا جهداً في مساعدتنا في مجال البحث العلمي

ونخص بالشكر الأستاذة الفاضلة: لينا حيدر الدسوقي مشرفتنا على هذه الدراسة وصاحبة الفضل في توجيهنا ومساعدتنا في تجميع المادة البحثية، فجزاها الله كل خير.

ولا ننسى أن نتقدم بجزيل الشكر للمشرف المساعد الاستاذ مازن الهادي أبو قرجة من شركة MTN الذي قام بتوجيهنا طيلة هذه الدراسة.

وأخيراً نتقدم بجزيل شكرنا إلى كل من مدوا لنا يد العون والمساعدة في إخراج هذه الدراسة على أكمل وجه.

الأستاذ الفاضل أمجد محمد عزالدين والأستاذ هشام عبد الله والأستاذ المهدي إبراهيموالأستاذة الفاضلة سارة أحمد والأستاذة الفاضلة سارة إدريس التي قدمت لنا يد العون في تعديل البحث فجزاها الله عنا كل خير.

إن قلت شكراً فشكري لن يوفيكم، حقاً سعيتم فكان السعي مشكوراً، إن جف حبري عن التعبير يكتبكم قلب به صفاء الحب تعبيراً .

المستخلص

تتطلع الشركات في عالمنا المعاصر وتهدف لخلق بيئة ذات عوامل جاذبة للزبائن والمستهلكين تكسبها وتمنحها قيمة تنافسية أكبر في السباق المحتدم بين الشركات في القطاعات المختلفة.ومما لا شك فيه أن كل شركة تمتلك أسلوبها الخاص في تحقيق ذلك الهدف الأوحد ولكن أنجح هذه الطرق هي تلك التي تعتمد على دراسة ومعرفةاحتياجاتالزبائن وتطلعاتهم وتوفيرها لهموحل أهم المشاكل التي يمكن أن تواجههم ومعرفة شعورهم اتجاه الشركة وهذا ما يسمىبخبرة الزبون (Customer Experience CX).

مع تطور التكنولوجيا اليوم أصبح من الممكن تحديد مواقع الزبائن بصورة دقيقة ومعرفة الأماكن التي يتنقلون بينها بواسطة نظام تحديد المواقع (GPS). وفي هذا البحث قمنا بإستخدام (GPS) وخرائط قوقل من أجل تكوين خبرة الزبون (CX) لشركة MTNوذلك من خلال بناء تطبيق أندرويد يساعد الزبون على معرفة أقرب مركز لخدمات المشتركين أو نقطة بيع من الموقع الحالي له و كذلك تقديم الشكاوي أو الإقتراحات التي يريدهاللشركة. كما أن هنالك يأضاً جزء خاص بالمدير من أجل إدارة العمليات السابقة ومعرفة التقارير عن مراكز خدمات المشتركين.

تم عمل النظام بعد تحليل دقيق ودراسة للمشاكل الموجودة بصورة مفصلة لإختيار أفضل التقنيات و الحلول الممكنة لتقديم خدمات مرضية للزبائن. كما تم إختبار النظام والتأكد من أن العمليات تتم بصورة صحيحة وواضحة بحيث يتمكن أي شخص من التعامل مع النظام وإستخدامه بكل سهوله ويسر.

ABSTRACT

Companies always aims to establish an attractive environment for customers and consumers which will eventually guarantee a leading position amongst competitors. All of these companies do have their unique theories, strategies and methods that they believe it will draw them closer and closer to the desired goal. Amongst all, Methods that aim to study the behavior of the customer through his feedbacks and positive input are proved to be the optimum ones. This is called developing a **Customer Experience** (CX).

With the growth of technology at the present it had become possible to identify the customers' locations accurately, and know the places they travelled among by using GPS. In our study we use GPS and Google maps to develop CX to MTN Company, and that is through developing android application which provide the customers with the knowledge about the closest CSP or SP and give them the ability to present any suggestions or complaints they have to the Company. Besides that, it contains a special side which is accessed only by the admin to managing the whole system and to show the reports of all CSPs.

Our System has been developed upon fine analysis and detailed study of the current problems the company addressed in order to find a suitable applicable technology and satisfactory solutions. The system has been put into operation and have been checked for any fault actions prior to the submission to guarantee that it is able to be used easily by any person.

TERMINOLOGIES

APIs
An Application Program Interface
is code that allows two software programs to communicate with each other., 12

ASP
An Active Server Page
is an HTML page that includes one or more scripts (small embedded programs) that are processed on a Microsoft Web server before the page is sent to the user., 14

ATS
Ambulance Tracking System, 10

BPMN
Business Process Modeling Notation
is a method of illustrating business processes in the form of a diagram similar to a flowchart, 7, 15, 18, 19, 79

CSP
Center of Service provider, 7, 18, 23, 24, 25, 26, 31, 70

CX
Customer Experience
the entirety of the interactions a customer has with a company and its products., VI, VII, 2

GPRS
General Packet Radio Service, 8

GPS
GPS
Global Positioning System, 1, 3, VI, 2, 3, 8, 9, 10, 12, 74

HTML
Hypertext Markup Language
is the set of markup symbols or codes inserted in a file intended for display on a World Wide Web browser page., 13

HTTP
Hypertext Transfer Protocol
is the set of rules for transferring files (text, graphic images, sound, video, and other multimedia files) on the World Wide Web., 12

IDE
An Integrated Development Environment
is a software suite that consolidates the basic tools developers need to write and test software., 13

IDEA
Integrated Development Environment for Android Platform, 13

IOS
iPhone Operating System is Apple's proprietary mobile operating system for its handheld devices, such as the iPhone, iPad and iPod Touch. The operating system is based on the Macintosh OS X., 12

IVR
Interactive Voice Response
An automated telephony system that interacts with callers., 2

JSON
JavaScript Object Notation
is a lightweight data-interchange format., 15

JSP
Java Server Page
is a technology for controlling the content or appearance of Web pages through the use of servlets, small programs that are specified in the Web page and run on the Web server to modify the Web page before it is sent to the user who requested it., 14

JVM
Java Virtual Machine, 15

OMG
Object Management Group, Inc.
is an international organization supported by over 800 members, including information system vendors, software developers and users. Founded in 1989,

the OMG promotes the theory and practice of object-oriented technology in software development., 15

OS
Operating System
is the program that, after being initially loaded into the computer by a boot program, manages all the other programs in a computer., 14

PHP
Hypertext Preprocessor
is a script language and interpreter that is freely available and used primarily on Linux Web servers., 14, 73

RDBMS
Relational Database Management system
is a program that lets you create, update, and administer a relational database., 14
Relational Database Management System, 14

SMS
Short Message Service)
is a service for sending short messages of up to 160 characters (224 characters if using a 5-bit mode) to mobile devices, including cellular phones, smartphones and PDAs., 2, 9, 41, 43

SP
Selling Point, 7, 18, 70

UML
Unified Modeling Language, 15, 20

W3C
The World Wide Web Consortium
is an industry consortium which seeks to promote standards for the evolution of the Web and interoperability between WWW products by producing specifications and reference software., 13

XML
Extensible Markup Language, 13

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CHAPTER 1

INTRODUCTION

1.1 PREFACE:-

1.1.1 INTRODUCTION:-

Today technologies offer better ways to serve companies and their customers in several domains, especially after they become the source of trust in the most of daily treatment. Companies invest these technologies to solve their problems and find amazing opportunities for developing their business to higher levels with less effort and cost. By using technology they can also build strong relationships with a high level of communications between customers and organizations such as social media, SMSmessages and IVR which drive at the end to customer's satisfaction.

The basic goal of the success companies is creating and building great CXwhich means observing the behavior of customers, knowing what is actually needed, their feelings about the company and their expectations to increase the loyalty and confidence.

We apply the concept of CX in our case study by using one of the most important technologies which is GPS. This is a technology that helps in collecting data about places, customer's locations and analyzing it to make decisions that couldsolve most of the problems which face customer with locations and places.

1.1.2 PROBLEMS:-

- The primary problem is that the customers cannot identify the available service providers around their regions neither the nearest one.
- Call center cannot describe the exactly service providers locations and the customers may miss-understand them (case study).
- The lack of information to the company about the crowded centers and where to open new ones according to the rallying points of the customers.
- A lot of calls to the call center (case study).
- Waiting for a long time until call is hold (case study).
- The serial operations to get the address is very long and boring (case study).

1.1.3 SCOPE:-

MTN customers in the state of Khartoum in Khartoum city.

1.1.4 METHODOLOGY:-

The customer experience is need to be improved to meet company's customer's issues where they live. The improvement willbe begin by developing an application to do so. First GPS is used to identify customer's and company's positions and visualize them as marked locations on a map. Thenthe closest service providers who can supply them with the suitable services must be calculated and explained.After thatthe path to reach it should be marked on a map in a way that facilitates how they can achieve their needs with less effort, cost and time. Alsothe customers should be allowable to present their complaints and suggestions to the company in an easily way.

On the other hand, administrator website is developed to control the service centers (add, update and delete) to keep the map updated all over the time. Another thing that the admin is responsible for is the studying of the suggestions and directing the complaints to the department which has the responsibility to solve it. Besides that hehas the authority to display the reports (which are received from the CSPs daily) of a specific period of time to check the calculations and to decide if there are any improvement opportunities that can be exploited to improve the quality, services and to increase profits.

1.1.5 OBJECTIVES:-

- Help customers to find their needs easily.
- Alleviate time of resolving issues.
- Decrease the number of calls to the call center (case study).
- Determine the shortest path between the current location and the destination in a configurable way.
- Improve customer's satisfaction.

1.1.6 STRUCTURE:-

The research contains six chapters:

- Chapter 1: Describes introduction, problems, scope, methodology and objectives of research and summary of MTN Company.
- Chapter 2: Gives brief descriptionsabout three of literature review that related to our research.
- Chapter 3: Describes tools and techniques which areused in implementation.
- Chapter 4: Describes the analysis of system-as-is and system-to-be.
- Chapter 5: Describes the design of application and website.
- Chapter 6: Results, Recommendations and Conclusion.

1.2 CASE STUDY (MTN):-

The MTN Group Limited is a leading provider of communication services, offering cellular network access and business solutions, Launched in 1994. The MTN Group is a multinational telecommunication group, operating in 23 countries in Africa, Middle East and Europe. As of September 2015, MTN recorded more than 230 million subscribers across its operators [1].

MTN has grown form a well-known brand through its chain of international experience during the past years in telecommunication becoming the first African telecom company ranked no 79 among the top 100 global brands according to Millward-Brown Brandz for the year 2013, it crossed 230 Million subscribers among its operating companies around the world and the one and only African company sponsoring the FIFA World Cup - South Africa in 2010 [1].

1.2.1 MTN SUDAN:-

At the end of 2002, MTN Sudan was officially licensed to operate its services by an official letter from the National Telecom Corporation. It granted the use of GSM (2G) and UMTS (3G), and the use of microwave transmission frequencies [1].

1.2.2 VISION:

Vision is: Your Customer is your Paycheck [1].

The goal of Company is provide high customer satisfaction and provide services that satisfy customer's needs.

The main goal is to reduce the time and effort to get the potential service.

CHAPTER 2

LITRATURE REVIEW

2.1 MTN AS IS SYSTEM: -

If the customers need a service or want to submit a complaint, they must go to the CSP or to the SP. To access the CSP or SP they can ask someone, search by themselves to find one or call the call center of the company.

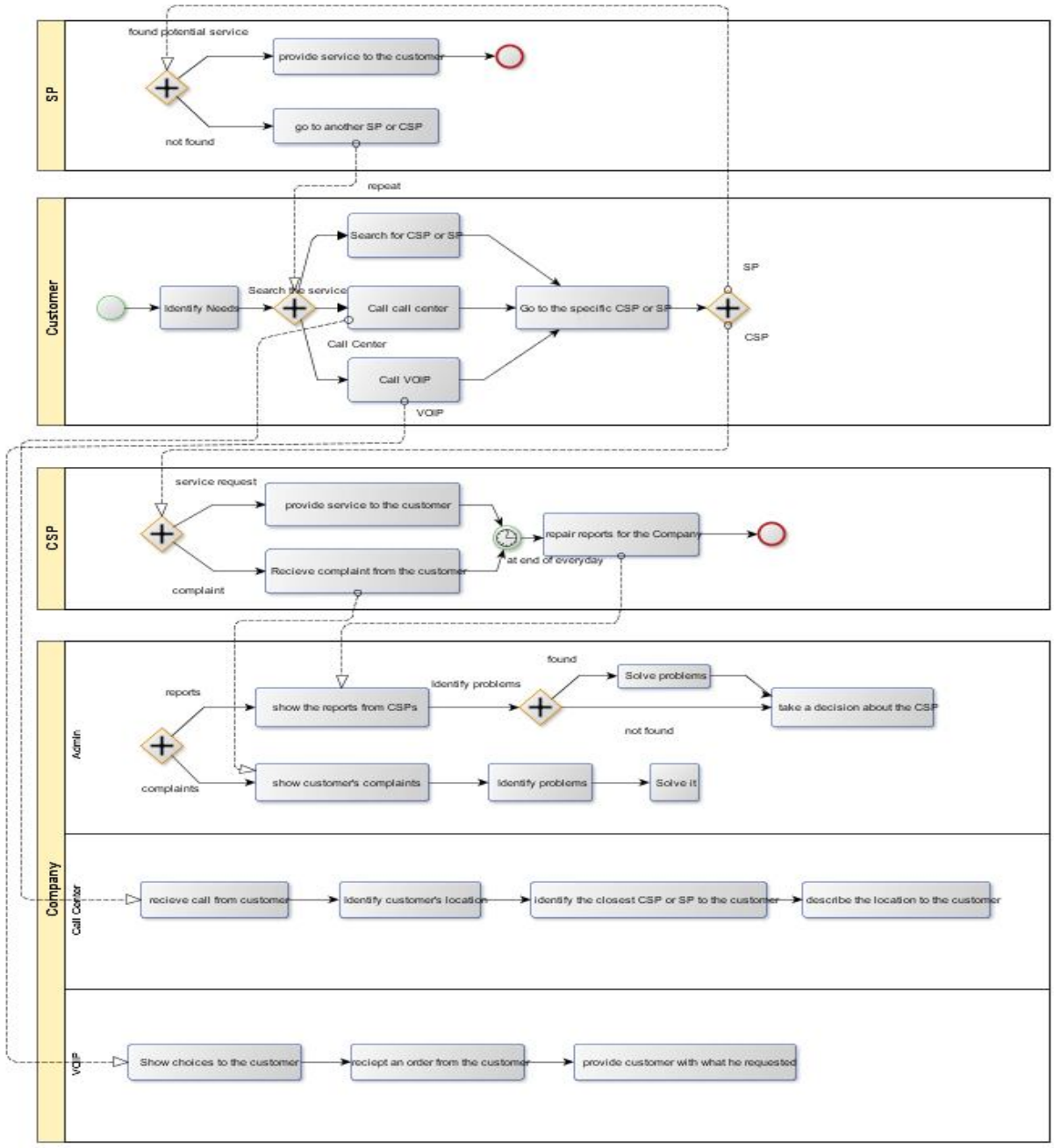

Figure 2-1 As-Is system BPMN

2.2 LITERATURE REVIEWS:-

2.2.1 MOBILE BANKING WITH LOCATION TRACKING OF NEAREST ATM CENTER USING GPS: -

Android application in recently year become popular use in several domains because it can be use in anytime anywhere. Banking application design for financial institute to facilitate services for customer by identify the transaction that happen to their account and give them ability to access their information. And also use location based service to identify the actual location of customer and closest ATM through GPS technology. The nearest ATM or bank information popup in alert dialog message [2].

They use android operation system, GSP and google map to implement banking application [2].

2.2.2 AMBULANCE TRACKING SYSTEM:-

In this study, reliance on follow the ambulance in real time using the GPS the technology which used is a unit for receiving the ambulance current location, forward it to a microcontroller and an Internet connection via GPRS to view the real-time location on Google Map which allows to see the vehicle at all times [3].
With Google map you can become acquainted with the ambulance on the website in real time, and can be monitored very well and that includes trails and / or vehicles directions [3].
When patients are transferred by ambulances, it should be medical data transferred from the ambulance to the medical center in an emergency via satellite [3].

2.2.3 A STAR PATHFINDING ALGORITHM:-

Venynova Lianty said that" In computer science, A * (pronounced "A star") is a graph or tree search method used to find a path from the start node to the goal node that has been determined before." [4]

An application was design to help the service provider of taxi to fulfill their customers' orders. Previous course that is required is the installation of GPS in each cab, Call Center which is active 24 hours either by phone or SMS, and servers that are used to perform calculations using A * Pathfinding Algorithm [4].

The customers call the call center services provider with a taxi by call or SMS, the call center search for a cab which is close to the pick-up location in a radius of 10 kilometers. Finally the taxi go to the customers in their pick-up locations [4].

2.3 THE COMPARISON:-

Table 2-1 Comparison between our study and the literature review:-

THE STUDY	THE SIMILARITIES	THE DIFFERENCES
MOBILE BANKING WITH LOCATION TRACKING OF NEAREST ATM CENTER USING GPS	• Use google map and GPS to identify the nearest place from the current location. • Implement system on android operation system devices.	In our application customer can find path that arrive to closest location that provided service with time and distance required to achieve that location which is not available for mobile banking study.
AMBULANCE TRACKING SYSTEM	• Use GPS to identify the location of service provider. • Use Google maps to analyze and determine the shortest path to the goal.	In ATS there is a micro controller which receives current location and view it on a map but in our study we use smart phones which do all of these operations.
A STAR PATHFINDING ALGORITHM	• Use GPS to identify locations. • Provide customers with their needs in their locations.	• In A star study they use A* algorithm to find the nearest cap while we'll not use it. • We use Google map while they depend only on the call center.

CHAPTER 3

TOOLS ANDTECHNIQUES

3.1 GOOGLE MAP:-

“Google Maps is a Web-based service that provides detailed information about regions and sites around the world “[5].

With google map we can search for most of the locations which we want to arrive such as location of countries, cities, restaurants, and so on. Also it is useful to find the nearest location of different services with shortest route and calculate the time to arrive the location you want by different ways like mobility by cars, planes, trains or footing. For each of those, Google map can determine the time it takes to move from point to point.

Google map APIs are available for any platform, android, IOS, web browser, and via HTTP web services.

The most important advantages of Google map are dealing with Google map is easy to learn and use, providing plentiful information about places and many types of view such as normal, satellite, and terrain and giving the directions for trips [6].

3.2 GPS:-

GPS is used to identify where we are exactly on the earth by latitude and longitude coordinatesand to determine time and speed when move from one location to another. To do that there are approximately24 satellitesrotundityin different orbit around earth for 24 hours, four satellites sent signals for satellite receivers on the earth to detect exactly location. Actually, to determine our current location we need to know our distance from three satellites. Signal from satellite 4 use to confirm that calculation is accurate. GPS satellites have atomic clocks to keep accurate time and set the time to the network over the world [7].

The advantages of GPSare providing an accurate way step-by-step from point A to point B even if people make a wrong turn it will provide them an updated route based on their new location and saving a considerable amount of time navigating foreign areas[8].

3.3 ANDROID STUDIO:-

“Android Studio is the official IDE for Android app development, based on IntelliJ IDEA”[9].

Android studio is one of the best tools especially designed by Google to develop android applications, to provide powerful features and to contain most of the characteristics that the programmers need to develop their applications. Also it facilitates adding plugins from external libraries. In other words, all services provided by Google prepared exhaustively with android studio which by using it you can develop applications for different types of devices such as phones, watches, TVs and cars.

The most important advantages of Android Studio are writing code and adding changes to the application using dramatically instant run will speed up edit, build and run cycles, is built on IntelliJ and is capable of advanced code completion, refactoring, and code analysis which makes coding better and fasting the work, installing and running applications become faster by using virtually any Android device configuration instead of physical devices, with Gradle, Android Studio offers high-performance build automation, robust dependency management, and customizable build configurations, facilitates configuring projects to include code libraries, facilitates sharing code among different versions of application and starting projects with code templates or import Google code samples from GitHub[10].

3.4 XML:-

XML is designed to be understandable by both human and machine. Also, it provides a flexibleway to describe, transport and store different kinds of data such as words, pictures and so no. It is likeHTML language but XMLcan’t predefine tags. To do that you can create your own tags for each purpose [11].

The most important advantages of XML are readable by both human and machine, standard markup language recommended by W3C and adaptation with any platform and easy compatibility when the .or schema is change [12].

3.5 PHP:-

PHP is a large part of server side scripting languages like JSP, ASP.net and Node.js designed for web development to make dynamic web page. This allows to create interactive channels between user, server and database. It takes request from frontend such as browser and return response from backend (database) to frontend [13].

The advantages we benefit from are it is Simple, clear and easy to learn and understand, open source, isn't OSspecific, there are no costs associated with using PHP, operates much faster than other scripting languages, you can easily increase your cluster size by adding more servers as your projects grow which increases the scalability and by using PHP it is easier to fix problems[14].

3.6 MYSQL:-

MYSQL is an RDBMS. Which work well in very demanding environments, such as web applications and supports a variety of data types so it is one of the best RDBMS used for developing web-based applications [15].

MySQL's most important feature is its storage-engine architecture which separates query processing and other server tasks from data storage and retrieval. Another feature is that each client connection gets its own thread within the server process separately from other clients which improve the speed and performance [15].

The basic features of MySQL are fast and has a high-performance, easy to use, query language support, many clients can connect to MySQL server at the same time because it is multi-threaded, run on many varieties of operating systems, open source project and an industry standard[16].

3.7 JAVA:-

Java is a programming language that is class-based, object-oriented, and specifically designed to have as few implementation dependencies as possible. It is intended to let application developers write codes once then run it anywhere[17].

Java code can run on many different operating systems. This makes Java platform independent. Java does this by making the Java compiler turn code into Java bytecode(class file) instead of machine code. This means that when the program is executed, the JVMinterprets the bytecode and translates it into machine code [18].

Java is the most widely used programming language for android application designing and development.

The features we benefit from are it is very simple, object-oriented, platform-independent, distributed computing which involves several computers on a network working together, interpreted language, is one of the first programming languages to consider security as part of its design and it is multithreaded[17] [18].

3.8 JSON:-

JSON is a part of Java Script language which is used to exchange data between different languages. It is a collection of key/value pairs and ordered list of value.

We used it to exchange data between server and android application.

The basic advantages of JSON technology are the syntax of JSON is very easy and fast to execute, JSON code is compatible with all of the browsers, used in server parsing to get fast response form a server side and it is the best way to share any size of data [19].

3.9 BPMN:-

Business process modeling notation is OMG stander which is provide ability to define the sequence of business process in graphical notations. BPMN depict the coordination and interactions between unit in organization and other participant.

3.10 UML:-

UML is not like other programing language it is a pictorial language use diagrams and charts to be easily understood by developers, designers and all people interested in system.

It provides several types of diagrams: use case, class, activity, sequence, etc. Each of this has a specific use to describe the behavior or the structure of the software.

3.11 USE CASE:-

Use case diagrams are high level requirement analysis of a system, which are behavior diagrams drawn to capture the functional requirements of a system as use case and actors then show which actors participate in each use case. Use case diagrams consist of use cases, actors, associations and packages [20].

3.12 ACTIVITY:-

Activity diagrams are used to illustrate activities and business processes which describe the functionality of the system. An activity diagram is used to display the sequence of activities by showing workflow from a start point to the finish point detailing the decision paths that exists in the progression of events [20][21].

The main elements of an activity diagram are activities, actions, initial node, final node, flow/edge arrows, forks, joins, conditions, decisions, merges and partitions [20].

3.13 SEQUENCE:-

Sequence diagrams are interaction diagrams that show how objects operate with each other's, the order of this interactions in time sequence and the sequence of messages exchanged between the objects [20][22].

CHAPTER 4

ANALYSIS

4.1 BPMN:-

4.1.1 BUSINESS PROCESSES TO BE REENGINEERED:

Reengineering is done by converting business processes from manual to an application which provides the locations of the CSPs and SPs, the closest one to the customers' locations, number of people in each (in case of CSPs), the best way to reach it in the shortest time, mark the path in a map, show the left time to reach it, identifying the services provided in each (in case of SPs) and facilitating the submitting of complaints.

4.1.2 ANALYSIS & REDESIGNING:

4.1.2.1 CSPs & SPs:

- **ANALYSIS:**

  If the customer asks someone he can describe a SP or CSP while another is closer to the location of the customer. Or he can call the call center and he must wait until his call is hold then take a long time to ask about the locations of the service he need and wait for a long time again to know the locations from an employee which also can be the CSP or SP which is not the closest one to him.

- **REDESIGN:**

  Showing the locations of CSPs and SPs on a map which facilitate the process of knowing the closest one to the customer which enable him to know the closest one, the time he will wait in the CSP until his turn, the SP provides the services he asked for, the potential time to reach it and the best way to reach in few seconds.

4.1.2.2 COMPLAINTS:

- **ANALYSIS:**

  If he wants to submit a complaint he must go to a CSP to do that or he can call them and tell them about his complaint and wait for the response. Which takes a long time to reach and submitting it.

- **REDESIGN:**

  Alleviate the effort to submit a complaint by computerize the process. The customer open the app and choose his complaint from a list of complaints that are sent from another customers or he can write it if it is not one of them.

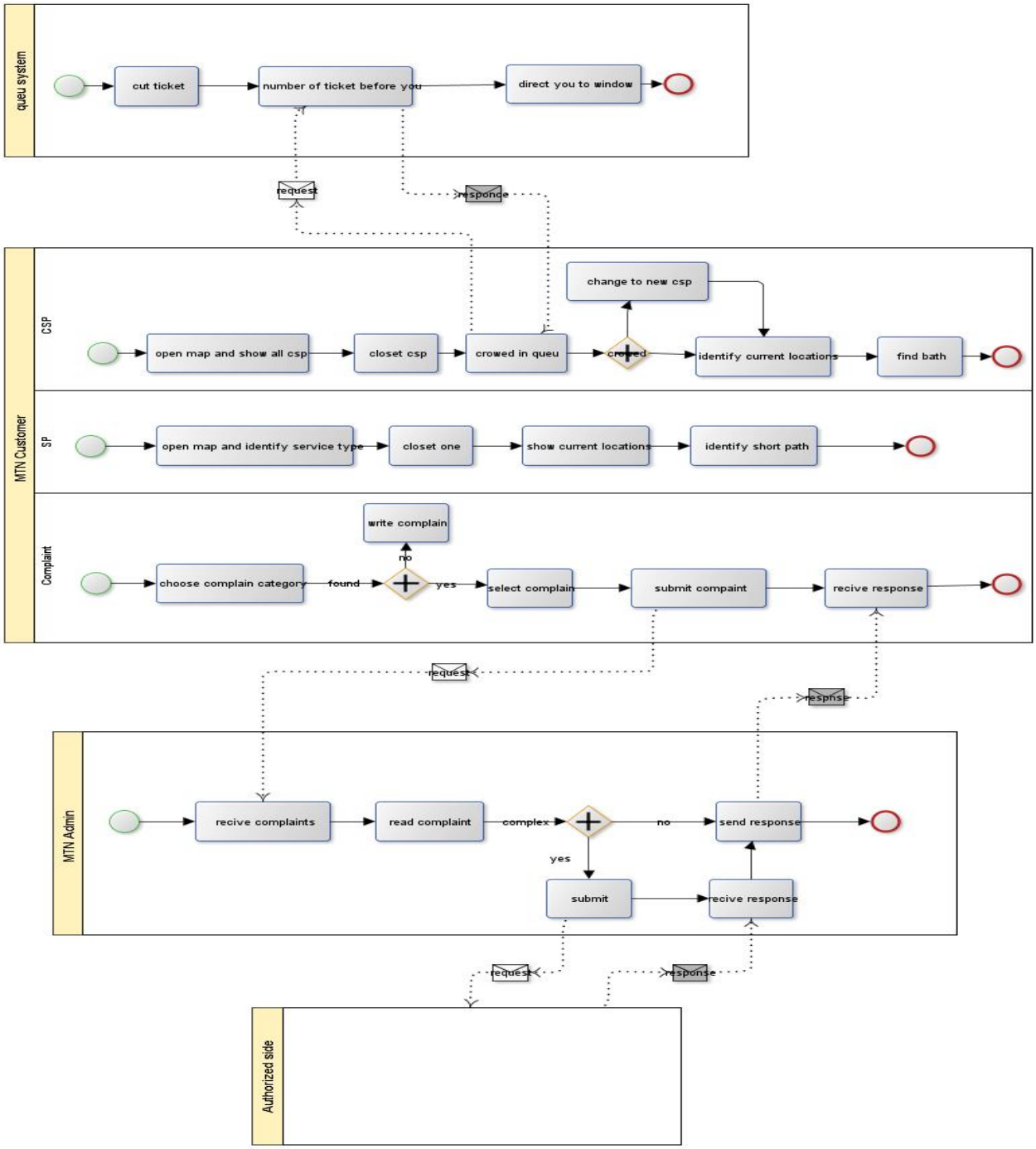

Figure 4-1 To-Be BPMN

4.2 UML:-

4.2.1 USE CASE:-

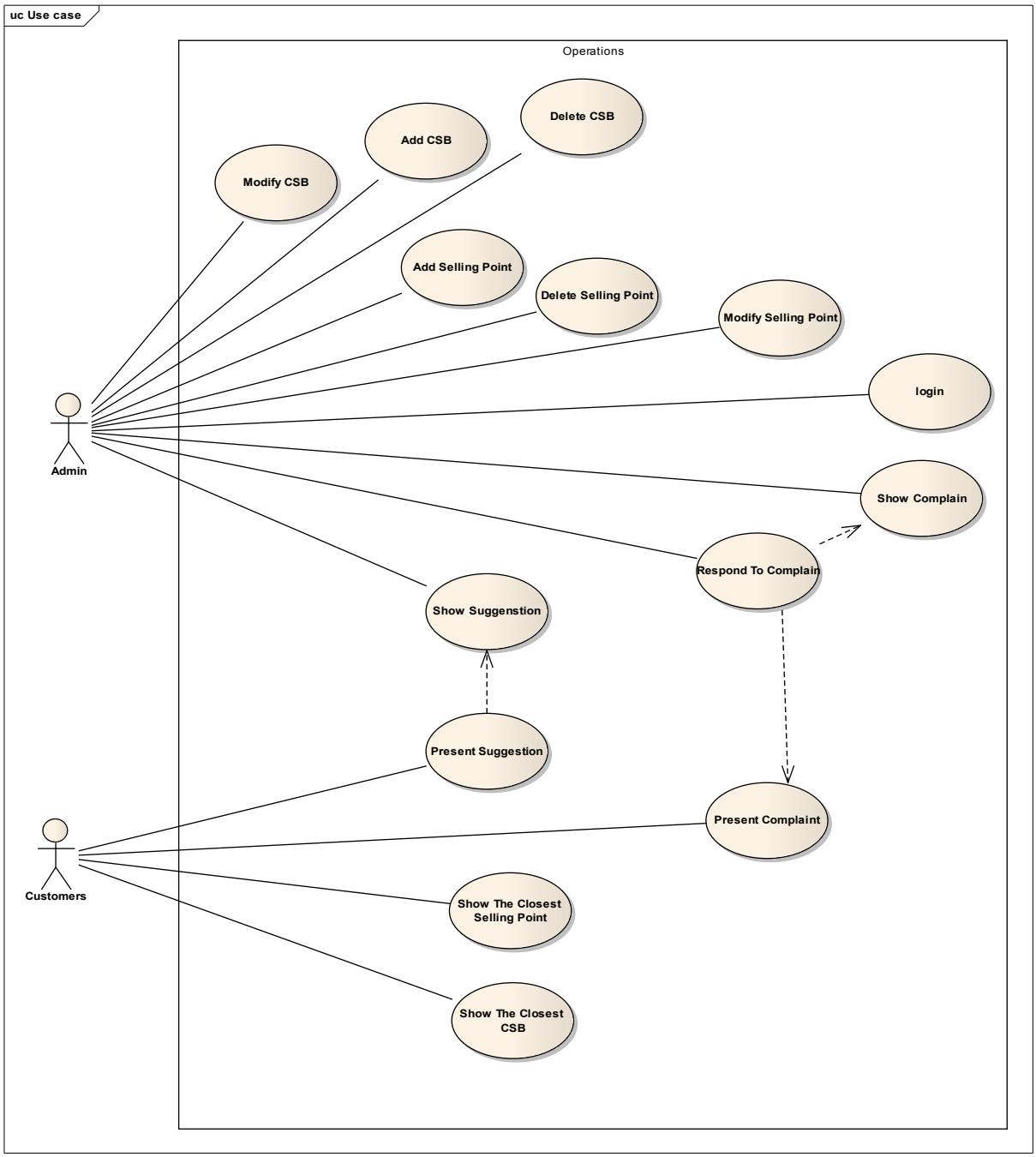

Figure 4-2 Use Case Diagram.

4.2.2 ACTIVITY:-

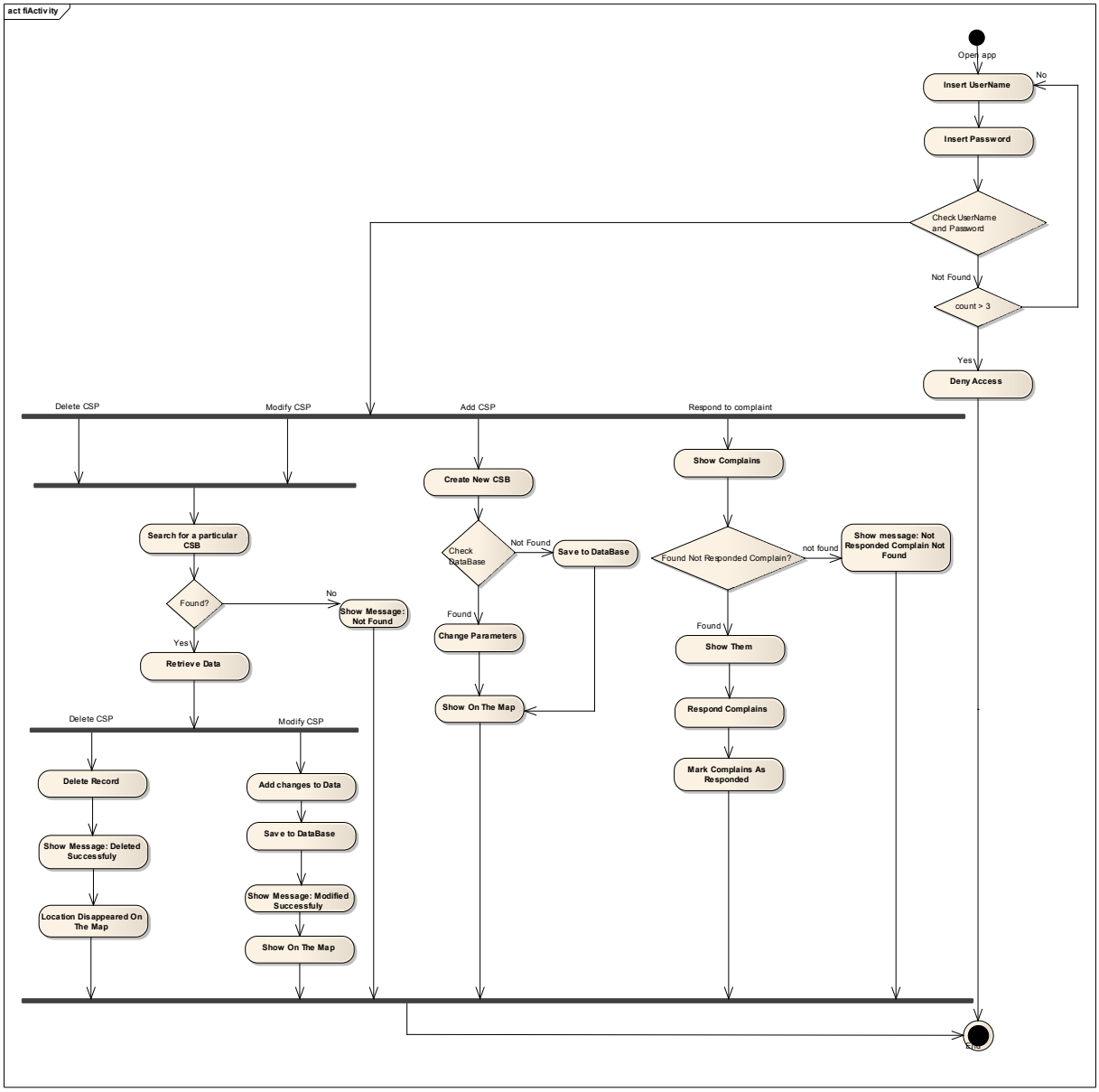

Figure 4-3 Admin Activity Diagram

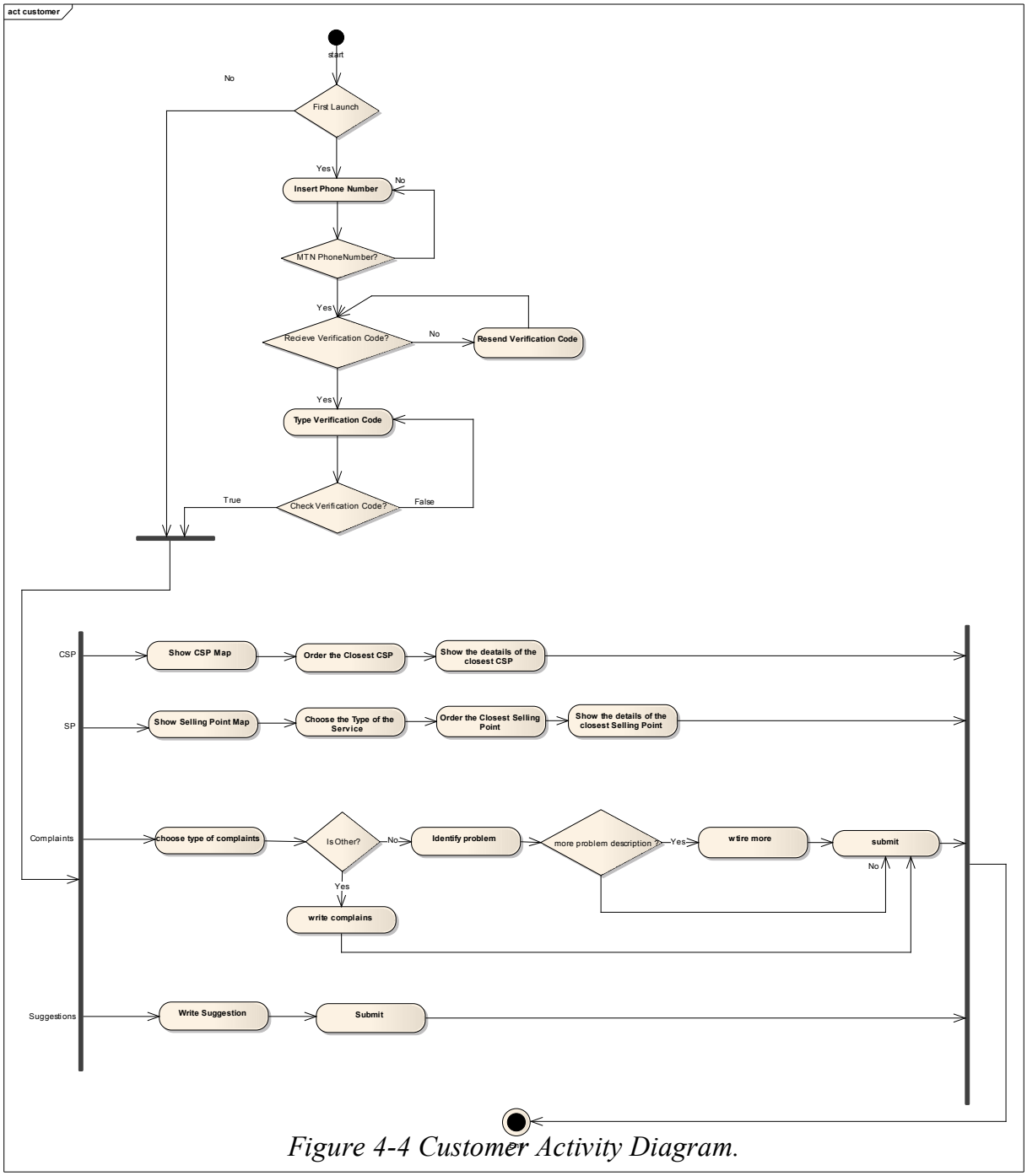

Figure 4-4 Customer Activity Diagram.

4.2.3 SEQUENCE:-

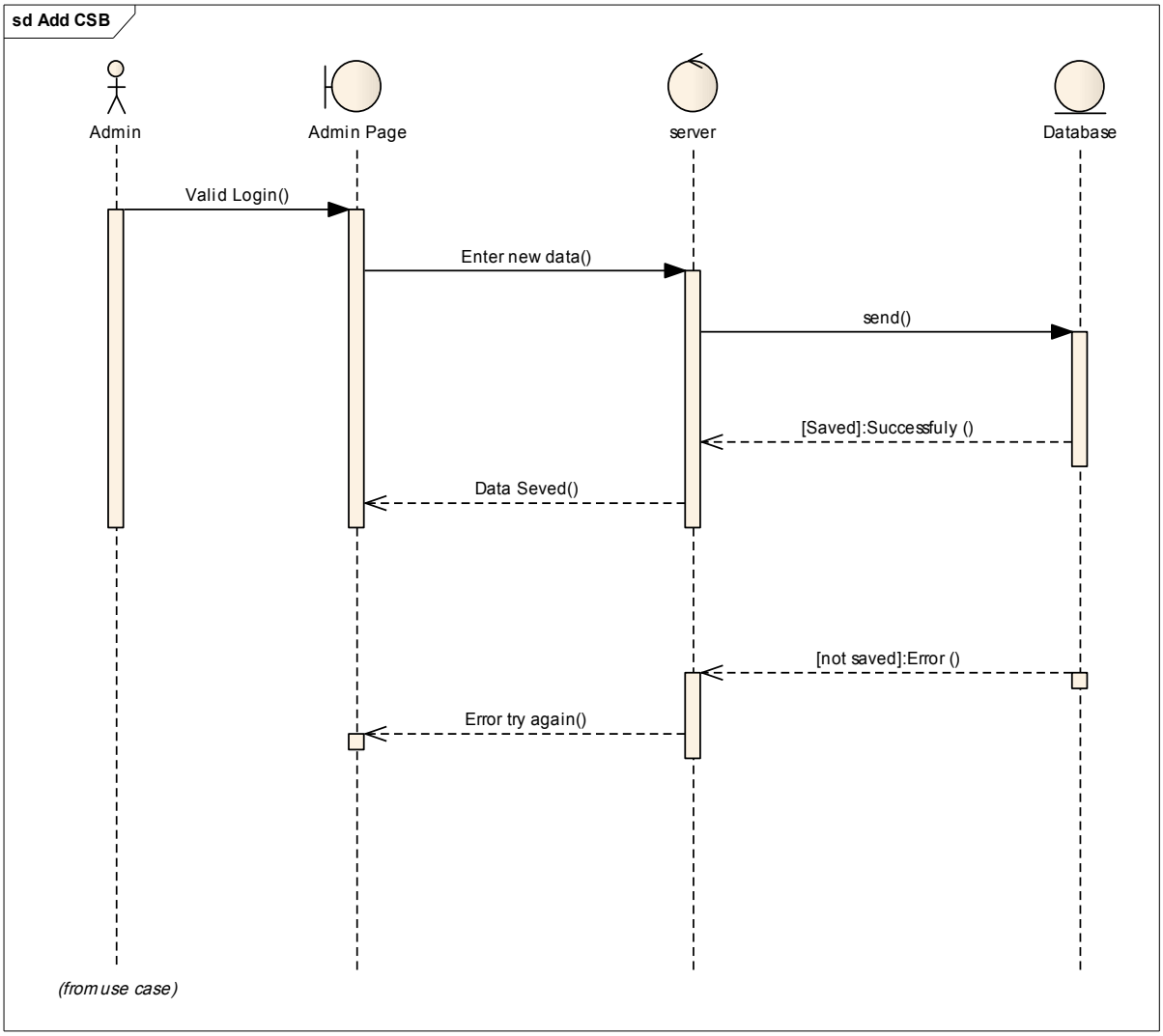

Figure 4-5 Sequence Diagram for Add CSP.

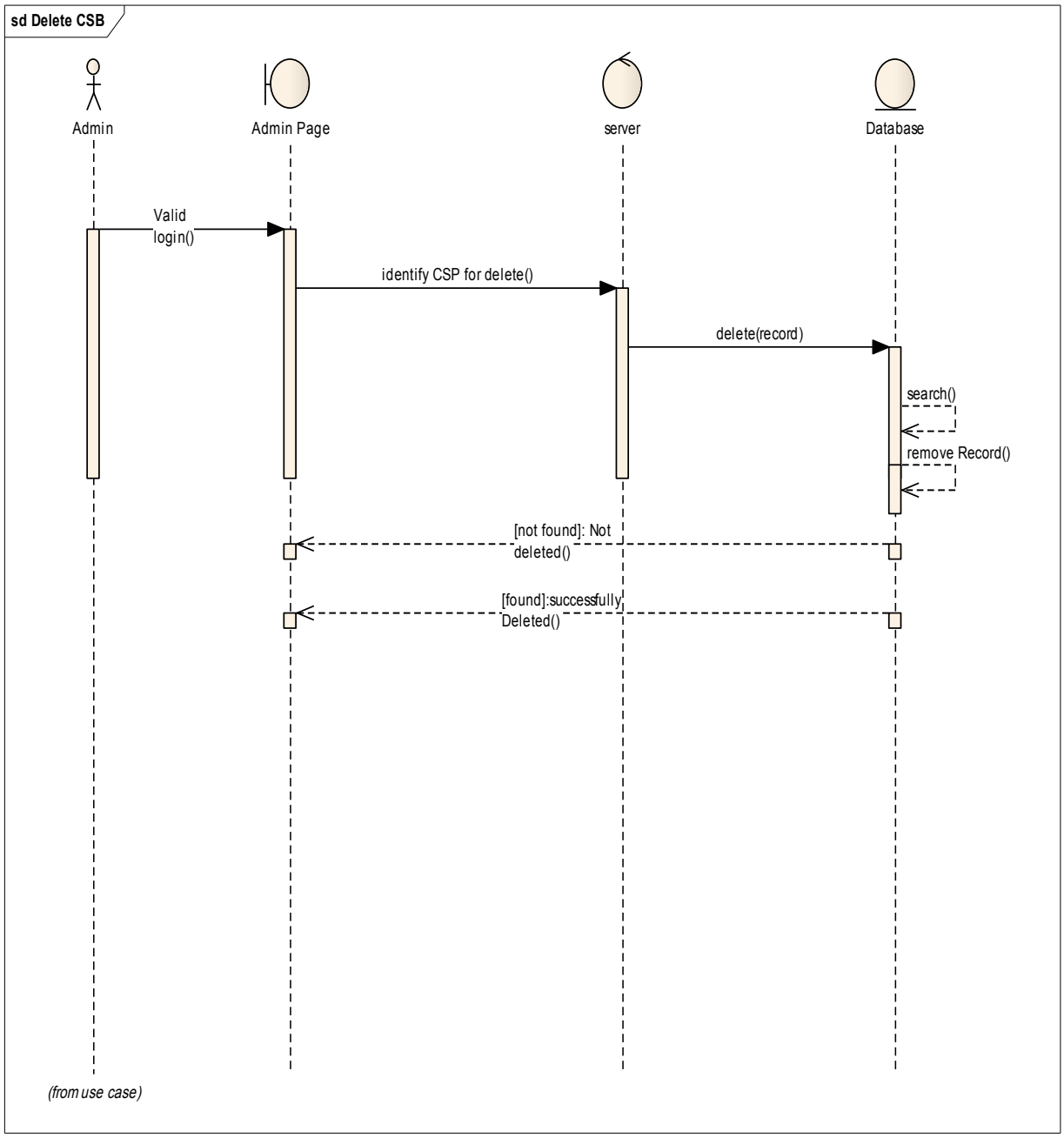

Figure 4-6Sequence Diagram for Delete CSP.

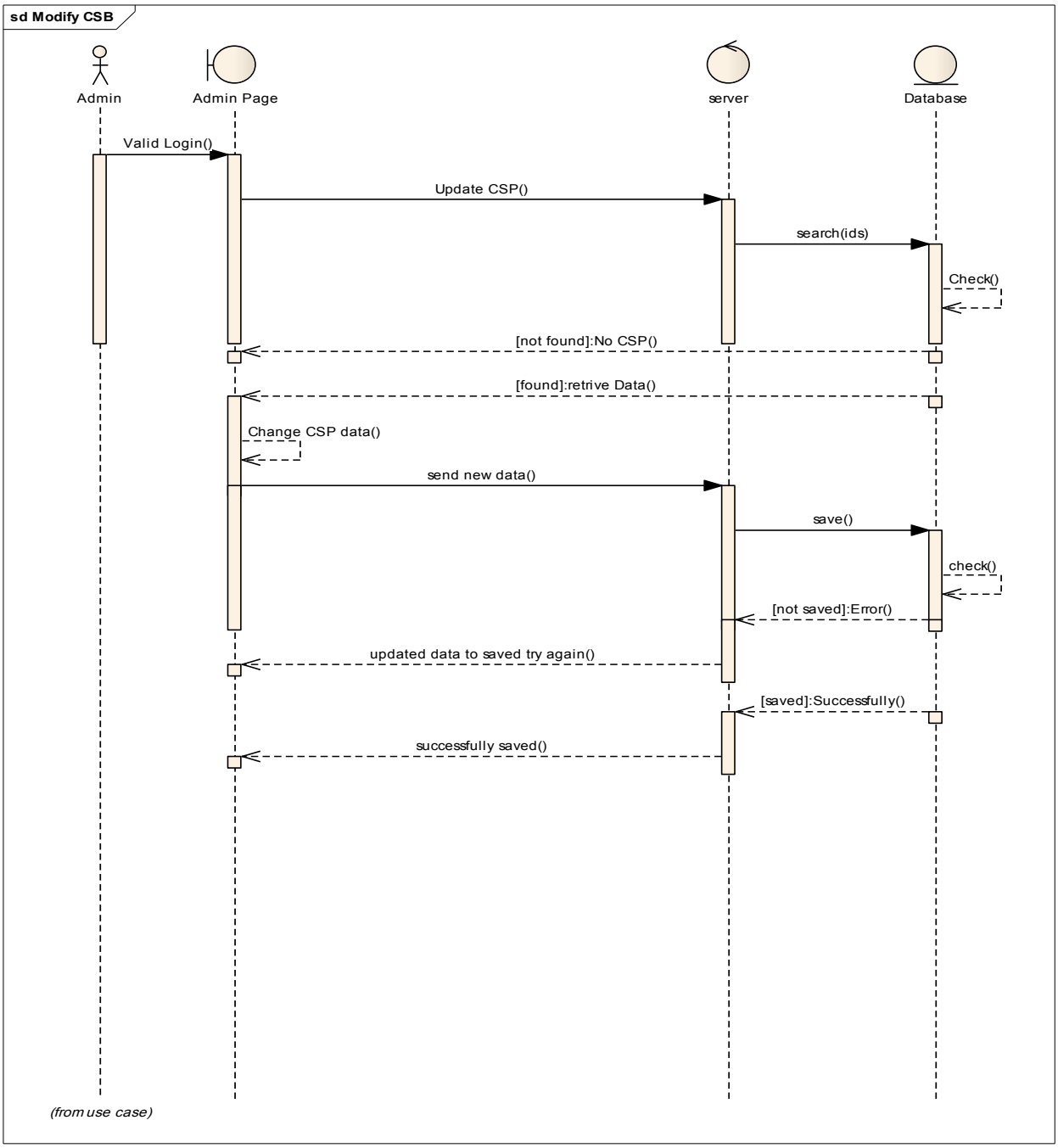

Figure 4-7 Sequence Diagram for Update CSP.

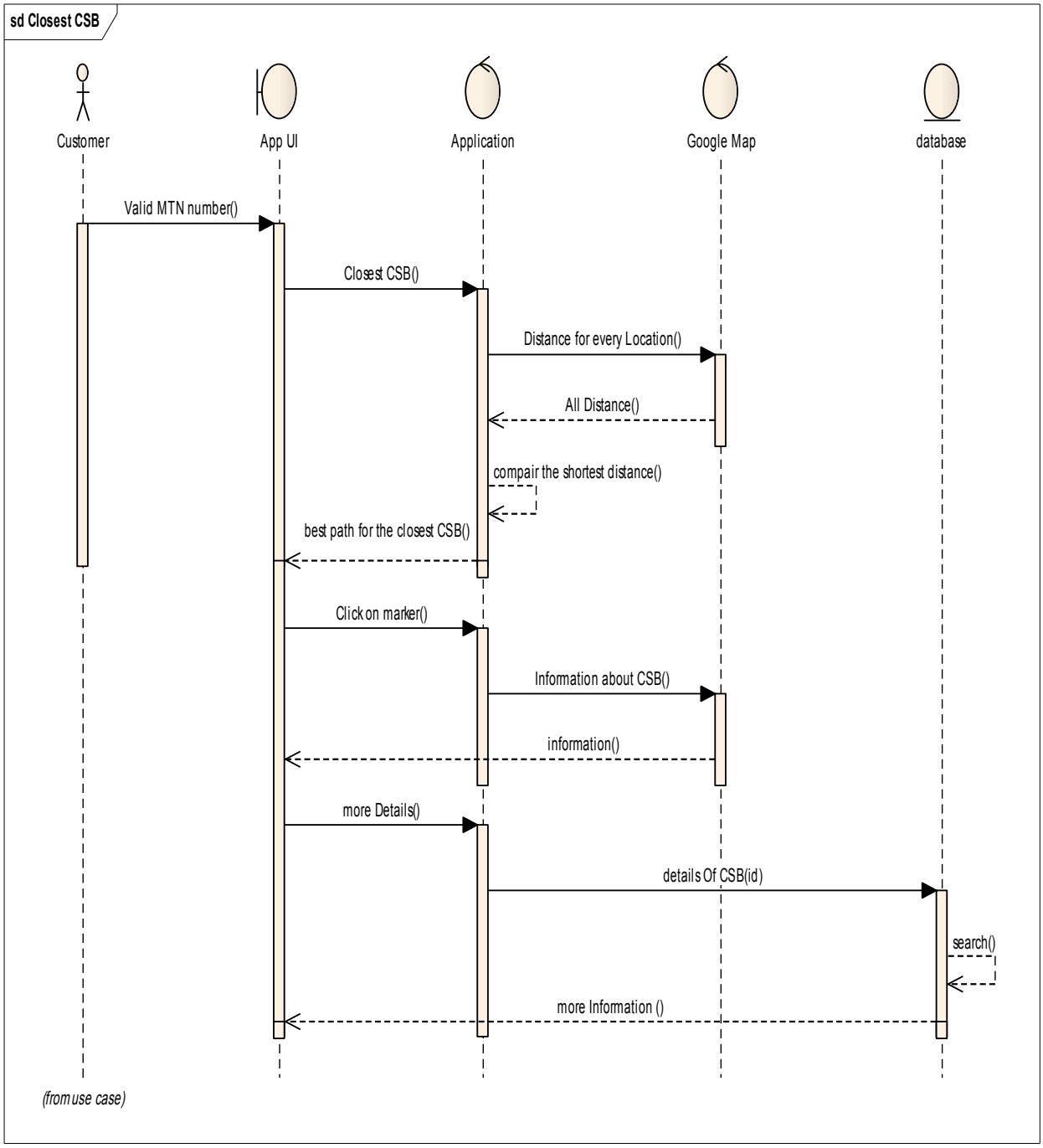

Figure 4-8 Sequence Diagram for the Closest CSP.

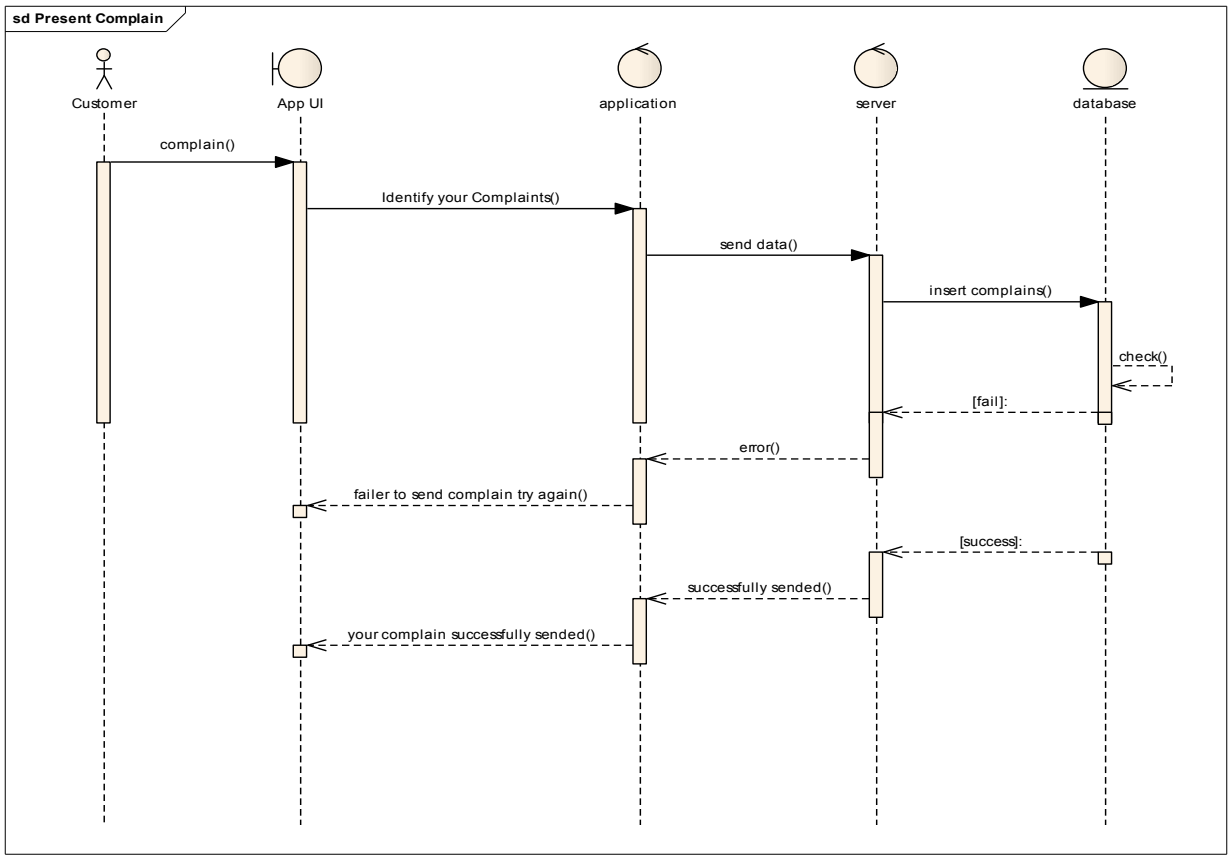

Figure 4-9 Sequence Diagram for Present Complains.

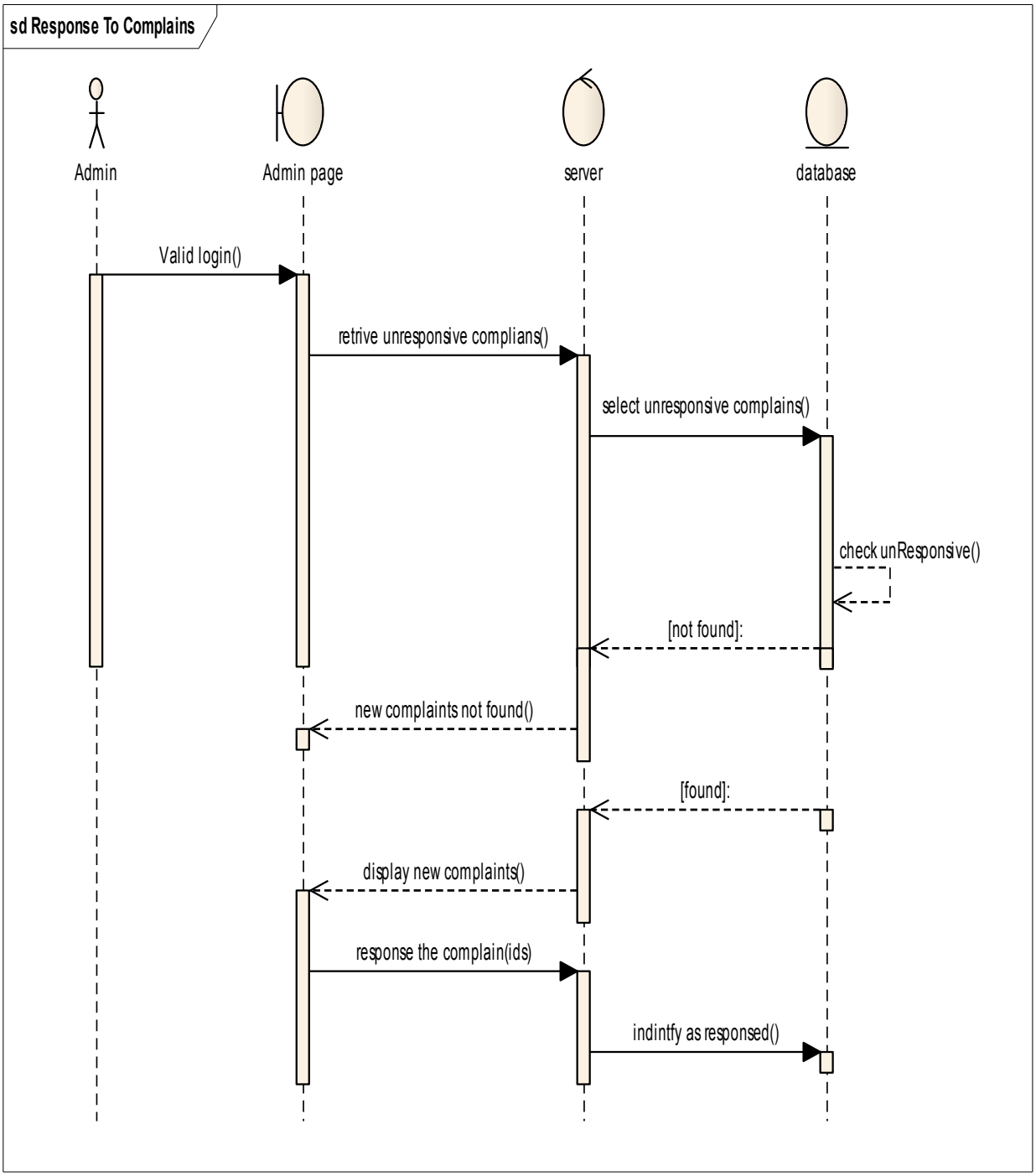

Figure 4-10 Sequence Diagram for Replay to Complaints.

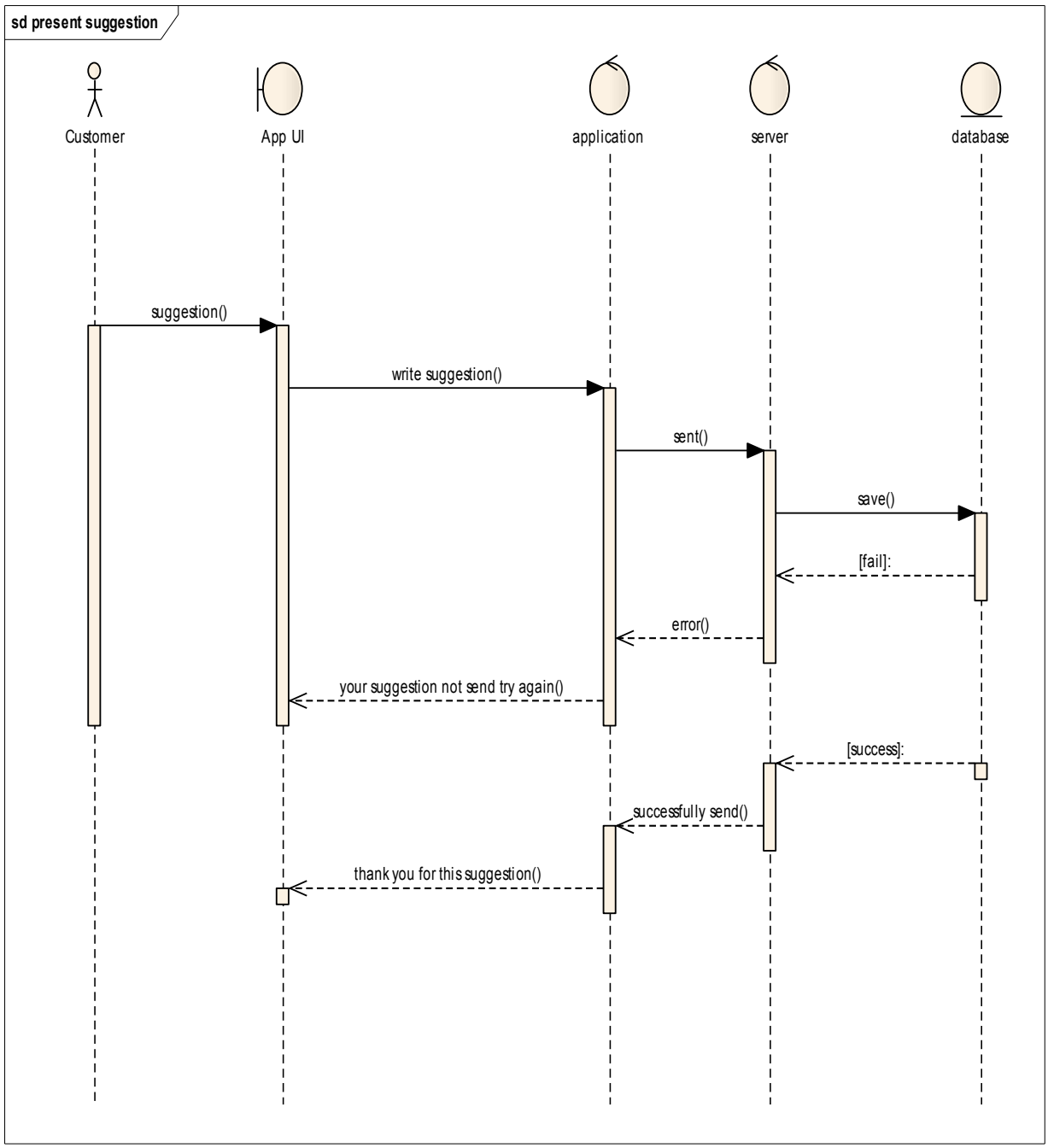

Figure 4-11 Sequence Diagram for Present Suggestion.

4.3 DATABASE:-

Table 4-1 Location Services:-

Column	Type	Key	Null	Auto Increment
location_id	int(6)	Primary key	No	Yes
name	varchar(20)		No	
latitude	Double	unique	No	
longitude	Double		No	
state	varchar(15)		No	
city	varchar(15)		No	
region	varchar(15)		No	
street	varchar(30)		No	
other_mark	Text		No	
type	varchar(15)		No	

Table 4-2 Services:-

Column	Type	Key	Null	Auto Increment
location_id	int(6)	Foreign key / Primary key	No	No
service_type	varchar(30)	Primary key	No	No

Table 4-3 CSP:-

Column	Type	Key	Null	Auto Increment
location_id	int(6)	foreign key/ primary key		No
openTime	time			
closeTime	time			
startDay	varchar(10)			
endDay	varchar(10)			
NoOfEmployees	int(2)			

Table 4-4 Customers:-

Column	Type	Key	Null	Auto Increment
customer_id	int(11)	primary key		Yes
first_name	varchar(20)		No	
second_name	varchar(20)		No	
third_name	varchar(20)		No	
last_name	varchar(20)		No	
phone_no	int(14)			
Email	varchar(50)			

Table 4-5 Complaints:-

Column	Type	Key	Null	Auto Increment
complaint_id	int(8)	Primary key	No	Yes
customer_id	int(11)	foreign key	No	No
complaint_category	varchar(50)		No	
Complaint	varchar(100)			
Details	Text			

Table 4-6 Complaint Category:-

Column	Type	Key	Null	Auto Increment
category_id	int(2)	Primary key	No	Yes
Category	varchar(50)		No	

Table 4-7 Complaint Category Type:-

Column	Type	Key	Null	Auto Increment
category_id	int(2)	Primary key / Foreign key	No	No
category_type	varchar(100)	Primary key	No	No

Table 4-8 Basic Services:-

Column	Type	Key	Null	Auto Increment
service_id	int(2)	primary key	No	Yes
Service	varchar(30)		No	

Table 4-9 Suggestion:-

Column	Type	Key	Null	Auto Increment
suggestion_id	int(8)	Primary key	No	Yes
customer_id	int(11)	foreign key	No	
Suggestion	Text		No	

Table 4-10Transactions:-

Column	Type	Key	Null	Auto Increment
ticket_no	int(8)	Primary key	No	Yes
ticketTime	Timestamp		No	
startTime	Time		No	
endTime	Time		No	
emNo	int(2)		No	

Table 4-11 Reports:-

Column	Type	Key	Null	Auto Increment
no_of_transctions	int(3)		No	
avg_serving_time	int(2)		No	
avg_wiating_time	int(2)		No	
Date	Date	Primary key	No	

CHAPTER FIVE

DESIGN

5.1 THE APPLICATION INTERFACES:-

5.1.1 WELCOME INTERFACE:-

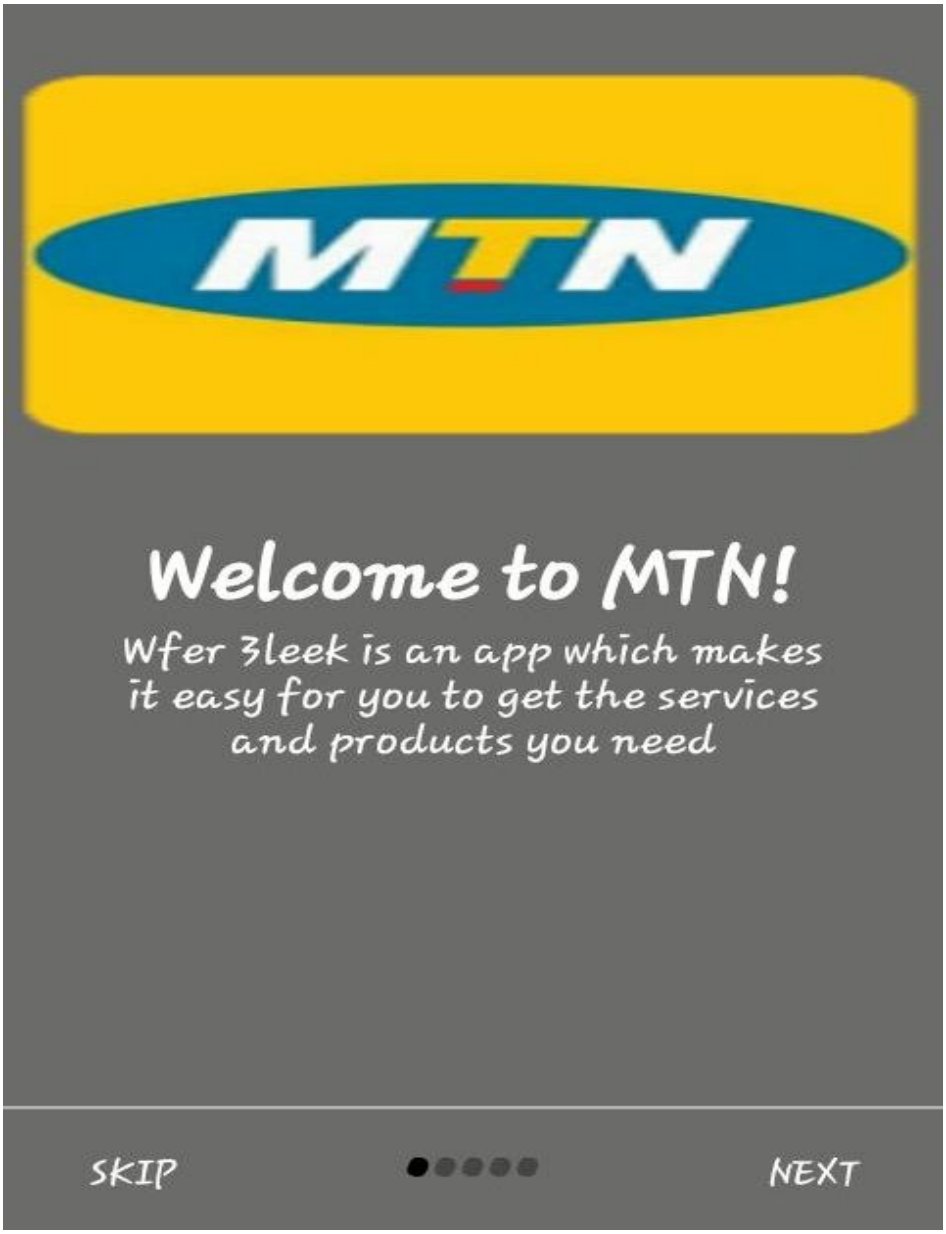

Figure 5-1 welcome interface

5.1.2 VALIDATION INTERFACE:-

Figure 5-2 when click Ok without insert the phone number the verification denied.

Figure 5-3 when the inserted number's length is not 9 the verification denied.

Figure 5-4 when the inserted number do not start with 92 or 99 the verification denied.

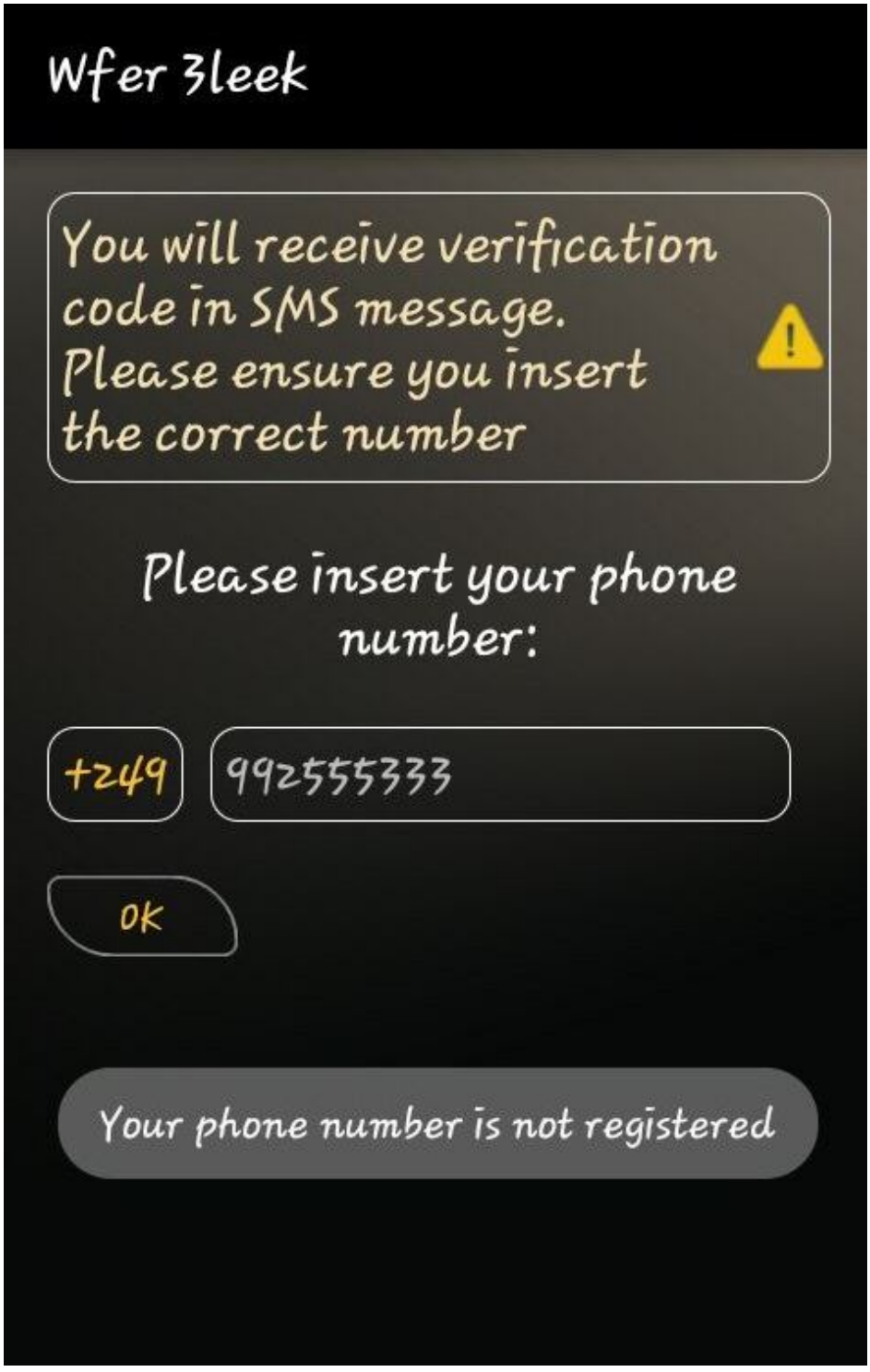

Figure 5-5 when the inserted number is not registered in MTN DB

5.1.3 THE VERIFICATION CODE SMS:-

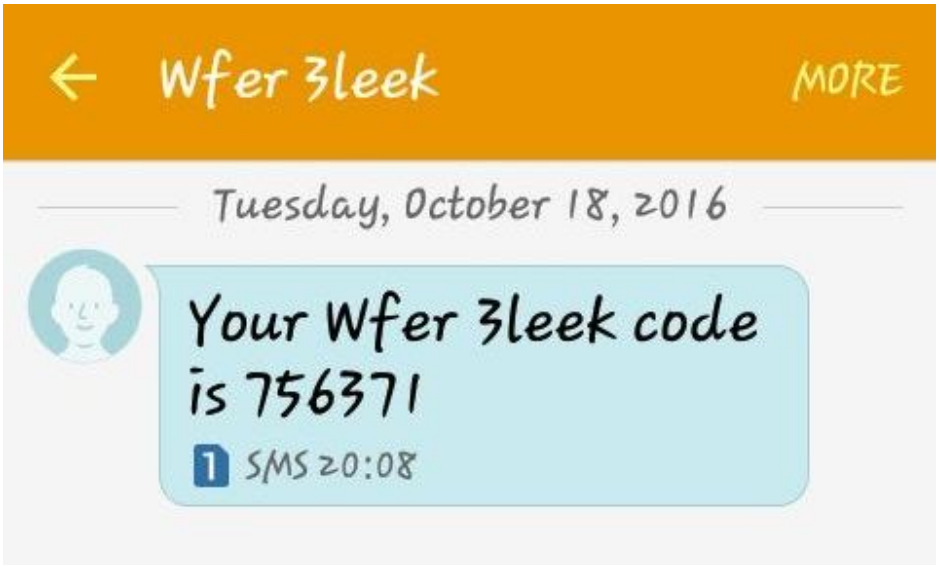

Figure 5-6 if inserted number achieves all conditions then a verification code will be sent.

5.1.4 INTERFACES FOR VERIFY THE VERIFICATION CODE:-

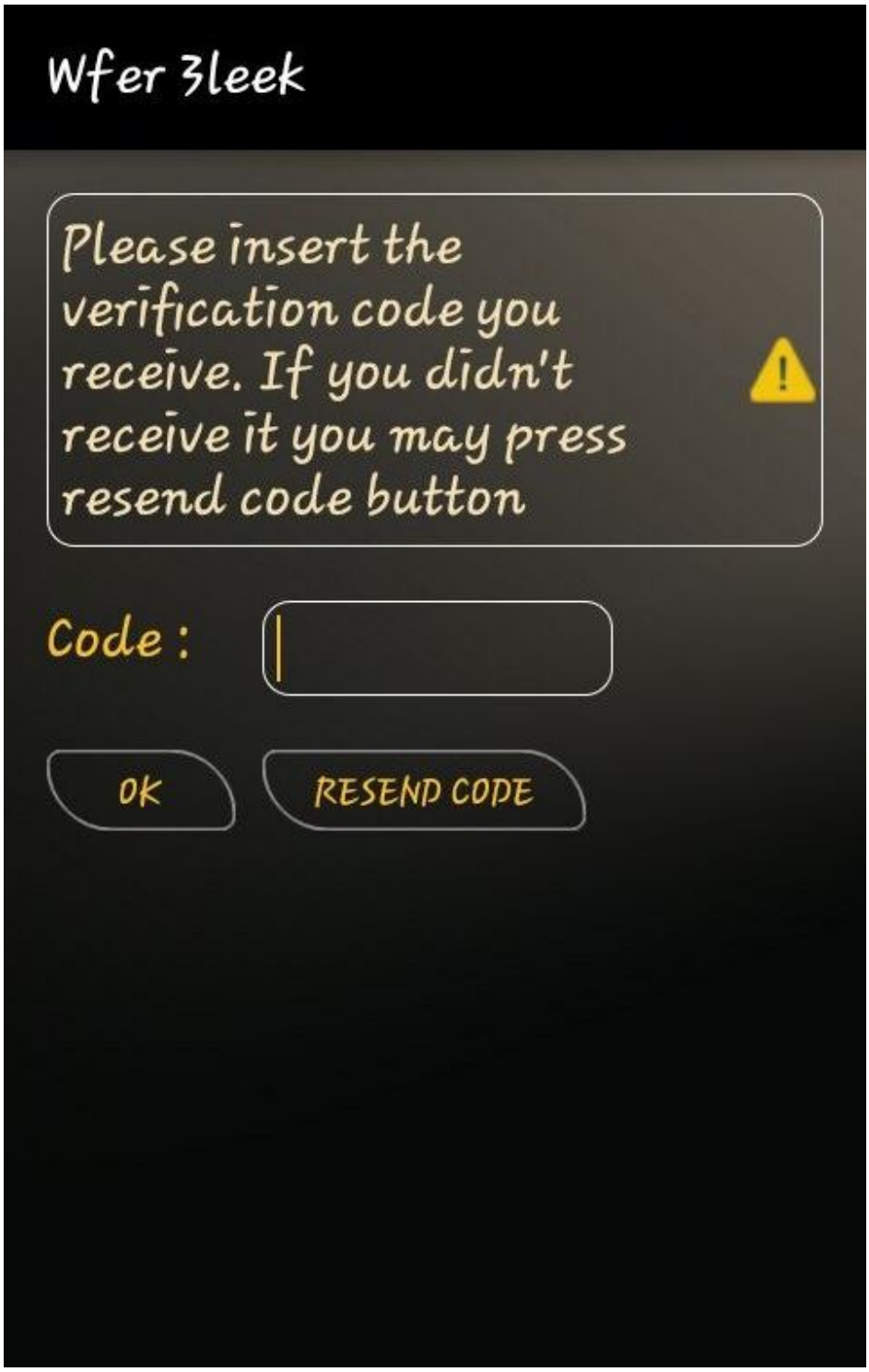

Figure 5-7 for insert the verification code or resend it to the customer's number

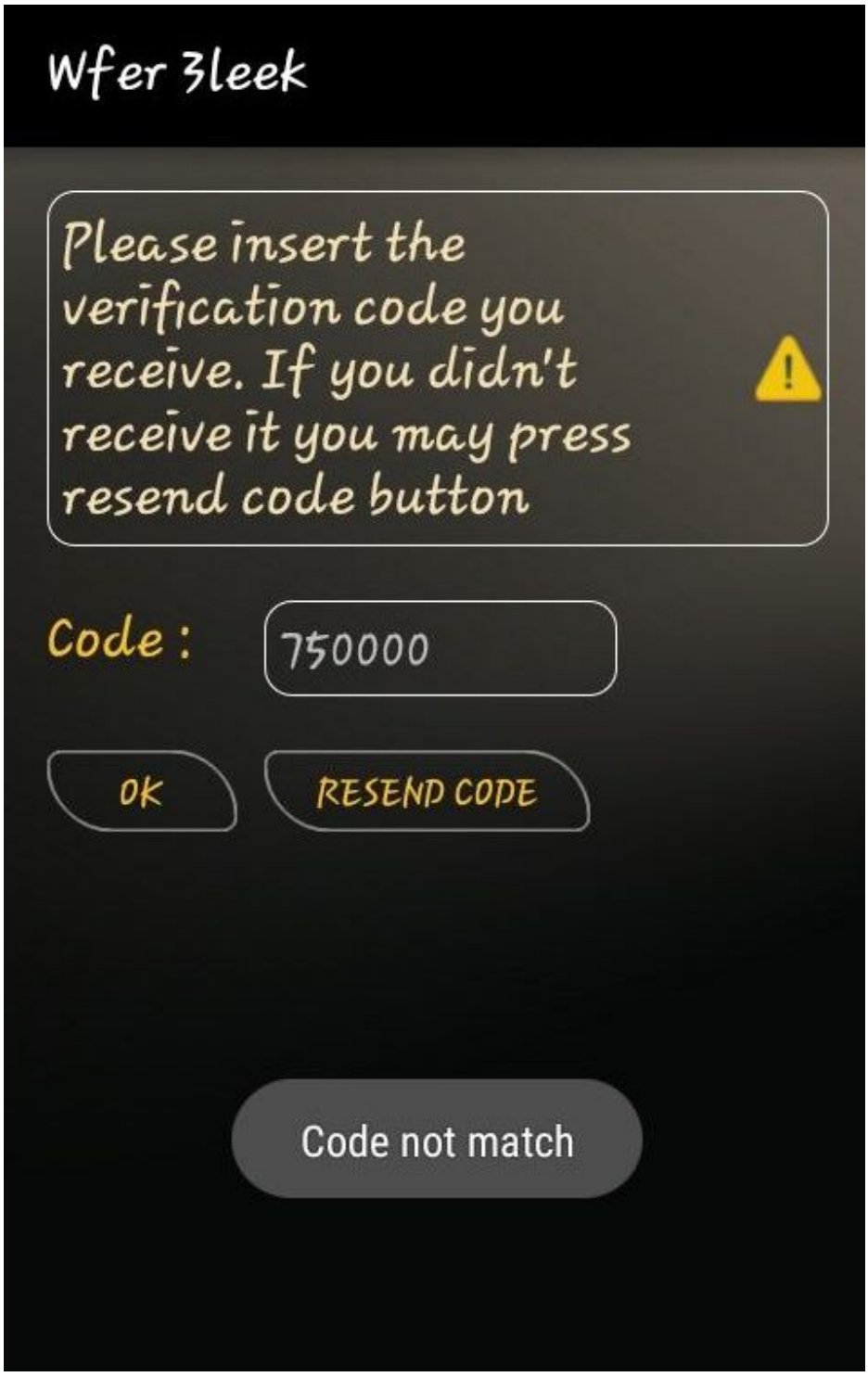

Figure 5-8 if the inserted verification code is not typical to the received one in the SMS.

5.1.5 THE MENU INTERFACE:-

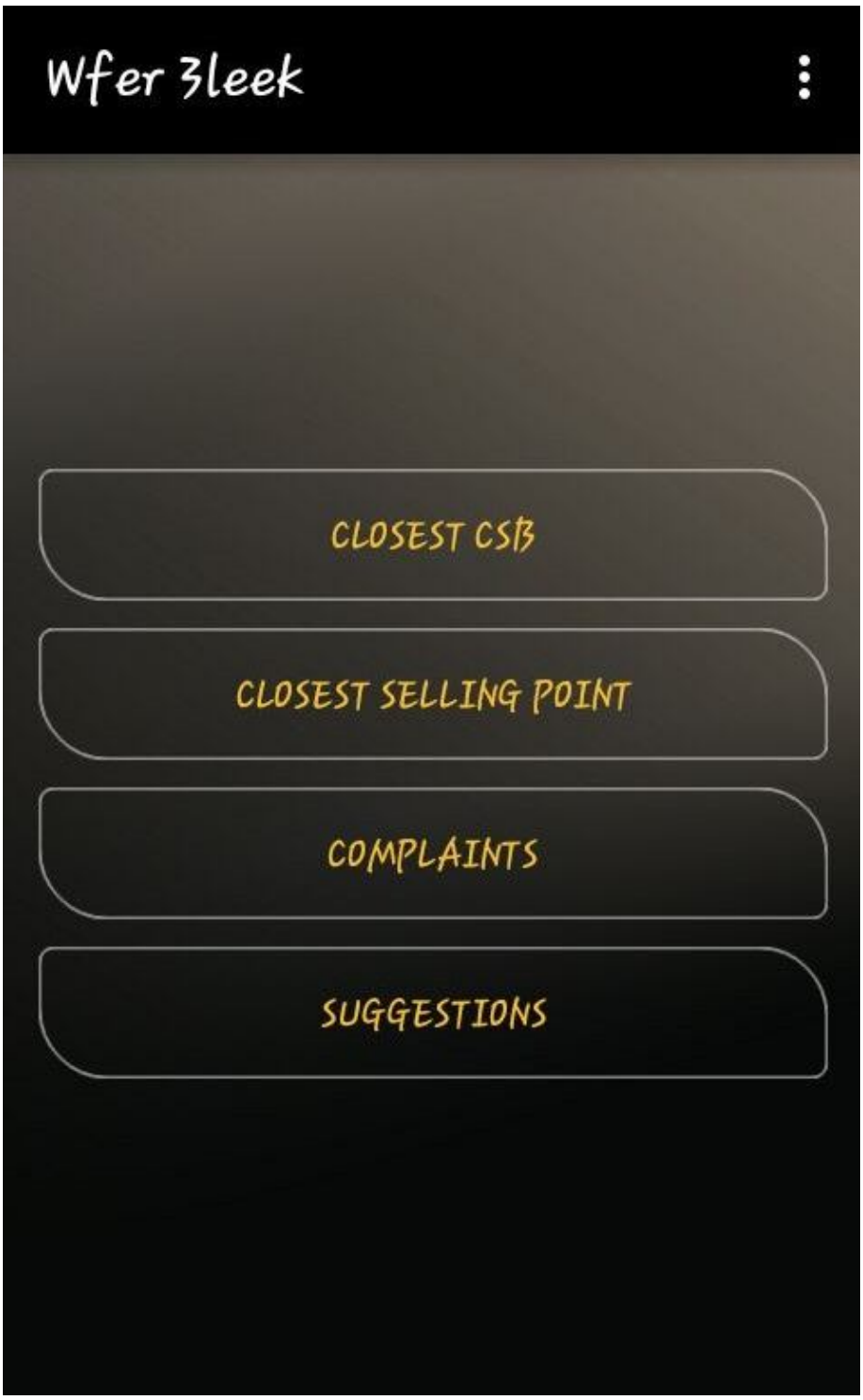

Figure 5-9 the primary menu which appear after the registration

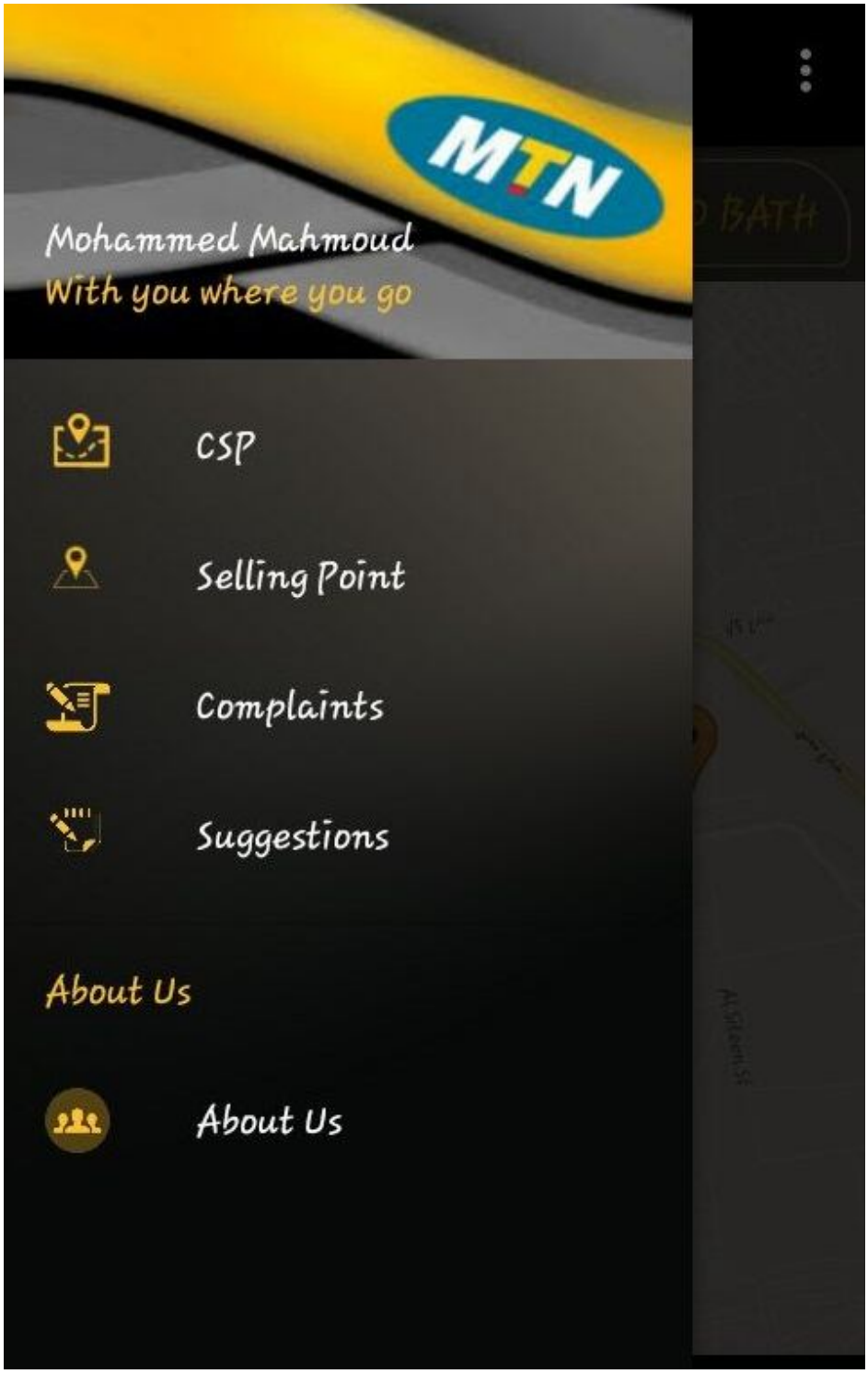

Figure 5-10 the sub menu which is accessed from every interface easily

5.1.6 THE CSP INTERFACE:-

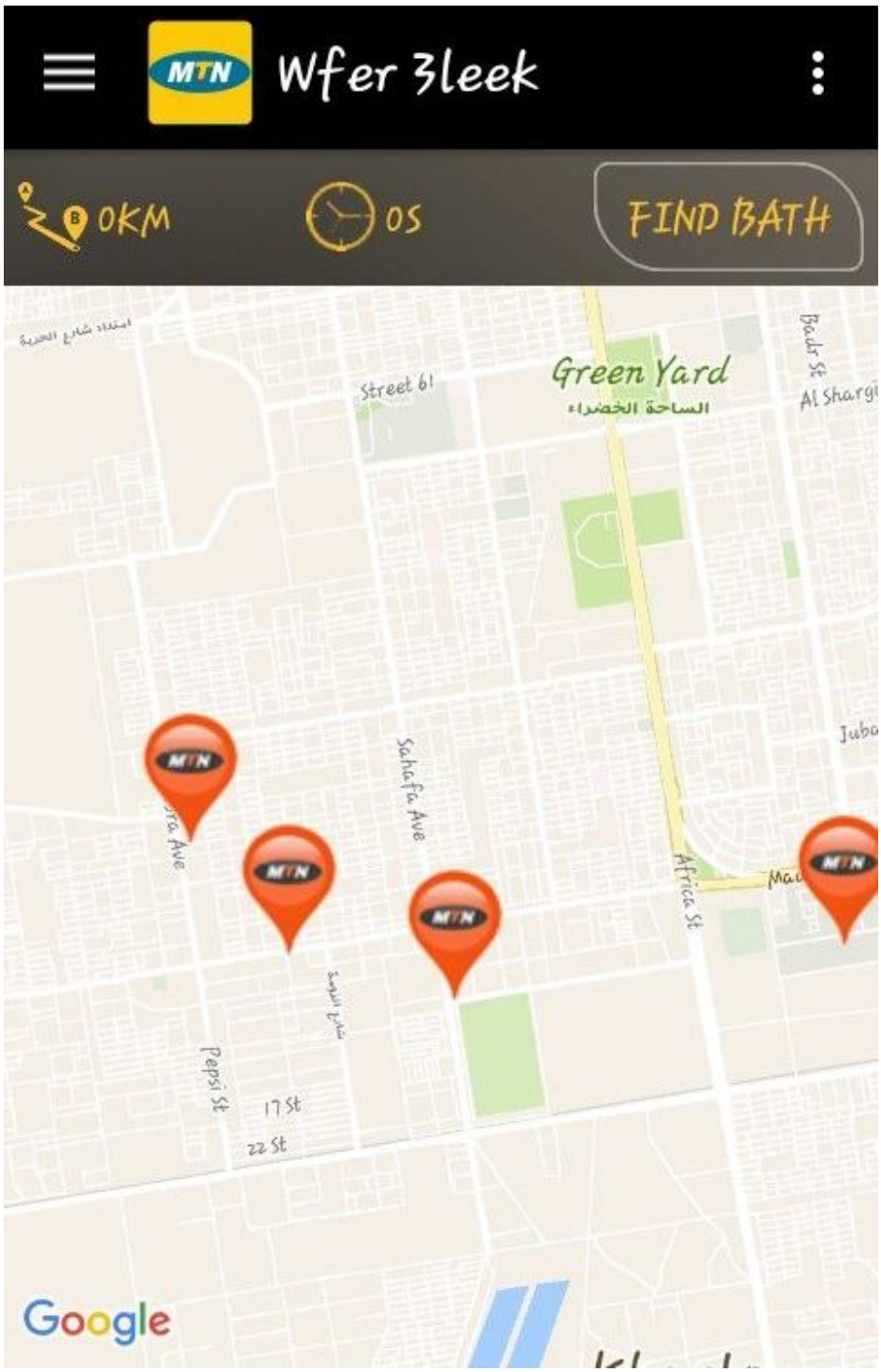

Figure 5-11the nearest CSPs

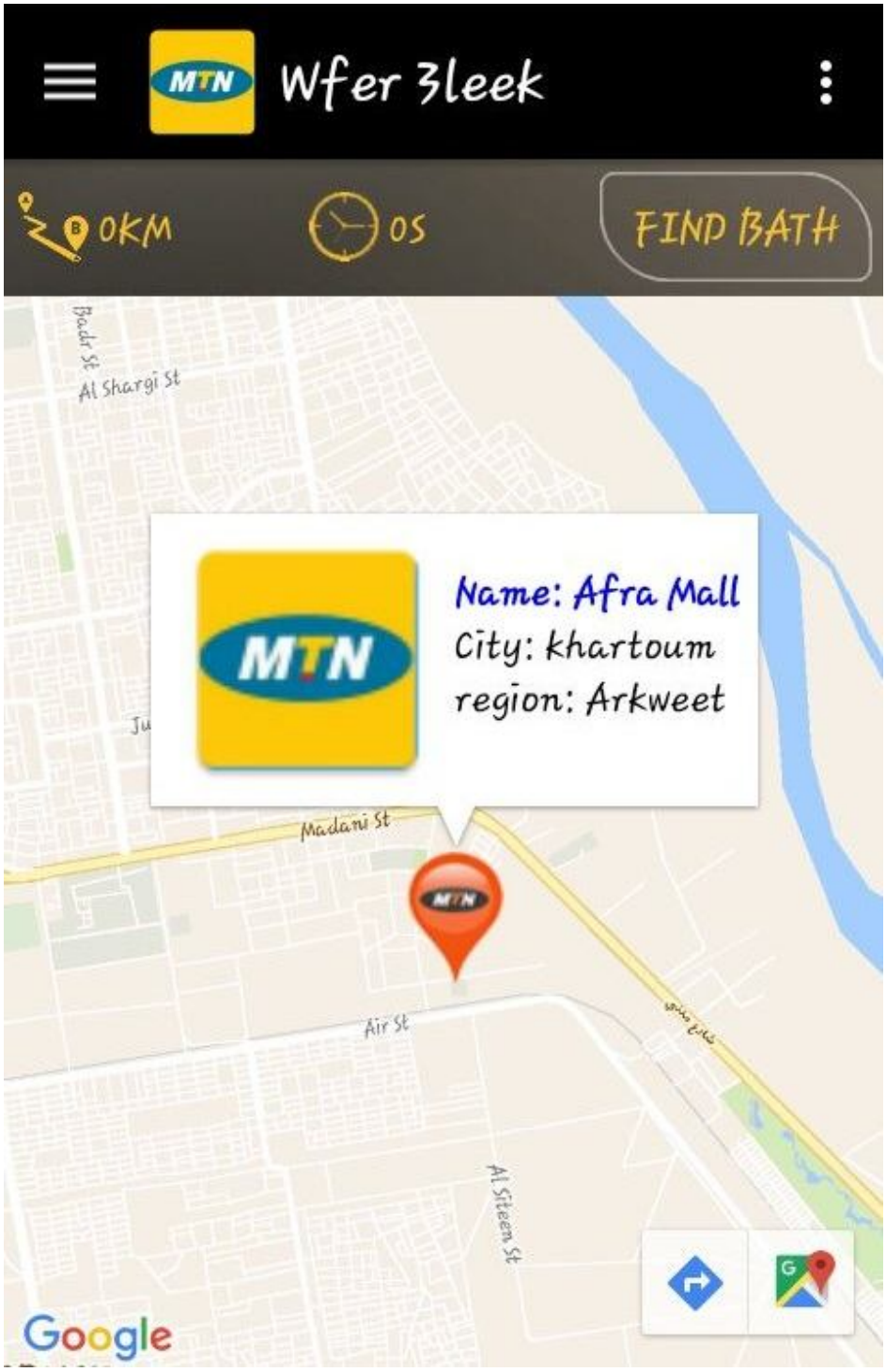

Figure 5-12 the nearest CSP

Figure 5-13 more details about the nearest CSP interface 1

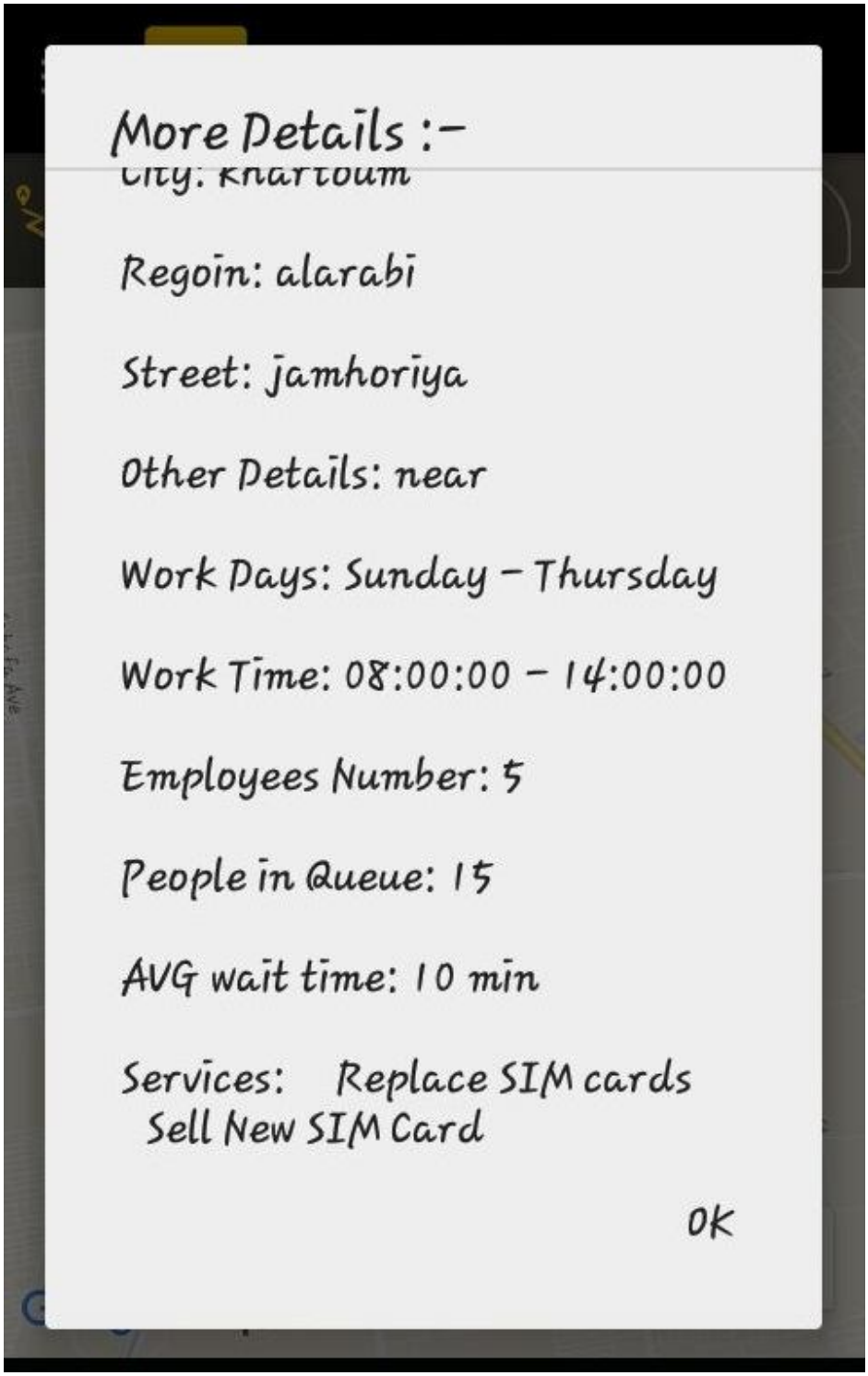

Figure 5-14 more details about the nearest CSP interface 2

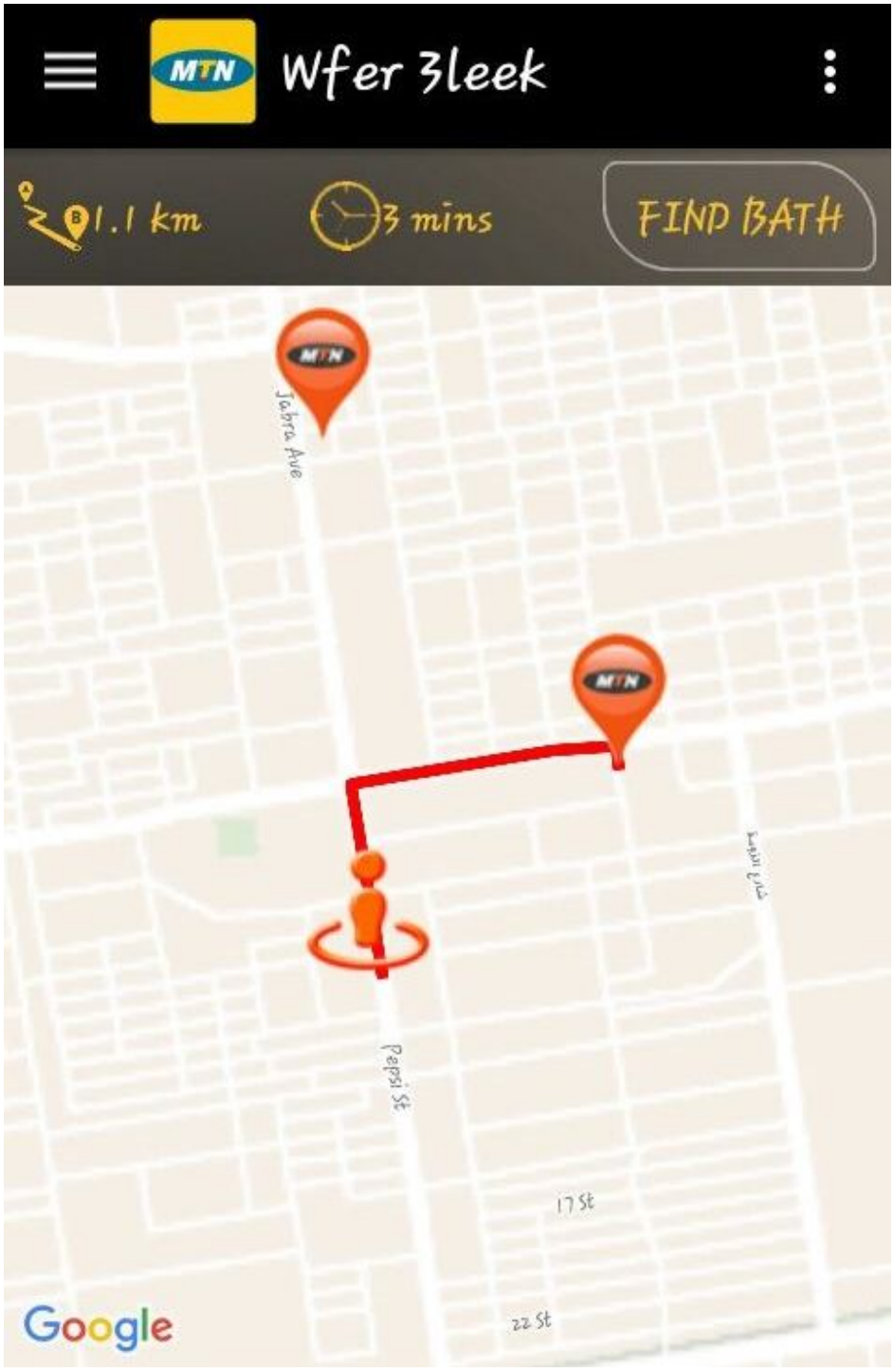

Figure 5-15 the path to the nearest CSP

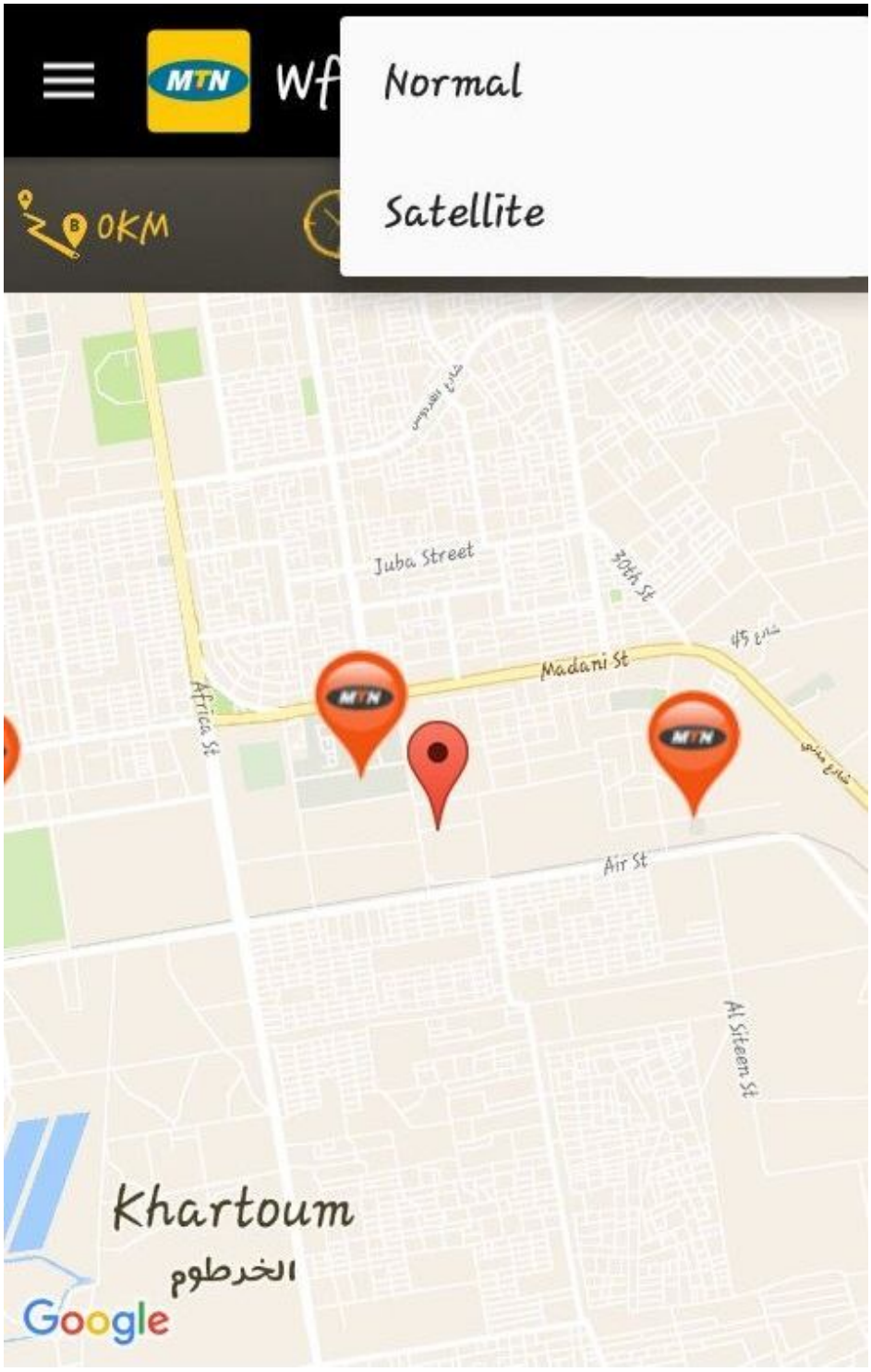

Figure 5-16 choose normal or satellite

5.1.7 THE SP INTERFACE:-

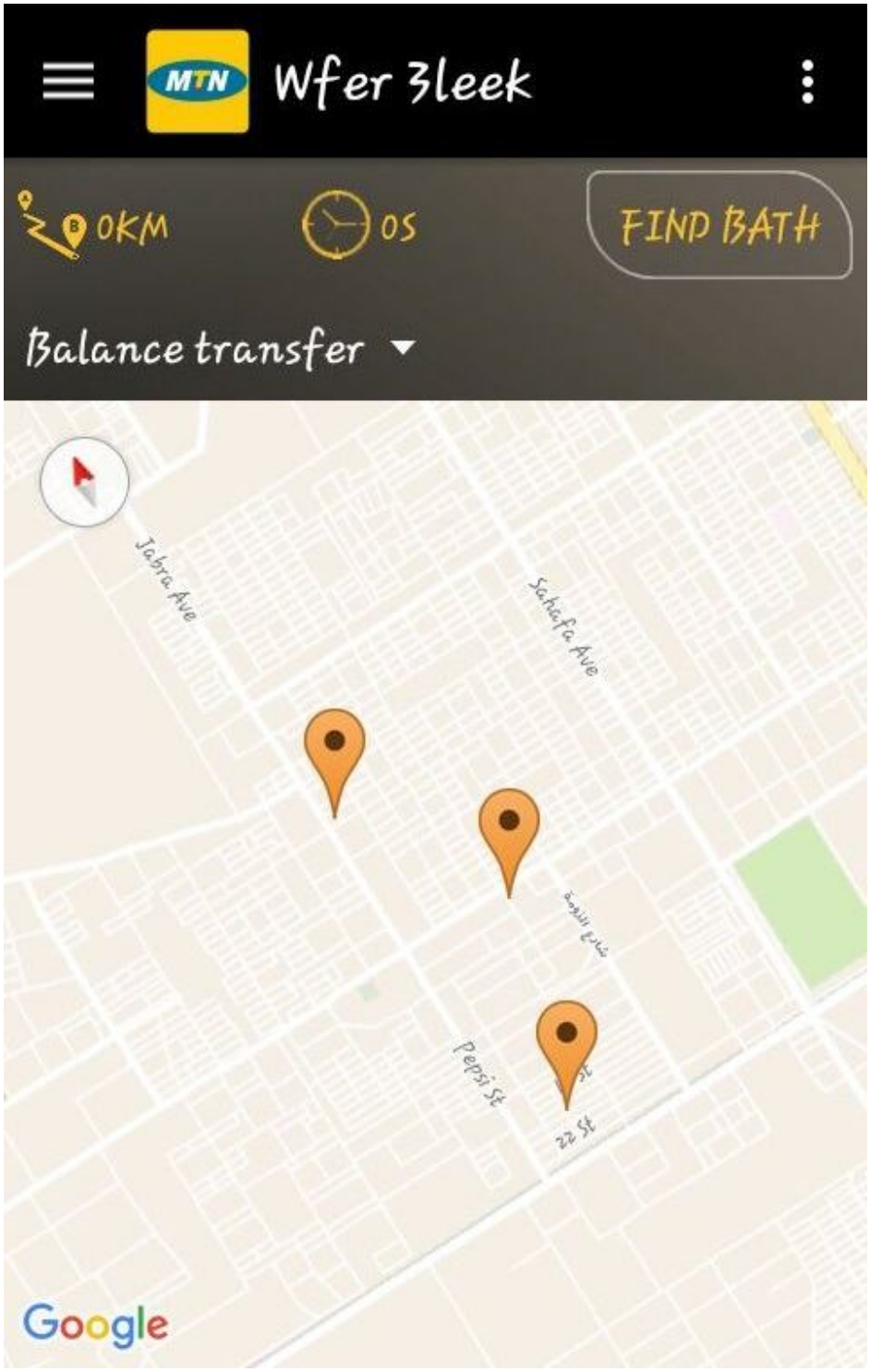

Figure 5-17 the nearest SPs

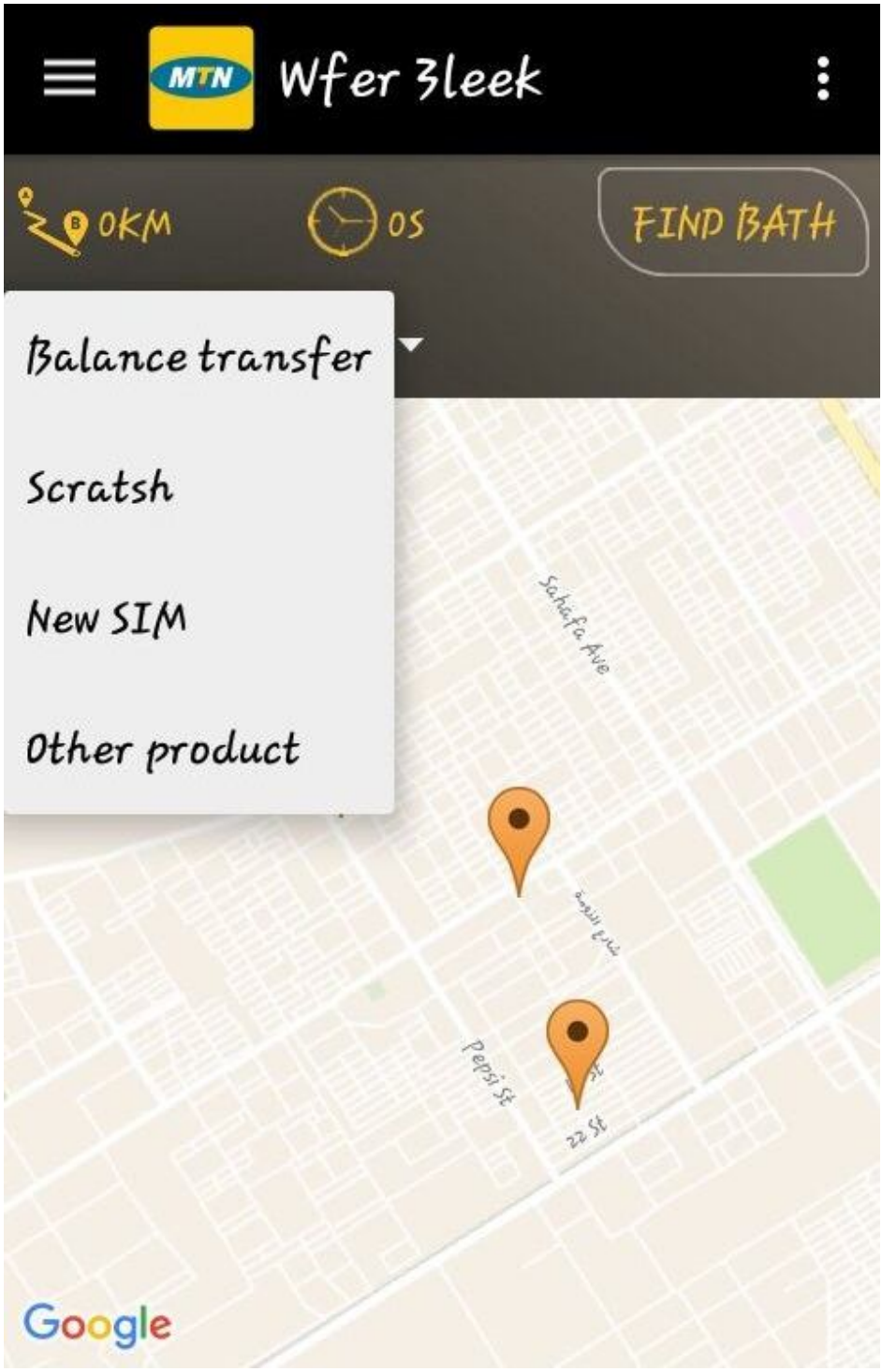

Figure 5-18 filter the search by the service

5.1.8 THE COMPLAINTS INTERFACE:-

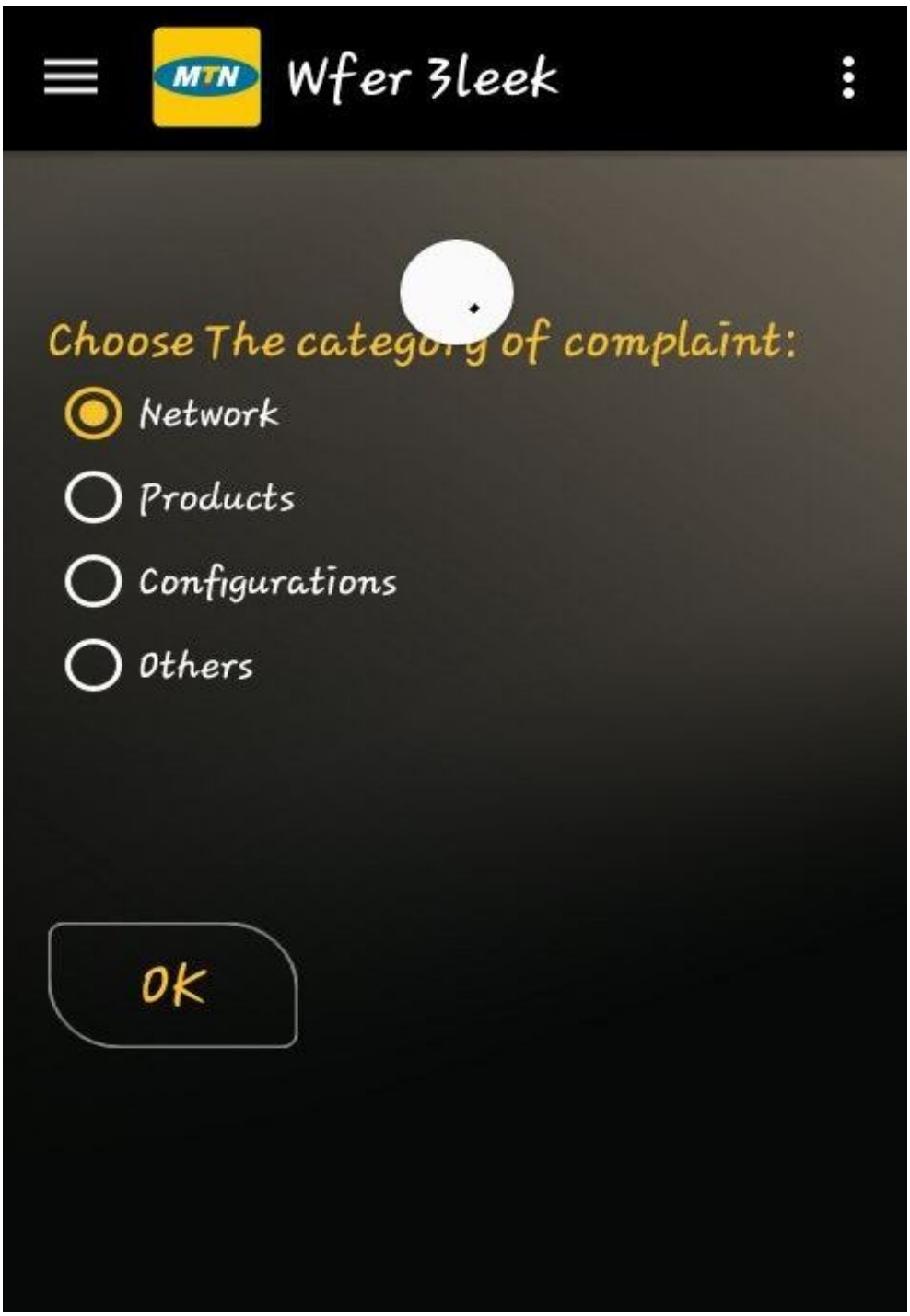

Figure 5-19 the categories of complaints

Figure 5-20 the complaints list

Figure5-21 time periods and more details about period of problem

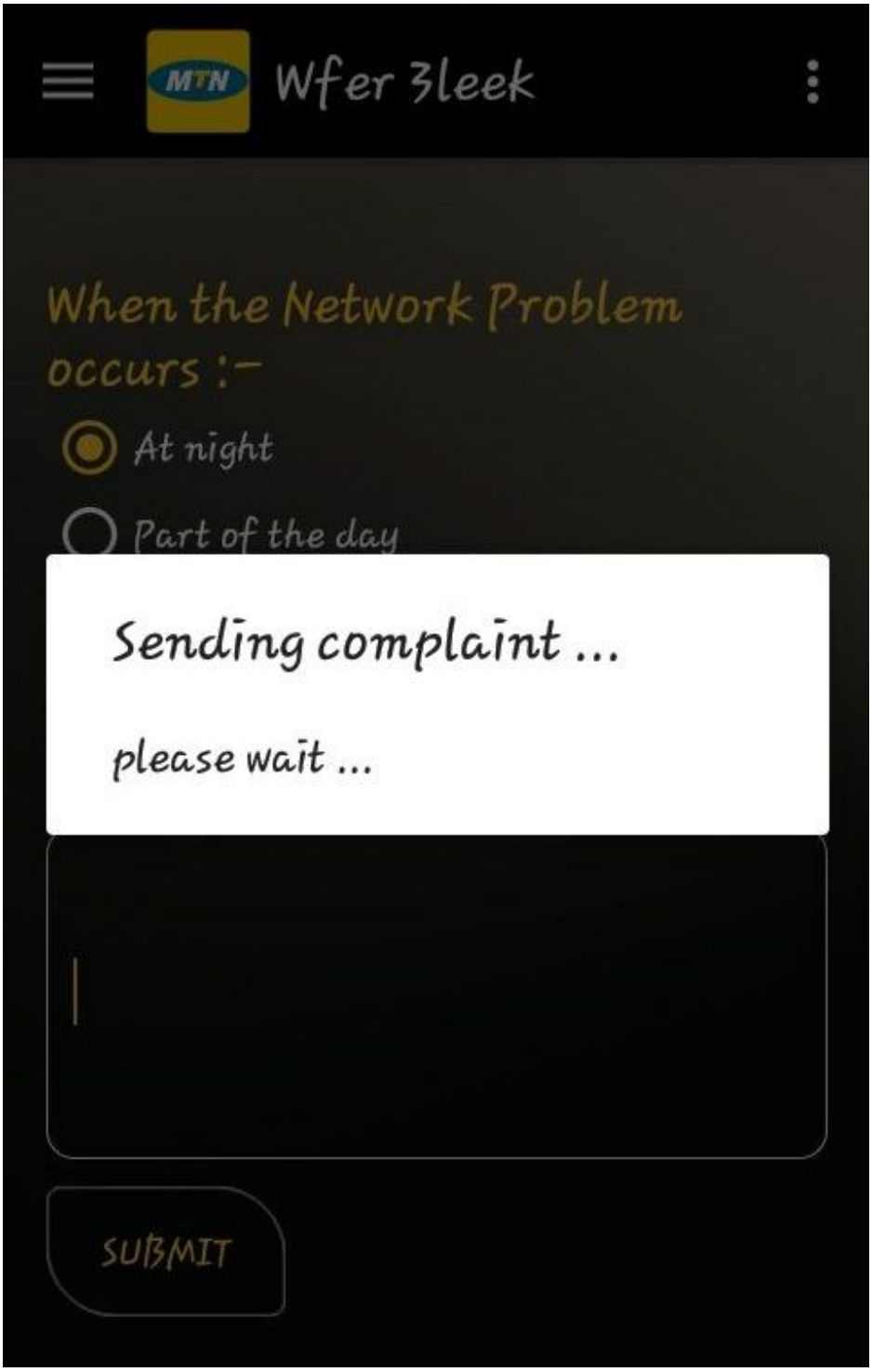

Figure 5-22 complaint is sending

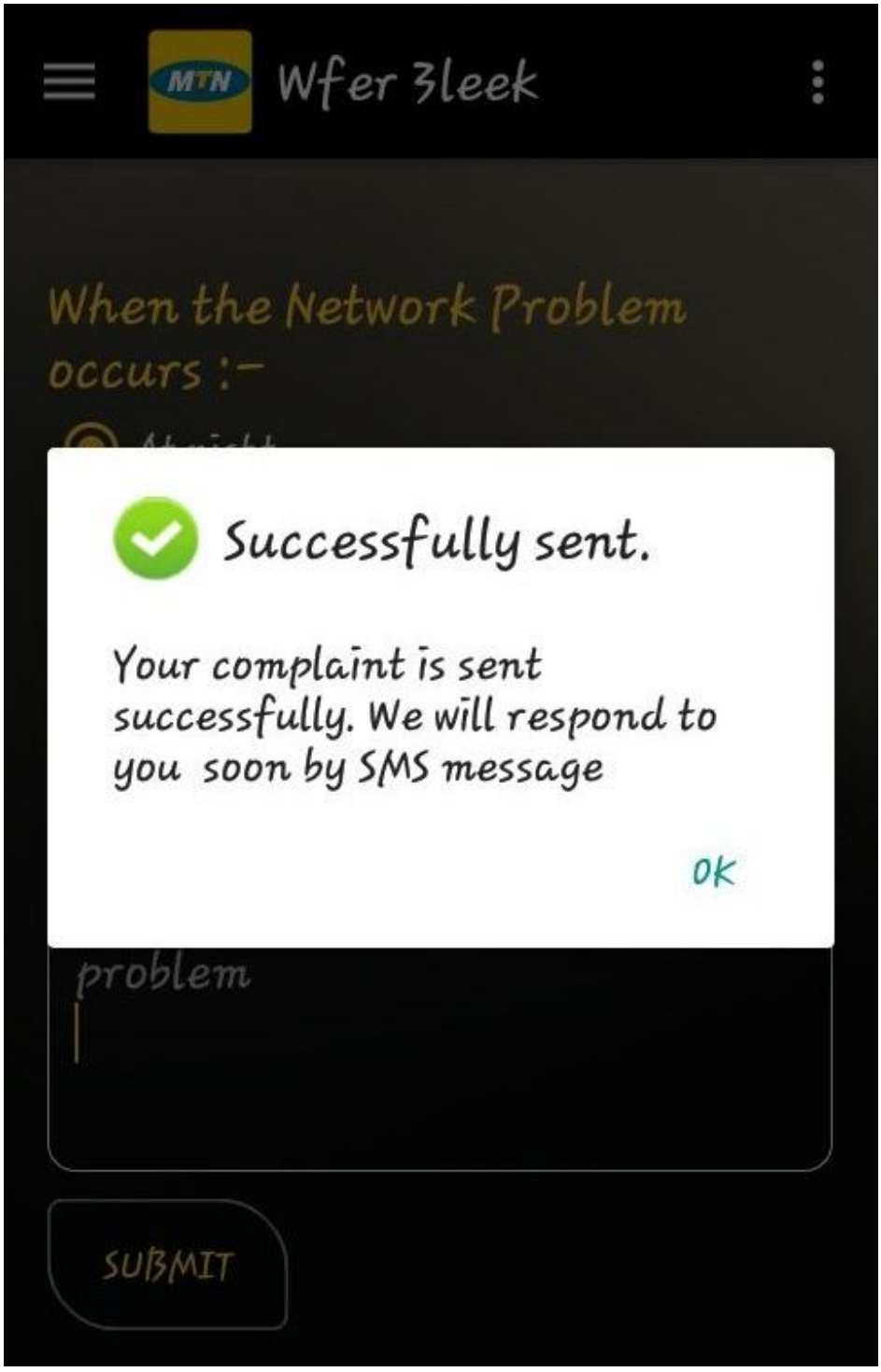

Figure 5-23 complaint is successfully sent

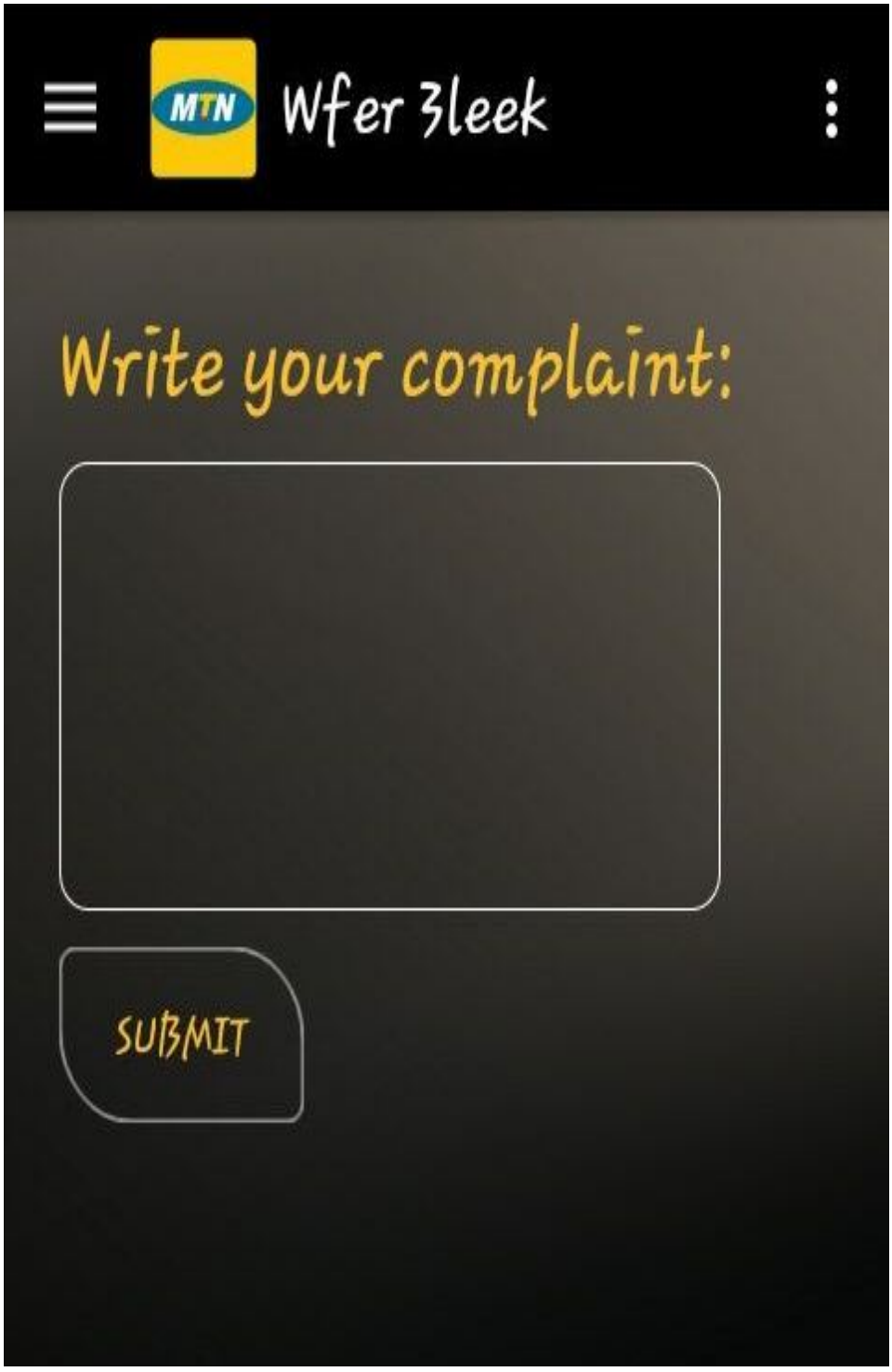

Figure 5-24 write the complaint if the customer click on other in the categories options or in the complaints options

5.1.9 THE SUGGESTIONS INTERFACE:-

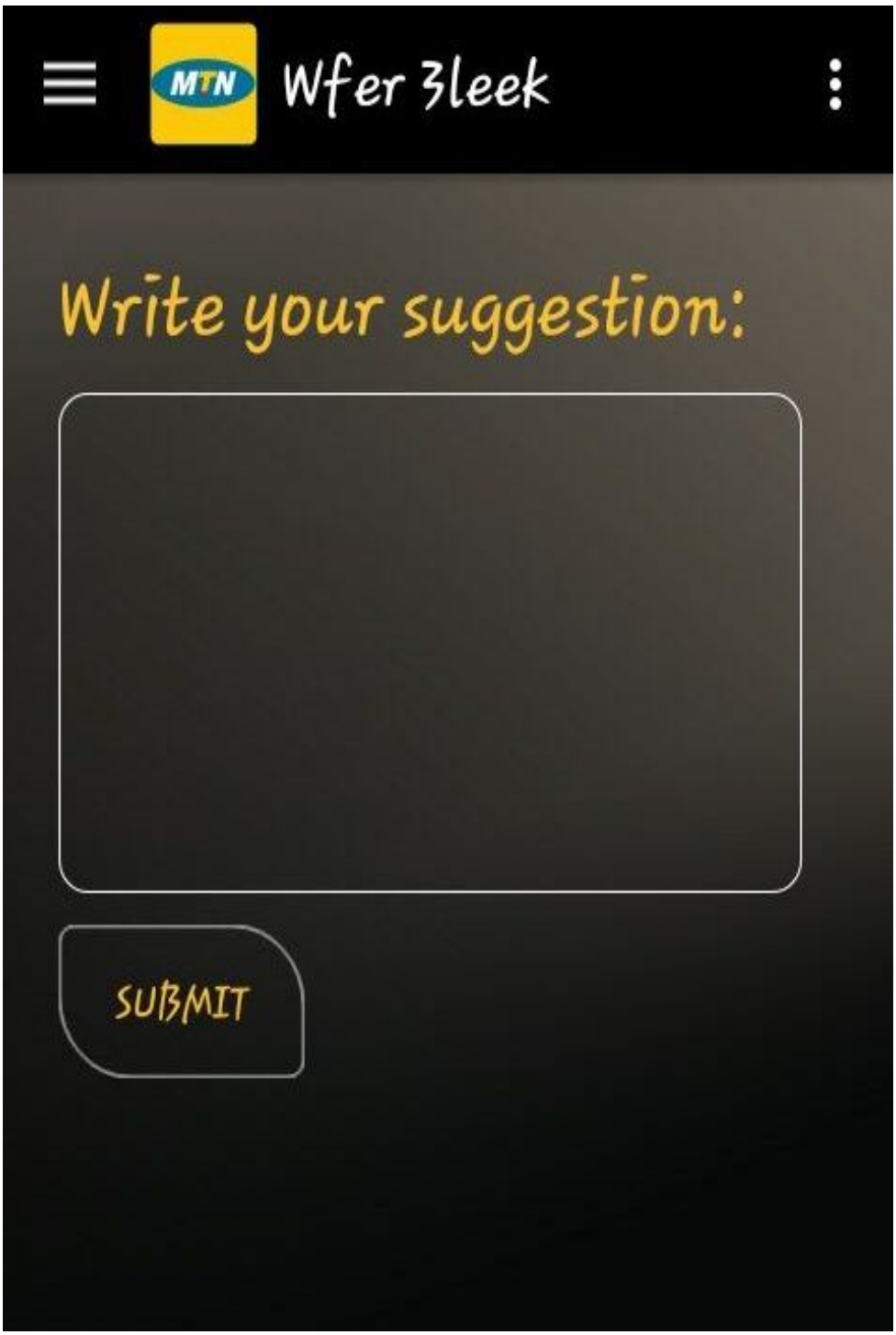

Figure 5-25 the suggestion interface

5.2 THE ADMIN WEB SITE INTERFACES:-

5.2.1 LOG IN INTERFACE:-

Figure 5-26 Log in interface

5.2.2 HOME INTERFACE: -

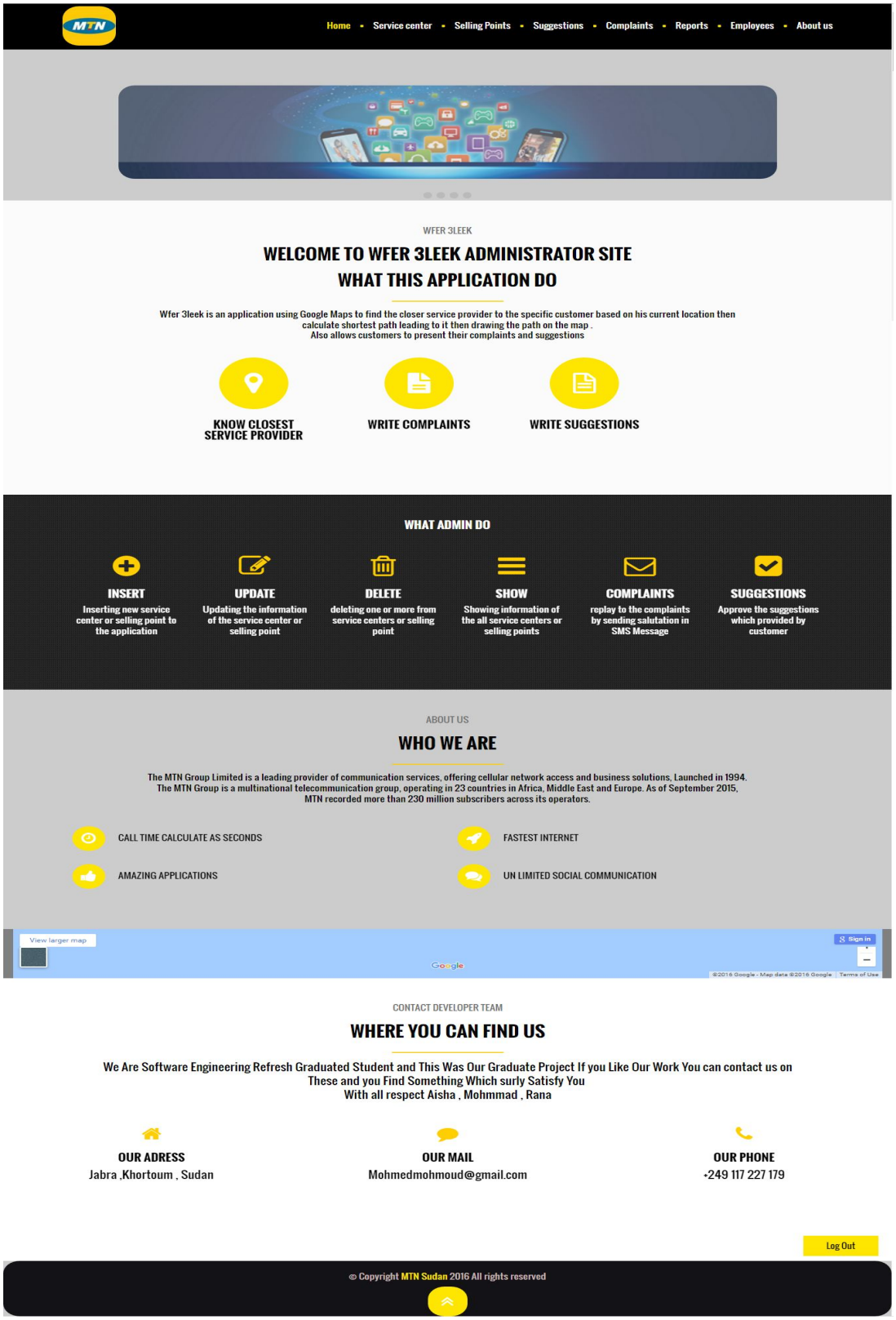

Figure 5-27 Home Interface

5.2.3 INSERT INTERFACE:-

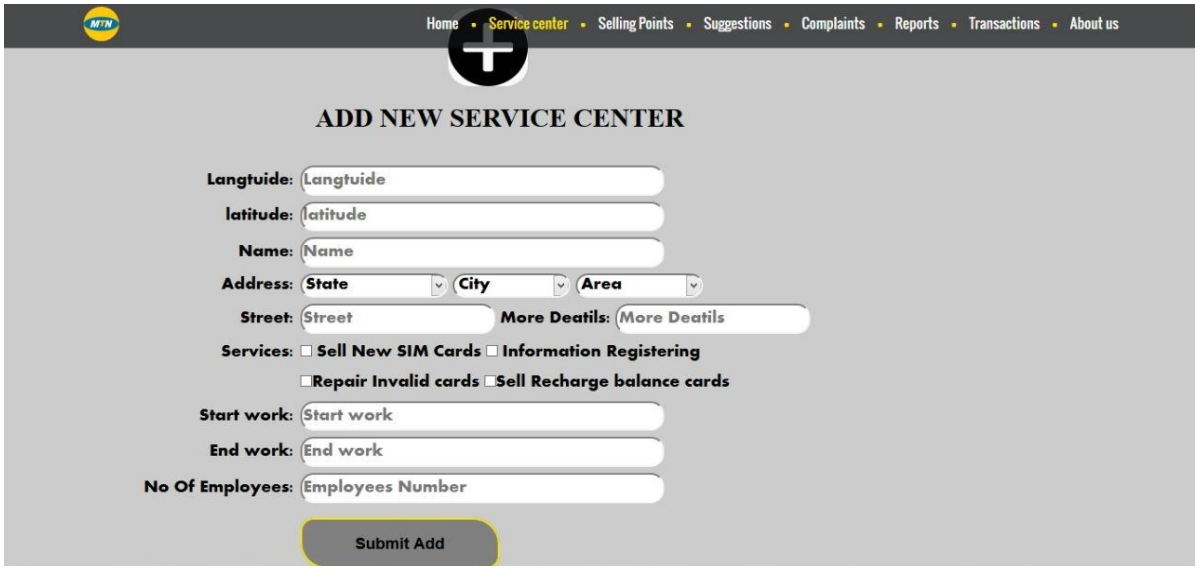

Figure 5-28 Insert Interface

5.2.4 UPDATE INTERFACE:-

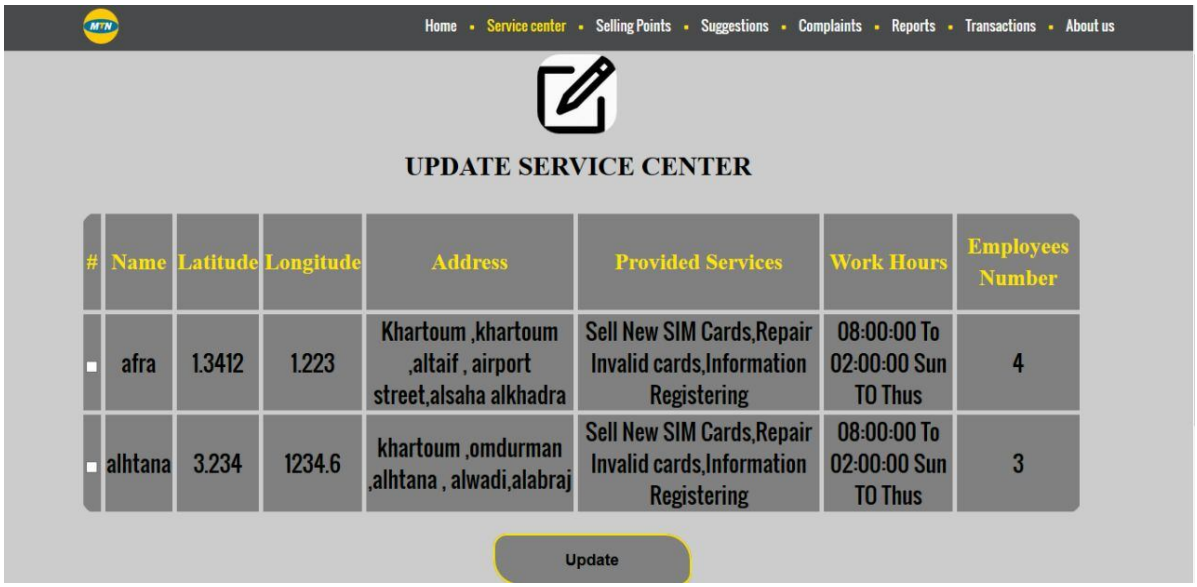

Figure 5-29 Update Interface a choose record to be updated

Figure 5-30 Update Interface b change the old information

5.2.5 DELETE INTERFACE:-

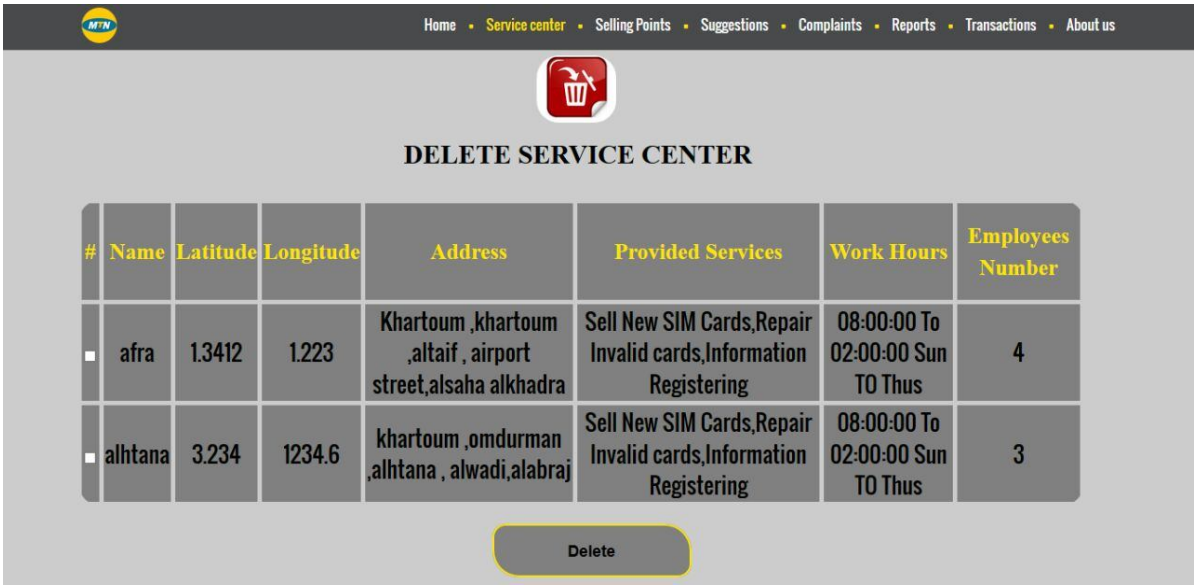

Figure 5-31 Delete Interface

5.2.6 DISPLAY INTERFACE:-

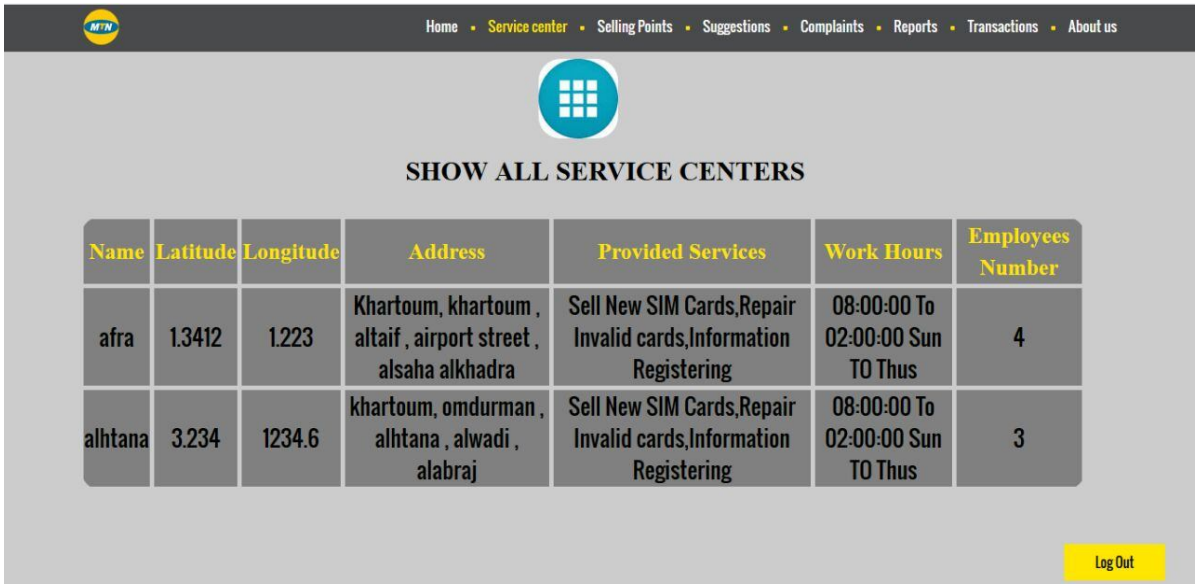

Figure 5-32 Display Interface

5.2.7 THE SUGGESTIONS INTERFACE:-

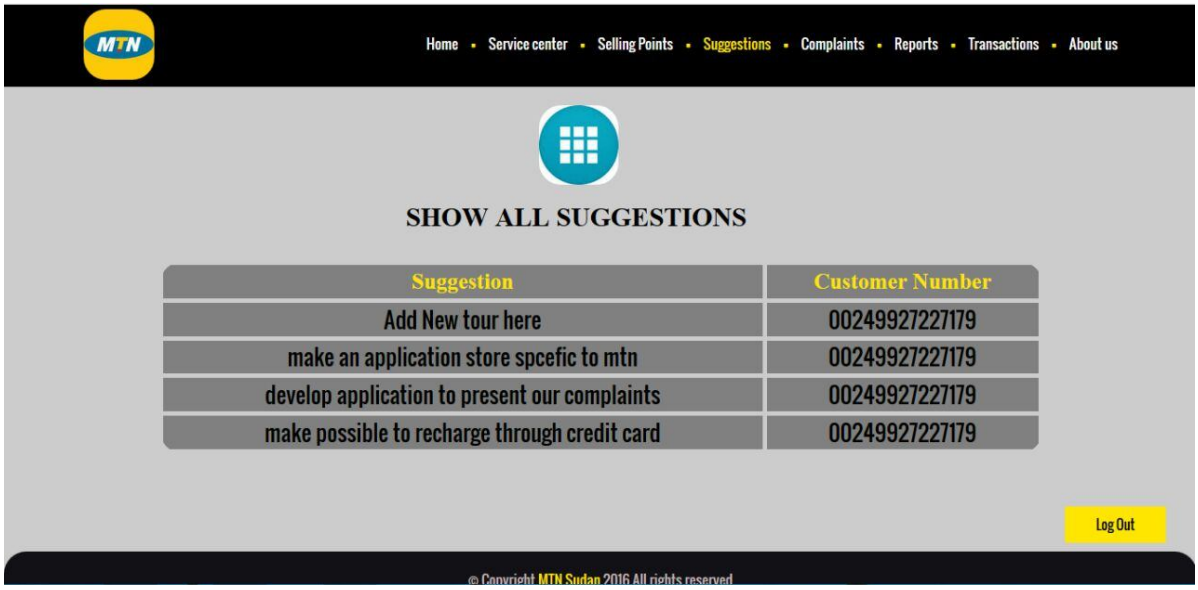

Figure 5-33 Suggestions Interface

5.2.8 THE COMPLAINTS INTERFACE:-

Figure 5-34 the complaints interface

5.2.9 THE REPORTS:-

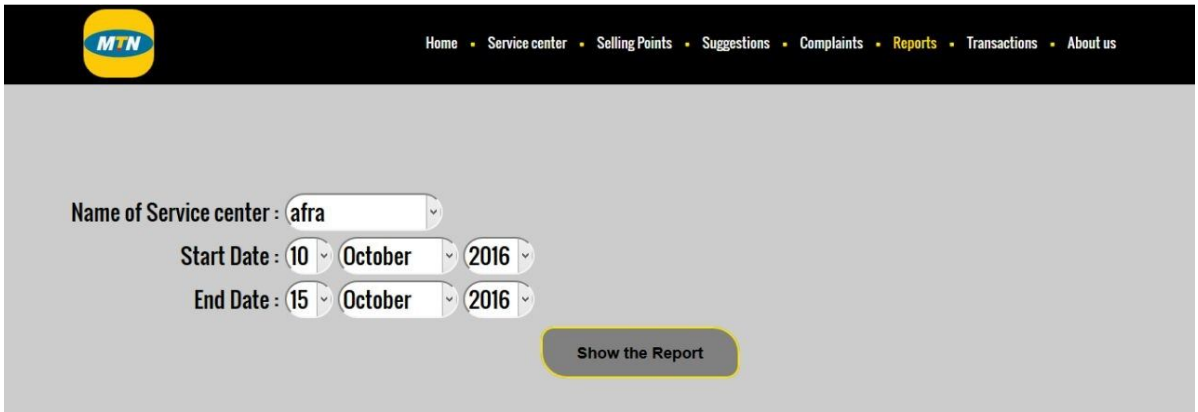

Figure 5-35 admin choose the start date and the end date

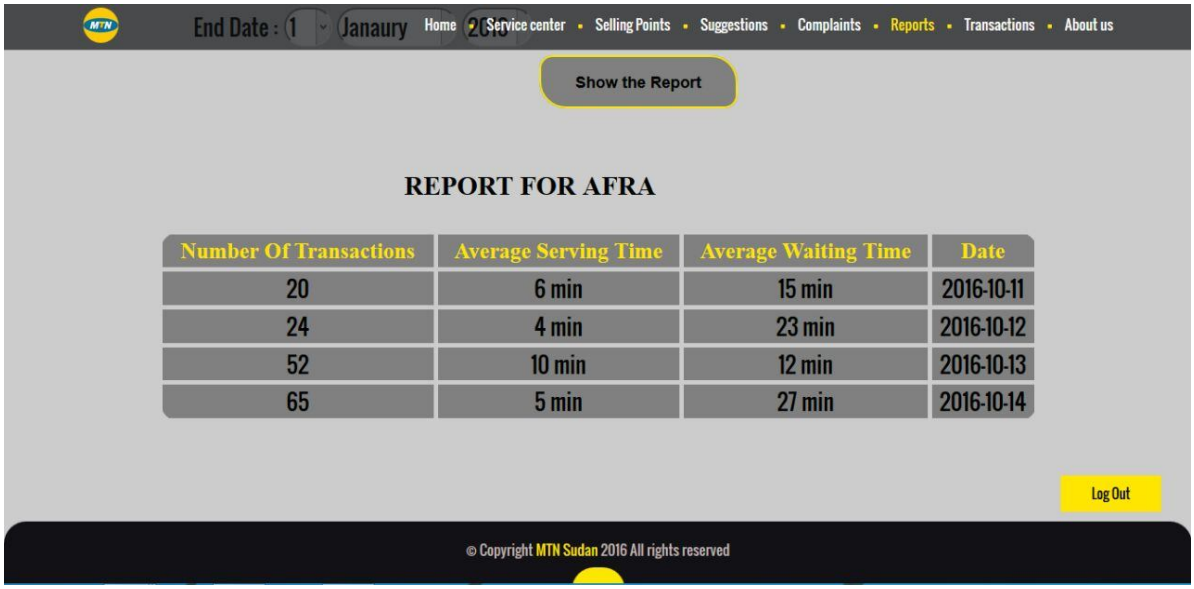

Figure 5-36 the reports

CHAPTER SIX

THE RESULTS,THE RECOMMENDATIONS AND THE CONCLUSION

6.1 THE RESULTS:-

After analyzing, studying and application the developed system some conclusions had been reached:

1. The android application (which help customers in finding CSP or SP and in presenting complaints or suggestions) and the web application (for admin to administrate the whole system) had been developed in a way that satisfy the MTN customers' requirements.
2. Give the customers the knowledge about the time they will spend to reach the closest CSP or SP, the number of people who will be served before them and approximately the time they must wait until they have been served.

6.2 THE RECOMMENDATIONS:-

1- When a complaint is sent by the application then the application must tail to the complaint the location of complaint automatically and give the customers the chance to know the status of their complaints.

2- Identify the products available in each CSP or SP.

3- The System must contain all of the CSPs and SPs even though the movable ones. Besides that, it should give each of them the ability to order a specific product or service from the company.

4- Customers who use the application can have profiles in the application.

5- Taking into accountwhen identify the nearest CSP the crowds in the roads and also in the CSP.

6- Give the departments of the Company the authority to login to the web site and deal with the problems which they responsible of, instead of delivering them in the email.

7- Using GIS.

6.3 THE CONCLUSION:-

Table 6-1 Comparison between System-As-Is and System-To-Be:-

PROBLEM	SYSTEM-AS-IS	SYSTEM-TO-BE
CSP location	Call the call center or visit their website to know the CSPs locations.	Through map the customers can identify the closest CSP and the best path toreach it.
SP Location	There is no way to know the closest SP that provide the service the customer need.	The ability to filter by the service which is needed and know the closest one from customer's location.
Complaintsand suggestions	Call the call center or search for CSP to present the complaint or suggestion.	Just submit the complaint or suggestion from mobile app and wait the response (in case of complaint).
Report	Does not contain reports.	Admin receives reports daily from all CSPs.
Relationship with customers	Poor relationships	Establish good relationships
Time & Effort	Consuming long time and high effort	Alleviate the time and effort

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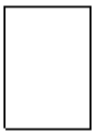
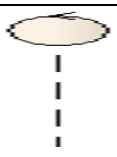
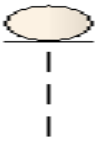
APPENDEXES

APPENDEX I:

UML notations:

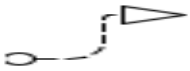
Symbol	Name
	Actor
	Use Case
	Boundary
	Dependency (Use Case Connectors)
	Associate
	Boundary
	Control

	Lifeline
	Entity
	Message (Sequence Diagram)
	Control Flow (Activity Connectors)
	Return-Message (Sequence Diagram)
	Self-Message (Sequence Diagram)
	Initial
	Final
	Decision
	Activity
	Fork/Join
	Fork/Join

APPENDIX II:

BPMN Notations:

Symbols	Name
	Pool
	Pool (Lanes)
	Task Activity
	Exclusive Gateway
	Parallel Gateway

	Start Event
	End Event
	Sequence Flow
	Message Flow

APPENDIX III:

MTN's CSPs locations:

Service Center Name	State/City	Location Address	Working Hours
Afra Mall	Khartoum	Khartoum , Airport street ,Afra Mall ground floor	09:30 am To 10:30 pm , Sat to Wen & 10:00 am To 12:00 Midnight Thu to Fri
Al Waha Mall	Khartoum	Khartoum , Al Waha Mall basement floor	09:30 am To 10:30 pm , Sat to Wen & 10:00 am To 12:00 Midnight Thu to Fri
Down Town	Khartoum	Khartoum , Al Qasr street , Regency Hotel (Old Meridian)	08:30 am To 07:30 pm , Sat to Thu
Al Amarat	Khartoum	Khartoum Amarat , Street 7 , next to free zone market , opposite Coptic Club	08:30 am To 07:30 pm , Sat to Thu
Al Manshia	Khartoum	Khartoum Al Manshia , Alkhel (Omac) Street , MTN Head Office	08:30 am To 07:30 pm , Sat to Thu
Almina Al Bary	Khartoum	Khartoum Alsoog Almahaly street , opposite Almina Al Bary Station	08:30 am To 07:30 pm , Sat to Thu
Airport	Khartoum	Khartoum International Airport -Airport Street , Arrival Hall	24 /7 All Week Days
Ebaid Khatem	Khartoum	Khartoum Arkaweet , Ebaid Khatem Street , Opposite Al Shaikh Hospital	08:30 am To 07:30 pm , Sat to Thu

Al Siteen	Khartoum	Khartoum , Al Siteen street , Eltaif block24	08:30 am To 07:30 pm , Sat to Thu
Al Salma	Khartoum	Khartoum, Al Azahari Block16 , AlBagala buss station	08:30 am To 07:30 pm , Sat to Thu
Al Kalakla	Khartoum	Khartoum, Jabal Awlya Street ,before Alkalakla Allafa , Opposite Alrasheed Complex2	08:30 am To 07:30 pm , Sat to Thu

/php-advantages-disadvantages.php