Developing a Mobile Application for a Taxi Service Company in Nigeria

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***Abstract*— Transportation is an issue of concern in big cities of many developing countries today. Due to the large population in these cities, there is constant traffic congestion and pollution. As a result taxi services are common. In Nigeria, companies offering these services have discovered that they can better serve the large population by providing their services through the mobile platform. Given the wide spread adoption of smart phones in these regions, we designed, developed and deployed an Android-based application for one of the taxi service company called Red Cab. The application makes it easier for Red Cab to cater for its current customers and also reach out to newer ones.**

Keywords- Android, Mobile application, Taxi booking, transportation

I. INTRODUCTION

Transportation plays a vital role in the day-to-day activities of the society. In most communities, a large fraction of the working population commutes to work daily [1]. Commuting may not only be for business purposes but also for relaxation, shopping and other social activities. Of all the means of transportation, land transport, comprising of the use of vehicles – both private and commercial is common especially in developing countries of Africa [2]. However, a key advantage of commercial transportation over owning a personal vehicle is that it is less expensive and economical considering the high poverty rate in this region [3].

Taxi services are becoming prominent especially in big cities of sub-Saharan Africa [4] [5]. Prior to this time, the companies offering these services have not been able to reach out to as many people as they would have desired especially remote locations [6], [7], [8]. However, given the wide spread adoption of mobile devices (particularly smart phones) in this region, there is a pressing need to reach out to more customers and also better cater for existing ones [9], [10]. Some of the companies based in Nigeria – the nation with the largest black population in sub-Saharan Africa – have already deployed mobile applications to better serve their customers but Red Cab Taxi is yet to successfully deploy a mobile app to support their services. Instead the company relies on its Web-based taxi booking system. In order to maintain a competitive edge with its competitors, Red Cab Taxi has recognized the need for a mobile version of its taxi booking service. The aim of this paper therefore is to discuss the development of an Android-based mobile app for Red Cab Taxi Company. The rest of this paper is thus structured as follows: In Section 2 a review of existing systems is conducted. In Section 3, we focus on the design of the proposed system using the Unified Modeling Language (UML) diagrams. In Section 4, we discuss the implementation of the mobile application and we compare it with the existing systems in Section 5. Section 6 concludes the paper.

II. REVIEW OF EXISTING SYSTEMS

Easy Taxi was founded in Brazil and has since been expanding. Bankole Cardoso introduced the company to Nigeria in July 2013 [11]. Its main goal is to create efficiencies in the Nigerian transportation network by changing the perception of Nigerians about taxis. With Easy Taxi, users can call a taxi anytime and anywhere and the app would automatically search for the taxi closest to the vicinity of the customer. As soon as a taxi is selected, a live map of the taxi's movement is shown on the screen of the customer's mobile device. The drawback of Easy Taxi however is that because it is new, Nigerians are still rather skeptical about its ability to always deliver hence it is not yet widely used.

Afro Cab is another Nigerian based taxi hailing app, which emerged in 2012 [12]. The company is currently servicing Lagos and Abuja with plans to expand their reach to more major cities in the country. The company has over 600 registered drivers in Abuja and Lagos. The application works by allowing users to input their location and then a menu of registered locations/streets are shown. If the location keyed-in is not known, an alternative pickup location is shown. The type of car the user wants to ride is listed and the user is also able to specify the range of amount that s/he is willing to pay before tapping the Get Cab button. The app sends the request to a number of the drivers within the vicinity. A driver can either accept or reject the request and the feedback is fed to the customer in real time. However, once a driver accepts the offer, a live map view of the taxi's movement is shown on the screen of the user's mobile device. A drawback of this application is that it fails to recognize some locations and so customers requiring the services in those areas may be denied the service.

Uber Taxi on the other hand can be described as a taxi service for the elite. It portrays its users as successful individuals who have style, class and elegance [13]. The Uber smartphone application that is available on all mobile platforms

connects passengers to drivers in an area. All passengers have to do is to download the Uber application on their smartphone. When a request is made, a GPS based dispatcher feature simply sends the location of the requesting passenger as pinpointed on a Google map, in specifics to the country. The user then selects the type of car s/he wants to use. A picture of the driver and the vehicle's registration detail is sent so the passenger and a suitable price is then agreed upon. When a passenger is in the car, s/he can send a link of an online map to a friend or loved one, who can track their entire journey via GPS. Driver rating is also a feature of the app, in which a rider can rate the driver and also give a testimonial on the service provided by Uber. However, this service is not yet functional in Nigeria.

Tranzit, unlike other mobile enabled taxi service is not just a transportation service, but also a delivery service that helps a person locate required and interesting places, events, by suggestions based on the person's current location. It can also be described as an intermediary between passengers and drivers [14]. Tranzit claims that with a few taps, goods can be delivered to a customer's doorstep, and can with those same taps find a license-vetted taxi. Tranzit, which was first called Taxi Park, was launched in August 2013, bridging the gap between passengers and drivers. Tranzit was borne of the desire to better serve our steadily growing database of client. The service is currently running in Lagos, though there are plans to expand the coverage. Lagos traffic is legendary and booking a taxi with ID and details of drivers unknown is very risky. Tranzit's plan is to change all this, is by developing a system of service that moves people and objects from one place to another in the city of Lagos.

Red Cab Taxi, which is one of the leading taxi service companies in Nigeria currently, has no mobile application that allows for booking as seen in the other existing systems. The company relies on its website for providing customers with a means of booking taxis. In order to maintain its competitive advantage, the need for such a mobile application that would complement their website was identified. The process of developing the initial version of the application is the subject of discussion in this paper.

III. DESIGN OF THE RED CAB MOBILE APPLICATION

Based on interaction with relevant stakeholders (customers, personnel in the company) and a study of similar existing applications, we identified the following requirements as core for the application:

- A module for registering on the platform
- A module that allows a user to update his/her profile
- A module for placing order for a Taxi
- A module for calling the Taxi man
- A module for locating the Taxi

A use case model was used to capture these basic functions and is shown in Fig. 1. Table 1 is use case narrative describing the flow of activity in the mobile application.

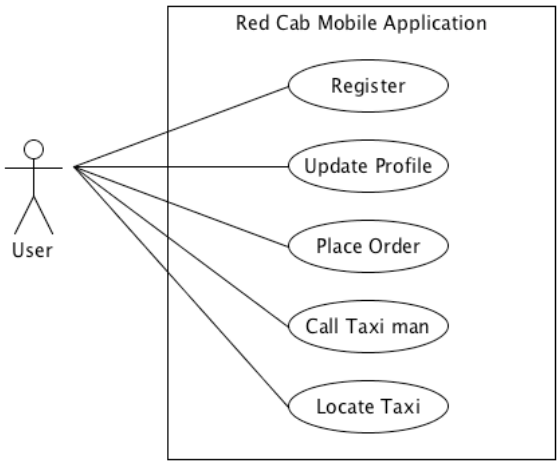

Figure 1. Use case diagram of the Red Cab Mobile Application

TABLE I. USE CASE NARRATIVE

	Red Cab
Brief Description	This Use Case describes how a user places an order to a Taxi driver and how the user monitors the taxi until its arrival
Actor	The owner of the mobile phone (the user)
Flow of Events	Basic Flow The use case starts when the actor inserts his details on a registration page which is displayed on installation 1. The actor can update the initial registered details 2. The actor places an order, tapping the icon on the application menu. 3. A page with different text fields is displayed requiring the user to insert his location and its description. 4. Details of placed orders are displayed in the order history on the application menu 5. The location of the Taxi man can be viewed on a Google map by tapping the 'Where is taxi' button on the application menu 6. A call can be made to a taxi man 7. A user double taps the exit button to exit Alternative Flow If in the Basic Flow when Registering and Placing an order, the actor clicks the Save or Submit button without having filled out the compulsory fields, an error message will be flagged.
Special Requirements	None
Pre-Conditions	The actors must have filled the Place Order requirements completely.
Post-Conditions	A message would be received by the user from the assigned driver
Extension Points	None

IV. Implementation of the Mobile Application

The mobile application was implemented using Eclipse IDE for the Android platform and was deployed to the Google Play Store. It can be retrieved at (https://play.google.com/store/apps/details?id=com.red.redcab&hl=en). Android is officially the most widely used mobile operating system in Nigeria [15]. The application is able to interface with Google maps to provide detailed information about a Taxi's location. The modules of the mobile application include: a menu page - that is displayed right after the application loads. If a user is downloading the application for the first time then s/he would have to register but subsequently the menu screen is displayed as shown in Fig. 2.

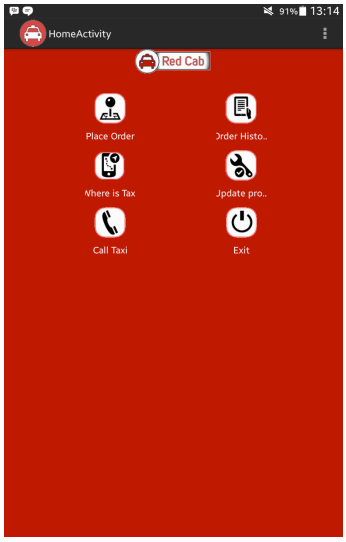

Figure 2. Red Cab Menu Screen

A. Registration Module

This is the first interactive screen that is displayed after the splash screen if the user is downloading the application for the first time. It provides fields that capture the name (surname) the mobile phone number and password for login to the application. This is depicted in Fig. 3.

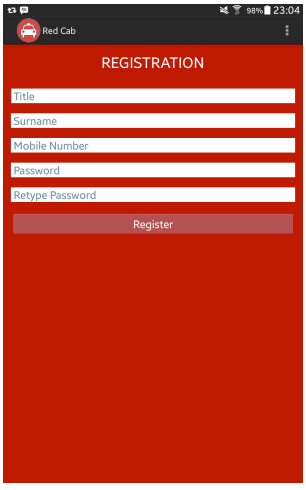

Figure 3. Red Cab Registration Page

B. Place Order Module

This module is the core activity of the mobile application. It allows a user to input his/her current location with specific details. This information is then sent to a potential driver's phone as text message. This is depicted in Fig. 4.

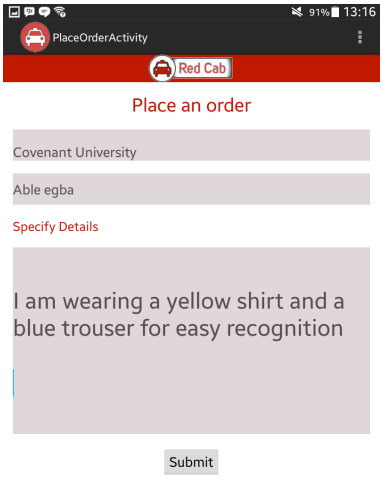

Figure 4. Red Cab Place Order Module

C. Order History

This module shows in ascending order, the various orders previously placed. The user can also delete an order history by pressing down an order for three seconds that is to be deleted. The module is depicted in Fig. 5.

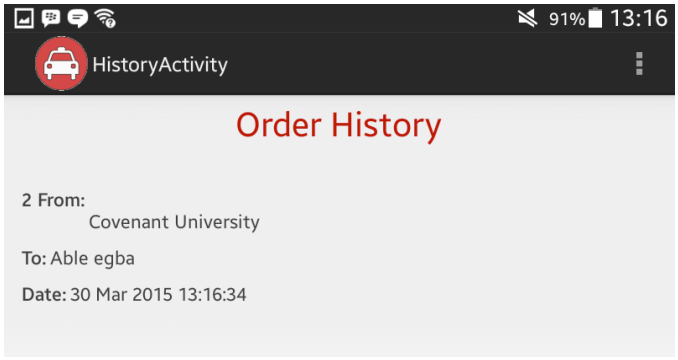

Figure 5. Red Cab Order History Module

D. Taxi Locator

This module is integrated with Google Maps showing the location of the assigned driver on the map. It is used to monitor the position of the driver as shown in Fig. 6.

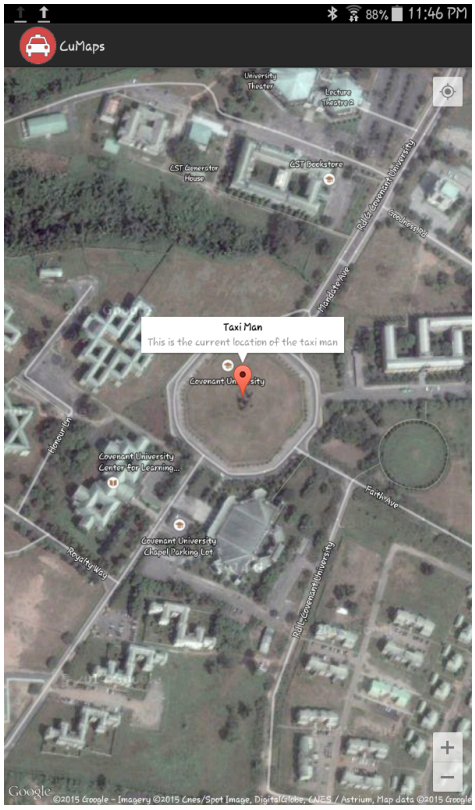

Figure 6. Taxi Locator Module

E. *Call Module*

The application can allow a user to call the Taxi man that receives his order or the Customer Care of the company. It is depicted in Fig. 7.

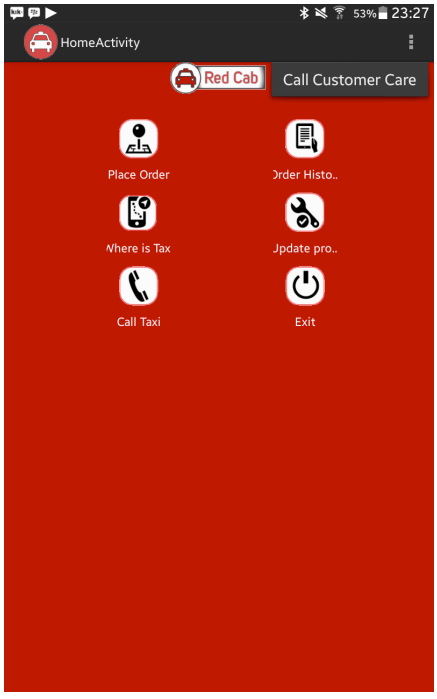

Figure 7. Red Cab Call Module

V. Comparative Analysis and Discussion

To check that the mobile application developed in this study provides features that can compete favorably with the existing mobile applications, we compare the application with the existing systems discussed in Section 2. The comparison is done based on the following criteria namely: whether or not registration is required in order to use; the size of the app when installed on a device; whether or not it works with Google Maps; the support for call services as well as the support for short messaging services (SMS). Table II gives the comparative analysis between the Red Cab app and similar existing apps.

TABLE II. A COMPARATIVE ANALYSIS BETWEEN THE RED CAB APP AND OTHER EXISTING APPS

Criteria	EasyTaxi	Afro Cab	Uber Taxi	Tranzit	Red Cab Taxi
Requires registration to use	Yes	Yes	Yes	Yes	Yes
App size when installed	10.68 MB	11.52 MB	40.11 MB	17.52 MB	2.60 MB
Payment Integration	No	Yes	Yes	Yes	No
Works with Google Maps	Yes	Yes	Yes	Yes	Yes
Call services supported within the app (to driver and customer care)	Yes	No	Yes	No	Yes
SMS messaging support	No	No	No	No	Yes

From Table II, we observe that all the mobile applications considered require their users to register initially after the application is downloaded from the store. The various mobile applications also integrate Google Maps. When installed on a device, Red Cab App happens to occupy less space compared to the other applications and so requires far less time to download. For payment integration, EasyTaxi app de-emphasizes payment focusing rather on hailing a taxi. Also, given that the application developed in this paper is an initial version, payment module is yet to be incorporated compared to the other existing mobile applications (Afro Cab, Uber Taxi and Tranzit) that incorporate payment. For call services within the app, Red Cab app makes it possible to call the driver assigned as well as customer care. Call services are also obtainable in Tranzit and Easy Taxi. SMS messaging is supported in the Red Cab application in instances where it might be impossible to get across via mobile data due to low signal strength.

VI. Conclusion and Further Works

This study has shown the process of designing and developing a mobile application for Red Cab Taxi Company based in Nigeria. Prior to this time, the company has had to rely solely on its website to provide user's with the booking functionality. To ensure that the possible deployment of this

system is progressive and that it reaches its maximum capabilities in the nearest future, the following will be considered in future work: Usability evaluation of the mobile application so as to elicit feedback from users that will help to further improve the quality of the mobile application. Also, the capabilities of the system will be extended by incorporating a payment module into the app to cater for users who prefer to use cards for transactions. All of these efforts will be geared towards giving Red Cab Taxi the leading edge in Nigeria.

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