Enhancing Courier Service with the Development of an Interactive Mobile App in Android Platform

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Abstract: *In a large world like ours, sending packages from place to place by a third party is inevitable since package owners cannot be able to tour round all the desired destinations within the required period. The courier service systems provide the service but with less efficiency in terms of delivery, comfort, cost estimation from the users' point of view, and tracking of items in dispatch. This paper studied the courier processes and offers a mobile platform to perform all courier transactions like providing users with a platform to cost their parcel's sending service, send package, track the package and make complains in case of missing package from the comfort of their home. The deployment platform of the software is Android mobile devices. The System was developed using Object Oriented Analysis and Design Methodology (OOADM). The programming language used for the implementation include: XML; and Java programming were employed for the development of the users application, whereas PHP was used at the server backend. Android Studio and PHP Storm served as IDEs at the development stage. The outcome of the research and development will ensure that customers easily participate effectively in pre-courier, courier and post-courier activities which will drastically reduce the unbudgeted cost of transaction and build trust in the courier service system.*

Keywords: *Courier service, mobile courier, Android, package trackability, pick up service, speed post, prior cost estimation.*

I.   Introduction

Mobile Courier Service system is a system that offers special delivery of packages, documents or information. Courier services usually boast of faster delivery times than any alternative method of transporting documents, and many services in the modern world. Couriers are distinguished from ordinary mail services by features such as door to door delivery, track and trace technology (US-ASEAN Business Council, 2005), speed, security, tracking, signature, specialization and individualization of services.

Mobile Courier Service System is a special courier system where all courier transactions are done via a mobile phone. The system also pre-informs the user about how much it will cost them to send the package and also the arrival date of the package they want to send. The mobile courier service system also provides a map for the courier agents which will enable them to easily navigate to their picking or delivery point.

II.   Review of related literature

According to Wikipedia (2007), the use of courier or courier-like services has been in existence right from the ancient days. Tracing back to those days when runners and homing pigeons and riders on horseback were used to deliver timely messages. Thus initially, foot messengers physically ran miles to their destinations. To this day, there are marathons directly related to actual historical messenger routes. In the Middle Ages, royal courts maintained their own messengers who were paid little more than common labourers Small (2012). This system is not efficient because a messenger can only be allocated to one user; therefore there is under utilization of the messenger's labour services and other resources. Following a report by US-ASEAN Business Council on Global Market (2005), the services provided by Courier companies share some characteristics which differentiate them from other traditional forms of delivery services: (i) *Door to door delivery:* This includes the seamless transfer across multiple modes of transport. The "integrated" aspect of the service offered frees the customer from the need to make complex transportation arrangements for pick-up and delivery. (ii) *Close custodial control:* Using sophisticated information systems that enhance security, EDS firms maintain close custodial and administrative control over all shipments. This is particularly important to reduce the risk of loss or damage to goods in transit, and (iii) *Track and trace technology:* Shippers and consignees may track the precise movement and location of their shipments and confirm delivery. Wikipedia Records (2007), wrote that the largest courier service in the world is the United Parcel Service (UPS), which delivers more than 12 million packages globally each day. Federal Express (FedEx) and DHL are other well-known global examples of the courier service, both with their roots in the early 1970s.

Orunga *(2012)* opined that *p*arcel delivery companies experience a host of problems in their service delivery which culminate in increasing the cost of services, time wasting and poor service delivery. He further argued that lack of messaging services lead to weak audit trails for deliveries and that the manual system of managing deliveries often results to poor coordination of deliveries and collections and recommended the use of right technology to customize the services for a greater step ahead in the courier industry. His major reason for the technological approach is to increase the accuracy of courier records, and manage time effectively. Karlson et al,(2008*)* took a study into the electronic file exchange aspect of courier. The study highlighted the essence and place of Courier leverages mobile phone and PCs especially in the activities of sharing of electronic files and URLs from users' personal work environment anywhere they have their phones and access to a shared display. It also portrays the usability issues that will require further refinement, such as users concerns with privacy, reliability and speed of package delivery.

Chris (2006) came up with a design for a courier system meant for a desktop application. But this is not sufficient, implementation is also needed. Chauhan et al., (2010) in their paper *ca*me from the angle that web based application is the magic of today's world and projected *"e-Courier Services"* for business to business interaction as a basic solution towards high-tech courier services in India. They presented an e-courier service that users can use and perform their courier transactions. Here the app was deployed as a web application targeted to Indian users. Their concept in the paper was deployed on the web and but was not targeted to mobile phone users. In Azeta et al *(2010),* it was noted that the existing express delivery system lack mobile facilities for customers to lodge complains and track which makes it difficult that while the shipment is on the move, the customers are kept in the dark about their consignment and also the courier agents are not able to access courier information while on the field. For this, the author therefore proposed the Mobile Express Delivery System (EDS) which will provide the courier customers with a means of tracing/tracking shipment, lodging of complaints and making financial transactions on shipment. This should also assist the courier staff to effectively manage courier related data with a mobile phone in order to enhance time, efficiency and documentation management for the customer and courier staff. The author took a critical look at the courier section in Nigeria and concluded that it was still far from using mobile device to support their operations, considering the enormous benefits of mobile applications in the global economy. Hence, there is need to scale it down to mobile since the number of mobile phone users now supersedes the number of PC users Murtagh,(2014).

The work of Karlson (2008) presented a system that enables two or more parties to share file from their mobile device. The limitation of this system is that it was just developed for sending and receiving of e-documents. Also, the system shares its documents over Bluetooth connection which has range limit. In Azeta et al., (2010), wap enabled phones was proposed to be part of designed considerations for a mobile express delivery system. The system enables user to perform various courier operations like tracking, check account statement and lodging complaint. In this contemporary period, mobile phones have become smarter with the advent of the Android operating system which now makes up 84% of the world's smart phone market. The work in Azeta et al. (2010) was designed for mobile using java language; but the system proposed, due to technological revolutions, now has less use and will be seen as archaic.

According to Fabiano *(2010),* the major selling point for logistics companies is access to the delivery status of a consignment which should be provided by courier and cargo companies for their clients through a toll free hotline, SMS and company website. In order to enhance this services, the author says that PT Repex Wahana (RPX), a local logistics company in partner with FedEx, is to offer a number of high tech service features which includes the RPX Global Positioning System (GPS) that is placed in every company vehicle so that its whereabouts can be traced and the RPX Tracker, which is an enhanced PDA complete with Wi-Fi and GPS that is carried by each courier to input data when the consignment is received by the customer or to update the status of the consignment.

Emeje(2013) opined that effort are being made to educate the courier operators on how they can use ICTs for tracking and other trading activities. He throws light on "national economic potential of indigenous courier operators leveraging electronic commerce platform as canvassed by the Courier Regulatory Department to prosper the industry". The Nigeria ICT Compumetrics report (2003) observed that multinational courier companies in developing countries such as Nigeria make use of sophisticated ICT products and equipment courtesy of their foreign partners. According to Schmidt (2015), the couriers and local delivery services in the US primarily provide express delivery and pickup of parcels. He highlighted that E-commerce trade is one of the major drivers of the global courier service industry. Electronic aspect of courier is recommended with the increasing demand of e-commerce all over the world. According to the author, there are 3 types of courier services in US, viz-a-viz; Carriers, Freight and Haulage.

The Carriers (they are large delivery companies that have a wide delivery network and a large fleet. Their fleet includes airplanes, trucks, vans, and ships). Carriers offer an entire supply chain solution for a large variety of goods. The Freight forwarders are subcontractors to airlines or carriers. Most freight forwarders offer specialized services like pallets, parcels, or bulky goods transport. The Haulage services transport bulky and heavy goods. Haulage services are not trackable like the services of carriers or freight forwarders. Most hauliers make use of rail networks to transport goods. In another work published in Yosep, (2014), a food ordering application was design for the Android platform. In Yosep, (2014) both the client-side(mobile phone) and the server side of the software were designed. It also included system that will be able to track an order.

Courier business is presently a critical service sector of global economy, reaching to nearly every hamlet across the world in Isaac (2010). It is also one of the fastest growing sectors. Inability of state run postal systems to cope with 20th Century jet-age demands of speed, security & expanded delivery led to emergence of modern private courier firms, operating side by side with state run postal system that has become an endangered species. Despite influx of new entrants in the last 15 years, the sector is still far from saturation point.

III. The Mechanisms of Interactive Mobile Courier Service System

The concept of mobile courier service system is to enable user to send packages without stepping out of their house. Courier service is not complete until the dispatched parcel gets to the final recipient and the delivery report to sender. This service is best if it can be efficient in the three stages of the service, viz-a-viz: pre-courier, courier and post-courier activities. The pre-courier activities encompass all the preparatory actions taken before the dispatch of the parcel. This includes identifying the courier agents/company, costing the service, specifying the delivery variables and registering the parcel for dispersal. The uncertainty of the costs of sending the package has become a big problem in the system. There is need for clients to know how much it will cost them to send a package from the comfort of their home or offices before making any move so as to eliminate some untold disappointments. The system will have the cost estimation capability using the parameters of date, time frame, weight, distance and delivery preference supplied by the clients thereby informing a potential user the cost of sending a particular package and the expected delivery date and time ahead of the initiation of the service proper.

There are associated stress and time wastage from the customers' point of view in going to the courier office as well as waiting on the service queue just to send packages. Therefore, it will be significant for the system to make room for users to send a request for service after the necessary pre-courier services and then a courier agent can come to clients location to pick up the package for delivery. The courier service starts from here. Payment for the service can be made at this point using the most prevalent and safest form of making payment.

Ineffective tracking system in the existing courier service is another problem to the customer's satisfaction of the service. With a mobile network platform, an easier, better and faster way of tracking users parcels coupled with a notification service which can be in form of an app custom notification or telecommunication SMS can be provided.

Some courier agents may find it difficult to locate recipient of the package being sent. The user's participation in the courier service using the mobile application makes the meeting ground very efficient. The courier agent can easily seek for direction and redirection from either/both the sender or/and the recipient using the mobile app. This is the turning point in the user's participation in courier service. At some point in time, the courier agents can also use the app to easily locate a customer's address with the aid of Google map API. This API assists courier agents navigating to their picking or delivery points.

At the final dispatch, both the recipient and sender can acknowledge the service completion using the mobile platform. This is regarded as the user's participation in post-courier service. In addition, It introduces a faster way to lay complain about a delay in delivery or missing package.

In this regards, fast means of communication between the customer and the agency is enhanced via virtualization of space.

IV. The Design of Interactive Mobile Courier Android System

The Object Oriented Analysis and Design Methodology (OOADM) was used in the research and development. Whereas Object Oriented Analysis (OOA) emphasizes on finding and describing the objects (concepts) in the problem domain, Object Oriented Design emphasizes on defining software objects and how they collaborate to fulfill the requirements dealing basically with objects, classes, relationships and instances.Figure 1, presents the requirement specification of the system in a use case diagram as a graphical means of representing the functionalities of the system. It represent the sequence of actions carried out by the system during execution and the relationships between functional parts of the system. The UML diagram in the figure 1 above shows the list of activities and actors involved in the system. A lot of actions need some other actions to precede before their completion (<<includes>>), while some actions too need other actions to follow their completion (<<extends>>). For instance, for a user to complete "Request for courier service", actions such as "Register parcel and Pay" for the service has to be executed before the completion of that function, whereas action like "Invite Agent" follows immediately after the completion of the request.
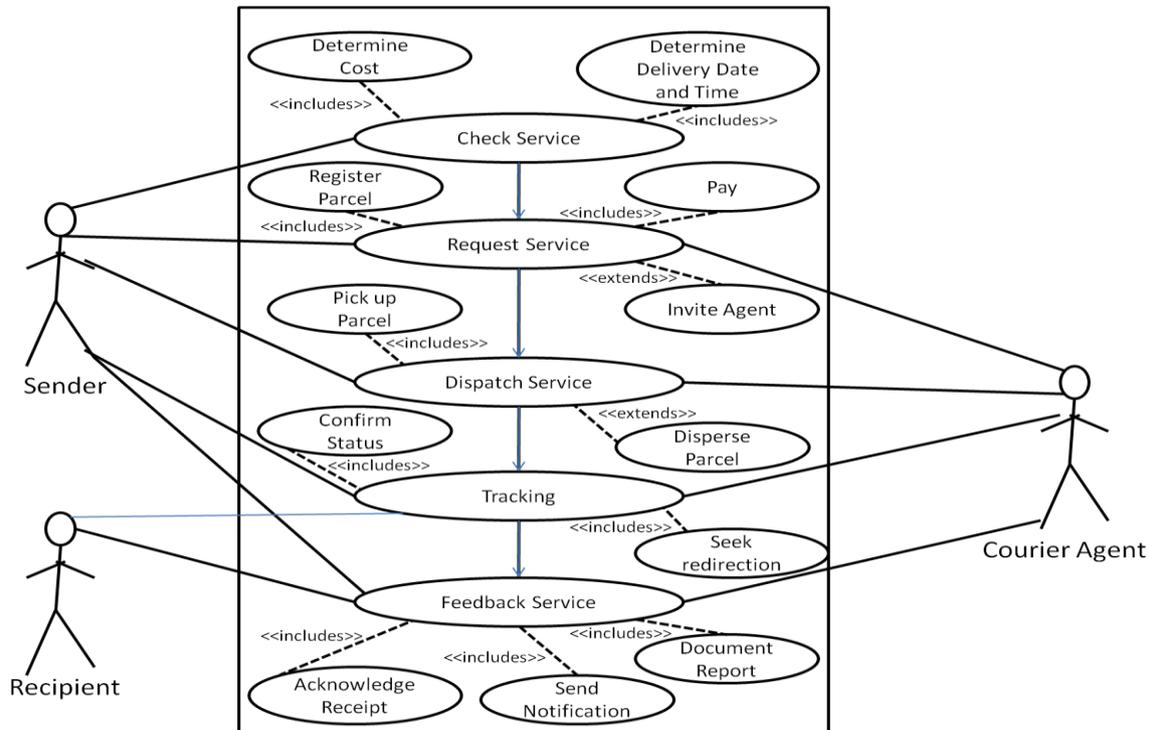
Figure 1: UML use case diagram for the interactive mobile courier system

Three actors, the sender, agent and recipient are the target users of the app. Whereas sender subscribes for the service, tracks the progress and gets notification of its completion, the agent is an intermediary actor between the sender and the recipient. When the user requests to send a package transfer request, the admin server receives the request and process it automatically. It finds and sends request to the appropriate and most convenient agents. The agent acknowledges the assignment and sees to the dispatch of the parcel. The recipient receives the parcel and acknowledges reception. The whole activities are synchronized on a central database which in combination of the software and the users make up the system.

All the actors can track service using a tracking code. The sender tracks the status, the recipient tracks the proximity of delivery and the agents tracks his directions. The customer service module handles the reporting of lost packages and so on.

How it works:
The proposed system presents a better way of sending and tracking your packages. Using the proposed system, here are the steps you have to follow to send a packages:
i.   Open the mobile courier app and key in the details of the package you want to send.
ii.   Key in the details of the recipient
iii.   The system will tell you how much it will cost to send the package and the date of arrival of the package.
iv.   When you complete the transaction, a courier agent comes to your address to pick up the package
v.   When you package leaves your destination, details about its location will be sent to you via mobile notification.
vi.   In case you have any complain to lodge, you can still do it via the mobile app.
vii.   There is also provision for courier agent to trace the route between two points with the proposed system.

V. Architecture of the System

The architecture of the system is 3-tier. The presentation tier, middle tier, and data tier. The system has two presentation tiers. The one at the client side which was built using XML. The one at the server side was built using HTML. The middle tier also called the business logic was built using java and PHP. Java was used to get all data from the presentation tier(client side) then it does calculations where necessary and parses the data to the server using JSON code. PHP interprets the data which was parsed from the client side and then stores it in the Data tier which is the SQL database.

System Implementation

The interface of the android client application was designed with XML, having java code running behind them. With built-in support for Google Cloud Platform, it was easy to integrate Google Cloud Messaging and App Engine. Being an Android app, java was used for all its activities implementations. PHP was used at the server backend and also to interface the MySQL database for its online contents. JSON was employed in creating an interaction between the Android SQlite database on the user's app and MySQL database at the admin's host. XML was very useful in the layout design and in storage of some static data.
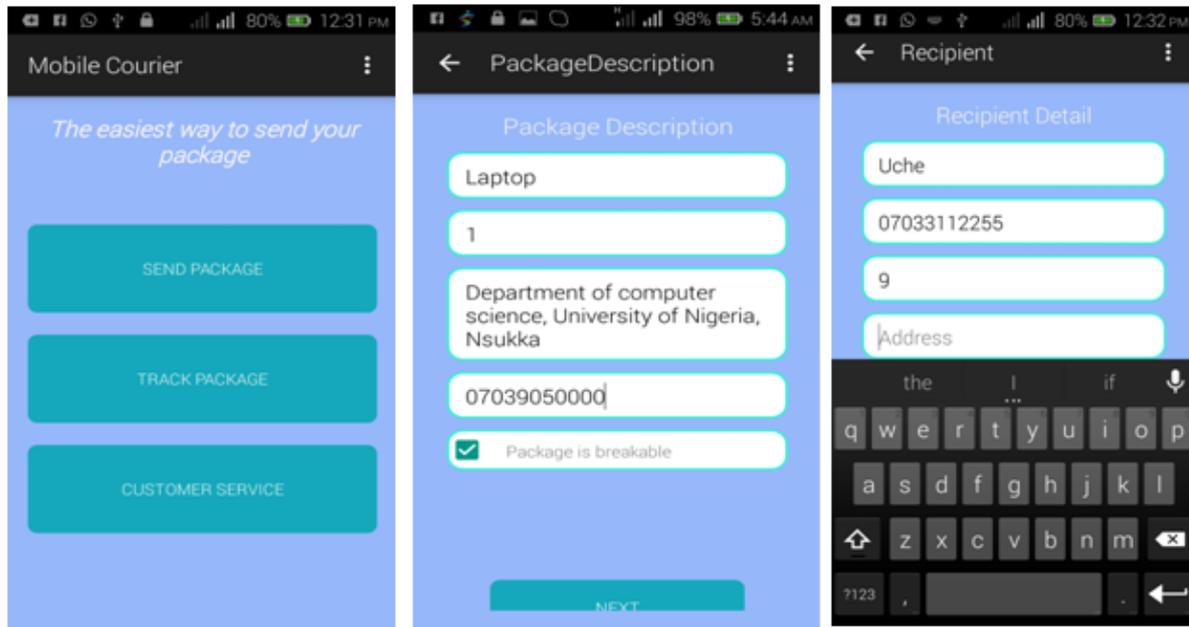

Figure 2: screenshot of the software

VI. Conclusion and Recommendation

This paper presents a mobile courier service system for the courier service sector in Nigeria. A critical look at the courier section in Nigeria shows that they are still far from using mobile device to support their operations, considering the enormous benefits of mobile applications in the global economy. The system as developed provides an easier means to send documents and other package like laptops, books, etc. with less delay and stress. People do not have to visit the courier offices again for any reason. The Mobile courier service system provided in this paper, when fully deployed, will help to improve the services rendered by courier companies in Nigeria. So far, this system provides complete client side courier software which customers can use to send their package to various destinations By the resources available to us and considering the limitation, we were able to completely implement the client side of the mobile courier service system and we leave the rest as recommendation for further development.

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