MAKERERE **UNIVERSITY**

COLLEGE OF COMPUTING AND INFORMATION SYSTEMS

SCHOOL OF COMPUTING AND INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

PARCEL MONITORING AND DELIVERY SYSTEM ON PUBLIC TRANSPORT
BUSSES PROJECT REPORT

By

GROUP 22

A PROJECT REPORT SUBMITTED TO THE SCHOOL OF COMPUTING AND INFORMATICS
TECHNOLOGY FOR THE STUDY LEADING TO A PROJECT IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF BACHELOR
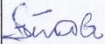OF INFORMATION SYSTEMS AND TECHNOLOGY OF
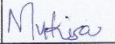MAKERERE UNIVERSITY

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DECLARATION

We, group 22, hereby declare that this Project Report is our original work and has never been submitted to any University or higher institution of learning for any academic award where other peoples' work has been used, due acknowledgment has been made

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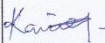Signature ……………………………………... Date: <u>Tuesday, November 1, 2022…</u>

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DEDICATION

This report and its contents are dedicated to our dear parents, caretakers, and sponsors who have financed our education for three years. May the Lord bless the works of their hands and reward them abundantly. This piece of work leaves us eternally grateful to our supervisor Dr.Grace Kamulegeya for her continuous consistency in offering much-needed guidance in completing this project

ACKNOWLEDGEMENT

ABSTRACT

The parcel monitoring and delivery system on public transport busses system enables clients using buses in Uganda to track their parcel during and after transit. The system was developed due to claims of delays and sometimes failure to receive parcels by clients of bus companies in Uganda. This report highlights the project objectives ,problems ,methodologies ,limitations ,conclusions and recommendations we arrived at during the project course. Data collection and analysis of the existing systems was carried out at bus companies like posta Uganda limited ,Modern Coast Coaches Limited, pioneers bus, YY coaches,baby coach buses and link busses where we analysed the strength and weakness of the existing system.we also carried literature review from related tracking system like UPS,Fedex, and DHL of other countries so as to get abetter understanding on how the systems were instantiated. Our case study mainly based on Moden Coast Coaches Limited which is a popular luxury coach company which operates with in Kenya, Tanzania, Uganda, and Rwanda. Since its inception on 26th may 2007, the company has managed to offer exceptional luxury bus services throughout the East Africa region. Currently, they have over 50 branches in Kenya, 7 branches in Tanzania, 5 branches in Uganda, and 1 branch in Rwanda. , Modern coast coaches has been handling clients booking details using the munual based systems the study of the existing sysrem was carried using observations ,interview;literature view of the acompany and questionaires this led to abetter understanding of the existing system and refined our user requirements ,its from the requirements that the system specifications were outlined and the system design and development based on them the system design was then implemented using laraval framework, PHP (laraval), flutter (dart) for the backend , MySQL and HTML using aclient/server artchitecture with adatabase running on the server and the interfaces running on the client personal computer. we also used flutter for the mobile application to enable the application run on both android and apple phones. The system is aimed at solving information problems at Modern Coast Coaches Limited

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LIST OF ABBREVIATIONS

EDS   **:** Electronic Detection Systems

ERD   **:** Entity Relation Diagram

 SDK   : Stands for software Development Kit

SMS   : Short Message Service

CHAPTER ONE

GENERAL INTRODUCTION

1.1   Background of the study

The courier srvices oprated on all scales, from within specific towns ,cities, to regional,national and global services,large companies like UPS,DHL and fedEX. These offer services world wide. (UKmarketsynopsis, 2013)

Courier are dinguished from ordinary mail services by features such as signature,specialization and individualization and swift delivery times which are option for most every day mail services such as electronic mails,packages;percels ,documents and packet mails (pavitt, 2005)

In Europe, the European commission launched anew and innoviatative ways to finance transport infrastructure projects with over 6.7 billion Euros invested into the sector (Builletin ,2016) many systems have been proposed and others put into place to solve the day to day need that has now become everyone‟s concern, lack of information about bus travels ,time wastage and other problems are solved

In Africa only the developing countries like South Africa, Egypt and others already came up with some transport management projects that enables the travelllers move in a safe and reliable way.

In Uganda , people use many means of transport to move from one place to another which include taxi,boda-boda ,coasters and busses to travel. Many companies have come upto provide with transportation services such as Modern Coast Coaches Limited, pioneers bus, YY coaches,baby coach buses,link busses, quick taxis and currently ubers and safe bodas have come up to manage boda-boda servicesquick taxis and currently ubers and safe bodas have come up to manage boda-boda services

At Modern Coast Coaches Limited,the transportation network of percels started Since its inception on 26th may 2007, the company has managed to offer exceptional luxury bus

services throughout the East Africa region. Currently, they have over 50 branches in Kenya, 7 branches in Tanzania, 5 branches in Uganda, and 1 branch in Rwanda .However , many people lack inf

ormation on travel time,delivery of the product,traznsit information and ticketing venues for busses .this has made manyh people to get late to where their producrs are going,spending long hours stages wwaiting for product pickup and transportation (samuel, 2022)

According to elicitations made, several clients using the different courier services from the different bus companies namely Modern Coast Coaches Limited, pioneers bus, YY coaches,baby coach buses and link bussesclaimed that they spent a lot of time at the courier offices registering their parcels for transit and also don''t have aclue of the way their percels are transported along the way. In additional, some percels are lost and there no clear trail to the transit information for the parcel. Conductors working that these bus companies claimed that a lot of time is spent registering and making an audit trail of the percel details incase it was not delivered as specified by the clients.

The main objectives is to develop and design a mobile application and aweb systems that provides travel and booking information to clients of Modern Coast Coaches Limited

1.2   Problem Statements

Modern Coast Coaches Limited, which operates in Uganda has amanual based system for holding parcel delivery and monitoring which involves a lot of paper work that is difficult to store and maintain, monitoring the status of the parcel, electronic messaging of the customers when the product reaches,receipts can be forged leading to poor information management .the process is time consuming hence transportation communication is not effective,thefty is also faced by the booking systems due cognition this process is inconviencing the customers. Therefore the research project intends to put an automatic system which will help the company manage their customers data save time and overcoming the challenges involved, thus yielding beter results such as conviences,

reduced congestion,backup copy of the the percel transported since an automatic receipt will be provided among others

1.3   Objectives

1.3.1   Main Objective

1. To collect requirements on how the public transport system can be used to safely deliver parcels/packages to destinations within Uganda.

1.3.2 Specific Objectives

1. To develop a mobile app-based delivery system to track parcels on public bus transport that meets sthe needs of the user
2. To test the usability of the parcel monitoring and delivery system with selected users

1.4   Scope

The study involved the development of mobile-app monitoring and a web system for the management and reporting of parcel delivery on public transport buses in Uganda. The application can register users and bus conductors, update information about parcels, delete, track the status of parcels being delivered, and notify parcel senders and receivers about the status of their parcels using SMS messages, This project excludes online payment which can be procured from the payment gateway providers and integrated into the system to support cashless transactions and onsite payment management. The system only focuses on parcels being transported and not passengers traveling on the public transport bus.

1.5   Research significancy

i.   It will assist public buses to increase sales opportunities by having a reliable parcel courier service.

ii.   It will help to increase the ease and readiness of travelers and users to send unaccompanied parcels/packages to their people in the villages or towns.

iii.   Furthermore, the mobile app delivery system will be easier to audit and monitor than the current manual systems and will thus safeguard the public against the theft of their parcels.

iv.   Unlike paper-based systems which are associated with storage problems like misplacements, burning, and fire outbreaks, thus the system will system help to back up data both online and any other electronic storage media.

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CHAPTER TWO

LITERATURE REVIEW

2.1   Introduction

This section consists of a critical review of research work from journals, internet sources, and other projects already done which is related to the subject area as well as an analysis of existing literature on Delivery Management systems to reveal contributions, weaknesses, and gaps.

2.2   General overview of courier services

According to (kanuna, 2013) courier services are companies that transport and deliver documents „packages and larger shipments of products ,although traditionally they specialized in the rapid delivery of such items as legal documents that required signatures.

The largest courier service in the world is the United Parcel Services (UPS), which delivers morethan 12 million packages globally each day . UPS has its roots in the beginning of the 20th centruary , when it was known as the American Messenger Company. Throughout the years, it acquired other delivery services,including the motorcycle Messengers and anumber of smaller European companies (UPS, 2005)

The process of courier services usually starts with pickup and ends with delivery. Every weekday UPS delivers morethan 14.8 million package and documents world wide .But pickup and delivery are a tiny part of the process . the much bigger , more impressive , more complex step is to sort ,which seperates and organizes all those packages. Its entirely automated and it turns one huge , random pile of packages into lots of small ,organized piles (Wilson, 2005)

(cMahr, 2015) stated that parcel delivery companies experience a lot 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 leads to weak audit trails for deliveries and that the manual system of managing deliveries often results in poor

coordination of deliveries and collections and recommended the use of the 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.

Leading carriers in the global courier and parcel sector include DHL,FedEx,TNT and UPS.The largest courier service in the world is the United Parcel service (UPS), which delivers more than 12million packages globally each day. UPS has its roots in the beginig of the 20th centuary, when it was kown as the American Messager company.throughout the years. It acquired other delivery services including motorcycle messangers and anumber of smaller European companies (UPS, 2005)

In (Azeta, 2010), it was noted that the existing express delivery system lacks mobile facilities for customers to lodge complaints and track which makes it difficult 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 courier customers with a means of tracing/tracking shipments, lodging complaints, and making financial transactions on shipments. This should also assist the courier staff in effectively managing courier-related data with a mobile phone 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 a mobile device to support its operations, considering the enormous benefits of mobile applications in the global economy. Hence, there is a need to scale it down to mobile since the number of mobile phone users now supersedes the number of PC users (Murtagh,2014).

In (Azeta,2010), wap-enabled phones were proposed to be part of designed considerations for a mobile express delivery system. The system enables the user to perform various courier operations like tracking, checking account statements, and lodging complaints. 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 smartphone market.

The work of (Azeta,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.

However ,bus companies including Modern Coast Coaches limited, Gaagga Enterprises limited and YY coaches limited were initially involved in transporting of people across the different regions of Uganda only but have now diversified into courier service provision

2.3   The Roles of Computers in Travel and Courier Management

The earliest management systems were manual systems. Staff would record transactions in numbered and multi-part forms. These records would later be transferred, manually, to a central system of handwritten records or file folders responding to individual clients or a specific time. These records would be set up to trigger statements of customers or checks for deliveries. Many courier businesses still operate with manual courier management systems; however, inexpensive and easy-to-use computer technology is finding its way into mo re small businesses (Alexander, 1992)Most businesses, the manual system presents numerous problems that are solvable by computer and Communication Technologies:

Error level; with manual systems, an uncomfortable level of error often exists. Frequently, look up the long prices, and prices incorrectly on invoices, or produce garbled journal entries or source documents. Sickness, worry, moodiness, and other inherently human variables can also contribute to high error rates in manual systems.

Temporary or permanent loss of data; source documents and file folders are easily lost are misplaced. This often results in lost customer payments and delayed purchases or payments.

Labor intensity; manual systems are labor-intensive and, therefore, costly. Data from a single transaction often have to be transcribed several times, and many types of lowvolatility data have to be re-recorded by clerks every time a new transaction takes place (Tromthy & Krasnewch, 1994).

Poor level of service; the level of service support in manual systems is often inferior. Customers like to know immediately if parcels have been delivered or not when these

parcels will be delivered when they can expect to be delivered, what their current status is regarding payments, and so on. This level of information support is difficult to achieve with a manual system. (Wilkinson, 1986).

Poor response; virtually everything takes longer to do with a manual system. When parcel orders are taken, the entry department might have to contact the receivable department to check before a can be validated. Today, many computerized order-entry operations are connected to a centralized database, and when a customer telephones and their status can be verified immediately (Mahr, 2003).

As technologies such as computers and communications become available to handle the courier management workload, departments respond to it in different ways. Some organizations simply look at their manual systems and code them directly into the computer. Thus, all of the bugs in their manual systems were inherited by their computer systems. Other organizations realized that technology can change the way people work, thus they are rethinking their recording processes before automating them.

Today, inexpensive computers and communications devices are setting up two new challenges to courier management systems like getting better information more quickly to the right people (Coy, 1992).

2.4   Travel and Courier Management Software

Travel and Courier Management Software is commonly referred to as just as Software, these courier systems enable you to manage the processing and delivery of packages and parcels from your depot or transport hub to the end customer.

A Courier Management System (CMS) helps the courier business to automate the many processes involved with running a transportation company and tracks the delivery of parcels and packages across every step of the journey.

The courier management software provides a powerful delivery job scheduling management solution that provides a central hub for all your deliveries, enabling you to manage, schedule, and track all your packages and drivers.

When a new job is received the job is booked into the system, and the system sends a notification to the customer to alert them and schedules the booking and delivery of the job. The system will also alert couriers if there is a change of schedule for an existing booking.

Courier Management Software can be hosted in the cloud so your employees can manage new bookings online.

Table 1**: Comparision table of the existing systems to the proposed system**

FEATURES	MODERN COAST COACHES LIMITED	GLOBAL POSTA AND TRACK SYSTEM
Cost	Its is expensive to use	Its cheap
Geographical Update	Doesn¨t provide	Provides names of locations
Inventory Update	Uses files and book keeping	Has inventory updates
Tracking Technology	Calls using phones	Use serial numbers
SMS Alert	It does not give sms alerts	Sms alerts are given

2.5   Conclusion

With the advent of improved technology and the rise in the demand for next-day and same-day deliveries, travel bookings management systems play an important part in the efficient scheduling of pick-ups and deliveries, the software also helps you to manage all processes

involved in running a profitable courier company. Inefficient and not effective. Hence this project intends to automate the process by developing software that helps will improve the delivery management and bookings located kilometers away.(Porter,2011) notes that for businesses to achieve and sustain superior performance, they must be able to implement competitively superior systems. Budree and (Williams,2013) and (Namada,2018) established that the areas with a large number of low-income earners experienced low uptake of technological advancements, and Businesses in these locations are not keen on leveraging on technology. The concept will therefore be intended to identify the salient factors that local businesses can apply in leveraging mobile Payment methods to gain a competitive advantage. It is estimated that more than 5 billion people have access to mobile phone devices and that out of this figure about a third of the population is based in local areas. Further, the village-based businesses do not have immediate access to the physical money banking system as they are located kilometers away. (Porter, 2011)notes that for businesses (Budree &Williams, 2013), (Namada, 2018)established that the areas with a large number of low-income earners experienced low uptake of technological advancements, and Businesses in these locations are not keen on leveraging on technology.

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CHAPTER THREE

METHODOLOGY

Introduction

3.1   Research design

The framework of research methods and techniques chosen by the researcher is known as research design. Researchers can fine-tune research methodologies that are appropriate for the topic matter thanks to the design. For our project, we used both qualitative and quantitative research design methodologies.

3.1.1 Qualitative Research Design

Qualitative research is a type of research that focuses on gathering information through open-ended, conversational discussion. We performed in-depth interviews (online) with the Modern Coast Coaches limited , which served as our project's case study.

3.1.2 Quantitative Research Design

Quantitative research is a systematic analysis of phenomena involving the collection of measurable data and the application of statistical, mathematical, or computational techniques.

As our case study, Modern Coast Coaches limited, we were able to perform an online survey by emailing the company, which allowed us to learn more about how the parcels are transported to their final destination

3.2   Data collection methods

The methods and procedures our project team used to identify the project requirements were mainly observation, interviews, and document review.

3.2.1 Observation Method.

Modern Coast Coaches limited was our main emphasis. This strategy entailed looking at how the bus company transport parcel to the final destination. This entailed direct observation without asking for units of interest from the respondents (conductors and clients). The project team kept track of all pertinent observable facts. This strategy was used by the team to capture, identify, and formulate crucial components that were not available through other methods.

We used a pen and paper to scribble down interesting phenomena seen usin our eyes

3.2.2 Interviews

 (Adams, G. ., & Schvaneveldt, 1985) define interviews as a vocal technique or discussion. Our team did hold oral interviews with identified Company stakeholder concerning how parcel transportation is carried out. These interviews were conducted to identify requirements and obtain reliable data. This was where we majorly focused on collecting data for the project.

The tools we used were an interview guide and notebooks.

3.2.3 Document Review.

Document analysis or review is a form of qualitative research in which documents are interpreted by the researcher to give voice and meaning around an assessment topic (Bowen, G. A. , 2009). Bowen sums up the overall concept of document analysis as a process of "evaluating documents in such a way that empirical knowledge is produced and understanding is developed"

The tools we used were, online journals, magazines, newspapers, books, and public records. This broadened our knowledge and experience to further understand the system requirements.

3.3   System analysis and design

3.3.1 Design And Implementation Of Tool

Data flow diagrams were used in planning and scheduling of project activities in addition to system entities, their attributes and relationships were identified and an Entity Relationship Model was designed. MYSQL was used as a database management system, PHP laravel was used to interface between the database and the users of the system.

3.3.2 Testing And Input Validation.

The system was tested using unit testing to check each component for integrity, integration testing when merging the components, performance testing determining how the system works in the parcel transportation. An acceptance test with the intended users was carried out.

CHAPTER FOUR

SYSTEMS ANALYSIS AND DESIGN

Introduction

This chapter focuses on the results of the study made about the performance of the current system and the identified requirements. It also focuses on the analysis and design of the parcel transportation systems.

4.1   Current system study.

The decription of the current system was made by using questionnaire with several senders and bus conductors and interview guide as documented in **Appendix**

The case study revealed that the process for parcel transportation by Public bus organizations in Uganda is done manually through file keeping ,book recording and use of fliers and makers to uniquely identify packages. Aconductor registers all the information about the sender and the receiver of the parcel, he also also asses the percel basing on quantity and quality the attaches aprice to the product accordingly. He then issues three(3) copies of the receipts that is to say ome receipt goes to sender,the conductor remains with acopy as proof of payment and the third receipt is attached to the parcel under transit. the receipts a common unique serial number that distinguishes it from others. the sender then makes aphone call or sends amessage to the receiver of the parcel to inform her about the parcel in transit. The receiver must have an identity card to prove her identity

4.2   Weakness of the current system

The following weaknesses of the current system were identified by use of requirements thematic analysis technique

- Loss of parcels due to poor tagging mechanism of using papers and markers

- The cost of monitoring and tracking parcels by making endless calls to bus conductors and drivers to ask for the location of the product is too expensive and poor method of tracking the parcel.

- Delayed service delivery caused by poor inventory mechanism that involves use of papers that are not well organized leads to poor information retrieval incase aparcel is lost or incase aclient loses the receipt.

4.3   System analysis

the analysed information of the current system was base on te requirement gathered for the mobile courier management and tracking system that were broken down into functional and non functional requirements

we used the thermatic network where we coded data from different users such as the conducctors and clients clearly outlining how it was to be captured ,stored ,processed and output in form of drill down and roll up reports so as to identify and analyse user requirements as shown in **figure1 and 2** below

Figure 1**: below shows thematic diagram showing how user requirements were analysed**
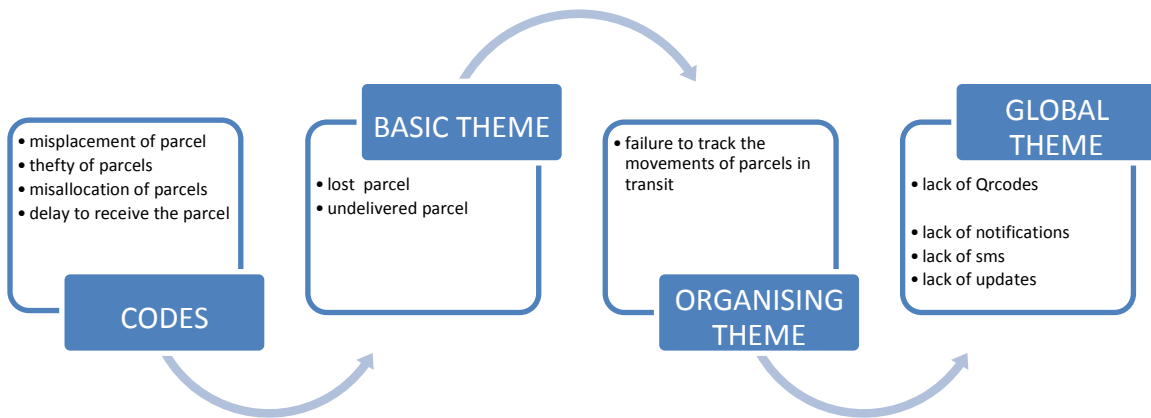
the lack of Qrcodes,notifications,sms and eventual update leads to failure to track the movement of parcels in transit which further leads to loss and undelivered of parcels as aresult of thefty, misplacement,delay and miss allocation of parcels.

Figure 2: below shows thematic diagram showing how user requirements were analysed
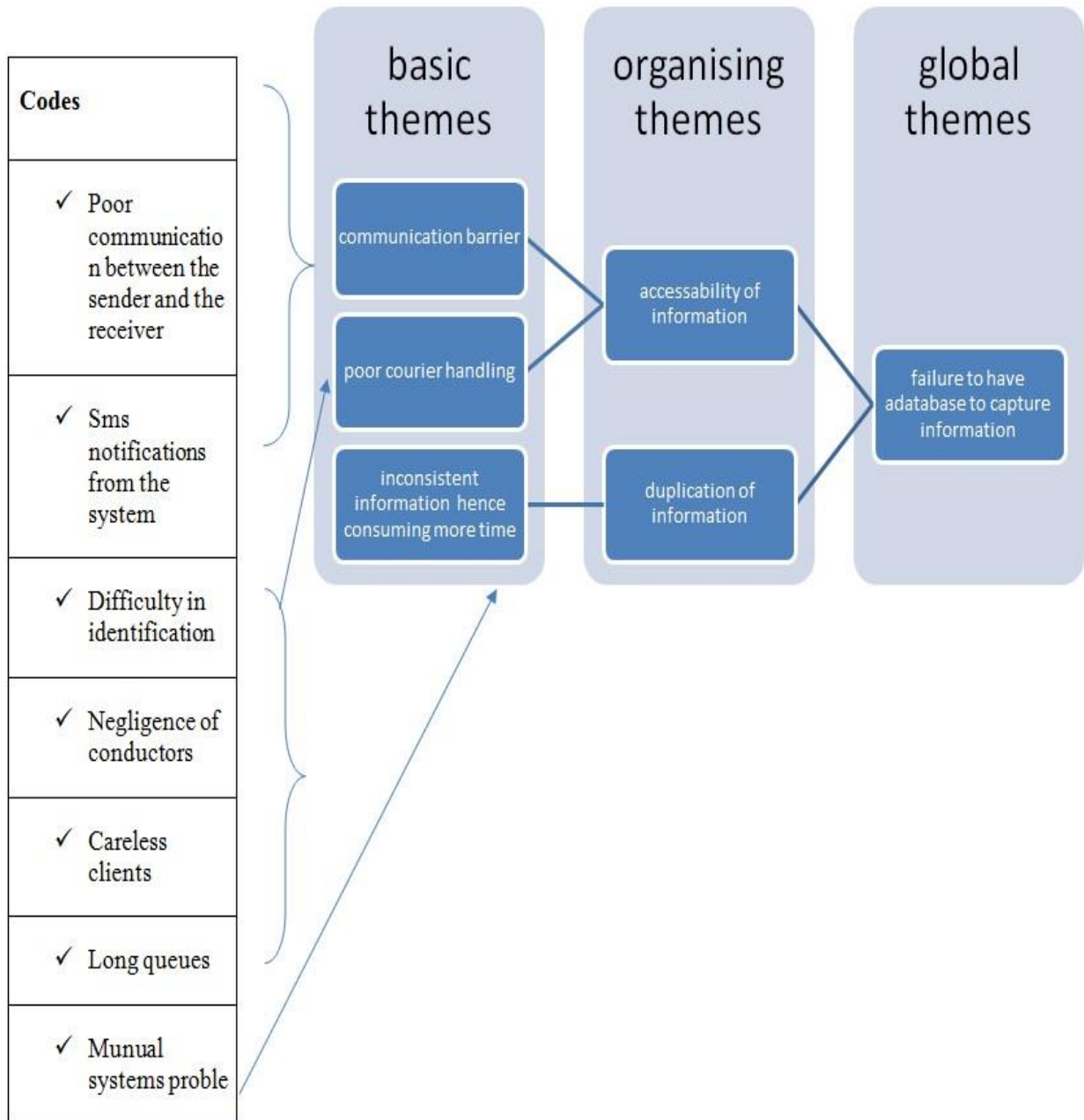
The failure to have adatabase to capture the information leads to duplication of information and accessibility of information which further leads to inconsistent information , poor courier handling and communication barriers thus the poor communication between sender and receiver such as sms notification which is caused by negligence of the conductors ,careless clients,long ques, difficult information reference and presences of the manual system

4.2.1 specific requirements

- ✓ Need to have adatabase to capturebdata
- ✓ Need for Qrcode to tag and track parcels in transit
- ✓ Need for anotificationand sms for eventual update

4.2.2 functional requirements

The desired behavior of online job recruitment systems is captured by functional requirements, which include the following:

- ✓ Registering of conductors into the system is done by administrators

- ✓ Senders are registered by conductor and later login into the system and can view the parcel details and status just by the use of the parcel number being provided.

- ✓ conductor receives a parcel, assigns a parcel the number, with details of size, quantity, and specifications, and senders details in terms of name, receivers, destination, and contacts.

- ✓ The administrator adds the agent and the agent shall know the sender and receiver and the specifications for that particular parcel and the receiver's destination.

- ✓ The sender will track the status of the parcel in terms of ready in transit, received, delivered, or ready for delivery, and the agent's details handling that particular service using a parcel number

- ✓ The sender shall know the expected departure time, day, and date and shall use the parcel number by both sender and receiver to track the parcel status.

4.2.3 Non functional requirements

Non-functional requirements are those that define the criteria that can be used to evaluate an application's performance. As a result, the online job application system should include the following features

✓ Logging in is essential for each user. As a result, it should use user authentication to prevent unwanted access to the application.

✓ It should be reliable and able to manage several concurrent users with no downtime.

✓ The general and administrative views should be simple and intuitive to use.

✓ Performance: It should be able to respond quickly.

✓ Scalability: It should have a database that can manage enormous volumes of data while also allowing for future expansion.

4.2.4 Programming Environment

Several compatible hardware and software resources were used in accomplishing this research work is specifically categorized below:

1. Hardware Requirement

   ✓ At least 40 gigabytes of hard disk
   ✓ At least 4GB of RAM
   ✓ Processor speed of at least 2.4 megahertz, etc.

2. Software Requirement

   ✓ Windows 10

   ✓ Android Studio development environment
   ✓ Visual Studio IDE with fluter and dart language as back end

3. Xampp version v3.2.2 will host the mobile courier management and tracking application

4. SMS gateway was used to support SMS transaction

5. Qrcode generator and scanner API was used to generate and scan the Qrcode

6. A smart mobile phone was used with android version 11 (<u>NB</u> the smart phone must support GPS location services)

4.3 Systematic design

System design is the process of defining the various components of a system, such as the architecture, modules, and components, as well as the numerous interfaces between those components and the data flowing through it. It is created to meet the specific aims and requirements of a company or organization by developing a well-functioning system. According to (Benjamin, 2010). The purpose of system design was to figure out how to achieve the stated goal of the system. Both process and data design techniques were used to accomplish this. Data Flow Diagrams (DFDs) and Entity Relationship Diagrams (ERDs) were used to explain the system's operations, as well as data modeling, user interface design, physical design, and hardware and software configurations.

4.3.1 System Architecture

The architecture design model of the proposed parcel monitoring system on public busesthat determines the system's structure, behavior, and other elements was referred to as this.

Figure 3:The parcel monitoring system on public busses architecture
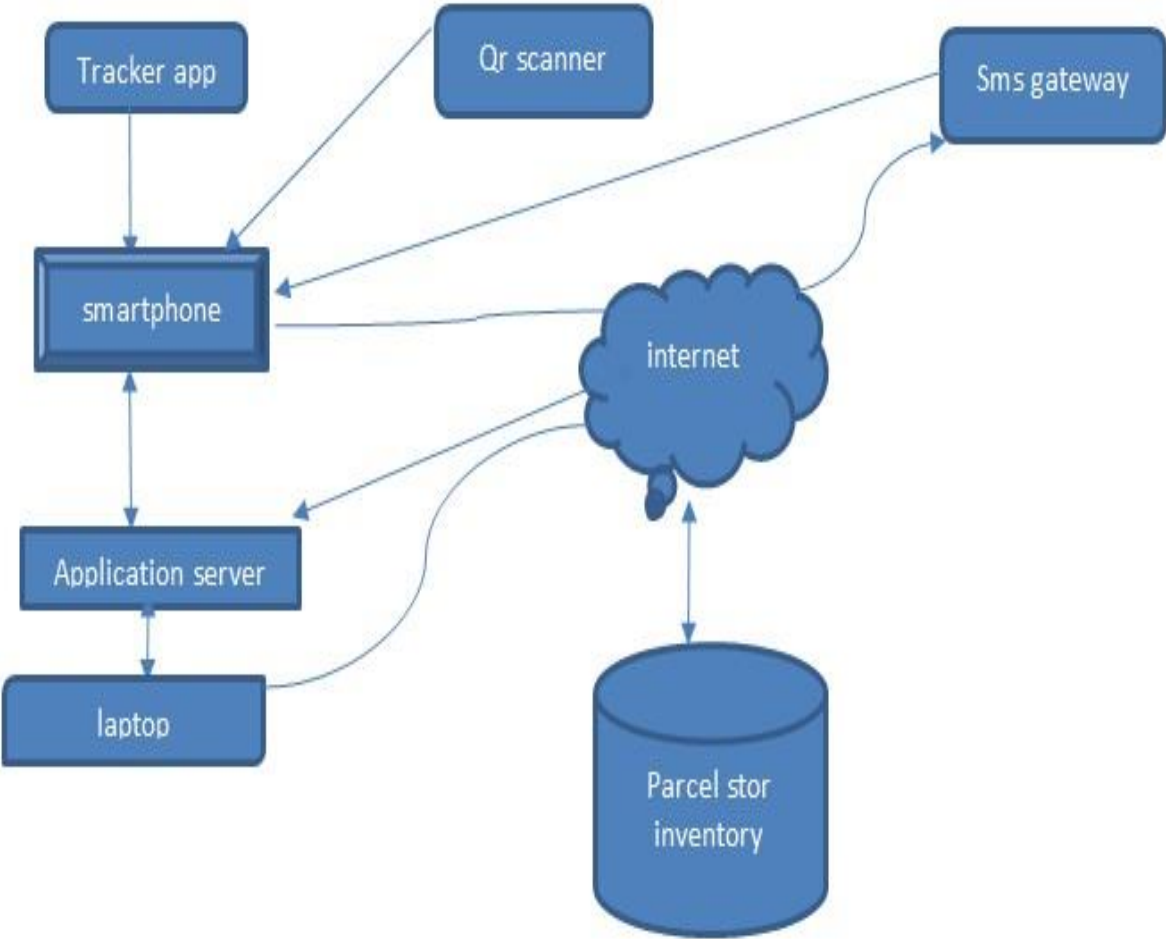
The modules in figure 4 are intergrated together to form the mobile parcel monitoring system on public buses however users use computers and smart phones to interface with the system.

Figure 4: **showing the process model of parcel monitoring system on public busses**.

SYSTEM PROCESS
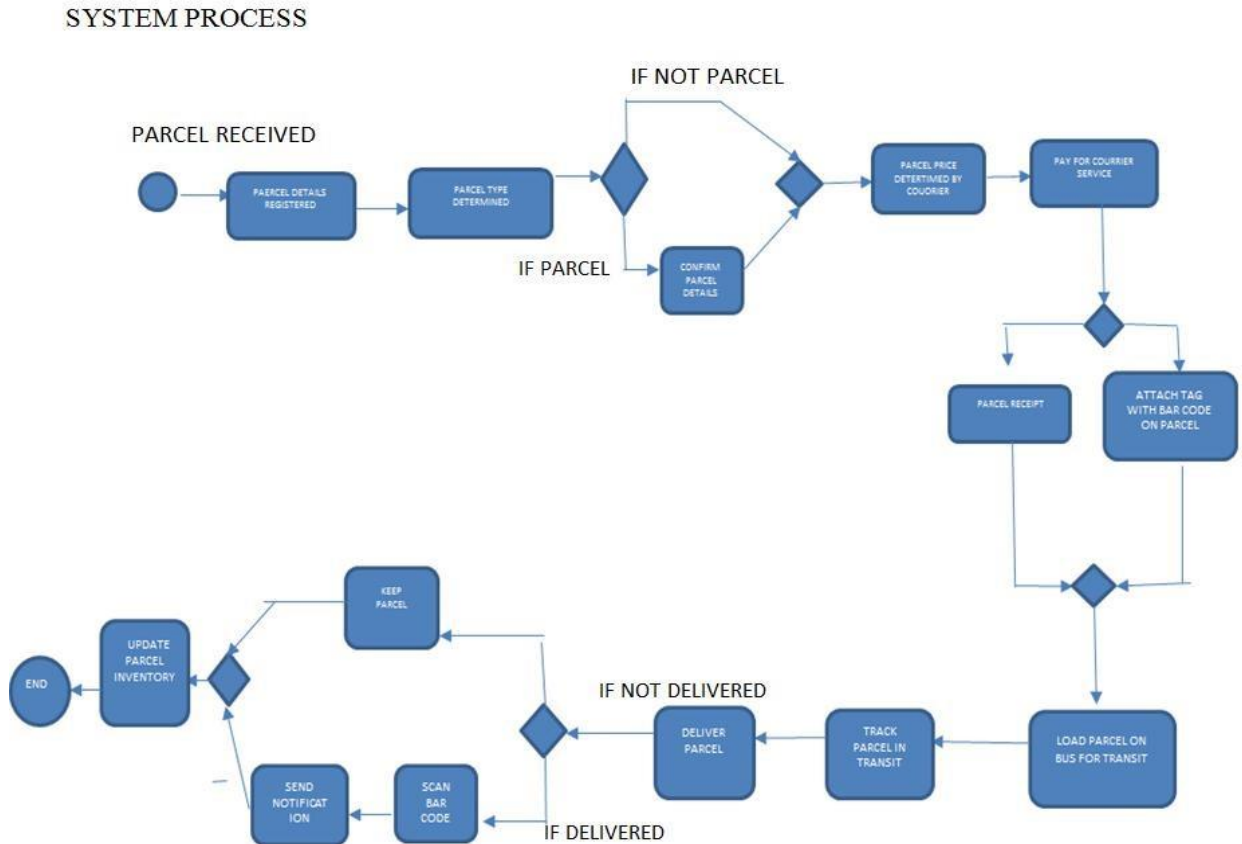
A conductor receives a parcel from the sender and the conductor registers the parcel by capturing its details into the parcel inventory/database and this includes both the sender and the receiver‟s details. Upon the entry of the details, the conductor determines the parcel type by assessing the weight and the quality of the parcel.

"parcel size <= 60kg, cargo size <=61kg" after which the conductor submits the information into the database.

Upon the submission of the details, the conductor determines the courier service price from sending the address to the receipt address bassing on the assessment made on size and weight.

"<= 20kgs=6000, 21kgs-30kgs = 12000, 31kgs>=45kgs = 48000"

After payment is made by the sender, the conductor then compares and prints a receipt and also attaches a tag that has the QR code and serial number of the parcel. The system automatically sends the message to the sender and receiver. The parcel is then put on the bus for transportation.

On transit, the receiver is able to use the parcel serial number that was assigned by the conductor to track the parcel.

The authentic receiver is identified by a national Id or any other Identity card.

4.4.2 Context diagram.

A context diagram depicts the system's borders, external entities that interact with it, and the major information flows between the entities and the system.

It shows how the system under investigation interacts with other systems, with interfaces flowing to and from external entities as seen below.

The following symbols represent;

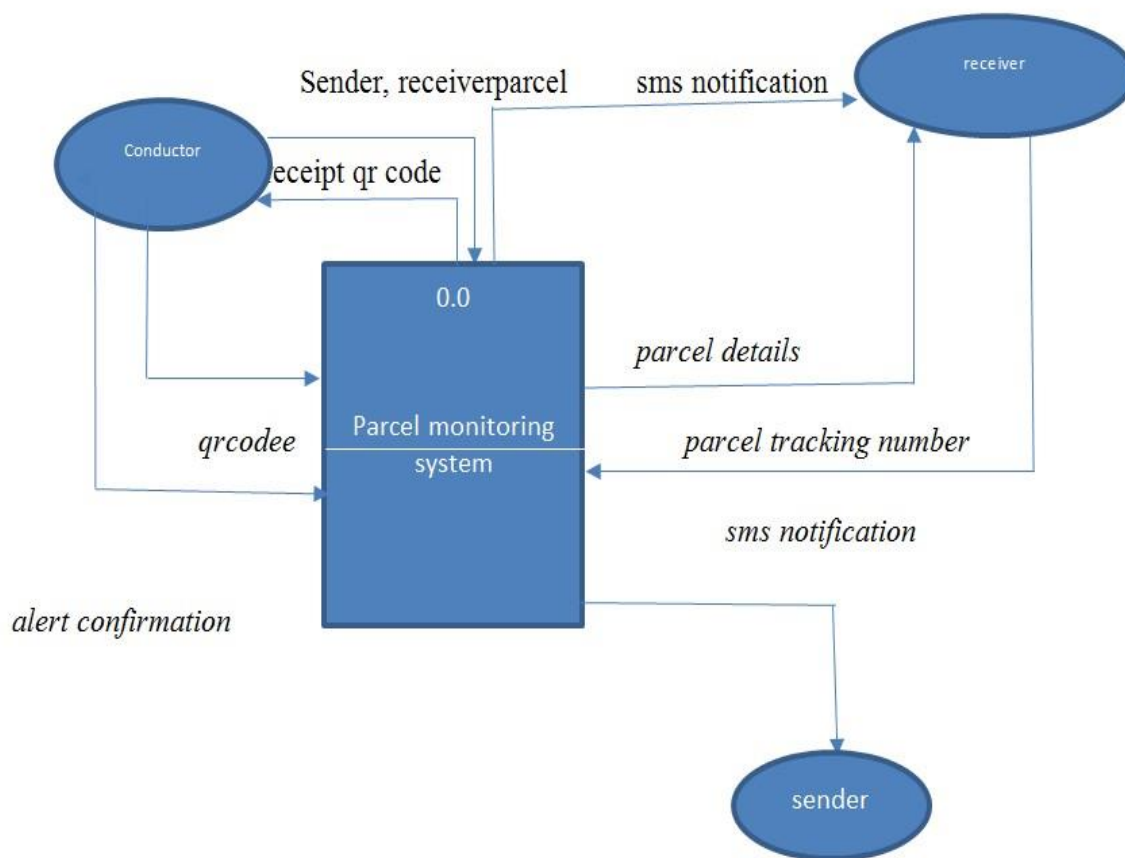Table 2:shows the symbols used to designs DFDs.

	Processes which are registration, pricing, tracking and verification.
	Data flow
	Data store the stores the parcel and client details,receipt and bus details.
	Entities; bus conductors, receivers and senders

Figure 5:shows acontxt diagram of the parcel monitoring system on public buses.

Data Flow Diagram(DFD) For The Cargo Application

The DFDs show how data flows fom the entity; bus conductor, sender, an

d receiver into the system , how the data moves from one process to another , as well as its logical storage in the database.

Figure 6**: Shows the data flow diagram for the Parcel monitoring system.**
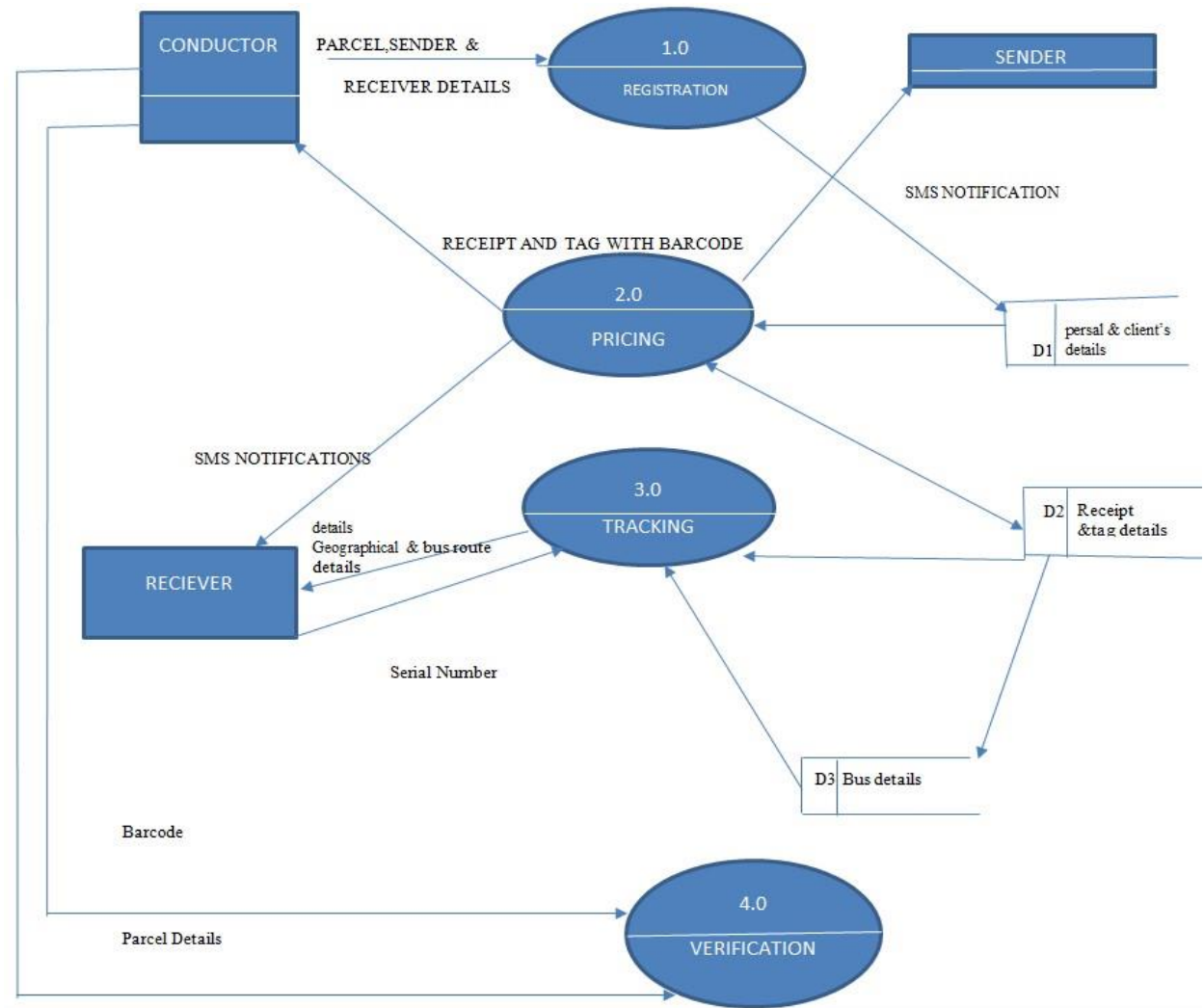
The Parcel monitoring system is composed of four (4) major processes namely Registration Process, Pricing process, Tracking Process and Verification Process. These can all be observed in figure 6. The sender submits the parcel for registration by the Conductor, the Conductor then captures all the details about both the parcel and clients (Sender and Receiver) after which process details are assessed to ensure they satisfy the minimum requirements for a parcel type. During the pricing, the parcel is loaded and a tag with Qrcode as well as SMS notifications sent to the receiver. After pricing, the parcel is loaded on to the bus that will be in transit. During transit, the clients are able to input their parcel serial numbers in order to track their parcel to know the status. However, on delivery of the

parcel, the conductor verifies the validity of the parcel ownership by scanning the Qrcode with updates the status of the parcel inventory shown in figure 6 above.

4.4.6 Physical database design

The process of translating a data model into the physical data structure of a database management system is known as physical database design. It provides properties, data types, and constraints for the various data tables.

Table 3:**Details of attributes in the administrator table.**

Field name	Data type	DATA VALUE	Constrain	DOMAIN VALUE
User_id_admin	INT	20	PRIMARY KEY	
Name	VARCHAR	25	NOT NULL	
Address	TEXT	12	NOT NULL	
Contact	TEXT	12	NOT NULL	
Username	VARCHAR	20	NOT NULL	
Password	VARCHAR	25	NOT NULL	

Access_level_status	VARCHAR	10	NOT NULL	
Weight	DOUBLE		NOT NULL	weight
Status	VARCHAR	250	NOT NULL	status
Pick_time	VARCHAR	20	NOT NULL	Pickup Time
Pick_date	VARCHAR	10	NOT NULL	Pick date
Comments	VARCHAR	250	NOT NULL	BUS

Diagram showing the entity relationship diagram for parcel monitoring system on public busses

Figure 7: Conceptual model
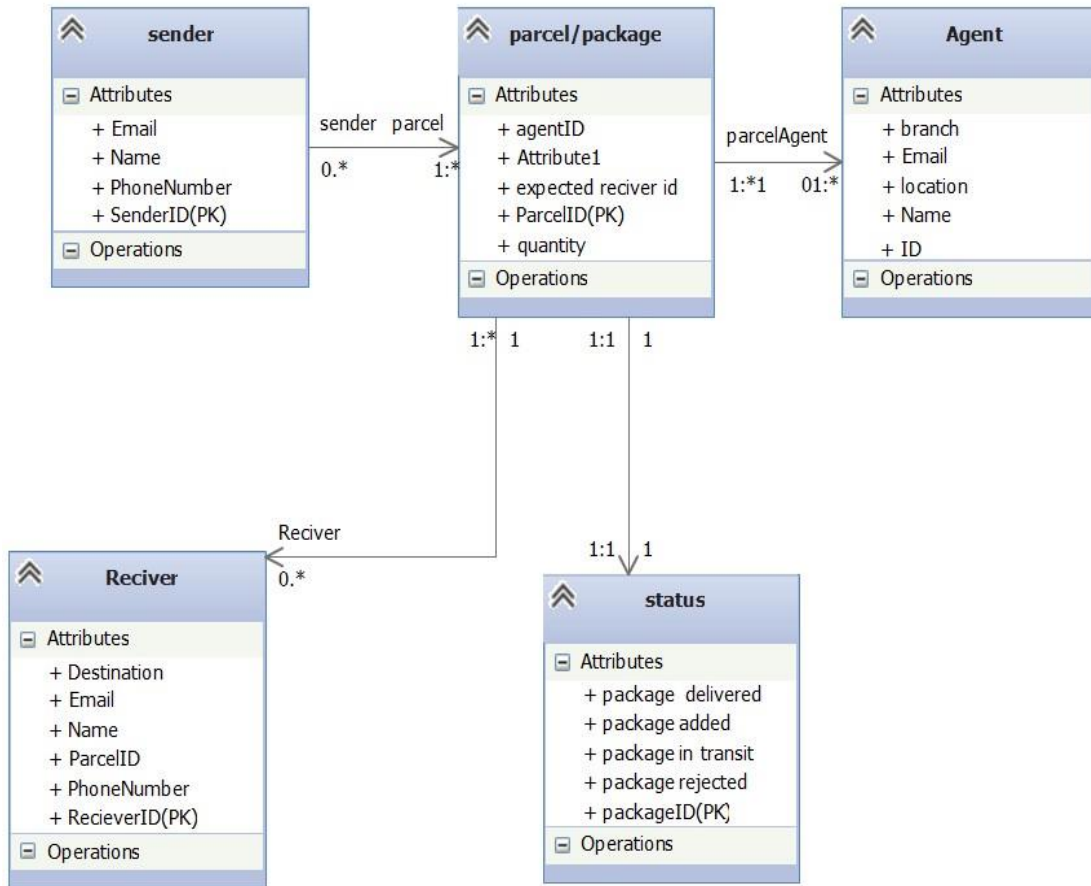
CHAPTER FIVE

SYSTEM DEVELOPMENT AND SYSTEM

Introduction.

This chapter clearly shows the system interfaces and how the user interacts with them right
from the time the user logs in to the system and until the user logs out of the system. The
interfaces are arranged in logical order to represent how the entire system usage flows and
also shows how the system is tested.

5.1   Bus conductor;

Loads the parcels on the bus, monitors and controls the movements of the parcel while on

bus and scans the QR code on delivery to verify ownership of the parcel. Receiver: tracks

the parcel   in transit and receives the parcel on delivery

Sender: provides parcel, sender and receiver"s information to the conductor

Agent ;   receives the parcels , registers the parcel and client details into the database then determines the courier service price for the parcel after assessment.

5.2   User interfaces

Figure 8:Login page.
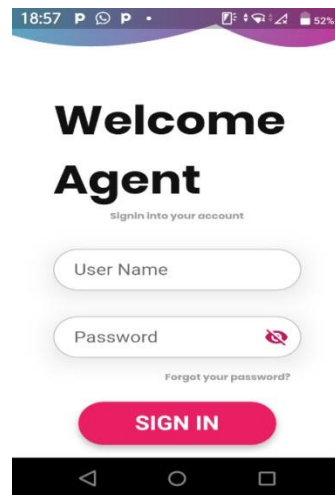
The admin amin and the agent are assigned credentials that they put into the login form

For the agent to log in he will be required to put in his username and password that was assigned to him by the admin hence only authorized agents are allowed to login

5.3   Home page .

The home page for the users has two interfaces that is to say; the agent account and the sender"s account. The sender logs into the account using the credentials created by them whereas the agent signs into account using credentials assigned to them by the administrator hence without authentic information by the administrator.

Add parcel page

All parcel details are filled in by conductor basing on the parcel delivered by the the sender at the bus station, the amount of the detailed detailed depends on the weight on the parcel that is to say the more heavier the parcel the more amount to be paid.
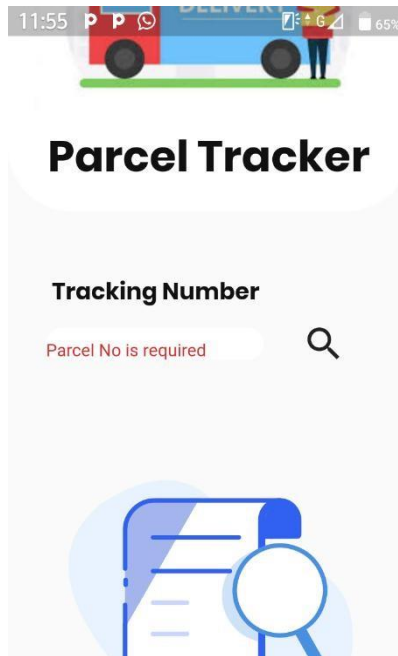
Figure 10:**Add a parcel**
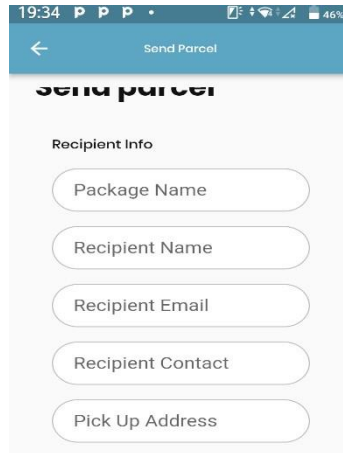
Sender's page.

The sender creates an account and the conductor puts in the parcel details including the name, weight, size. Then uses the parcel number to scan the parcel after receiving the notification that the parcel is under transit.

Figure 11: Sender''s page

CHAPTER SIX

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

Introduction.

This charpter discusses the entire project, its intended objective, the requirements for the new system how it is implemented with the conclusions and recommendations for the further improvement of parcel monitoring system on public busses.

6.1   Discussion

This project was forcused on developing a mobile application of parcel monitoring on public busses, which was done through careful research stuy of the existing parcel monitoring mechanisms at bus companies and stations in Uganda.

The system was able to meet some of the functional requirements and non-functional requirements hence partially fulfilling its intended purpose of claims of delays and sometimes failure to receive the parcel that are filed monthly by clients to bus companies that offer courier services in Uganda.

The development was using various technologies like PHP, flutterdart to transform the designs into functional modules. The system was finally tested usingpostman for testing the API and system testing so as to check for the errors and determine whether it addressed issues obtained from field during data collection.

6.2   Limitations and Problems of the study

The researchers faced some problems during the study and there were also some limitations to the study. Time was also one of the limitations of the study; this is because the time frame allotted was not enough for the researcher to implement all the technologies needed for the application development (mobile and web). These technologies needed a lot of time for detailed analysis and implementation times it could need to watch some video tutorials for implementation of some features. Limited tools for example powerful computers to run android studio software for emulators, software, Internet speed was so slow, it was always on and off and could only be accessed at the University, otherwise, it was costly that installations of some SDKs visual studio code for fluter and dart as back ed could require

an internet connection for their installations and updates, Given the setting of the case study, it was quite not easy to involve the users in the development process full-time. This is all because of the busy schedule and the many activities that the semester has had,

6.3   Conclusions

In conclusion, the project study offered greater knowledge to us the researchers, and also will help stakeholders know the advantages of using computerized systems as opposed to the manual process of courier delivery management. The system application built as a result of this study showed the success of the study that was conducted while at Makerere University call for future research on the related topics presents/indicates that more is still needed to be done to improve the quality of systems development.

6.4   Recommendations

Although it was an academic study, it can be put to use at the bus companies in Uganda offering courier services to support efficient data entry, queries and monitoring of the parcels.

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APPENDICES

This chapter covers the interview guides that will be used in conducting interviews

Appendix A: (Conductor interview guide)

1) How do you use the available system to manage parcel booking and receiving?
2) How do you track the customer's records and know the true sender?
3) What information do you give out to the clients before they send their packages?
4) What challenges do you always face in the due course of this transportation activity as bus conductors and how do you deal with them?
5) What are the weaknesses of the current system and how do you expect to overcome them?
6) In case of theft or misplacement cases, how do you trace the owner and the misplaced cargo?
7) If an application is to be put in place, what are the likely features would you need to be implemented to help you monitor and deliver the parcel to their destinations?

Appendix B: (client interview guide)

1. What procedure do you always go through to send a package?
2. Which challenges do you face during sending and receiving the parcel?
3. How do you always get to know that the package has reached the right destination?
4. What should the bus company Put in place to ease and quicken the process of monitoring and delivering your package in time and to the right destination?
5. If in case an application is developed to help in tracking and monitoring your parcel, what are the likely features as clients would you want us to implement to ease the process of monitoring and delivery of parcels by public buses?