DESIGN AND IMPLEMENTATION OF SMS BUS BOOKING SYSTEMTO INCREASE EFFICIENCY AND EFFECTIVENESS OF BUS SERVICES

A CASE STUDY OF LINK BUS COMPANY

BY

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A PROJECT REPORT SUBMITTED TO THE SCHOOL OF COMPUTER STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE BACHELOR DEGREE OF COMPUTER SCIENCE OF KAMPALA INTERNATIONAL UNIVERSITY.

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DECLARATION

I MUGISHA BUSINGYE GODFREY, REG NO: BCS/ 10007/81/DU hereby declare to the best of our knowledge that this report is my original work and that it has never been submitted to any University or any other institution of learning for any award.

The literature and citations from other people's work have been duly referenced and acknowledged in the text, footnotes and bibliography.

Date: 30/6/2011

Signed: 

MUGISHA BUSINGYE GODFREY

APPROVAL

I certify that this project report is an original work of **Mugisha Godfrey** and has been submitted with my approval.

Supervisor

Mr. Ochen Moses

Kampala.

Signed .....

Date 30/12/2011

ACKNOWLEDGEMENT

Iam highly thankful to all those who helped me to carry out my research successfully.

My sincere appreciations go to my staff work members for the support they gave me during the course of preparing this report

Special acknowledgement goes to Mr. Samson Barigye and Gilbert for their support towards this work

DEDICATION

I dedicate this special work to my family for being whole heartedly committed to my education. Especially my wife who took family responsibilities during my absence Mrs. Florence Busingye.

ACRONYMS

HTML: Hypertext Text Markup Language

SMPP: Short Massage peer to peer protocol

ESME: External Short Massage Entity

PHP: Hypertext Preprocessor

IT: Information Technology

API: Application programmable interface

RDBMS: Relational database management system

ICT: Information communication technology

SMS: Short message service

ABSTRACT

Bus ticketing process in Africa is one of the slowest and time wasting yet it is the mains means of travel between the capital cities to major towns. Currently use of mobile telephone is widespread and considerable penetration has been achieved. In Uganda the application of SMS-based bus ticketing system is yet to be explored. This comes in the light that Uganda's bus travel business has grown steadily over time without matching improvement in ticketing or booking services. For long there has complaints and dissatisfaction among the public because travelers move long distances to book tickets and suffer congestion at bus terminals, unnecessary time wasting as a result of misplaced tickets and unauthorized agents who can cause financial loses. Ticket booking at bus companies is inherently time consuming, inconvenient and sometimes frustrating for time conscious passengers and therefore there is need to develop efficient mechanism that operates through an increasingly available technology like the mobile phone and specifically through a widely used application like SMS. The study examined SMS bus booking reduced terminal congestion, minimize time wastage and eliminate unnecessary expenditure.

Mobile ticketing is the process whereby customers can order, pay for, obtain and validate tickets from any location and at any time using mobile phones. The passenger downloads the essential program onto his /her mobile phone. This program allows the passenger to press a button to send an SMS to server indicating their travel details (Departure Date, Departure time, Destination Town, Departure Town). An SMS is sent back to acknowledge receipt, confirmed reservation, or to inform the passenger that no seat or vehicle is available for that travel time. Payment (fare) may also be implemented by MOBILE MONEY, Credit cards or Cash. The 'reply' SMS contain the bus booking number for the customer to call.

SMS booking has been steadily employed in different parts of the world to improve the service industry. Considering the fact that the cost a Mobile Phone is lowering in Uganda thereby increasing its availability among the population, we can take the advantage of its SMS application to solve a business requirement so as be able to help the stakeholders offer quality service in the market place.

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CHAPTER ONE
INTRODUCTION

1.0 Introduction

Bus ticketing process in Africa is one of the slowest and time wasting. Being the major means of travel from place to place, there is needed to devise means to improve the process through the use of modern technology.

In Uganda, however, the SMS based system has just emerged which has not yet solved the problems of interaction between the bus companies and their passengers, thus, there is need for alternative solution such as use of mobile phones.

1.1 BACKGROUND TO THE PROBLEM

Uganda's bus travel business has increased over time with a number of operators joining the travel business with inadequate ticketing booking services, as a result, there is some dissatisfaction among the public due to travelers moving long distances to book tickets and face congestion at bus terminals, unnecessary time wasting as a result of misplaced tickets and unauthorized agents who can cause financial loses.

Given the above reasons, there is need to develop an SMS based bus system that will help to reduce the above mentioned problems in the travel business. This will be made possible when any passenger owning a mobile phone sends an SMS to the Travel Company requesting for updates on travel information, booking for travel and getting an instant reply to any request.

1.2 Problem Statement

Ticket booking at bus companies is inherently time consuming, inconvenient and sometimes frustrating for time conscious passengers. For example, an intending traveler has to travel from a remote area to a bus terminal to book for the next day's travel which is an inconvenience which leads to increased expenditure (additional cost), therefore, there is need to develop an SMS based system which can allow the passengers to be able to create an account, request for booking information regardless of location.

1.3 Main Objective

To develop an SMS-based booking System that will enable passengers to book for tickets regardless of location.

1.4 Specific objectives

- To study and analyze the system requirements.
- To build and test the system to ensure that it is of the expected quality
- To design and implement the system.

1.5 Research questions

- Can SMS Bus booking system reduce congestion at the booking offices?
- Can the proposed system minimize time wastage during the booking process?
- How can the proposed system eliminate unnecessary expenditures?
- Can SMS bus booking system promote easy planning and management in the company?

1.6 Scope

The scope of the study focused on both urban and rural passengers in Uganda. Our interest is to develop an SMS based bus booking ticketing system for the passengers and the administrators at the bus terminal, therefore, the emphasis was put on the booking method that is currently in use, which will avoid time wastage.

1.7 Significance of the study

This project increased the efficiency in conducting the business processes hence saving time and money. For instance tickets are booked via the sms then few employees will be employed hence saving cost and increasing the company's profitability status

Since system runs on a networked environment, information will be shared efficiently hence reduce the time wasted by moving from one place to another. Since the system will run on a networked environment a database will be used. This will probably increase the privacy of customer's information since the database will be accessed by the authorized personnel only.

- The project will help passengers book for travel regardless of their location.
- The project will help the bus company to perform better management services.
- This project will be a foundation for further research in the same area.

CHAPTER TWO

LITERATURE REVIEW

2.0 INTRODUCTION

This part consists of a critical review and analysis of research work from internet sources, journals and other projects already done related to SMS bus booking with an aim to discover information and ideas that may be relevant to this project identify contributions, weaknesses and gaps so as to improve on bus booking experience.

2.1 MOBILE TICKETING

Mobile ticketing is the Process whereby customers can order, pay for, obtain and validate tickets from any location and at any time using mobile phones. The advantages of mobile ticketing include reduced paper work time, reduced chance of tickets being made void by human error and immediate accessibility of information by other departments.

The Observer (2010) Telecoms operator MTN integrated its Mobile money transfer service and data platform to enable users book and pay for their domestic road and rail travel through their data-enabled mobile phones.

SMS booking has been steadily employed in different parts of the world to improve the service industry. In England a company called ComforDelGro, the world's second largest public listed passenger land transport company with a fleet of 45,000 vehicles. The company's business challenge was its customer contact center catering to more than 20 million taxi bookings annually thereby operating at full capacity with a situation becoming more pronounced during peak hours and on rainy days.

In 2008, the company started to explore more ways to automate the booking process so as to handle the increasing volume of calls and reduce the time it takes for calls to be handled. The benefit was proven to be a hit with many customers switching to SMS taxi booking reducing waiting time to only 30 seconds. It also enabled another group of passengers with speech and hearing impaired to book by themselves without having to rely on assistance.

With the number of transport service companies and increased use of mobile phones in Uganda there is need to develop a system that organize and harmonize the transport business for the benefit of all the stakeholders. The intension of reviewing literature in this subject area is to facilitate further research in the development of even better systems that can suit our kind of society.

2.2 RELATED STUDIES

SMS booking of taxi.

Tan Kin Lian (2008) posts an article indicating that a passenger sends an SMS with the postal code to a server and an instant reply is sent to the passenger with in two minutes, giving the particulars of the taxi. The taxi driver then calls the passenger shortly afterwards to communicate the pickup place and fare for off-peak and peak hours.
The passenger can download the program into the mobile phone. This program allows the passenger to press a button to send an SMS to server with the current location, no need to enter the postal code. If no taxi available, the server will send an SMS back with in two minutes and the SMS will contain the taxi booking number for the customers to call.

Mcheck.com (2008), one of India's mobile payment platform and red bus, the online bus ticket booking portal have come together to provide the service of booking bus ticket via mobile. All that users need to do for booking the bus ticketing is choose Mcheck option on the red bus site or "SMS REDBUS" then send to a toll free number 543219 from their mobile phones.
Mcheck's vision is to make payment for all goods and services through the security and convenience of mobile phones.

2.2.2 Bus Booking.

Hellen, Mark, Morgan, and Gladys (2008) demonstrated the concept of being able to use a mobile phone to reserve bus tickets via SMS. This service will allow people to check whether a bus ticket is available without having to go all the way to a bus terminal. This will also assure the user that a ticket has been saved for him or her. When the user needs to travel, he or she can simply present a code number received via SMS fro the service.

A passenger sends an SMS indicating their travel details (Departure Date, Departure time, Destination Town, Departure Town). An SMS is sent back to acknowledge receipt, confirmed reservation, or to inform the passenger that no seat or vehicle is available for that travel time. Payment (fare) may also be implemented by M-PESA, Credit cards or Cash. A wed interface to inform passengers of the service will also be made available.

2.3 Bus Passengers buy tickets via SMS.

The SMS-based TXT2GO service allows customers to receive a digital ticket direct to their headset with in minutes of placing an order. Passengers then show the ticket information on the phone screen to the driver as they board the bus.

Customers must set up an online account at the Go North East website. Money is then added to the account using a debit or credit card and cost of each ticket is automatically taken from the account.

The account can be topped up through the online account, via text message or automatically when funds reach a certain level.

Subscribers can buy single and day tickets for adults and children, but more ticket choices and more advanced ticketing could be introduced if the scheme proves popular.

"This is an exciting step in making bus travel more convenient and we want to find out whether passengers feel comfortable with this method of buying tickets," said Martin Harris, commercial director at Go North East.

"Buying tickets in advance speeds up the time it takes people to board our buses and helps us run a smooth and efficient service."

Go North East stressed that the new tickets are very secure, as each is locked to the handset from which it was ordered and cannot be transferred to another phone. Coded information within the digital ticket also reduces attempts at forgery.

2.3.1. System functionality

The system should offer the following basic functionalities:

To allow a citizen to register into the system and pre-pay for a certain number of trips, recognize when a registered citizen gets on a bus and determine the journey he/she performs, calculating the fare he/she has to pay, and detracting it from his/hers credit, when the citizen's credit is finished, allow him/her to pay the bus fare through the cell phone, and provide registered citizens with information about changes in the lines they use most frequently.

Every bus in the system is equipped with a computer with both bluetooth and WiFi. We assume registered citizens have modern cell phones that are also equipped with either a bluetooth or a WiFi connection (or both). The system recognizes when a registered citizen boards the bus when it detects his/her cell phone on the bus. The registration phase happens through the system website. In this phase the citizen inserts the Bluetooth and/or WiFi identifier of its cell phone so that it can be used during the recognition process.

2.3.2 Review of methodologies

System development methodology is a very formal and precise system development process that defines a set of activities, methods, best practices, deliverables and automated tools for system developers and project manager to use to develop and maintain most or all information systems and software (Whitten, 2000)

2.4 System development life cycle (SDLC)

The SMS bus booking used the system development life cycle (SDLC). A traditional SDLC consists of four fundamental phases i.e. Planning, Analysis, Design and Implementation phases (Turban, 2001).

They argue that it is cycle because it is possible to return to any phase from any other. According to them all projects must go through these phases. Whitten (2000) argues that development life cycle methodologies have seven phases these are preliminary investigation, problem analysis, requirement analysis, decision analysis, design, construction and implementation. In general terms the proposed system will use the

system development life cycle which includes the four major phases which are planning, analysis, design and implementation.

2.4.1 System Investigation

- Interviews: were carried out by the researcher with the key bus company stakeholders by interacting with them face to face.
- Naturalistic observation of the ticketing process in the bus companies to gain insight on how the system operates.
- Review documents related to ticketing.
- The tools that were used in this methodology include among others pen and paper.

2.4.2 System Design

- Logical flow diagrams were used to help conceptualize the proposed system.
- A Context diagram and Data Flow diagrams (DFDs) were used to model the various processes involved showing how data moves in and out of the proposed system.
- The research comes up with an entity relationship model of the proposed system using Entity Relationship Diagrams (ERDs).

2.4.3 Implementation and Testing.

a) Font end

- **HTML:** It was used to develop the web interfaces to help the user interact with the database while retrieving or updating information.
- **JavaScript:** It was used for form validation.

b) Middle

- **Eclipse:** It is an open source Java development environment to be used as a platform for implementation for example J creator, Dr java.

- **SMPP API:** It is a telecommunication industry protocol to define ways in which ESME will interact with SMS centers.

- **PHP:** It was used for server scripting.

c) Backend

- **MySQL,** It is an open source program, good on RDBMS and widely used.

- **WAMP server 5.0 x:** It was used to host the website.

2.5 Testing.

The researcher used test data that were fed into the proposed system in order to verify that the system meets the specified objectives and working to meet the user needs.

2.5.1 Various Tests to be used:

Unit Testing: Each executable component of the system was thoroughly tested for the desired functionality.

Module Testing: Executable system components were integrated and tested together in related component modules.

System Testing: The different modules were integrated to come up with one functional system which were tested as a whole to make sure that it meets the general objective of the project.

2.6 Conclusion

Considering the fact that the cost a Mobile Phone is lowering in Uganda thereby increasing its availability among the population, I can take the advantage of its SMS application to solve a business requirement so as be able to help the stakeholders offer quality service in the market place.

While most of the projects reviewed in this section refer to the credit card system as a channel of payment I fill this is not applicable in the developing world which still lack that mode of money exchange. Therefore I am proposing a system that will bridge the gap between offering a service using modern ICT tools with the banking sector a way that will be secure to all stakeholders.

In conclusion the most significant relationship between this project and the larger area of already researched material is the use of a tool that can enable all customers use it regardless of location.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This is a detailed description of the selected methodology that was used by the researcher to achieve the objectives of the proposed system. The methods that to be used during data collection, analysis, designs and implementation of the proposed system are discussed below.

3.1Study Literature

Study of literature revealed selling practices of systems such as e-Bay, fundamentals of online marketing and the formal supply chain mechanism in the Ugandan market. In addition, documentation on integration of SMS based applications using GSM modems and how to integrate them with SMS gateways in the communication patterns in software applications is of great use.

3.2 Data Collection

A preliminary investigation was used to carry out in order to have a clear understanding of the current systems in place. This is the most important stage in the research process for it gives a clear understanding of how others have solved a similar problem and helped in the establishment of the requirements of the proposed system. The following techniques will be used.

3.3 Interviews

This method is used to collect information from individuals face to face. The individuals include both bus-operators and the general public. The method provided an opportunity for the researcher to find out and generate facts about the current system.

3.4 Reading existing documentation

This involves making use of journals and articles over the Internet to acquire information on how others have solved a similar problem. This technique also helped me clearly understand other relevant written material on the problem domain.

3.5 Questionnaires

Questionnaires were administered to both bus-operators and the general public. This was of advantage to individuals who are busy because they answered the questions at their own convenience and since it provides anonymity, individuals confidently give information.

System Design

The system was designed using Data Flow Diagrams (DFDs), Context Diagrams and Entity Relationship Diagrams (ERDs),

3.6 Data Flow Diagrams (DFDs)

DFDs were used to show the logical flow of data and represent processes in the system. They also helped to give a graphical representation of the system's components, processes and interfaces.

Context diagrams

Context Diagrams were used to demonstrate the processes taking place in our system.

Entity Relationship Diagrams (ERDs)

ERDs were used to model the relationships among the various entities of the system.

Tools: A GSM modem (mobile phone) was used as the gateway for sending and receiving SMS messages.

Database: SQL server 2005 as the database management system.

Testing

The system was tested by subjecting it to dummy data to check for errors in the system.

Validation

The system was presented to experts for examination and recommendations to make sure it meets user, functional and non-functional requirements.

3.7 Analysis, Design and Development of the Prototype

After the data had been collected from the owners of the Link bus company and the end-user then it was checked for accuracy. The existing system was analyzed by collecting facts from the existing documentation so that the researcher can know the problem with the current system and be able to come up with solutions. Requirements of the new system were analyzed. This is because fact finding activities can produce requirements that are conflicting with each other.

The goal of requirement analysis is to discover and resolve the problems with the requirement and reach agreement on any modifications in order to satisfy the user. Designing the new system was done after the requirements analysis phase had been done. A network and database architecture design was made to show how the database and the network system were interconnected. The prototype was developed after the design of the system was complete. The prototype was implemented only to the point that the users were given the opportunity to experience working with the prototype and the system was then tested to ensure that it functioned as expected.

Expected value of the system

The system is expected to improve efficiency in conducting the business processes, hence saving time and money. For instance if the buses are booked via SMS then few employees will be employed hence saving cost and increasing the company's profitability status.

3.8 Risk assessment

Every business decision has a degree of risk and uncertainty; this also includes building a new system. For instance lack familiarity of development tools may delay the project completion making it lag behind schedule. However this risk was avoided by training and acquiring expertise on the unfamiliar tools. Also managing the four phases of the system development life cycle was not easy. It is not easy to manage the implementation phase and complete it in time. This can be controlled by acquiring professional guidance whenever possible.

3.9 Problems encountered during the study

The research was carried out in a tight time schedule which led to delays and beating deadlines wasn't possible. Carrying out a research requires a lot of finances which were not available hence it was a great limitation to the research process. Difficulty was also experienced during interviewing the top-level management of the Link bus company, this is because most of the time these managers were always busy. Also designing of questionnaires was not an easy task. Questionnaires were needed in collecting requirements of the new system from the users.

CHAPTER FOUR

SYSTEM DESIGN AND IMPLEMENTATION

4.1 Introduction

This chapter comprises of system study, analysis, design and implementation that broadly describe the tools, instruments, approaches, processes, techniques and methods that were employed as stated in the methodology. A comprehensive study of strengths and weaknesses of the existing system, the processes, requirements, design and implementation of the new system is described.

4.2 System study

The study was carried and its main purpose was to find out how the process of booking tickets by passengers at the bus company.

4.2.1 Existing System

In the workflow of the existing system, the passenger goes to the Bus Terminal to buy a ticket and the Bus Terminal's Staff gives him or her ticket according to the buses available.

4.2.2 Workflow in the Current System

The figure below demonstrates the work flow in the current system. It shows the process of buying tickets by passengers at the Bus Company/Terminal.

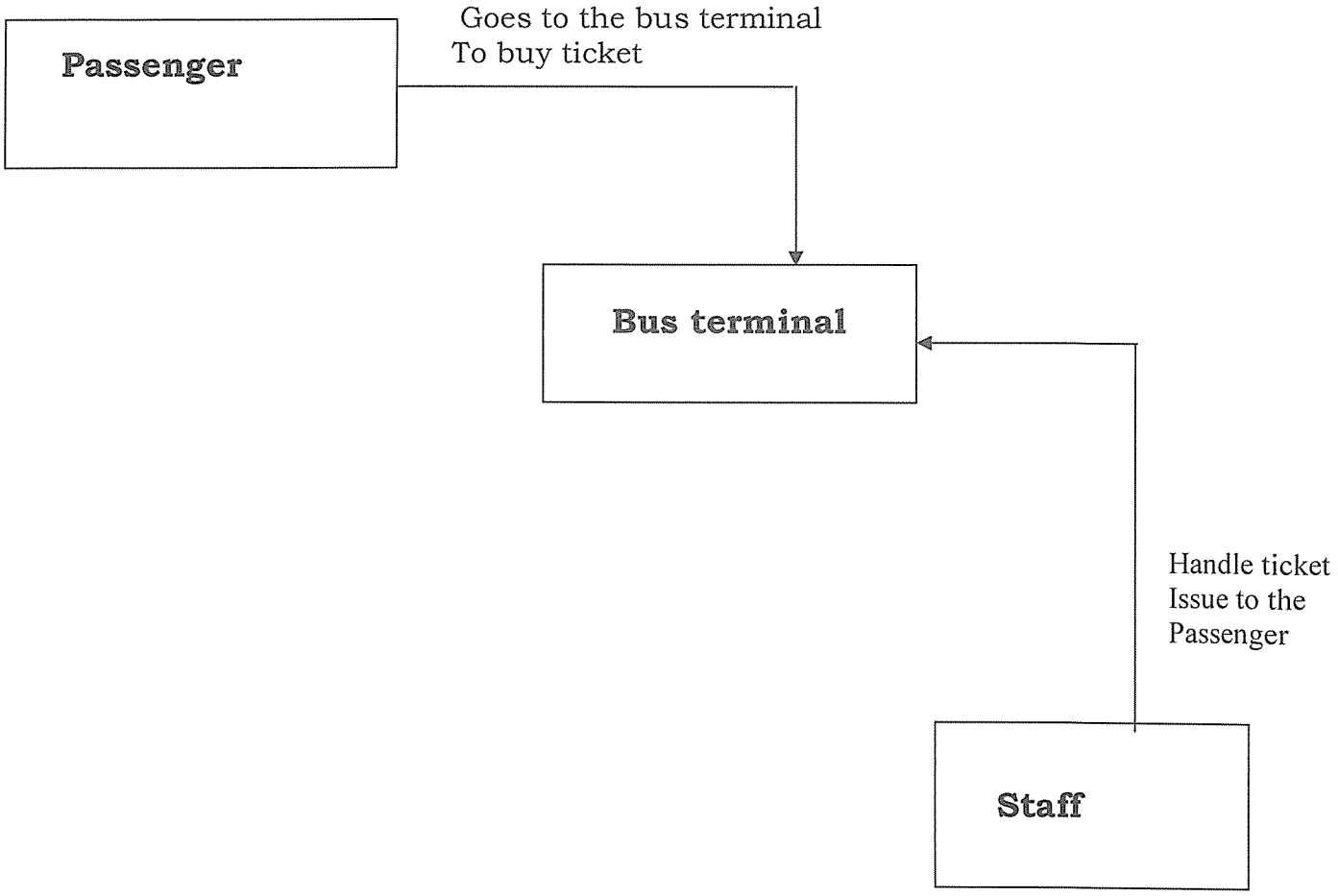


Fig 4.1 Work Flow in Current System

4.1.3 Strength of the Current System

1. The passengers are able to find tickets at the bus terminals.

4.1.4 Weaknesses in the Current System

1. Passengers manually look for tickets either by making phone calls or any other means that he/she can use which are relatively expensive in terms of cost and time.

2. The Bus Company is limited to number of passengers i.e. passengers those that are within the geographical boundaries of its village.

3. The passenger has to go to areas where the Bus Company stages for booking a ticket.

4. There is no automated platform through which the passenger can book the ticket in wider area i.e. beyond his/her geographic location.

5. Passengers are not informed about the current transport fairs/costs of different routes.

4.2 The Proposed System

4.2.1 System Analysis

To document all the end user requirements for the proposed application, all the data collected was analyzed using structured analysis approach to explicitly specify the processes. This section includes the requirements of the new system categorized into user, functional and non-functional requirements.

4.2.2 User Requirements

From the study, the system stake holders were identified. These are passengers and staff. Their respective requirements are:

a) Passenger

i. Submit booking details.

ii. Submit request via SMS during the booking process.

b) Staff

i. Registers passenger details into the system.

ii. Register route details.

iii. Monitor the booking process.

iv. Edit and view booking details; update booking status and delete routes.

4.2.3 Functional Requirements

The system should perform the following functionalities:

i. Store information of past and ongoing booking process.

ii. Store personal details of passengers and Staff.

iii. Send feedback messages to the passenger who made a request for updates or a booking.

iv. Generate reports of booking results.

v. Query data that has been entered and generate error messages.

4.2.4 Non-Functional Requirements

The system was designed to fulfill the following non-functional requirements:

i. The system must verify and validate all changes to staff/passenger details and the administrator must be notified in case of errors.

ii. The system must be reliable.

iii. The system must be easy to use.

4.2.5 System Requirements

In order for the application to perform successfully, the required system specification for hardware and software are expounded below.

a) Hardware Requirements

The table below describes the tangible components of a computer required to implement the application.

Hardware	System requirement
Processor	600MHZ speed and above
Memory (RAM)	128 MB Minimum(1GB Recommended)
Disk Space	10 GB
USB Port	Version 1.5 minimum
GSM Modem/ GSM phone E.g. Nokia and Sony Ericsson cell phone	Should support AT Commands E.g. ATEO that configures communication

Table 4.1 Hardware Requirements

a) Software Requirements

The table below describes the computer programs that should be available for proper configuration, installation and performance of the application.

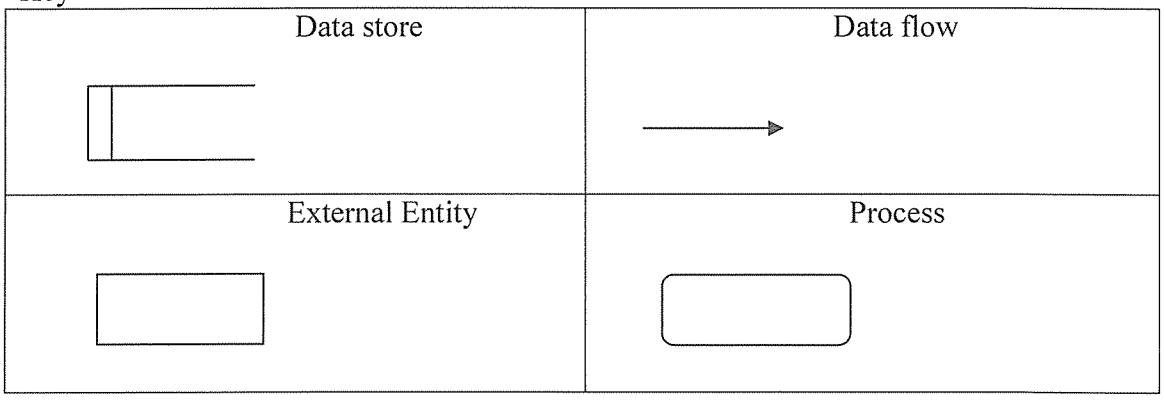
Software	System Requirement
Operating System	Windows 2000/XP /Vista
Runtime Environment	Visual C # 2008 editions
Database Management System	SQL Server 2005(Express or standard editions)

Table 4.2 Software Requirements

4.3 System Design

This section describes the system design that includes the context diagram, Level One DFD and system architecture.

Key



4.3.3 Context Diagram of the System

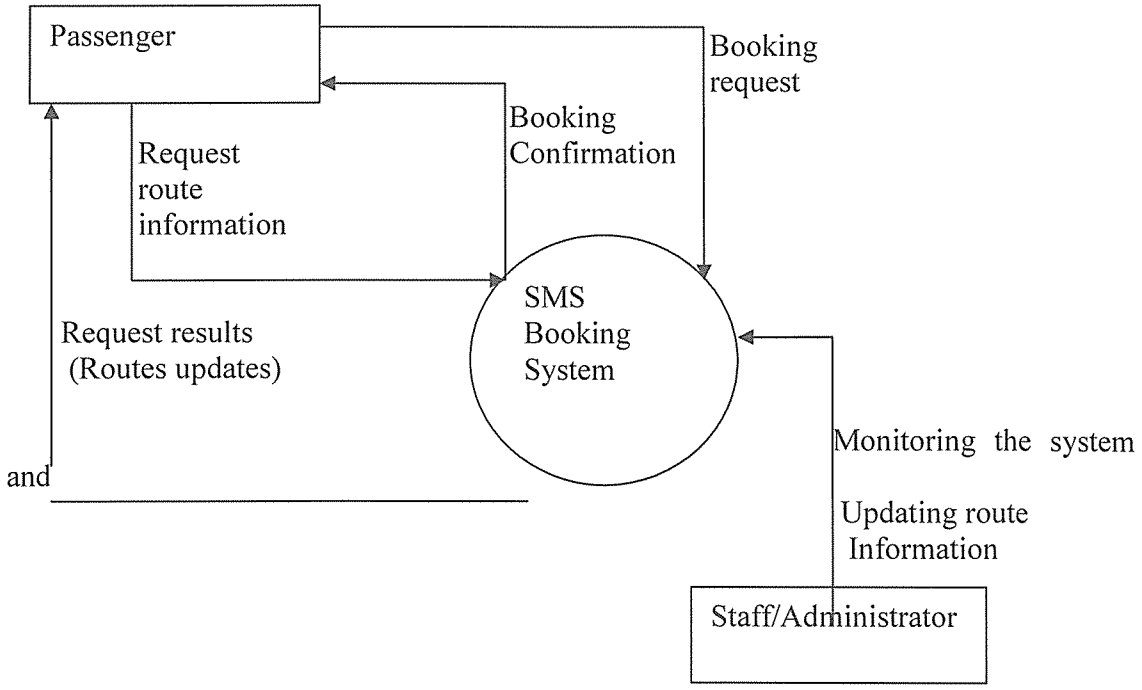


Fig 4.2 Context Diagram of the System

The figure above shows all the external entities that interact with the application and the data flows between these external entities and the application. It models the SMS Based Booking Application. This application interacts with two external entities: Passenger and Staff. The main data that flows from Passenger is 'sending request details' or 'sending booking details'. In response, the Passenger receives a 'notification/feedback message' informing him that the request/booking has been accepted. The Staff/Administrator monitors the system and updates route information.

4.3.4 Level One Data Flow Diagram

The figure below identifies the major system processes and the data flows between them. Each process has a unique name and a number as shown.

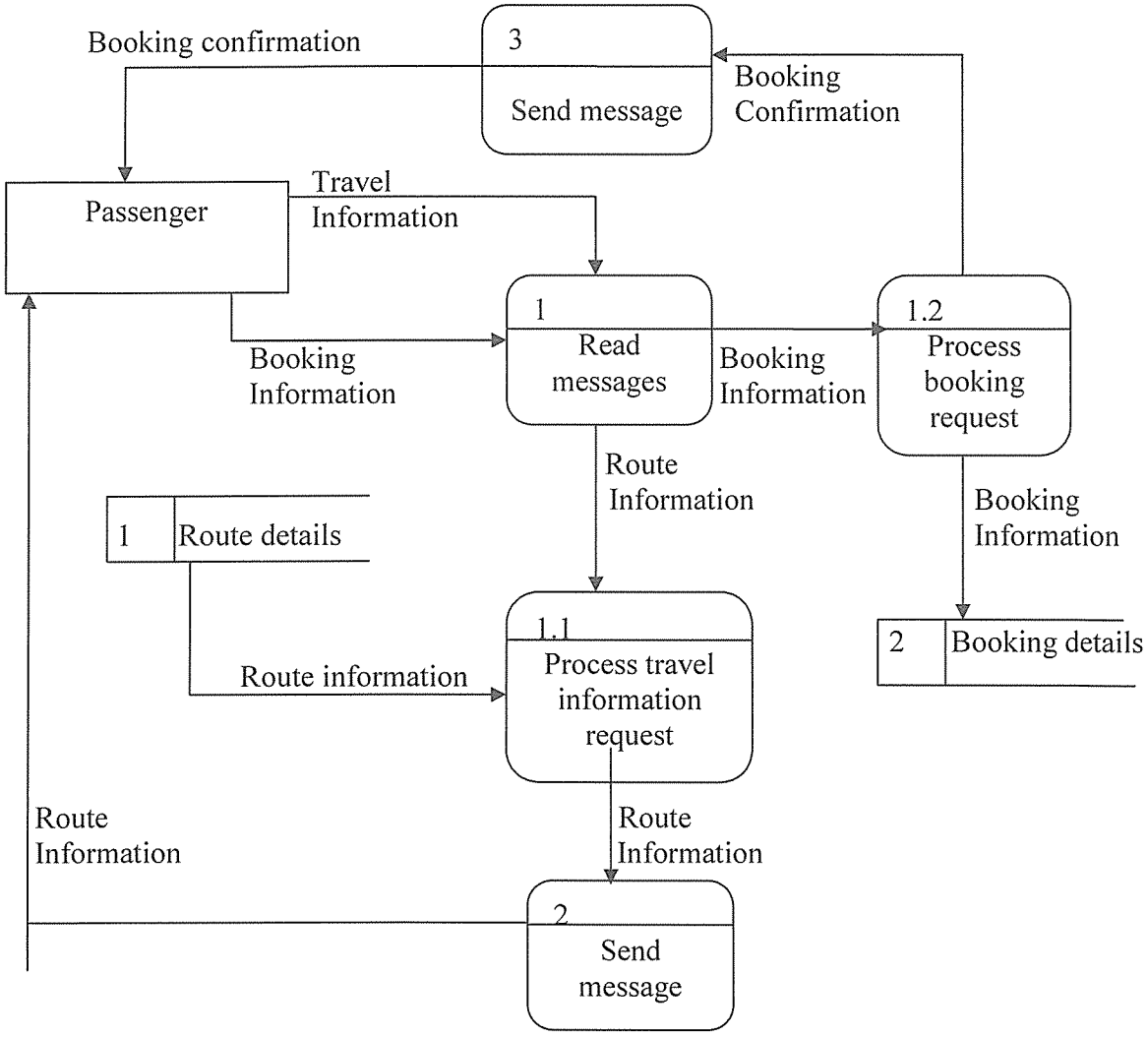


Fig 4.3 Level One Data Flow Diagram

4.4 System Architecture

This gives a high level view of the new system with the main components of the system and the services they provide and how they communicate. The system is implemented using a three-tier architecture that comprises of user interface, process management and DBMS as illustrated below. This structure ensures that users' interaction with the system is independent of storage consideration.

4.4.1 Architectural Design of SBBS

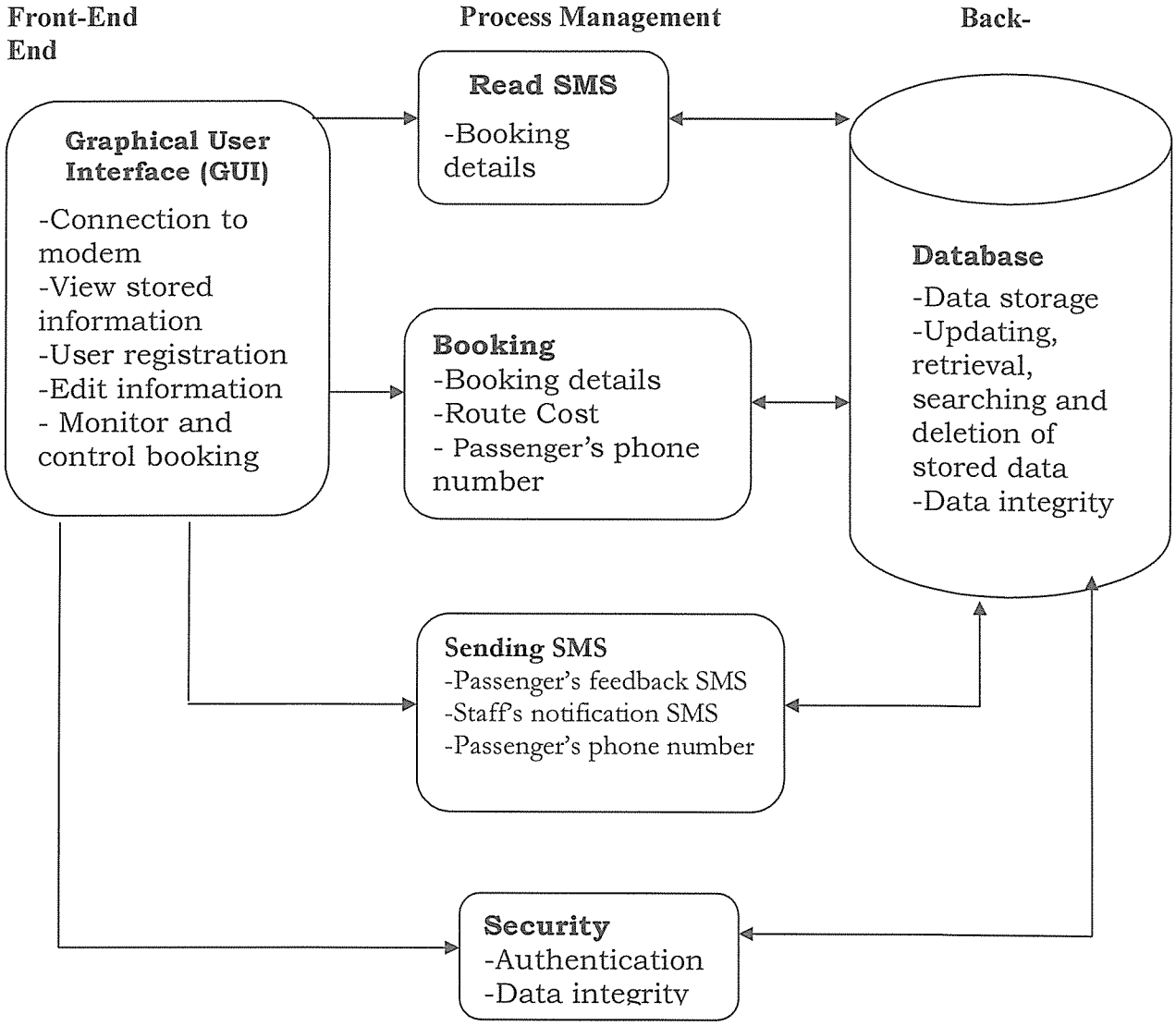


Fig 4.4 Architectural Design

4.4.2 Application Architecture of SBBS

system architecture of the sms booking application

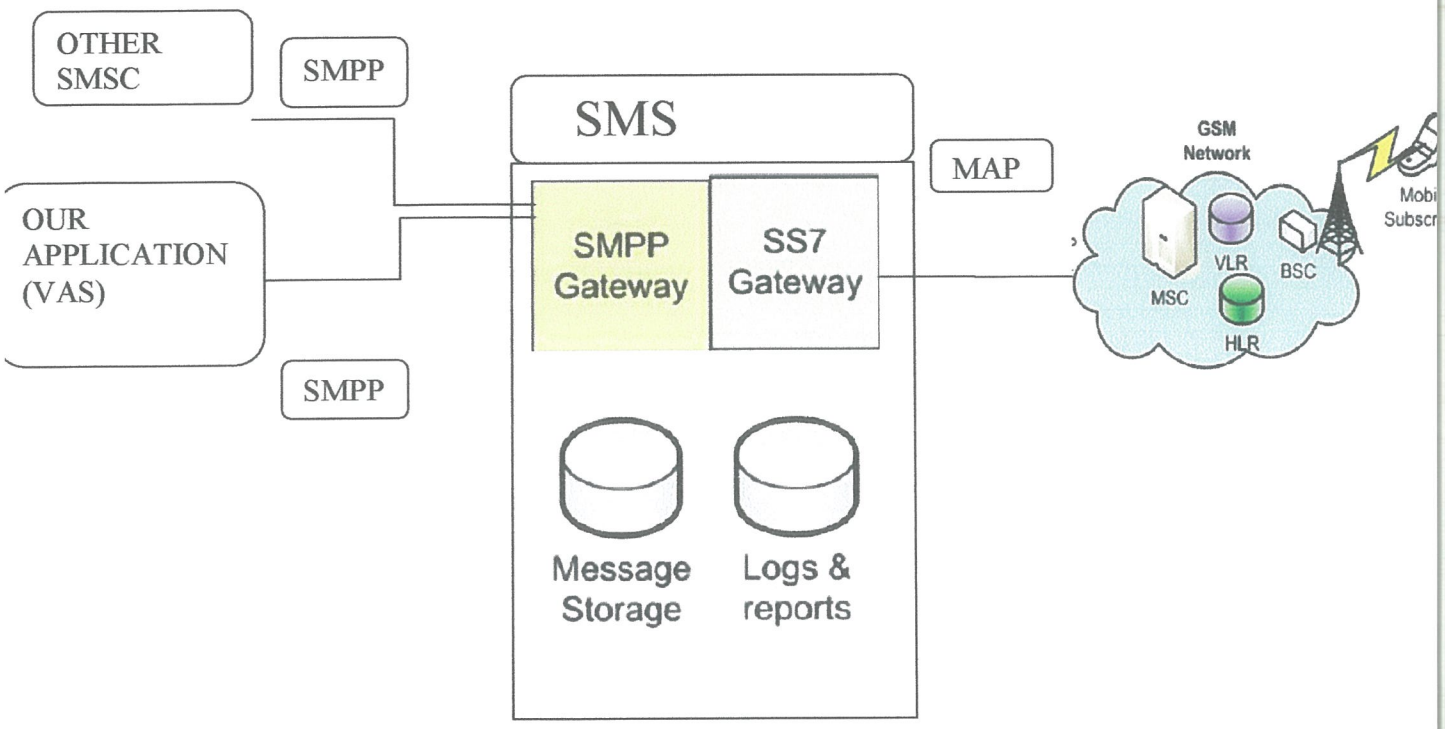


Fig 4.5 Application Architecture

4.5 System Database Design

4.5.1 Introduction

The DBMS used was Microsoft SQL Server 2005 and this section includes details of the database design. The conceptual and physical database design plus the data dictionary are described below.

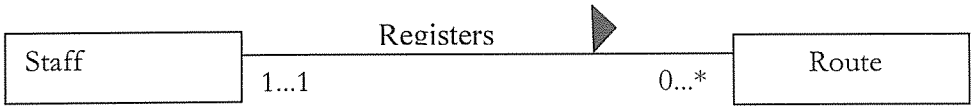
4.5.2 Conceptual Database Design

After system investigation and analysis, the concept of the new system was designed and all the relevant entities involved in the system were identified. Therefore the following entities were chosen to capture this information.

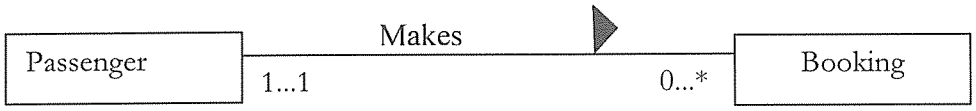
i. Route
ii. Booking
iii. Passenger
iv. Staff

4.5.3 Entity Relationships of the System Database

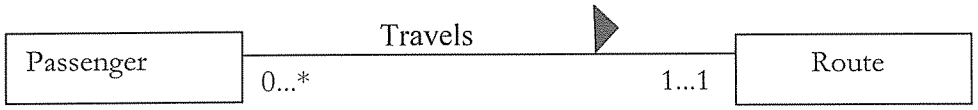
The relationships of the different entities were identified as shown below:



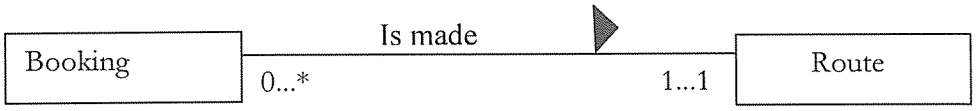
Staff registers zero to many routes. The cardinality is 0..*



Passenger makes zero to many bookings. The cardinality is 0..*



Passenger travels one to one route. The cardinality is 1..1



Booking is made on one and only one route. The cardinality is 1..1

4.5.4 Entity Relationship Diagram of SBBS

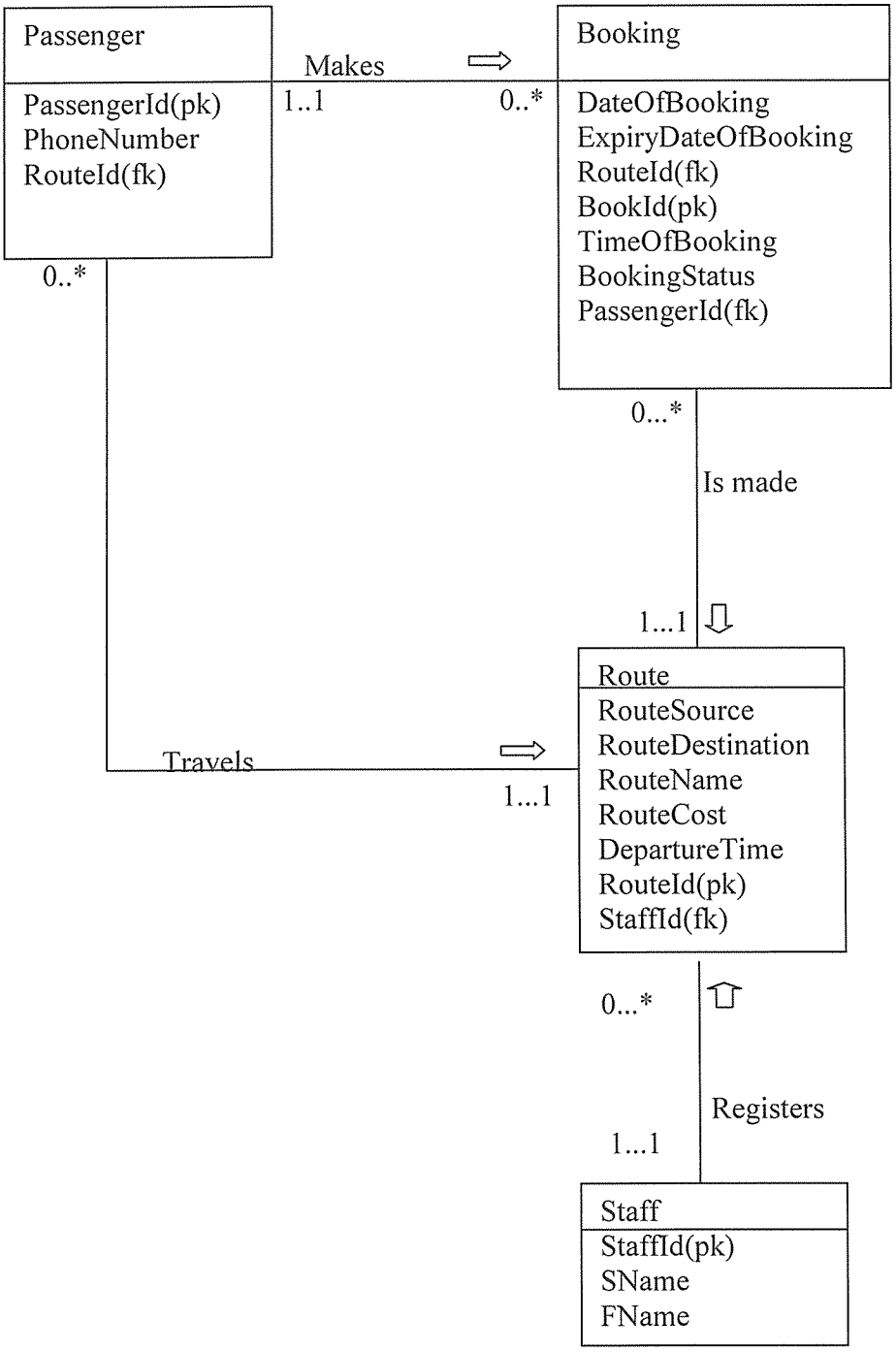


Fig 4.6 Entity Relationship Diagram

4.5.5 Mapping the ERD to the Relational Database Schema

a) Mapping Strong Entities

Route (RouteId, RouteSource, StaffId*, RouteDestination, RouteName, RouteCost, DepartureTime)

Passenger (PassengerId, PhoneNumber, RouteId*)

Staff (StaffId, FName, SName)

b) Mapping Weak Entities

Booking (BookId, DateOfBooking, ExpiryDateOfBooking, RouteId*, TimeOfBooking, BookingStatus, PassengerId*)

c) Mapping One-to-Many Relationships

Staff (StaffId, SName, FName)

Passenger (PassengerId, PhoneNumber, RouteId*)

Booking(BookId, DateOfBooking, ExpiryDateOfBooking, RouteId*, TimeOfBooking, BookingStatus, PassengerId*)

Route(RouteId, RouteSource, StaffId*, RouteDestination, RouteName, RouteCost, DepartureTime)

d) Mapping Ternary Relationships

No ternary relationships identified.

Therefore, the **final relations for the System Database Design** are:

1. Booking (BookId, DateOfBooking, ExpiryDateOfBooking, RouteId*, TimeOfBooking, BookingStatus, PassengerId*)

2. Route (RouteId, RouteSource, StaffId*, RouteDestination, RouteName, RouteCost, DepartureTime)

3. Passenger (PassengerId, PhoneNumber, RouteId*)

4. Staff (StaffId, SName, FName)

4.5.6 Data Dictionary

The data dictionary gives details of the entities, such as the name, attributes, size, description and the various data integrity constraints on them. It further shows the tables implemented in the SBBS database

Relation	Attribute	Type and Size	Key	Description
Booking	BookId	Varchar(4)	Primary Key	Identifies a booking
	DateOfBooking	Date		The date of booking
	ExpiryDateOfBooking	Date		Expiry date
	RouteId	Varchar(15)	Foreign Key	Identifies a route on which booking is made.
	TimeOfBooking BookingStatus	Time Varchar(15)		Booking Time Whether a booking is valid or not.
	PassengerId	Varchar(4)	Foreign Key	Identifies passenger who made the booking
Passenger	PassengerId	Varchar(4)	Primary Key	Identifies a Passenger
	PhoneNumber	Varchar(20)		Passengers' phone number.
	RouteId	Varchar(4)	Foreign Key	Identity's route on which passenger made booking.
Staff	StaffId	Varchar(15)	Primary Key	Identifies a Staff member
	SName	Varchar(15)		Staff member's Surname.
	FName	Varchar(20)		Staff members' First name
Route	RouteId	Varchar(4)	Primary Key	Identifies a Route
	RouteSource	Varchar(20)		Source of a Route
	StaffId	Varchar(4)	Foreign Key	Identifies Staff who registered the Route
	RouteDestination	Varchar(20)		Destination of a Route
	RouteName	Varchar(20)		Name of the Route
	RouteCost	Big integer		Cost of travel on a Route
	DepartureTime	Time		Time of Departure

Table 4.3 Data Dic

4.6 System interfaces

Figure 4.6.1 Interface for the system start up

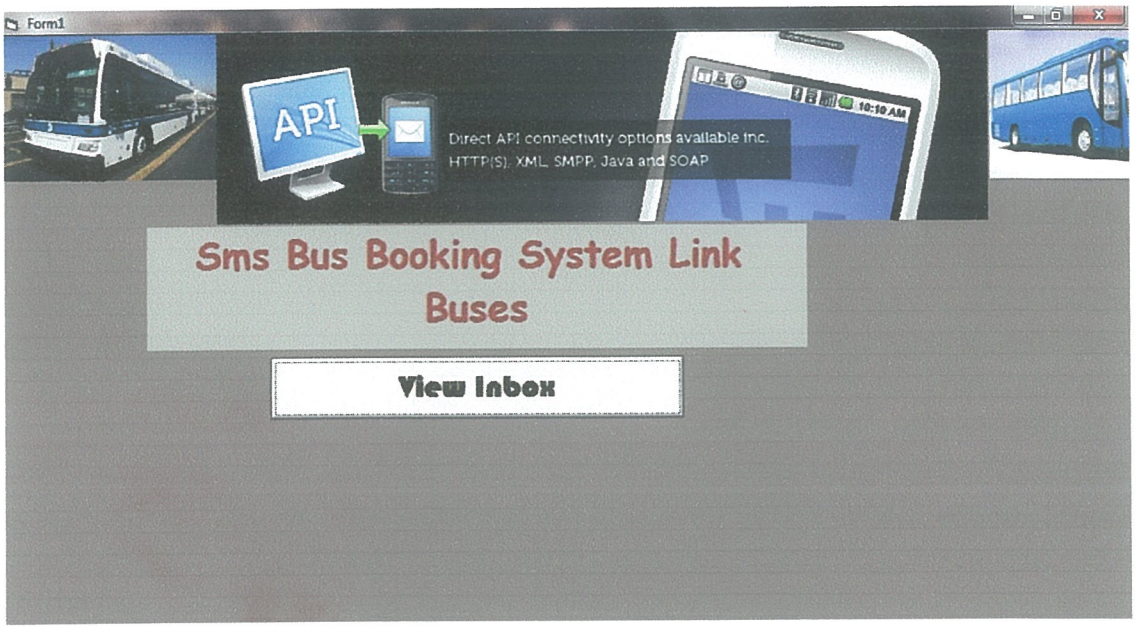


Figure 4.6.2 Interface for the reading inbox messages

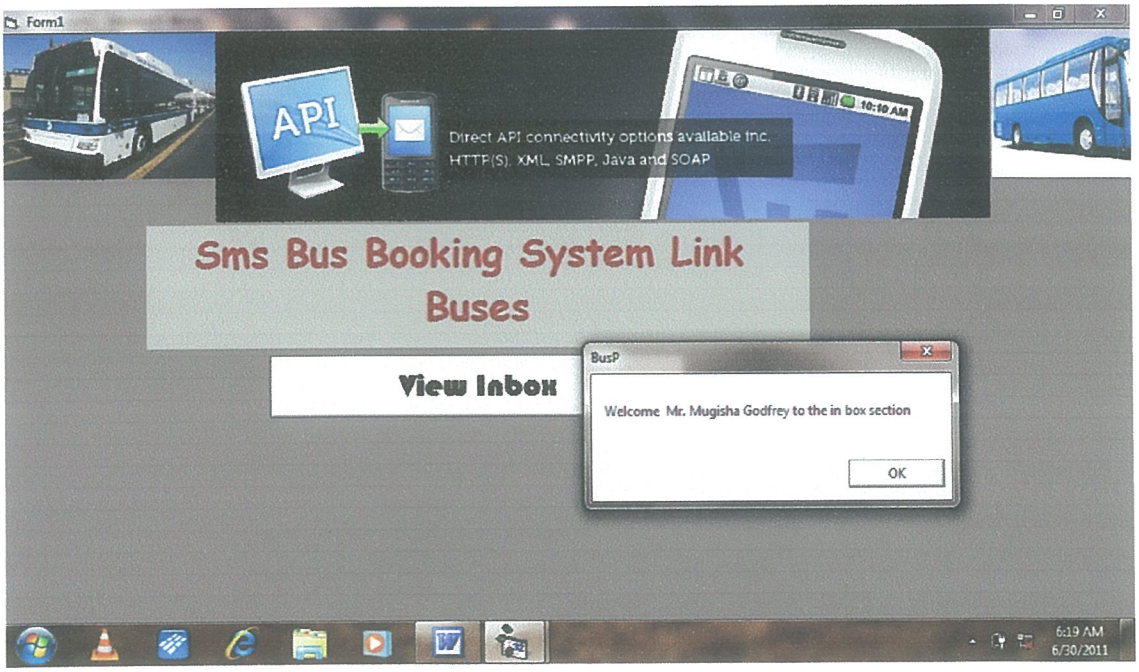


Figure 4.6.3 Steps followed to reach the inbox page

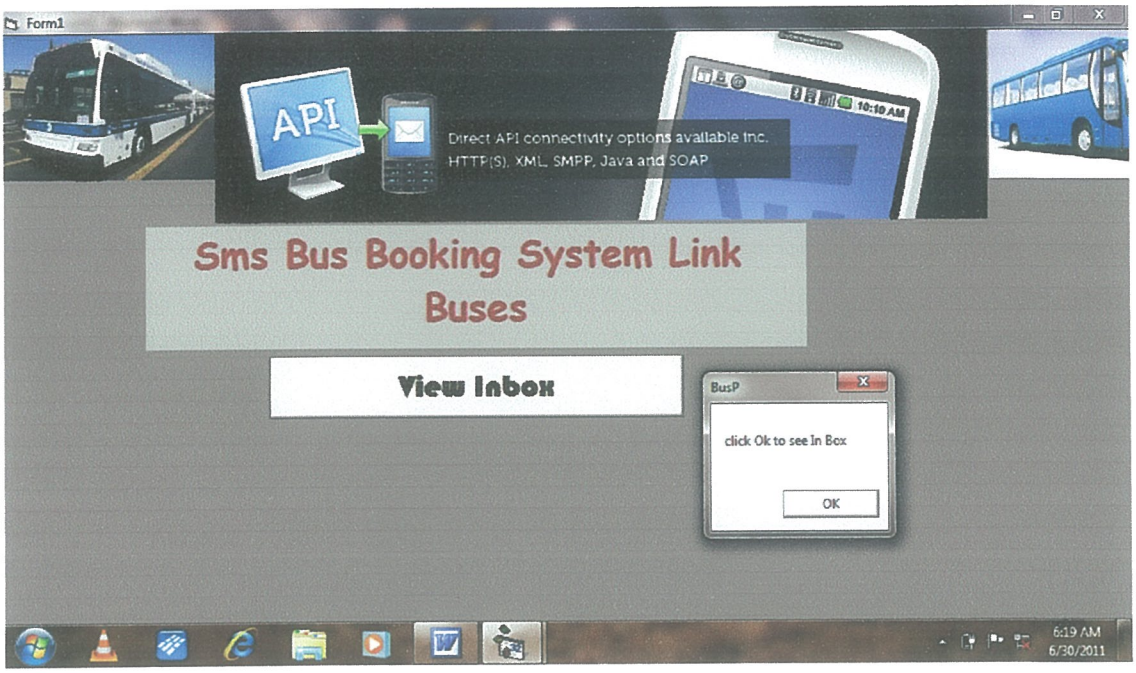


Figure 4.6.4 Interface that that prompts the SMS manager to perform some tasks

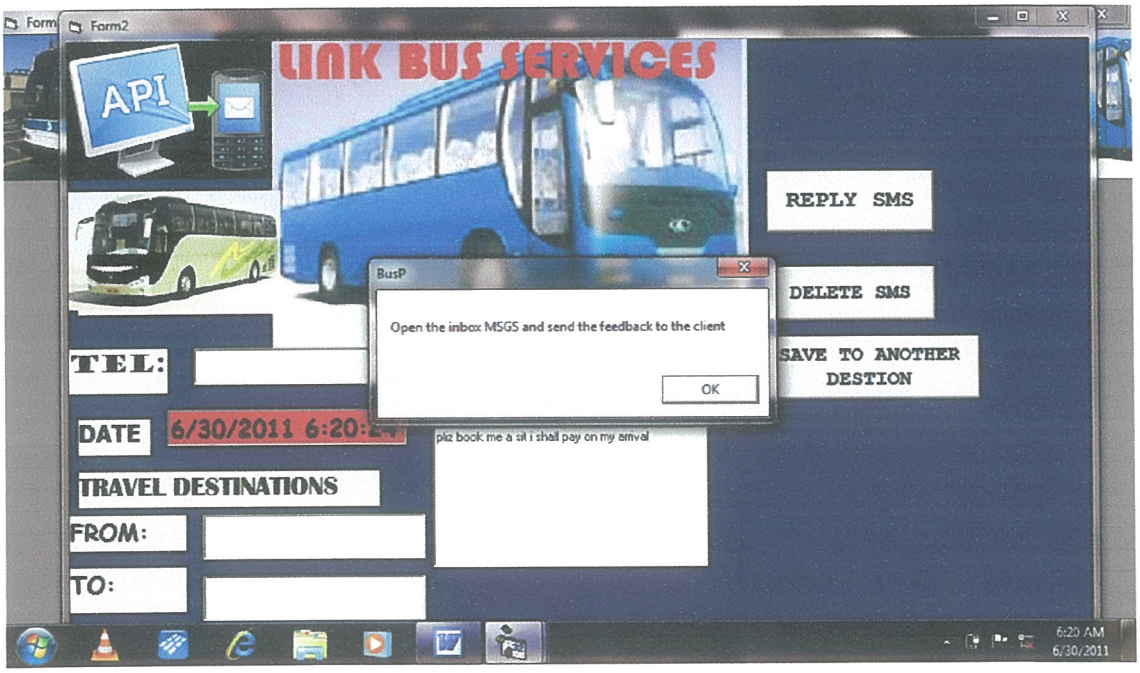


Figure 4.6.5 An interface followed to reach the send REPLY page

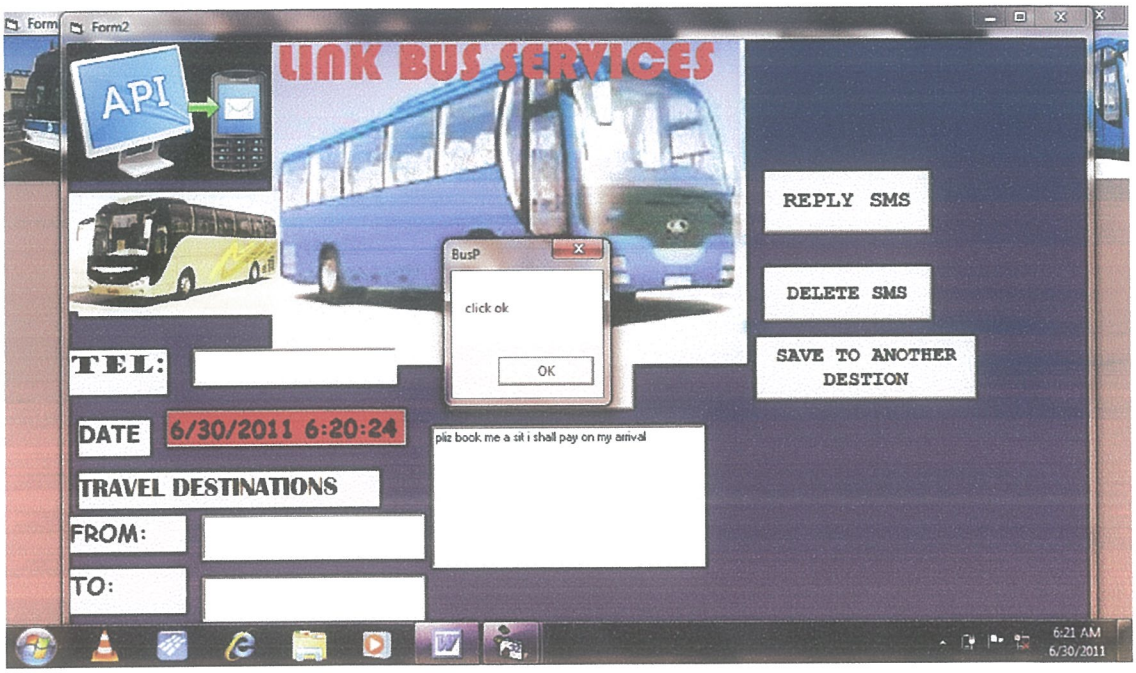


Figure 4.6.6 Interface for identifying telephone numbers from different ISPs(Networks)

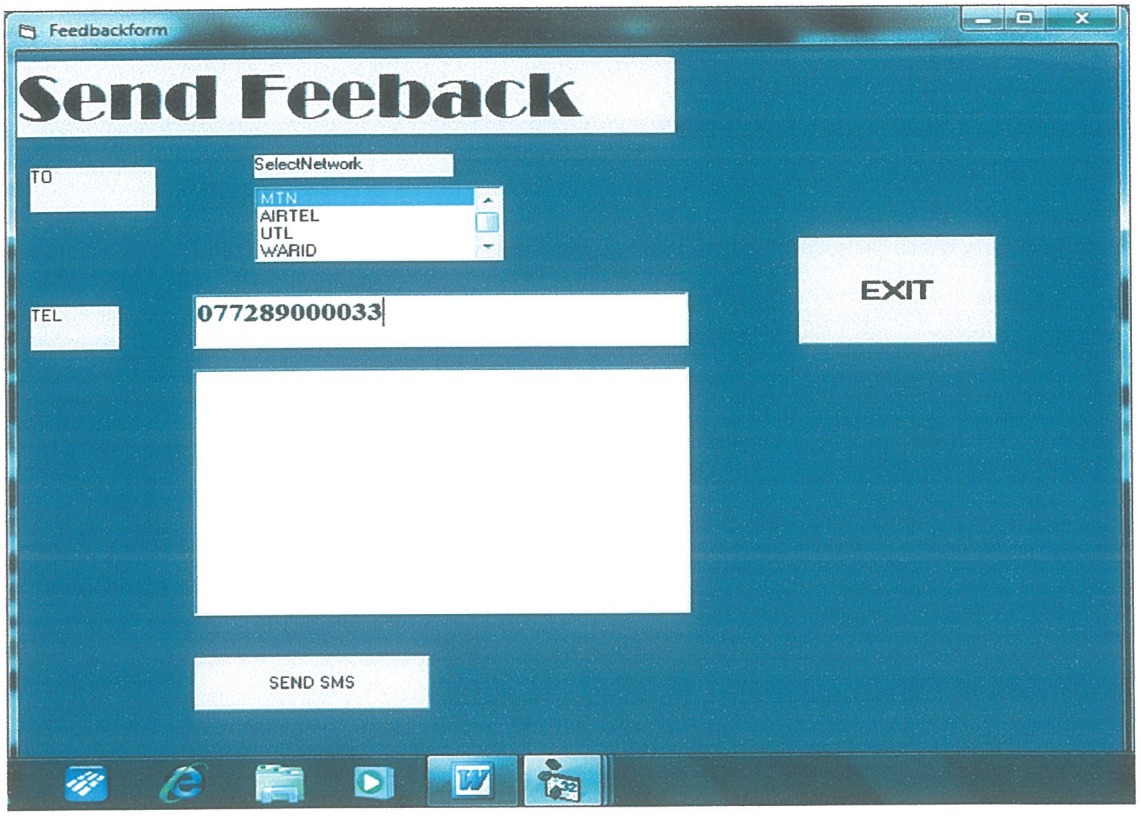
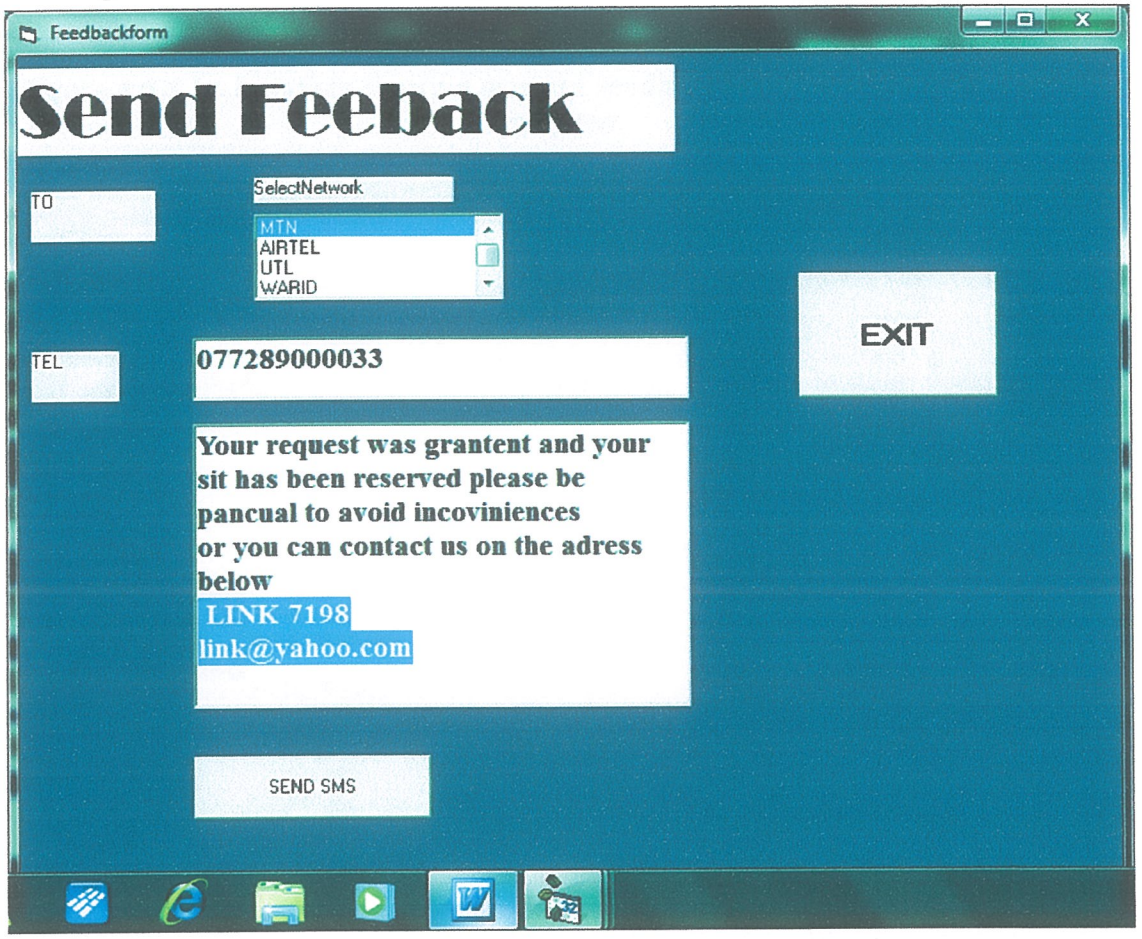
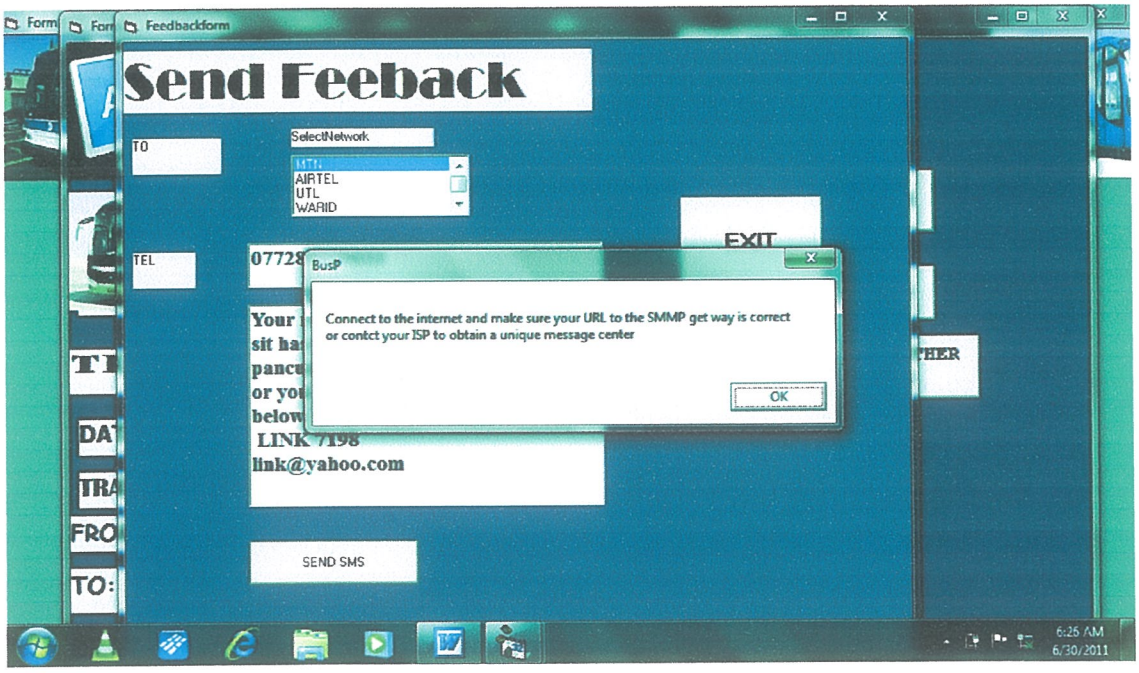


Figure 4.6.7 Interface for that prompts the SMS manager to type feedback





CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATION

5.0 Introduction

The objective of this research project is to model business requirements, in order to come up with an efficient system that will meet all user-needs. In this chapter, we shall discuss about the findings, draw a conclusion from the research made and recommendation.

5.1 Discussions

The SMS transaction processing systems are an important asset for company to maintain efficiency, profitability and competitive advantages. The company will collect data through SMS of their costumers, and the SMS transaction will be speedy and accurate in correcting data.

The performance of a the SMS transaction processing system depends heavily on the system Input/output architecture, data communications architecture and even more importantly on the efficiency of the system software.

Although the detailed picture provided by SBBS diagrams is often desirable for summary purposes it is useful to hide or compress the display of much of this detail.

Another conceptual approach is provided by Entity-Relationship (ER) modeling.
Although ER models can be of use once the design process is finished, they are less suitable for formulating, transforming or evolving a design. ER diagrams are further removed from natural language, cannot be populated with fact instances, require complex design attributes, lack the expressibility and simplicity of a role based notation for constraints, hade information about semantic domains which glue the model together and lack adequate support for formal transformations.

The SMS system if implemented will achieve the following: the information system will control data redundancy in Link bus company thus improving performance. Also the system will ensure data integrity within the company since there will be only one single storage area of data.

The Link Bus Company will increase efficiency and effectiveness in its operations, making it stand at the competitive environment.

Although the new system achieved the above performances it has some Limitations.
For instance a comprehensive SMS system should be capable of doing all that the new system has been designed to do except that the new system cannot print receipts after transaction has been made.

5.2 Recommendation

Link Bus Company should adopt the database in order to store customers' information details. This enables easy retrieval of customer records, this will increase the customer loyalty hence more profits to the Company

Link Company should also test the system in order to ensure that it of the expected quality. Testing the system avoids unexpected failure or break down which may lead to lose customer loyalty. Testing the system ensures that bugs are identified and taken care of before full system implementation takes place.

The Company should also use the user-interactive system because it is easy for the users to learn how it is used. Interactive user systems have a short learning curve which is cost effective and also save time.

5.3 Conclusion.

This project can be considered to have achieved most of the set goals and objectives as they were intended during the analysis phase. For instance a database to store the customer's information was designed and implemented. This is expected to increase efficiency and proper record keeping

Also the SMS and business processes of Link Bus Company were automated and computerized. Calculations on the number of customer are computed automatically which reduces the time taken to serve one customer.

A user interactive system was also designed. The Link Bus SMS system has attractive interfaces which are easy to learn. This has reduced the time and money spent by the Company on training new employees, this is because user-interactive systems have a short learning curve.

After the system was developed, it was tested to ensure that it was functioning as expected and to ensure that it had no bugs. System testing avoids future system breakdowns which may cost the Company dearly.

5.4 Area for Future Research

The constraint of time and desire to deliver meaningful conclusions has led to many areas of this research being curtailed in order to keep the main thread work focused. But in future I propose that the conceptual design for Link Bus Company using SMS be optimized and implemented into an online Database system using a suitable Database system

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APPENDIX A

STUDY QUESTIONIARES FOR BUS OPERATORS

TOPIC: SMS BUS BOOKING SYSTEM.

This questionnaire is seeking information on the SMS bus booking of Link Bus Company. The information you will provide will be treated with the highest level of confidentiality.

You are kindly asked to fill the form below appropriately.

Guidelines: Put a tick in the appropriate box.

☑

Objective: Design SMS bus booking system

Question1

(a) Will the SMS system help the bus operators in your company?

Yes ☐

No ☐

If yes, explain.

.....

.....

.....

If no, explain.

.....

.....

.....

(b) What do you think about SMS system for bus booking in your company?

It's necessary ☐

Not necessary ☐

I don't know ☐

If necessary, explain.

.....

.....

.....

If not necessary, explain.

.....

.....

.....

Question 2

(a) Are the booking of bus been for SMS in your company?

Yes ☐

No ☐

If yes, explain.

.....

.....

.....

If no, explain.

.....

.....

.....

(b) What do you think about development and implementation of SMS system?

It's necessary ☐

Not necessary ☐

I don't know ☐

If necessary, explain.

.....

.....

.....

If not necessary, explain.

.....

.....

.....

(a) How long does it take to train employees on how to use SMS system?

1-2 weeks ☐

2-4 weeks ☐

More than a month ☐

STUDY QUESTIONIARES GENERAL PUBLIC

TOPIC: SMS BUS BOOKING SYSTEM.

This questionnaire is seeking information on the SMS bus booking of Link Bus Company. The information you will provide will be treated with the highest level of confidentiality.

You are kindly asked to fill the form below appropriately.

Guidelines: Put a tick in the appropriate box. ☐

Objective: Design SMS bus booking system

QN1.

Will the SMS system help the people in area?

Yes ☐

No ☐

QN2.

Have you ever booked bus via the SMS before?

Yes ☐

No ☐

APPENDIX B: BUDGET

The study is estimated to cost 1,124, 000/= arrived at as follows:-

ITEM	COST PER UNIT	TOTAL COST (UGX)
Library	50.000	50,000
Transport	200.000	600,000
Communication	50.000	50,000
Photocopy	100.000	100,000
Typesetting and printing	150.000	150,000
Binding	9000 45,000	9000 45,000
Internet	50.000	50,000
Miscellaneous	200.000	200,000
Total	1,124,000	1,124,000