

**INFORMATION SYSTEM OF TELEPHONE  
SUBSCRIBERS**

**{CASE STUDY OF NIGERIAN GSM PROVIDERS}**

*By*

**OLAYEMI TAYELOLU ADELEKE**

**PGD/MCS/2005/2006/1187**

**SUBMITTED TO**

**THE DEPARTMENT OF MATHEMATICS, AND COMPUTER  
STUDIES**

**SCHOOL OF SCIENCE AND SCIENCE EDUCATION  
FEDERAL UNIVERSITY OF TECHNOLOGY  
MINNA, NIGER STATE**

**IN PARTIAL FULFILMENT FOR AWARD OF POST GRADUATE DIPLOMA (PGD)  
IN COMPUTER SCIENCE**

# CERTIFICATION

This project has been read and approved by the under listed persons and having met the requirement of Mathematics and Computer Department of Federal University of Technology Minna, for the award of Post Graduate Diploma in Computer Science PGDCS

  
27/08/07

.....

Mr. Gbolohan Bolarin  
Project Supervisor

.....

Date

.....

Dr. N. I Akinwande  
Head of Department

.....

Date

.....

External Supervisor

.....

Date

## **DEDICATION**

This project work is dedicated to my late sister Mrs Morayo Adetutu Dare.

May your soul rest in perfect peace

## **ACKNOWLEDGEMENT**

Words are not enough for me to express my profound gratitude to God Almighty for His blessings, mercies and provisions for the time I was born up to this day and level.

My appreciation goes to my supervisor in person of Mr Gbolahan Bolarin who through his untiring effort ,guidance and direction helped in making sure that this project was read and corrected. Thank you, Sir. Also to the lecturers of Mathematics and Computer Department. I say a big thank you.

It will be unfair if I do not mention my parent His Royal Highness Oba Jacob Adeyeye Olayemi Aroyinkeye Okandumoye II. The Asaoni of Ora-Igbomina, who always asks how far and my mother who prays always for me.

It is not yet completed if I fail to mention my colleagues Mr Alade, Mr Lekan Olayemi, Mrs Adeagbo, Mal Baba Ibrahim, Mr Adewole and others not mentioned.

My course mates are not left out – Ajayi Akinyemi, Adaji Adamu, Adeniyi Quazeem, Isah Gado, and others, I say thank you.

Lastly but not the least, my wife Olori Busola Olayemi, my lovely children Favour and Dotun and my sister Kehinde for their moral, financial and prayer supports.

You are highly appreciated.

Thank you all and God bless.

Prince T. A Olayemi

## **ABSTRACT**

Prior to 1999, communication could be seen to be at stand still. The emergence of the Global System Mobile (GSM) Telecommunication has brought about changes. Over the years, the number of subscribers to a telephone provider keeps rising and expanding and the relationship of those subscribers together with other network providers is of great importance. This research work shows the rate of subscription, services and preference for the said network. Also, the entity relation and relational models are derived and the information reports from database of subscribers are generated.

## TABLE OF CONTENT

TITLE PAGE	i
CERTIFICATION	ii
DEDICATION	iii
ACKNOWLEDGEMENT	iv
ABSTRACT	v
TABLE OF CONTENT	vi

### CHAPTER ONE

1.0 INTRODUCTION	1
1.1 GENERAL BACKGROUND OF NIGERIAN GSM PROVIDERS	3
1.2 AIMS AND OBJECTIVE OF THE STUDY	3
1.3 SIGNIFICANCE OF STUDY	3
1.4 SCOPE	4
1.5 LIMITATION OF STUDY	4

### CHAPTER TWO

2.0 LITERATURE REVIEW	5
2.1 INFORMATION SYSTEM OF TELEPHONE SUBSCRIBERS	5
2.2 SUBSCRIBER	6
2.3 RIGHT OF SUBSCRIBER	7
2.4 SUBSCRIBER NUMBER	8
2.5 PROVIDER / OPERATOR	9
2.6 USER	11
2.7 OPERATOR OPTIONS	12

2.7.1	PAY AFTER SERVICE	12
2.7.2	ROAMING	13
2.8	ELECTRONIC ON-LINE SUBSCRIBER TELEPHONE DIRECTORY	13
2.9	SYSTEM AND METHOD OF PROVIDING ON-LINE DIRECTORY SERVICE	14
2.10	TELEPHONE CONTROL SYSTEM THAT CONNECTS CALLER WITH SUBSCRIBER	15
2.11	DATA TRANSMISSION SYSTEM BETWEEN TELEPHONE SUBSCRIBER LOCATION AND TELEPHONE EXCHANGE LOCATION	15
2.12	METHOD AND APPARATUS FOR PROVIDING TELEPHONE CALL CONTROL AND INFORMATION	16
2.13	TELEPHONE ACCESSIBLE INFORMATION SYSTEM	16
2.14	TELEPHONE ACCESS INFORMATION SERVICE DISTRIBUTION SYSTEM	17
2.15	BILLING SYSTEM FOR TELEPHONE SIGNALLING NETWORK	18
<b>CHAPTER THREE</b>		
3.0	OVERVIEW OF DATA MODELLING	19
3.1	IMPORTANCE OF DATA MODELLING	19
3.2	METHODOLOGY	20
3.3	DATA MODELLING IN DATABASE CONTEXT	20
3.4	OVERVIEW OF ENTITY RELATION MODEL	20
3.5	ACCEPTABILITY OF ENTITY RELATION AL MODEL	21
3.6	BASIC COMPONENTS OF ENTITY-RELATION MODEL	21
3.6.1	ENTITIES	21

3.6.2	RELATIONSHIPS	22
3.6.3	ATTRIBUTES	22
3.6.4	DEGREE OF A RELATIONSHIP	22
3.6.5	CONNECTIVITY AND CARDINALITY	23
3.6.6	DIRECTION	23
3.6.7	TYPE	24
3.6.8	EXISTENCE	24
3.7	ENTITY-RELATION NOTATION	24
3.9	STEPS IN BUILDING A DATA MODEL	25
3.10	OVERVIEW OF RELATIONAL MODEL	26
3.11	RELATIONAL NOTATION	27
3.12	PROPERTIES OF RELATIONAL TABLES	27
3.13	IDENTIFYING DATA OBJECTS AND RELATIONSHIPS	29
3.14	NORMALIZATION	29
3.15	ENTITY RELATIONAL MODEL OF TELEPHONE SUBSCRIBER	29
3.16	DISCUSSION	29
3.16.1	SUBSCRIBER	29
3.16.2	TELEPHONE NUMBER	30
3.16.3	OPTIONS	30
3.16.4	DIRECTORY	31
3.16.5	ZONE	31
3.16.6	COUNTRY	31
3.16.7	ACCOUNT	31
3.16.8	CODE	31
3.16.9	SERVICES	31
3.16.10	PROVIDER	32

4.0 INTRODUCTION	33
4.1 WHAT IS PHP	33
4.2 WHY PHP	33
4.3 REQUIREMENT	34
4.5 DECLARING PHP	35
4.6 MYSQL	35
4.6.1 PROGRAMMING LANGUAGES	36
4.7 USES	37
4.8 DOCUMENTATION AND ADMINISTRATION	37
4.8.1 MYSQL COMMAND LINE	39
4.8.2 MYSQL GUI	40
CHAPTER FIVE	
5.0 SUMMARY, CONCLUSION AND RECOMMENDATION	41
5.1 SUMMARY	41
5.2 CONCLUSION	42
5.3 RECOMMENDATION	42
REFERENCES	43
APPENDICES	

## CHAPTER ONE

### 1.0 INTRODUCTION

Information is anything that can be communicated; Beekman (2001). Zago (2004) states that information is anything that increases ones knowledge.

Therefore, information is a veritable tool because it aids decision making.

Communication came about as a result of need for data and information transfer.

Lucas (1976) states that information is a tangible entity that reduces uncertainty about a future state or event.

Information and communication Technology (ICT) are synonymous with development. Over the years, communication has witnessed tremendous changes in terms of digital, audio, graphical types of data that are transmittable via the ICT channels or devices.

Essentially, most information are transferred through the Global System Mobile telecommunication together with internet which is without a doubt one of the most explosive sector that have taken over the telecommunication industry.

ICT services are sometimes provided by service or network providers. There are several network/service providers that are in communication industry/ sector of the economy.

Nigeria witnessed the advent of communication providers each with her peculiar services to the subscribers. Prior to 1999, the communication industry was inactive as most of the sector had been grounded. There were so many tractable

problems that refused to be solved. Interestingly, there came a translation that made meaningful development in the telecommunication industry.

### **1.1 GENERAL BACKGROUND OF NIGERIAN GSM PROVIDERS**

Telecommunication industry in Nigeria was one man or sole provider of fixed telephone lines which was initially analog(ue). Events and problems made the analog(ue) method of data transmission to be obsolete and later it was digitalized for technical reasons.

Improvement on fixed wire telephone technology brought about the wireless technology. Nigeria Telecommunication (NITEL) was the sole provider/network for all communication in Nigeria which was fixed wire telecommunication.

In 1999, efforts were made to privatize all government functionaries for effective delivery of services through competition. The Obasanjo administration commenced the privatization of these government companies of which NITEL was not excluded. The Bureau of Public Enterprises (BPE) was the agency saddled with the responsibility of privatising the companies.

Privatization without any doubt brought about the transformation in the telecommunication industry with NITEL producing MTEL as a subsidiary of NITEL. MTEL was also licensed and regulated by Nigeria Communication Commission (NCC) the regulatory body in charge of communication.

Later, the Global System Mobile Telephone providers like MTN, Econet which later transformed into VMobile and later Celtel through acquisition and

Globacom were all licensed to operate as a network provider in Nigeria. These are all wireless network providers.

Among MTN, VMobile( Celtel) and Globacom network providers, the MTN has the highest network coverage of Nigeria with the number of subscribers running into millions. Virtually all cities and towns are covered by these providers. Recently, fixed wireless network providers like Starcomms, multilinks etc were being licensed to increase competition and growth which has improved the telecommunication sector. Appraisal of these providers testifies to the living style and condition of common man as it has reduced unemployment considerably.

## **1.2 AIMS AND OBJECTIVE OF THE STUDY**

The aims and objective of the proposed system are as follows:

1. To maintain information database of telephone subscribers.
2. To show the rate of subscription, services and preferences
3. To generate Entity-Relation model together with Relational model
4. To show the relationships among entities
5. To show naturalization of the entity schema.

## **1.3 SIGNIFICANCE OF THE STUDY**

The information system of telephone subscribers is a veritable tool that can aid decision making. It shows the importance with much emphasis on the various use that it can be put to by Statistical bodies or agencies for national planning,

communication commission and the technological development yardstick in communication. Also, the sector's achievements also contribute to national growth.

#### **1.4 SCOPE OF THE STUDY**

The project is limited to maintaining a database of telephone subscribers of Nigeria. Though there are other areas of research but this research work centres on three major network providers which are Celtel(VMobile), Globacomm and MTN

#### **1.5 LIMITATION**

The following contributed as limitation to this project research:

- (i) Time Constraints: The period given to undertake this project was not enough to accomplish all required and even for expanding the scope.
- (ii) Funds: This constraint is also a major setback
- (iii) Insufficient literature/materials: There were limited or insufficient literatures on the project topic.

## **CHAPTER TWO**

### **2.0 LITERATURE REVIEW**

Information system is a collection of people, machines, data and methods organized to accomplish specific functions and to solve specific problems.

Programming is part of the process of designing, implementing and managing an information system (Beekman(2001)). Also, he stated that information system is the computerized system that includes procedures for collecting data, a database for storing data and producing a variety of reports for different levels of management (Beekman(2001))

Lucas (1976) states that information system is a set of organized procedures which is followed to provide a desired output. Information system entails procedures for collecting, analyzing, storing and processing of data to produce various reports from queries run on the database using criteria for immediate decision making.

### **2.1 INFORMATION SYSTEM OF TELEPHONE SUBSCRIBERS**

This can be defined as a computerized system that includes procedures for collecting, maintaining, analysing a telephone database of subscribers and querying the database to generate various reports for the management of the telephone network.

## 2.2 SUBSCRIBER

A subscriber is a person, a person is a subscriber who is provided network services like calling and texting i.e short message service (sms). The subscriber owns a telephone line and is being served by a provider. The provider assigns a unique number to a subscriber and maintains a database of services provided to the subscriber. The subscriber resides in a country which the country's code in dialling must be used within and outside the country the user resides. There are various services / options that providers roll out but the best option is selected by a subscriber.

Subscribers' details and particulars are maintained in a database called directory. This directory is self explanatory in terms of name, address, city and state of telephone subscribers together with the telephone number for easy referencing, identification and location of a particular subscriber.

The subscriber also maintains an account with her provider for all telephone communication services provided to a subscriber. This account is used in billing the subscriber. The billing pattern differs from one provider to another depending on the type of option of services selected or chosen by the subscriber.

In the numbering plan, subscribers are allocated unique national number to gain access to telephone system. The numbering area covers a part of the country in which a trunk code (or area code) has been allocated and within the area only the directory numbers are dialled.

## 2.3 RIGHTS OF SUBSCRIBERS

Regulations give telephone subscribers rights with respect to the inclusion of their personal details in telephone directories. The increasing competitiveness in the telecommunications market place means that many service providers may wish to publish directories of, and provide Direct Enquiry (DO) services relating to subscriber. It is however expected that the regulation be uniformly applied to ensure that subscribers' rights are respected and the service providers are operating within an equivalent environment.

The European Communities Directive on Privacy and Electronic Communications Ordinance 2004 states in the legislative regulation that "this applies in relation to a directory of subscribers whether in printed or electronic form, which is made available to members of the public included by means of a directory enquiry service. The personal data of an individual subscriber shall not be included in a directory unless that subscriber has, free of charge been:

- (i) informed of the purposes of the directory in which his personal data are to be included
- (ii) given the opportunity to determine whether such of his personal data are considered relevant by the producer of the directory to be included in the directory
- (iii) given an expressed consent of the subscriber to the inclusion of his data in a directory

- (iv) data relating to a corporate subscriber shall not be included in a directory
- (v) where data of a subscriber have been included in a directory, the subscriber shall without charge, be able to verify , correct or withdraw those data at any time”

Normally, the ‘collector’ of the personal details of the subscriber is the organisation that provides the relevant telecommunication services. A subscriber should expect that the service provider should:

- (i) advise them that their name and installation address would normally be included in a directory and disclosed to the Directory enquiry service;
- (ii) offer the option to change those details, with the warning that an incomplete address may limit the effectiveness of the DO service in finding them.
- (iii) Offer the option (free of charge) to be ex-directory in which case no details would be disclosed for directory production or DO purposes.

## **2.4 SUBSCRIBER NUMBER**

The subscriber number is that part of the National (significant) number which follows the area code. It identifies the subscriber inside this numbering area. By adding the area code, the numbering becomes unique inside Nigeria and forms the National Number. The combination of these national numbers with the country code identifies the subscriber unambiguously all over the world.

The subscriber number for fixed line consist of the trunk code and the subscriber telephone number.

The maximum length of the national number is limited to 8 digits for Nigeria in the present 11 – n numbering plan formats.

## **2.5 PROVIDER/OPERATOR**

The provider is the network services provides what serves the subscribes with her telecommunication services. The provides has so many services and option from which the subscribes choose or select from each provides ensures attractive and competitive services to subscribers to woo them like promo.

The provider provides unique number to the subscriber which can be accented or dialled within the country. Also, the provider can also permit roaming services for subscriber to have unlimited network accent even when not n local area.

The provider has some obligatory responsibilities

They are:

- (i) The service provides must give both corporate and individual subscribers the opportunity to have their personal details included in a subscriber directory
- (ii) The provides should make it clear to the subscriber that being included in a directory means that
  - Their names and address details will be included in the alphabetical section (and a numerical section if produced of the printed directory).
  - Their name and address will be disclosed for direct enquiry

The subscribers account status / database is maintained by the providers. For every call or transaction made, the status, time, type of calls are all outlined and appropriate bill is computed based on the tariff rate and type of option the subscriber chooses be it prepaid, post paid or roaming ( for outside territorial network service )

The major providers that are considered are:

- (i) MTN
- (ii) CELTEL (Vmobile)
- (iii) Globacom.

These providers are global system mobile telecommunication network providers of services like telephone calls, SMS etc.

The providers connect the subscriber to herself or other networks . For example, the subscriber of MTN of 0803 / 0806 codes, Celtel has 0802 and 0808 , Globacom has 0805 and 0807 and MTEL has 0804 codes, can access by calling or texting other subscriber in the same network or another.

The provider is saddled with the responsibility of charging the caller (subscriber) and not the receiver in the same network or other network.

The provider permits the subscriber to enjoy her network services provided the subscribers account according to option of services selected can accommodate the services to be provided . The subscribers account in recharge vouchers, range from

one hundred, two hundred, four hundred, 500, 750, 1000 and 1500 denomination / worth of credit card for affordability of subscribers.

Also, the provider (operator) observes the subscribers habit in terms of local calls, international calls and no of SMS text made.

The number / statistics of these habits of subscribers are maintained and being used in the billiard of the subscriber for each service provided.

The rates of local calls are quite different from that of international calls. It is expected that subscriber must ensure a minimum balance for international calls to be made. Even, a local call is expected to have a minimum balance.

Operators sms billing method vary from one operator to another some have relatively cheap sms within its network while to another network is not cheap compared to another network.

All these competition are healthy rivalry in business as it ensures to co- operation and improvement of services to teeming subscribers.

Deregulation of the telecommunication industry made operator services to be competitive and so forced the rate of telephoning down as opposed to apprehensive of inflated rate.

## **2.6 USER**

The user is the person that can use the directory of telephone subscribers.

The person can be a subscriber or not infact he / she can be staff of the operator.

The directory is searched by using either the first name or last name or telephone number. The directory is not limited to an operator but universal in which a roaming subscriber can use for accenting another person or the directory.

## **2.7 OPERATOR OPTIONS**

There are various options available to subscriber depending on his / her choice.

These are

(i) Pre- paid: This is an option to be selected by a subscriber if so desired. The option ensures an account balance to be maintained for network services to be provided for the subscriber. The pre – paid option is rechargeable with rechargeable vouchers that are loaded and increases the subscribers' credit balance.

The pre- paid recharge cards are of different worth of naira ranging from # 100 #200, 500, 750.00, 1000 and #1,500. depending on the purchasing strength of the subscriber.

### **2.7.1 PAY AFTER SERVICE**

This is an option that is open to subscriber to select. This option entails payment of services rendered at an agreed date and time where the bill for the period under review is given according to the number of both local and international calls, sms and other network services provided. Few subscribers use this option as the operator would prefer the pre-paid option to this. Flexibility is inevitable because of the competitive structures on ground in the telecommunication sector of the economy.

## **2.7.2 ROAMING**

This is an option that the user requests from the operator for him / her to call and be called from anywhere in the globe. Definitely, this service rate is quite different and may cost a little higher than both local and international calls. This option ensures connectivity at all times regardless of moving from one country to another or from one zone to another.

The provider of the subscriber calling is responsible for the calculation of bill, status and necessary documentation of the roaming services rendered. The cost of a call is determined by each provider based on the geographical zoning of countries. A zone groups a set of countries.

Also, a global telephone directory is provided referencing all subscribers irrespective of their provider, country or zones. There is a serial number in the directory so as to facilitate searching when the need arises. The telephone directory is open to all users who are not necessarily a subscriber. Users / persons may not be a subscriber because he / she may use another person's telephone line.

## **2.8 ELECTRONIC ON-LINE SUBSCRIBER TELEPHONE DIRECTORY**

This is a compact telephone directory system that integrates a subscriber's telephone with a local on-line telephone directory database system and with a central directory service provider that maintains the local on-line telephone directory database.

The telephone directory database system comprises an electronically stored equivalent of a telephone book. The telephone directory database can, for example store local residential directories, local business directories, local and federal government directories and a user specific directory. The user specific directory contains telephone numbers and other information that is particular to a subscriber or a group of subscribers as in the case of business. This information can be grouped into various lists as determined by the subscriber. All other directories excluding the user specific directory are maintained by a Central Telephone Directory Service Provider (CTDSP), which downloads the directories to the subscriber's telephone.

## **2.9 SYSTEM AND METHOD OF PROVIDING ON-LINE DIRECTORY SERVICE**

An on-line directory service includes a server associated with a database containing a plurality of directory listings including advertising information. A customer subscribing to the on-line directory service may selectively view directory listings from the database by initiating a search research at a personal computer linked with the server. The search request may specify a particular service or a product, a particular geographical preference or other search parameters. The search request is then forwarded to the server which accesses the database and retrieves the responsive information for the customer.

To place a telephone call to a service provider listed in response to the customer search request, the customer merely activates a telephone icon associated with the selected service provider from the database and automatically dials the telephone.

## **2.10 TELEPHONE CONTROL SYSTEM THAT CONNECTS CALLER WITH SUBSCRIBER**

A communications control system is disclosed which includes a computer together with means for storing a schedule for subscribers of the system, the schedule including time and call processing information for the subscriber which indicate at least one call processing mode and at least one time call for subscriber to telephone calls processed via the system, a switch controlled by computer, a communication network for connecting a call from a caller to one or more points on the network, a two-way communication apparatus for communicating with the computer being programmed to control the switch to connect the caller in response to a telephone call placed by the caller to one or more points on the network selected by the computer information supplied to the computer by the schedule.

## **2.11 DATA TRANSMISSION SYSTEM BETWEEN TELEPHONE SUBSCRIBER LOCATION AND TELEPHONE EXCHANGE LOCATION.**

An electrical transmission system employs a telephone line to transmit data equipment when the telephone line is idle. A first idle line operable to connect the line to the subscriber equipment when the line is idle and to disconnect the line from the subscriber equipment when the line is busy.

A second idle line sensing means in associated with the exchange data equipment and in operable to connect the line to the exchange equipment when the line idle and into disconnect the line from exchange equipment when the line is busy.

## **2.12 METHOD AND APPARATUS FOR PROVIDING TELEPHONE CALL CONTROL AND INFORMATION**

Telephone call management is provided via a computer network (web) facility which can be remotely accessed by subscribers using web browser. The web facility include an information database for storing personal telephone directives and call logs, and a telephone call control system coupled to a telephone switch via a switch computer interface.

Information on calls to and or from telephone number of subscribers is communicated from the switch to the web facility to be stored in the database without requiring the subscriber to be active. Subscribers can make telephone calls and control telephone communications via the browsers and the web facility. Subscribers do not require any hardware or software in addition to a telephone and web browser.

## **2.13 TELEPHONE ACCESSIBLE INFORMATION SYSTEM.**

A traffic information system which in directly accessed by individual subscriber by telephone or computer wherein the subscriber will have the option of

receiving reports of updated information by way of telephone, mobile telephone , personal computer or personalised pager. The system provides information concerning the current status of traffic condition along specific commuter routing and / or other information which may be of interest to a subscriber. On subscriber's demand, the system continuously monitors selected routings or other information and automatically provides the subscriber with updated information concerning changes in status.

#### **2.14 TELEPHONE ACCESS INFORMATION SERVICE DISTRIBUTION SYSTEM**

A digital interactive communication system designed to provide a plurality of remote subscriber with any one of a variety of stored information service software packages through the use of a home computing assembly maintained within the subscriber's home and structured to display video as well as generating audio on a standard television receiver. A bi-directional communication link is established over telephone lines between the home computing assembly and a central remote information storage centre wherein a selected one of the variety of information services is transmitted as a modulated carrier to the subscriber. Information service selection is controlled by a remote information storage centre executive software program.

Automatic billing is performed by computing equipment maintained in the remote information storage centre and transmitted to a headquarter which also

receives diagnostic messages associated with the remote information centre and the associated plurality.

## **2.15 BILLING SYSTEM FOR TELEPHONE SIGNALLING NETWORK**

This is a billing system for use in a telephone signalling network. The network comprising offices through which telephone calls can be routed, each office being owned by a telephone company that participates in the network. Each office includes a signalling point (SP) that includes means for formulating message signalling units.

A message signalling unit may comprise a query requesting a call data pertinent to a particular call. The network also includes signal transfer points(STP) for receiving and routing the message signalling unit and plurality of service control points each being linked to one another. Each service control points comprise a database that includes call data provided by one or more of the participating telephone companies. The billing system includes means for capturing at least a portion of the message signal units received by one or more signal transfer points.

## **CHAPTER THREE**

### **3.0 OVERVIEW OF DATA MODELLING**

A data model is a conceptual representation of the data structures that are required by a database. The data structure includes data objects, the associations between data objects, and the rules which govern operations on the objects. As the name implies, the data model focuses on the what data is required and how it should be organised rather than what operations will be performed on the data. Illustratively, the data model is equivalent to an architect's building plan.

### **3.1 IMPORTANCE OF DATA MODELLING**

Data modelling is probably the most labour intensive and time consuming part of the development process. The goal of the data modelling is to make sure that all data objects required by the database are completely and accurately represented. Since the data model uses easily understood notations and natural language, it can be reviewed and verified as correct by the end users. However, it gives an insight to what the final database will look like.

Also, the data model is detailed enough to be used by the database developer as a "blueprint" for building the physical database. The information contained in the data model will be used to define the relational tables, primary and foreign keys, and stored procedures.

### **3.2 METHODOLOGY**

There are basically two methodologies used in creating data model. The Entity- Relational model and Object model(Relational model)

### **3.3 DATA MODELLING IN DATABASE DESIGN CONTEXT**

Database is defined as “the designing of logical and physical structure of one or more databases to accommodate the information needs of the uses in an organization for a defined set of applications”

Designing entails five steps, namely:

1. Planning
2. Conceptual design
3. Logical design
4. Physical design and
5. Implementation.

Summarily, a data model is a plan for building a database. To be effective, it has to be simple enough to communicate to the end users the data structures required by the database yet detailed enough for the database design to use to create the physical structure.

### **3.4 OVERVIEW OF ENTITY RELATIONAL (ER)MODEL**

The Entity-Relational (ER) model was proposed by Peter in 1976 as a way to unify the network and relational database views. It is a conceptual data model that views the real world as entities and relationships. A basic

component of the model is the Entity-Relation Diagram which is used to visually represent data objects.

### **3.5 ACCEPTABILITY OF ENTITY RELATIONAL MODEL**

The following reasons show why Entity-Relation (ER) model is generally accepted in the database design:

1. It maps well to the Relational model. The construct used in the ER model can easily be transformed to relational tables.
2. It is simple and easy to understand with a minimum training. This necessitate easy communication to the end users
3. It can be used as a design plan by the database developer to implement a data model in specific database management software.

### **3.6 BASIC COMPONENTS OF ENTITY-RELATION (E-R) MODEL**

The ER model views the real world as a construct of entities and association between the entities.

#### **3.6.1 ENTITIES**

Entities are the principal data object about which an information is to be collected. They are usually recognizable concepts, either concrete or abstract, such as person, places things or events which have relevance to the database. Specific examples are EMPLOYEES, PROJECTS etc. Entities are \classified as independent (entity that does not rely on another for identification) or dependent (one that relies on another for identification).

### **3.6.2 RELATIONSHIPS**

A relationship represents an association between two or more entities for example projects have subtasks, department manages one or more projects.

### **3.6.3 ATTRIBUTES**

Attributes describe the entity of which they are associated. A particular instance of an attribute is a value. For example, "Taye Olayemi" is a value of the attribute name. Attributes are classified as identifiers or descriptors. Identifiers commonly called keys, uniquely identify an instance of an entity: A descriptor describes a non-unique characteristics of an entity. Classification of Relationships extends to degree, connectivity, cardinality, direction, type and existence. Not all methodologies use all these classifications.

### **3.6.4 DEGREE OF A RELATIONSHIP**

The degree of a relationship is the number of entities associated with the relationship. The n-ary relationship is the general form for degree n. The Binary relationship, the association between two entities is the most common type in the real world.

### 3.6.5 CONNECTIVITY AND CARDINALITY

The connectivity of a relationship describes the mapping of associated entity instances in the relationship. The values of connectivity are “one” or “many”. The cardinality of a relationship is the actual number of related occurrences for each of the two entities.

**One –to –one (1:1)** relationship is when at most one instance of entity A is associated with one instance of entity B .For example, one Registrar to one office of the Registrar.

**One – to – many (1:N)** relationships is when for one instance of entity A, there are zero, one or many instances of B. For example, an employee is assigned to a department.

**Many- to – many (M:N)** relationship sometimes called non-specific is when for one instance of entity A, there are zero, one or many instances of entity B and for one instance of entity B, there are zero, one or many instances of entity A.For example, employees can be assigned to more than two projects .

### 3.6.6 DIRECTION

The direction of a relationship indicates the originating entity of a binary relationship. The entity from which a relationship originates is the parent -entity while the entity where the relationship terminates id the child entity.

The direction of a relationship is determined by its connectivity. In a one-to-one relationship, the direction is from independent entity to dependent entity. With one-to-many relationship, the entity occurring once is the parent. The direction of many-to-many relationship is arbitrary.

### **3.6.7 TYPE**

An identifying relationship is one in which one of the child entities is also a dependent entity. A non-identifying relationship is one in which both entities are independent.

### **3.6.8 EXISTENCE**

Existence denotes whether the existence of an entity instance is dependent upon the existence of another related entity instance. The existence of an entity in a relationship is defined as either mandatory or optional. If an instance of an entity must always occur for an entity to be included in a relationship, then it is mandatory. If the instance of an entity is not required, it is optional.

## **3.7 ENTITY-RELATION (E-R) NOTATION**

There is no standard for representing data objects in ER diagrams. All notational styles represent entities as rectangular boxes and relationships as lines connecting boxes. The basic ER constructs are:

1. Entities are represented by labelled rectangles. The label is the name of the entity which should be singular nouns

2. Relationships are represented by a solid line connecting two entities.  
The name of the relationship is written above the line. Relationship names are verbs
3. Attributes, when included, are listed inside the entity rectangle.  
Attributes that are identifiers are underlined. Attribute names should be singular noun.
4. Cardinality of many is represented by a line ending with a crow's foot. If the foot is omitted, the cardinality is one.
5. Existence is represented by placing a circle or a perpendicular bar on the line.

### **3.9 STEPS IN BUILDING A DATA MODEL**

There is no standard process of listing and defining ER model constructs. Bottom-up development process may be used. Basically, the following steps are taken into consideration when building a data model.

1. Identify data objects and relationships
2. Draft the initial ER diagram with entities and relationships
3. Refine the ER diagram
4. Add key attributes to the diagram
5. Add non-key attributes
6. Diagramming generalization hierarchies
7. Validating the model through normalization

8. Add business and integrity rules to the model.

### **3.10 OVERVIEW OF RELATIONAL MODEL**

The relational model was introduced in 1970 and has since evolved through series of writing. The model provides a simple yet rigorously defined concept of how users perceive data. The relational model represents data in the form of two-dimension tables. Each table represent a real world person, place, thing or event about which information is collected.

A relational database is a collection of two-dimensional tables. The organization of data into relational tables is known as the logical view of the database. The way the database software physically stores the data on a computer disk is called the internal view. A basic understanding of the relational model is necessary to effectively use relational database software such as oracle, Microsoft SQL Server or even personal database system such as Access or Fox which are based on the relational model.

#### **3.10.1 DATA STRUCTURE AND TERMINOLOGY**

In a relational model, a database is a collection or relational tables. A relational table is a flat file composed of a set of named columns and arbitrary number of unnamed rows. The columns of the table contain information about the table. The rows or the table represent occurrences of the “thing” represented by the table. A data value is stored in the intersection of the of a row and column.

## Terminology

s/n	Relation model	Formal terms	Database conventional name
1	Relational Table	Relation	Table
2	Column	Attribute	Field
3	Row	Tuple	Record

### 3.11 RELATIONAL NOTATION

Relational tables can be expressed concisely by showing just the table name and the column names. For example

AUTHOR (au\_id, au\_lname, au\_fname, address, city, state, zip)

TITLE (title\_id, title, type, price, pub\_id)

PUBLISHER (pub\_id, pub\_name, city)

AUTHOR\_TITLE (au\_id, title\_id)

### 3.12 PROPERTIES OF RELATIONAL TABLES

The properties of relational tables are as follows:

1. Values are atomic:- This means columns in a relational table are not repeating group or array. This is important because it is one of cornerstones of relational model
2. Column values are of the same kind:- This means that all values in a column come from the same domain . A domain is a set of values which a column may have. This property simplifies data access

because developers and users can be certain of the type of data contained in a given column.

3. Each row is unique:- This ensures that no two rows in a relational table are identical; there is at least one column, or set of columns that uniquely identify each row in the table.
4. The sequence of column is insignificant:- This states that the ordering of columns in the relational table has no meaning. Columns could be retrieved in any sequence.
5. The sequence of rows is insignificant:- This is analogous to the one above but applies to the row instead of columns. The main benefit is that the rows of a relational table can be retrieved in different order and sequence.
6. Each column has a unique name:- Columns are referenced by name and not by position. In general, a column name need not be unique within an entire database but only within the table it belongs.
7. Relationships and keys:- A relationship is an association between two or more tables.

A primary key is a column or columns in a table whose values uniquely identify each row in a table.

A foreign key is a column or columns whose values are the same as the primary key of another table.

### **3.13 IDENTIFYING DATA OBJECTS AND RELATIONSHIPS**

In order to begin constructing the basic model, the following requirement analysis must be considered:

1. classify data objects as either entities or attributes
2. identify and defining relationships between entities
3. naming and defining identified entities, attributes, and relationships
4. documenting this information in the data document.

### **3.14 NORMALIZATION**

Normalization is a design technique that is widely used as a guide in designing relational databases. Normalization is essentially a two step process that puts data into tabular form by removing repeating groups and then removes duplicated data from the relational tables. There are five normalization forms.

### **3.15 ENTITY RELATIONAL MODEL OF TELEPHONE**

#### **SUBSCRIBERS**

The explanation goes thus on how Entity Relation model came about and then the Relation model as shown in figs.1 2 and 3.

### **3.16 DISCUSSION**

#### **3.16.1 SUBSCRIBER**

A subscriber is a person and a person is a subscriber but not every person is a subscriber because a person can make use of another person's

telephone. A person can own or may not own a telephone number (user). A person can call a person i.e a person can reference himself or herself. Since a person can be a subscriber or not the person can own one or many telephone numbers.

More so, a person can subscribe to zero or many options depending on if the person has a telephone number or not, and the number of telephone numbers he / she has. Also, he / she may or may not use a directory. A person can have one or many accounts depending on if the person has a telephone number and the number of telephone number he / she has.

A person will reside in one and only one country.

### **3.16.2 TELEPHONE NUMBER**

A telephone number will be in one and only directory since the directory is universal. A telephone number can be owned by one and only one person.

A telephone number can have one and only one option (prepaid, post-paid and roaming)

### **3.16.3 OPTIONS**

An option can be for one or many telephone numbers. An option may be subscribed for by one or may persons.

### **3.16.4 DIRECTORY**

The directory will contain one or many telephone numbers and the directory can be referenced by one or many persons.

### **3.16.5 ZONE**

A zone contains one or many countries.

### **3.16.6 COUNTRY**

A country will belong to one and only one zone

### **3.16.7 ACCOUNT**

A person can have zero or many accounts depending on if the person is a subscriber or not and if the person has more than one telephone numbers.

### **3.16.8 CODE**

A code belongs to one and only one provider. The code is used to distinguish the providers or operators from one another.

### **3.16.9 SERVICES**

A service can be provided by one or many providers. The service can also be on one or many telephone numbers. Services like sms, local and international calls are provided by providers / operators.

### **3.16.10 PROVIDER**

A provider will have one or many codes and will provide one or many services. A provider can connect one or many providers including itself and can serve one or many persons.

## **CHAPTER FOUR**

### **4.0 INTRODUCTION**

Up until recently, scripting on the internet was something which very few people even attempted, let alone mastered. Recently though, more and more people have been building their own websites and scripting languages have become more important. Because of this, scripting languages are becoming easier to learn and PHP is one of the easiest and most powerful yet

### **4.1 WHAT IS PHP?**

PHP stands for Hypertext Preprocessor and is a server-side language. This means that the script is run on your web server, not on the user's browser, so you do not need to worry about compatibility issues. PHP is relatively new (compared to languages such as Perl (CGI) and Java) but is quickly becoming one of the most popular scripting languages on the internet.

### **4.2 WHY PHP?**

One may be wondering why you should choose PHP over other languages such as Perl or even why you should learn a scripting language at all. I will deal with learning scripting languages first. Learning a scripting language, or even understanding one, can open up huge new possibilities for your website. Although you can download pre-made scripts from sites like Hotscripts, these will often contain advertising for the author or will not do

exactly what you want. With an understanding of a scripting language you can easily edit these scripts to do what you want, or even create your own scripts.

Using scripts on your website allows you to add many new 'interactive' features like feedback forms, guest books, message boards, counters and even more advanced features like portal systems, content management, advertising managers etc. With these sort of things on your website you will find that it gives a more professional image. As well as this, anyone wanting to work in the site development industry will find that it is much easier to get a job if they know a scripting language.

### **4.3 REQUIREMENT**

As mentioned earlier, PHP is a server-side scripting language. This means that, although your users will not need to install new software, your web host will need to have PHP set up on their server. It should be listed as part of your package but if you don't know if it is installed you can find out using the first script in this tutorial. If your server does not support PHP you can ask your web host to install it for you as it is free to download and install. If you need a low cost web host which supports PHP I would recommend HostRocket.

### **4.4 WRITING PHP**

Writing PHP on your computer is actually very simple. You don't need any

special software, except for a text editor (like Notepad in Windows). Run this and you are ready to write your first PHP script.

#### **4.5 DECLARING PHP**

PHP scripts are always enclosed in between two PHP tags. This tells your server to parse the information between them as PHP. The three different forms are as follows:

```
<?
```

```
PHP Code In Here
```

```
?>
```

```
<?php
```

```
PHP Code In Here
```

```
php?>
```

```
<script language="php">
```

```
PHP Code In Here
```

```
</script>
```

#### **4.6 MYSQL**

**MySQL** (pronounced /m•••s kju••l/) is a multithreaded, multi-user SQL database management system (DBMS) which has, according to MySQL AB, more than 10 million installations. MySQL is owned and sponsored by a single for-profit firm, the Swedish company MySQL AB, which holds the

copyright to most of the codebase. This is similar to the JBoss model and how the Free Software Foundation handles copyright in its projects, and dissimilar to how the Apache project does it, where the software is developed by a public community and the copyright to the codebase is owned by its individual authors. The company develops and maintains the system, selling support and service contracts, as well as proprietary-licensed copies of MySQL, and employing people all over the world who collaborate via the Internet. MySQL AB was founded by David Axmark, Allan Larsson, and Michael "Monty" Widenius. The CEO is Mårten Mickos. The MySQL company also sells another DBMS, MaxDB, which is from an unrelated codebase.

#### **4.6.1 PROGRAMMING LANGUAGES**

Libraries for accessing MySQL databases are available in all major programming languages with language-specific APIs. In addition, an ODBC interface called MyODBC allows additional programming languages that support the ODBC interface to communicate with a MySQL database, such as ASP or Coldfusion. The MySQL server and official libraries are mostly implemented in ANSI C.

## **4.7 USES**

MySQL is popular for web applications and acts as the database component of the LAMP, MAMP, and WAMP platforms (Linux/Mac/Windows-Apache-MySQL-PHP/Perl/Python), and for open-source bug tracking tools like Bugzilla. Its popularity as a web application is closely tied to the popularity of PHP, which is often combined with MySQL. PHP and MySQL are essential components for running the popular WordPress blogging platform. Wikipedia runs on MediaWiki software, which also uses PHP and a MySQL database.

## **4.8 DOCUMENTATION AND ADMINISTRATION**

Information on using MySQL can be found on the company's site, under their Documentation section. There are also many books written about MySQL. To administer MySQL databases one can use the included command-line tool (commands: `mysql` and `mysqladmin`). Also downloadable from the MySQL site are GUI administration tools: MySQL Administrator and MySQL Query Browser. Both of the GUI tools are now included in one package called MySQL GUI Tools.

In addition to the above mentioned tools developed by MySQL AB, there are several other commercial and non-commercial tools available.

## **4.7 USES**

MySQL is popular for web applications and acts as the database component of the LAMP, MAMP, and WAMP platforms (Linux/Mac/Windows-Apache-MySQL-PHP/Perl/Python), and for open-source bug tracking tools like Bugzilla. Its popularity as a web application is closely tied to the popularity of PHP, which is often combined with MySQL. PHP and MySQL are essential components for running the popular WordPress blogging platform. Wikipedia runs on MediaWiki software, which also uses PHP and a MySQL database.

## **4.8 DOCUMENTATION AND ADMINISTRATION**

Information on using MySQL can be found on the company's site, under their Documentation section. There are also many books written about MySQL. To administer MySQL databases one can use the included command-line tool (commands: `mysql` and `mysqladmin`). Also downloadable from the MySQL site are GUI administration tools: MySQL Administrator and MySQL Query Browser. Both of the GUI tools are now included in one package called MySQL GUI Tools.

In addition to the above mentioned tools developed by MySQL AB, there are several other commercial and non-commercial tools available.

PhpMyAdmin is a free software webbased administration interface implemented in PHP.

MySQL works on many different platforms—including AIX, BSDi, FreeBSD, HP-UX, GNU/Linux, Mac OS X, NetBSD, Novell NetWare, OpenBSD, OS/2 Warp, QNX, SGI IRIX, Solaris, SunOS, SCO OpenServer, SCO UnixWare, Tru64, Windows 95, Windows 98, Windows ME, Windows NT, Windows 2000, Windows XP and Windows Vista.

The MySQL Enterprise Server is released once per month, but the binaries are not publicly available from the download pages. The sources can be obtained under the GPL from MySQL's FTP server[1] and all patches for bug fixes are immediately available from the public MySQL BitKeeper repositories. The MySQL Community Server is published on an unspecified schedule under the GPL and contains all bug fixes that were shipped with the last MySQL Enterprise Server release. Binaries are no longer provided for every release of the Community Server.

MySQL is written in C and C++. The SQL parser uses yacc and home-brewed lexer. A document describing some of the internal structures of the code and the coding guidelines is available from the MySQL web site<sup>[8]</sup>

MySQL is a relational database.

In a relational structured database there are tables that store data. Each table is made up of columns and rows. A table's columns define what kind of information is going to be stored. You need an individual column for each type of information you wished to store (i.e. Age, Weight, Height).

While columns define what kind of information is going to be stored, a row is the actual data that is stored. Each table row is an entry of that table and contains values for each of the table's columns (i.e. Entry Bob: 65 years old, 165 lbs, and 6'2"). If all this relational database talk is confusing, do not despair, we talk about and show a few table examples in future lessons.

#### **4.8.1 MYSQL COMMAND LINE**

If you are an old-school programmer that has no need for a graphical user interface then you can simply use any command line interface to execute MySQL queries. For those of you with MySQL installed on your Microsoft Windows operating system you can reach the command line by going to the Start Menu and choose "Run...". Type the keyword "cmd" into the text field and press Enter to launch Window's command line interface.

## 4.8.2 MYSQL GUI

With so many free MySQL administration tools available , many developers favor these free Graphical User Interfaces over the command line. The popular options include:

phpMyAdmin - A popular web interface that is included with almost every type of Shared, Virtual or Dedicated hosting solution.

MySQL Administrator - A powerful tool developed by the folks at MySQL.com

Navicat - A purchasable MySQL admin tools for Windows, Mac and Linux

## 4.8.3 MYSQL PHPMYADMIN

Also contained with most hosting services is phpMyAdmin. This tool will allow you to view all the MySQL database, tables, and entries, as well as perform SQL queries remotely through a web browser.

Although we will be teaching how to create databases, tables and all other MySQL tasks through PHP, we encourage you to learn about phpMyAdmin. Its easy to use interface will literally save you hours of time.

## CHAPTER FIVE

### 5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 5.1 SUMMARY

The information database of subscribers helps in determining the type, the number and modes together with the rates of subscription of subscribers. The inter-relationships among network providers can not be thrown away. Subscribers and even persons that are not subscribers do call (be it local or international), send texts etc. It is however required that services rendered by network providers / operators be functionally dependent of the satisfactions of the users and subscribers.

From the Entity diagram, it is shown that there are relationships that exist among the entities which are all functional characteristics of the whole Entity-Relational model. The instances are the real world concept of the various associations and degree of relationships that abound in telecommunication network environment.

Information system of telephone subscribers is a necessary or veritable tool to be used in judging the performance of the Global System Mobile Telecommunication industry.

## **5.2 CONCLUSION**

The importance of the information system can not be over-emphasized because of the benefits that are derivable from maintaining such a database. Precisely, the options rolled out by the GSM providers or operators are making a healthy competition towards the satisfaction of the subscribers.

The relative connectivity enjoyed by subscribers from one network to another is also a breakthrough in the telecommunication industry which must be improved upon.

The database of subscribers together with associated information shows the level of standard of telecommunication and the areas of improvements of the sector being keenly supervised or monitored by Nigeria Communications Commission (NCC)

## **5.3 RECOMMENDATION**

It is however recommended as follows:

- (i) Satisfaction of the subscribers or users should be improved upon by the network providers.
- (ii) The NCC should be all-encompassing in monitoring the activities, rates of billing together with standard of services rendered.
- (iii) The tariffs of services should be reduced to achieve some goals.
- (iv) The user-friendly services should be extended and maintained.

- (v) Government should formulate policies to better the lives of users especially in the telecommunication industry by introducing incentives for healthy competition.
- (vi) Government's policy on telecommunication for all should be pursued vigorously.

## REFERENCES

- Beekman George(2001): Computer Confluence:Exploring Tomorrow's  
Technology: 2nd Edition Prentice Hall New Jersey
- Bolarin Gbolahan(2006): Entity and Relational Model  
Unpublished lecture note Federal University of  
Technology(FUT) Minna Nigeria
- Lucas H.C(1976): Analysis, Design and Implementation of  
Information System: McGraw Hill Kogakusha,  
New York
- Zago Abdullahi(2004): Practical Computer Science  
Akan Communication Publishers, Ibadan

## WEBSITES

[www.dataprotection.gov](http://www.dataprotection.gov)

[www.google.com](http://www.google.com)

PHP/MSQL: Tutorials

PHP:MySQL Function manual

[www.sandiego.edu/usdlaw/doc](http://www.sandiego.edu/usdlaw/doc)

[www.nccgov.ng](http://www.nccgov.ng)

[www.wikipedia.org](http://www.wikipedia.org)



## Relations are presented below

PERSON(Person No, Fname, Lname, Country Name, Option Id, Serial No)  
PROVIDER(Provider Id)  
CODE(Code No, Provide Id)  
COUNTRY(Country Name, Zone No)  
ZONE(Zone No)  
OPTION(Option Id)  
TELEPHONE(Telephone No, Person No, Serial No)  
DIRECTORY(Serial No)  
ACCOUNT(Account No, Person No)  
SERVICE(Service Id)  
PROVIDES(Provider Id, Service Id, Rate)  
CONNECTS(Provider Id, Connects)  
SERVES(Person No, Provider No)  
CALLS(Person No, Calls, Call Serial No, Duration)

```
graph TD; PERSON[PERSON] --> PROVIDER[PROVIDER]; PERSON --> COUNTRY[COUNTRY]; PERSON --> ZONE[ZONE]; PERSON --> OPTION[OPTION]; TELEPHONE[TELEPHONE] --> PERSON; TELEPHONE --> SERIAL[Serial No]; DIRECTORY[DIRECTORY] --> SERIAL; ACCOUNT[ACCOUNT] --> PERSON; SERVICE[SERVICE] --> PROVIDES[PROVIDES]; PROVIDES --> PROVIDER; PROVIDES --> SERVICE[SERVICE]; CONNECTS[CONNECTS] --> PROVIDER; SERVES[SERVES] --> PERSON; SERVES --> PROVIDER[Provider No]; CALLS[CALLS] --> PERSON; CALLS --> SERIAL[Call Serial No];
```



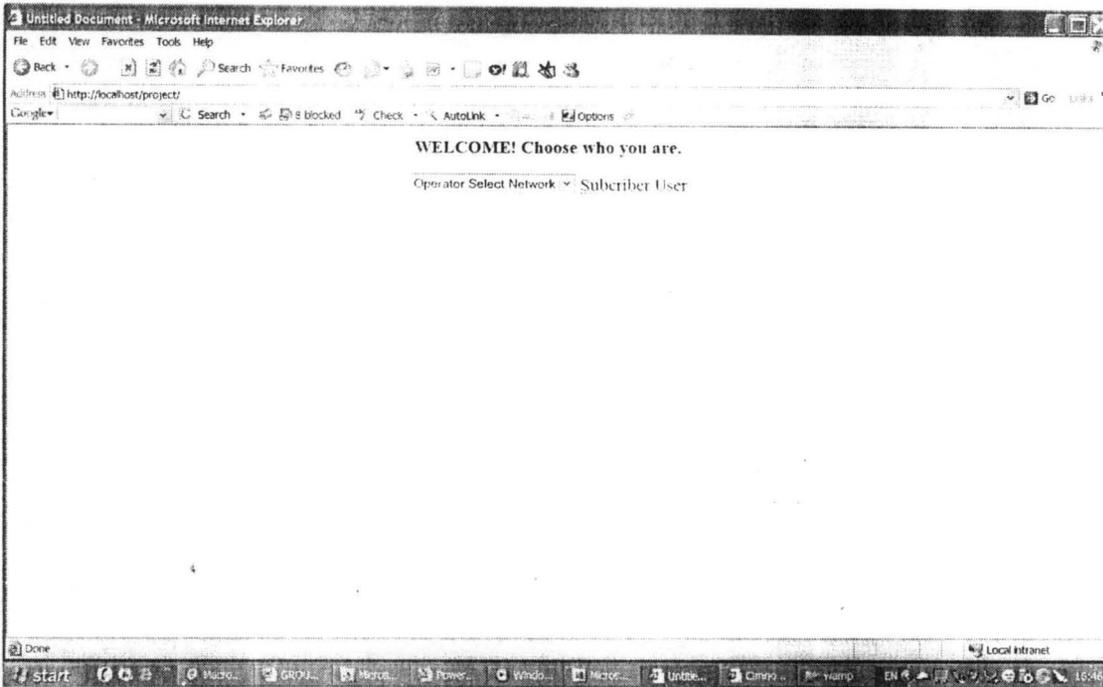


Figure 3: Index page

The operator can choose his/her network but we did not put login on the page because normally the users or the subscribers will not have access to this segment. We created this page so the individual activities can be determined.

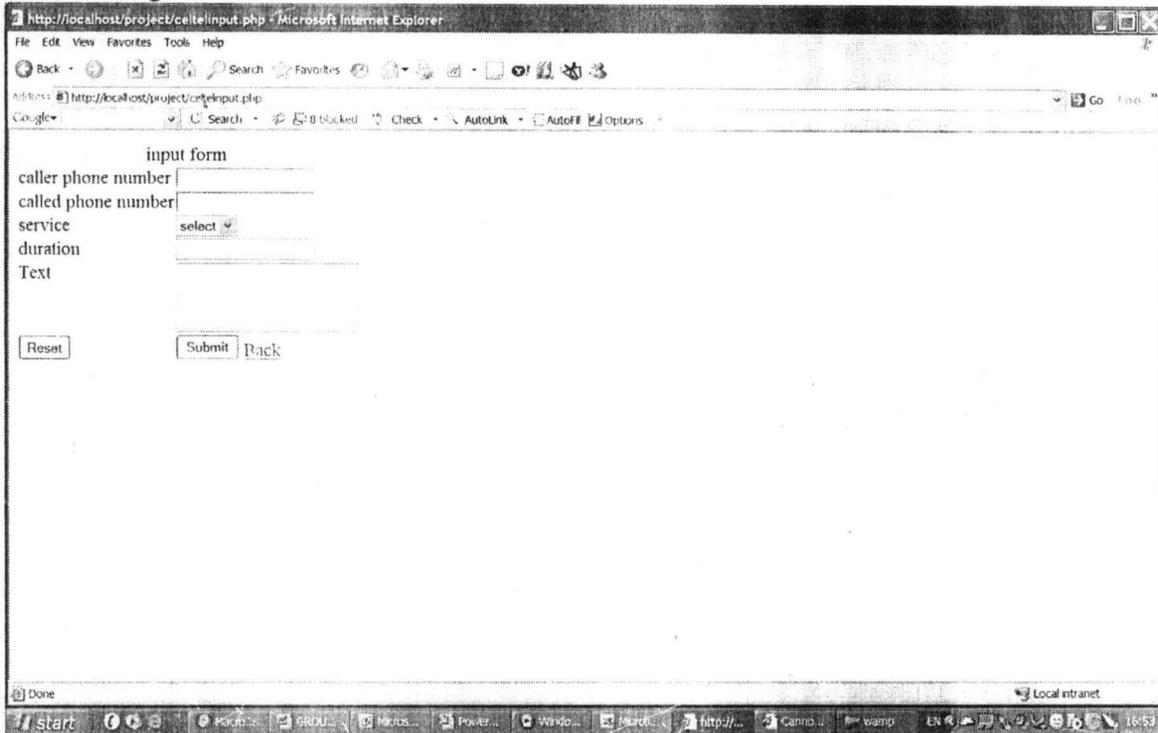
## Operator

If the operator dropdown menu is chosen it will jump to the corresponding page belonging to the provider. Figure4 shows the options under the dropdown menu.



Figure4: Name of providers.

If for example the provider named CELTEL is chosen then we will have the following as shown in figure5.



The screenshot shows a Microsoft Internet Explorer browser window displaying a web page titled "input form". The page contains several input fields and buttons. The fields are labeled "caller phone number", "called phone number", "service", "duration", and "Text". The "service" field has a dropdown menu with "select" visible. Below the fields are three buttons: "Reset", "Submit", and "Back". The browser's address bar shows "http://localhost/project/celinput.php". The taskbar at the bottom shows various application icons and the system clock indicating 16:53.

Figure5: The input for that is representing our handsets.

This is acting like a handset that the subscriber can use to make call or send sms. We put this page under the operator because they will be one to calculate the bill. This page will take the caller's number and check if it is the table of the operator and check the balance before allowing the call or the sms to go through. An example of a number that is not on the operator's network is shown in the figure6 below.

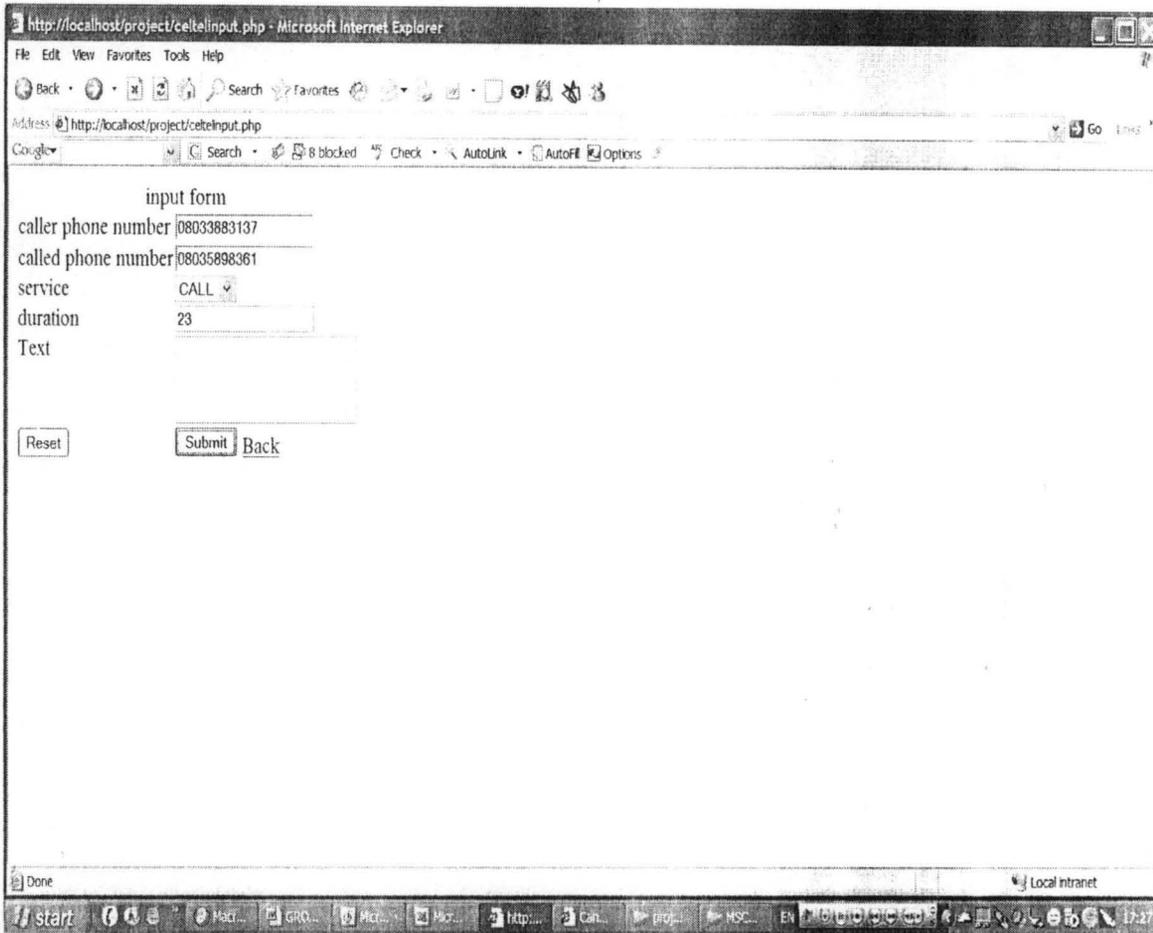


Figure6: Wrong number input.

From figure6 we can see that the number is 08033883137 which belong to another network so if the callers attempt making call figure7 will the result.



Figure7: Output of wrong number entry.

If the number is on the network but the balance is not enough to make the call the caller is trying to make we will have the result as shown in figure8.

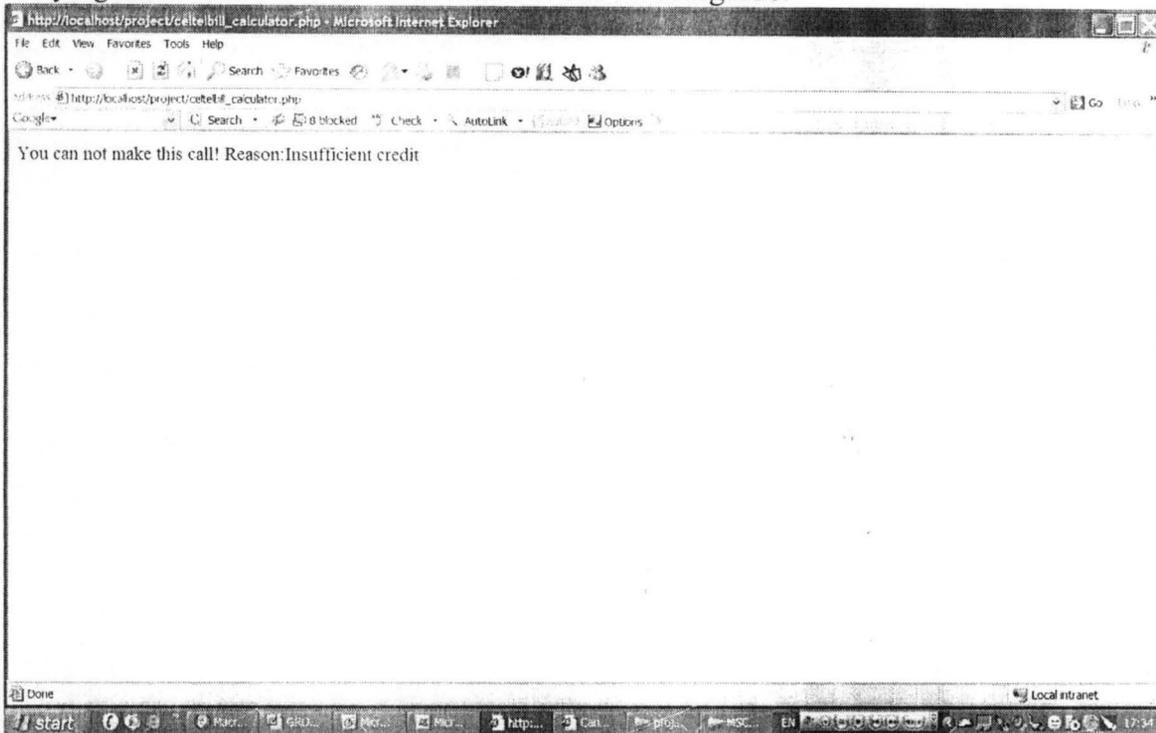


Figure8: Lack of sufficient credit.

If the balance is enough to make the call we will have to following result as shown is figure9.

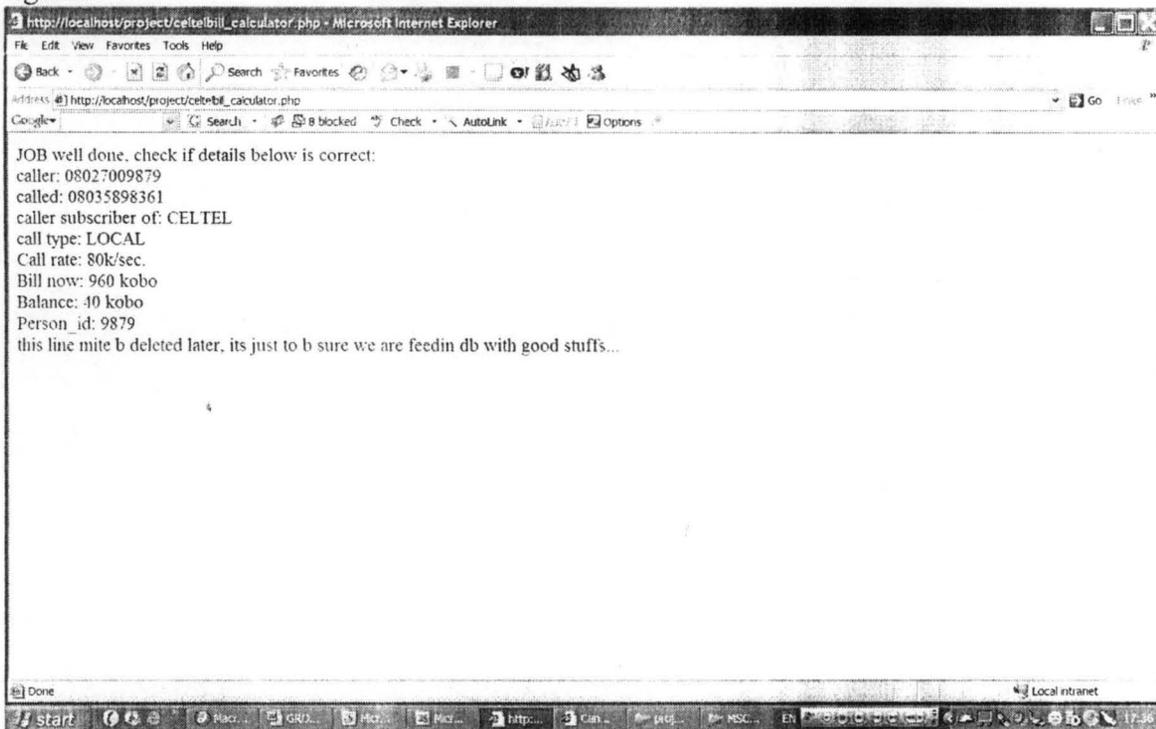


Figure9: Output of successful call.

We design the form in such a way that is an sms is to be sent the number of character will be counted. We note that the length of a sms is 160 so the cost will be taken from the table of the provider and if the length is more than 160 but less than or equal to 320 it will multiply the cost that was taken from the database by 2, that will determine the final cost. Also if the length is greater than 320 but less than or equal to 480, the cost from the database will be multiplied by 3, but if the length is greater than 480 it will output error message. Figure 10 shows output of sms that is longer than 480.



Figure 10: The output of SMS that is more than 480

The output of sms that is less than 480 is given in figure 11.

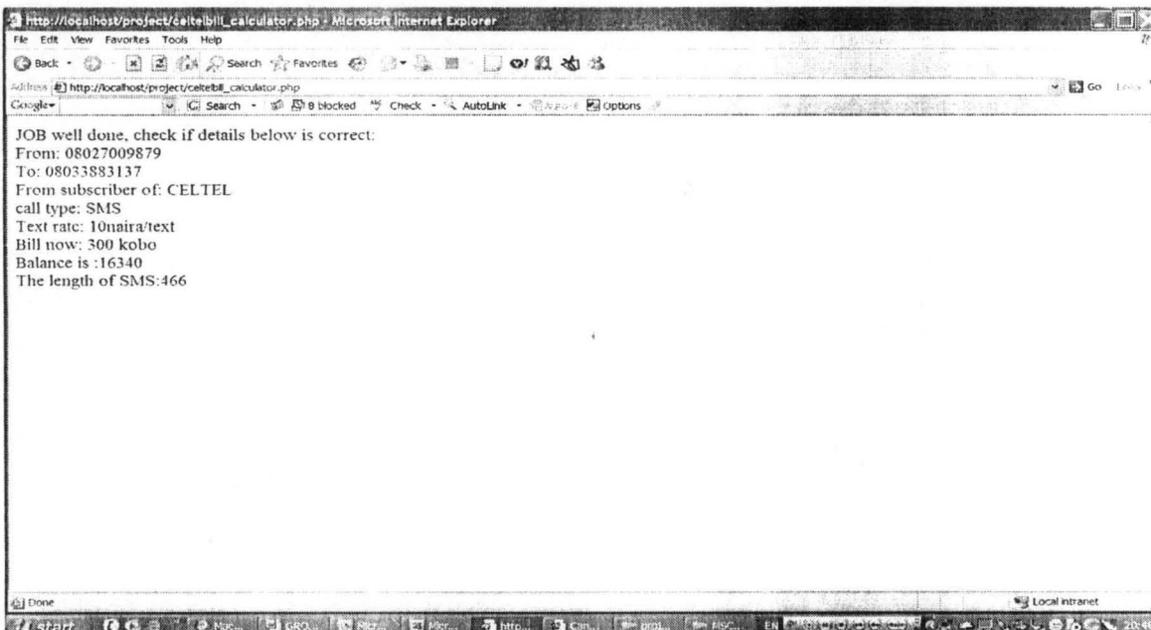


Figure 11: Output of SMS that is less than 480.

The code of the operation is in the appendix.

# SUBSCRIBER

When subscriber is clicked on the index page it will take you to the page shown in figure12. The idea about this is that the subscriber should be able to recharge his/her phone and check the balance.

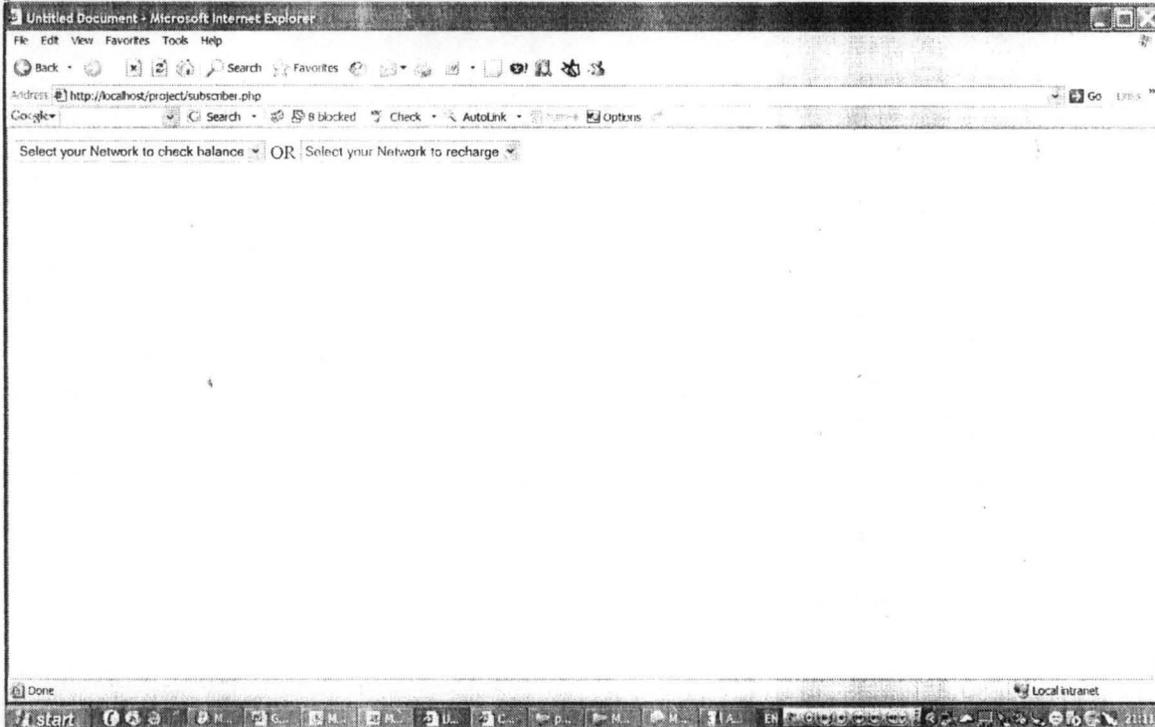


Figure12: Network/Operation selection page.

In figure12 the subscriber can choose his/her network and from there he/she will be able to perform the operation available. For example let the subscriber be a subscriber of CELTEL, and he/she wants to check his/her balance, what he/she has to do is to choose the network to which he/she is a subscriber as shown in figure13 and figure14.



Figure13: Network selection.

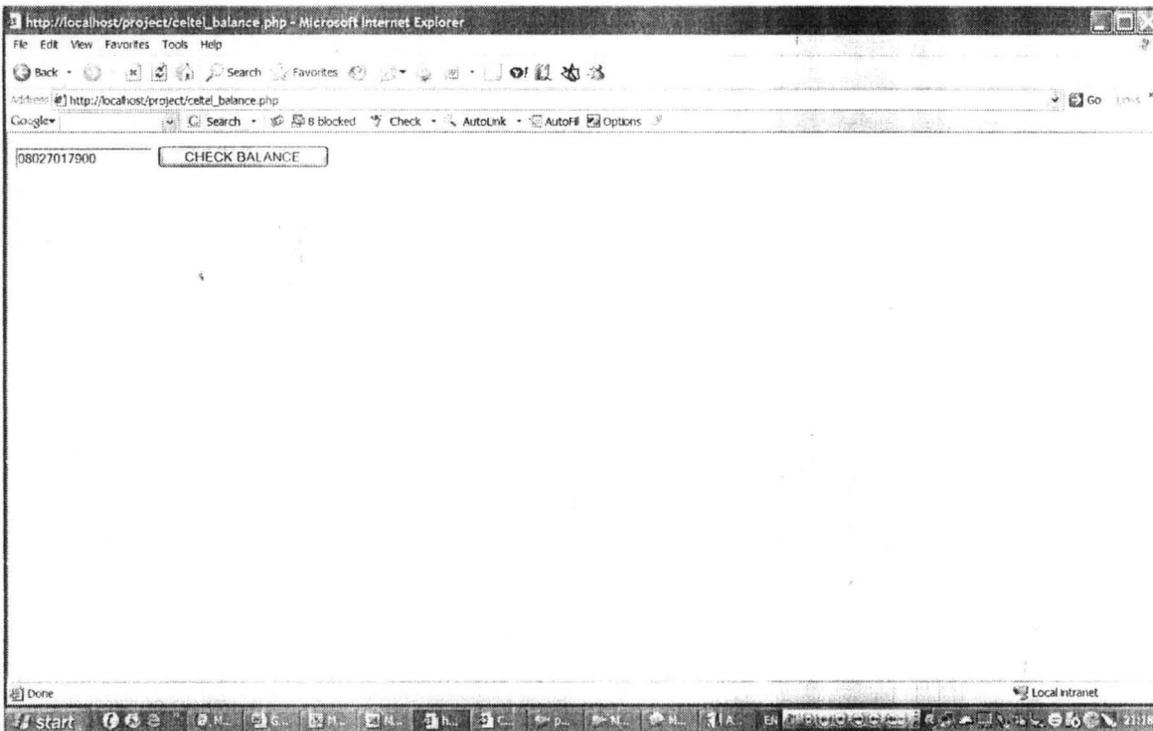


Figure14: Balance checking.

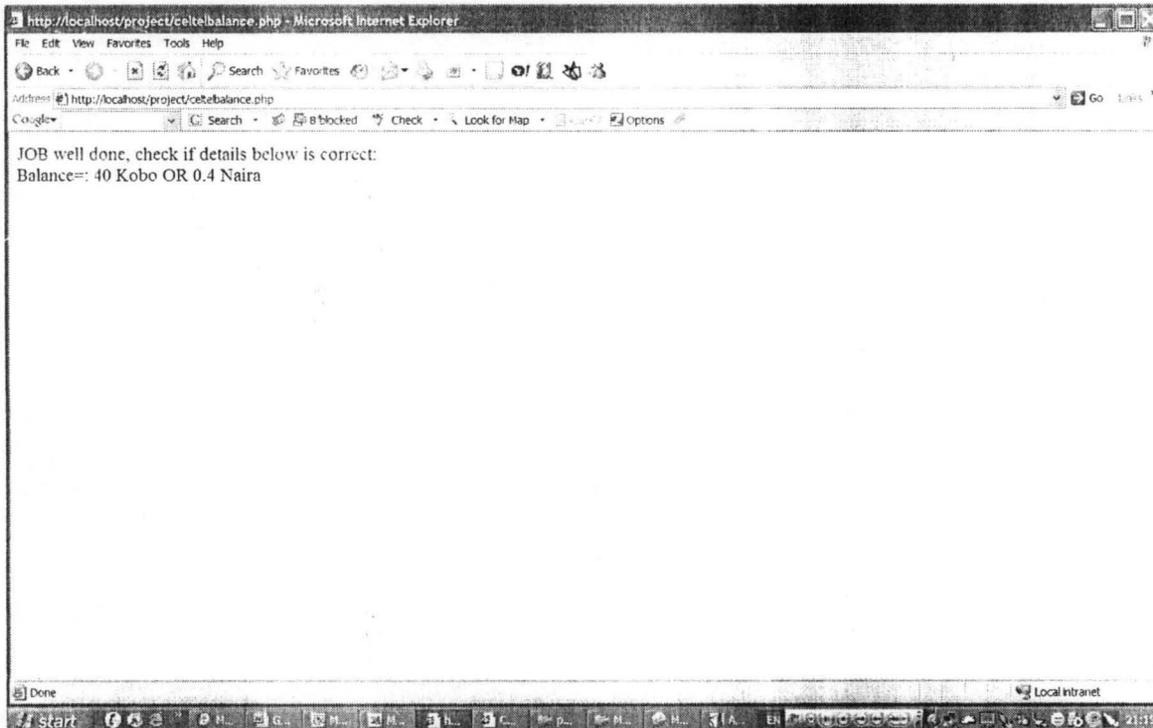


Figure15: Output of the operation.

Figure15 shows exactly what the balance is in the database as shown in figure16.

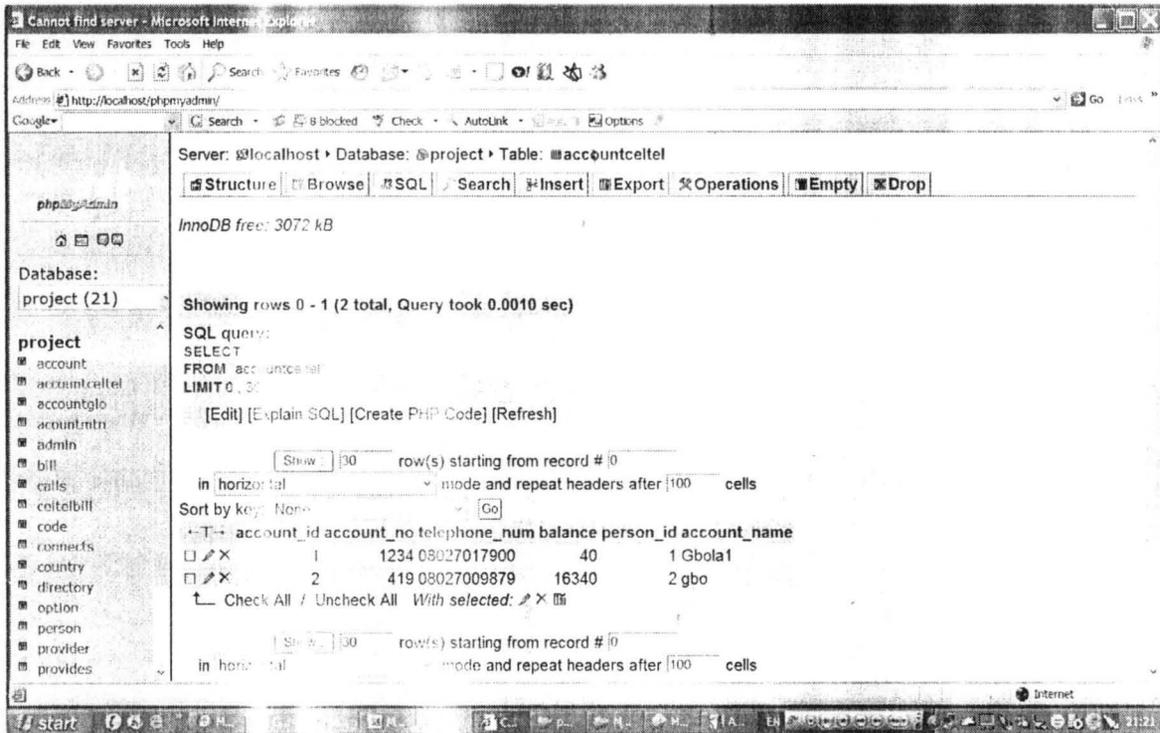


Figure16: Database entry.

The same procedure is used when the subscriber want to recharge as show in figure17, figure18 and figure19.

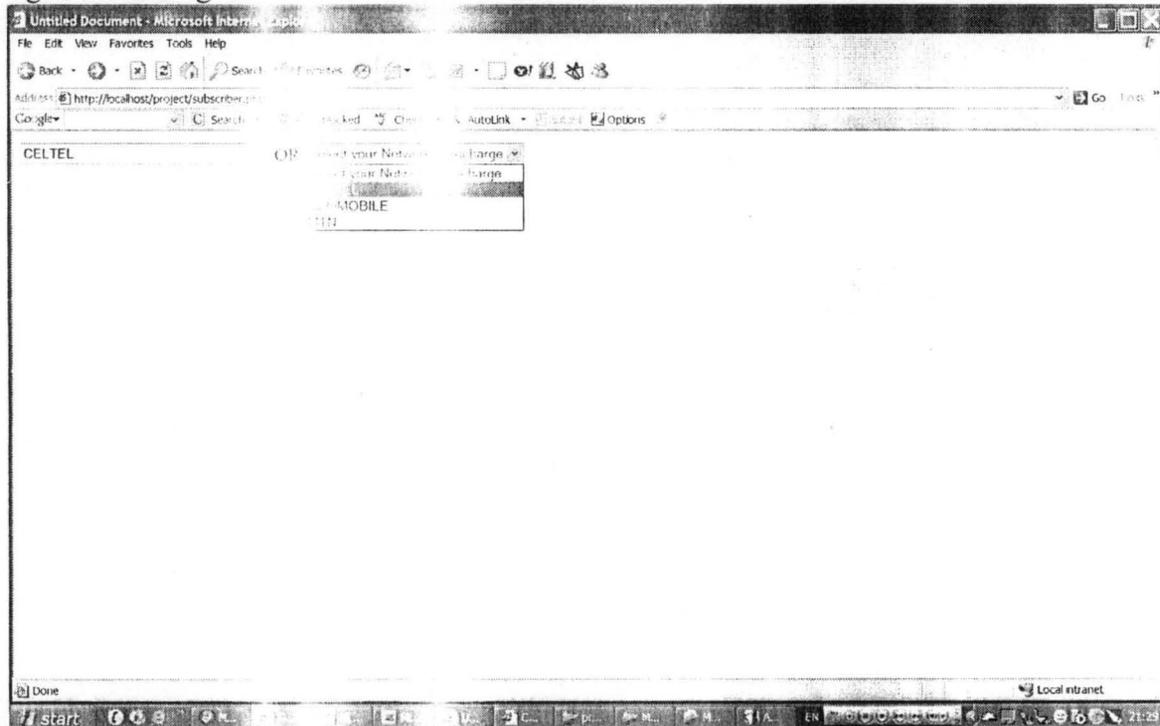


Figure17: Network selection.

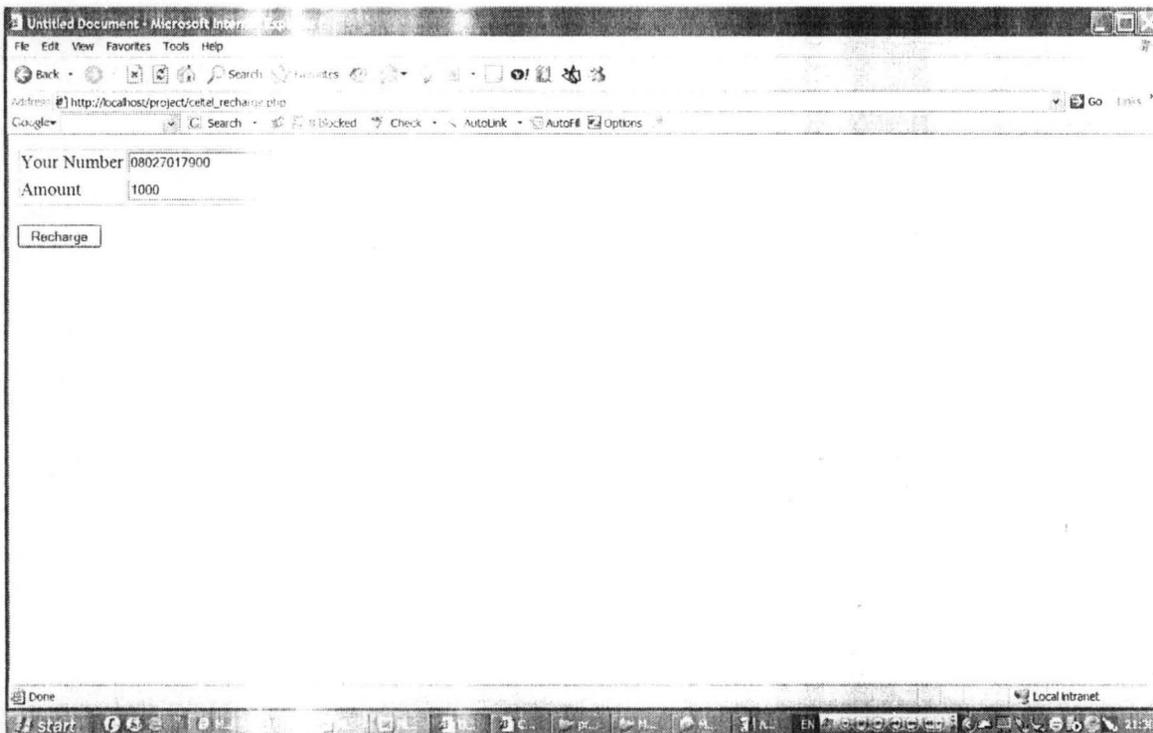


Figure18:Input page

We can see that the subscriber want to recharge his/her phone with 1000naira but it will still be converted to kobo by multiplying it by 100 before updating the database.

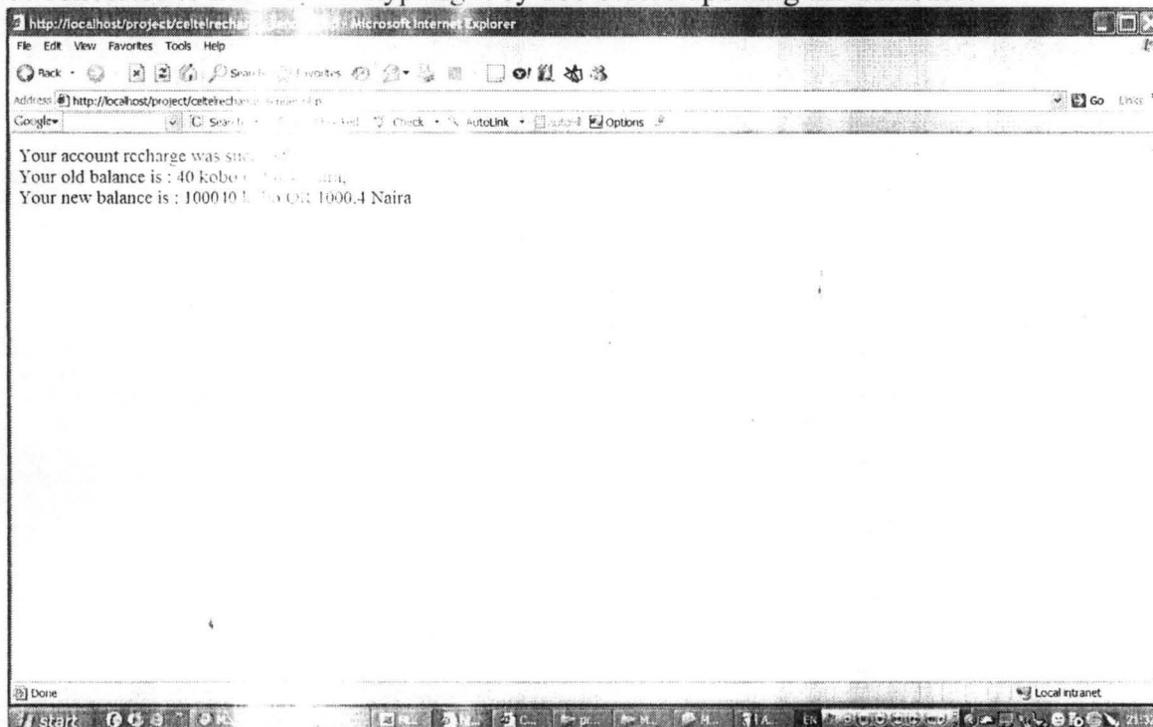


Figure19:Output of the operation

Figure20 shows the content of the database as a result of the recharge.

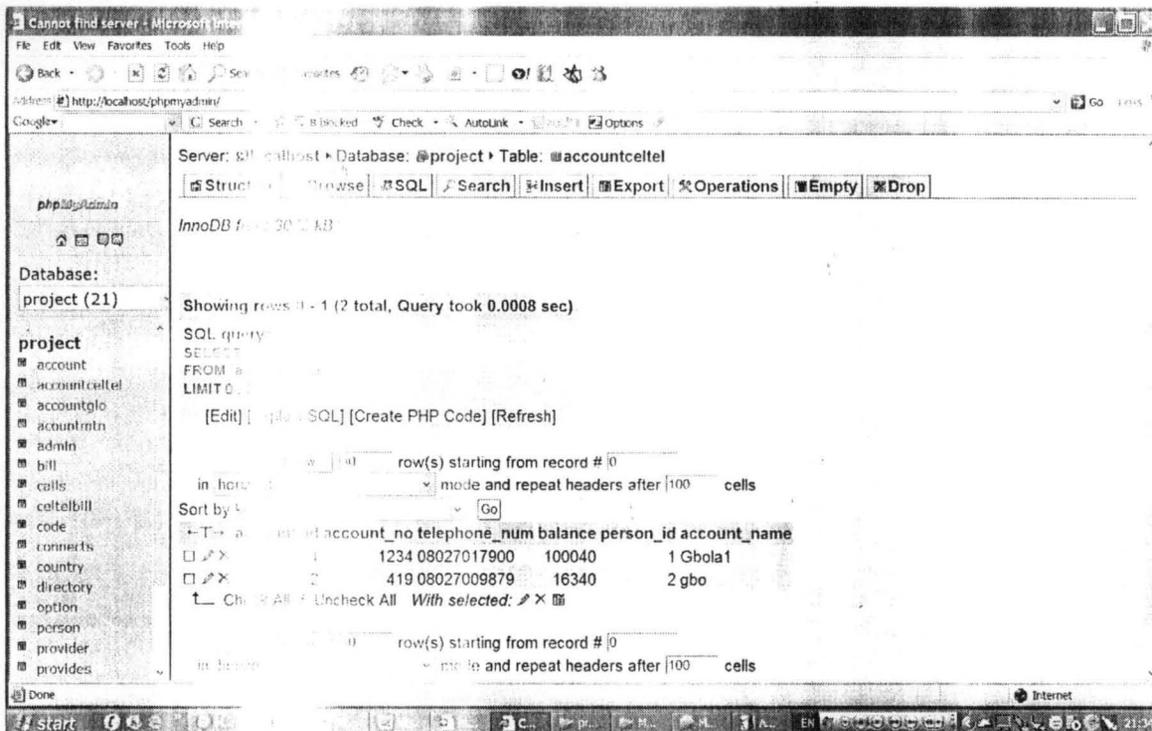


Figure20: Content of the database.

## USER

The user is the person that can use the directory, the person can be a subscriber or not in fact he/she can be any of the operator.

The directory is searched by using either first name or last name or telephone number. If the record is not in the database as show in figure21, we will have figure22.



Figure21: Input of search criteria that is not in the database.

The search criteria is first name and the value is Toyn and what we have in the database is Toy. The screenshot shows the content of the database.



Figure22: Output of a search using an existing search criterion

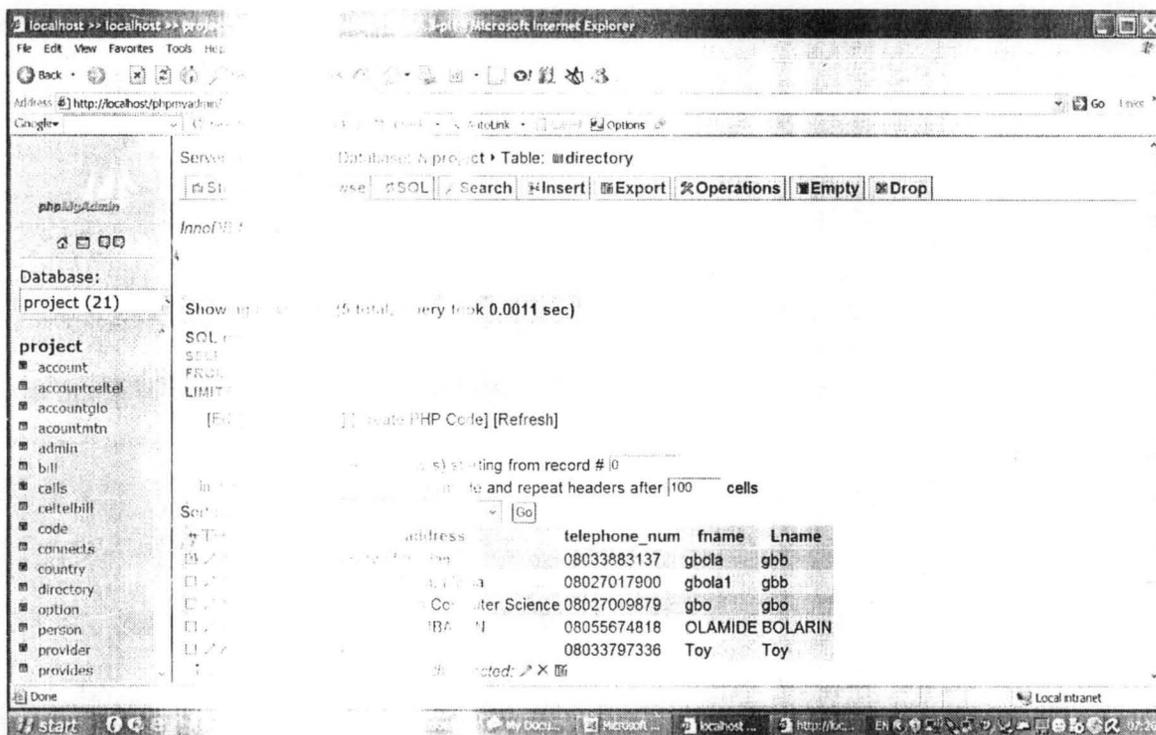


Figure23: Content of the database.

Figure24 shows the content of the table that is in the database.





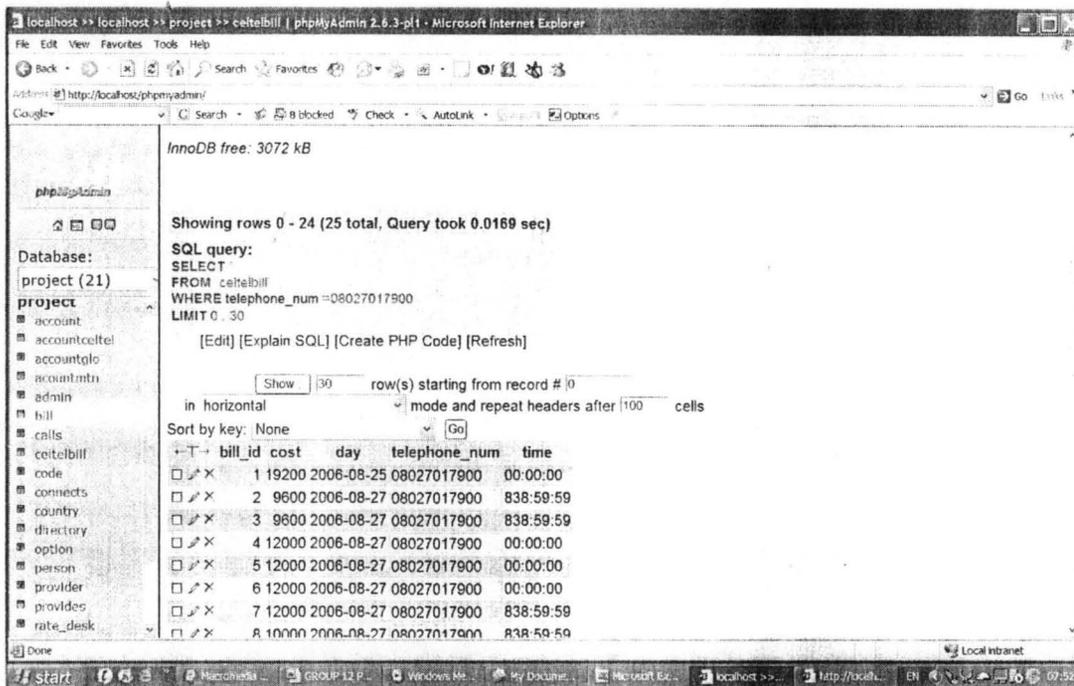


Figure 27: The result of extraction of bill of a subscriber with telephone number 08027017900.

Again it is possible to know the bill base on date for a particular subscriber. We have to state here that the content of the table is sent when a call is being made or sms being sent.

## APPENDIX

### The code

#### INDEX PAGE

```

<script type="text/JavaScript">
<!--
function MM_jumpMenu(targ,selObj,restore){ //v3.0
    eval(targ+".location='"+selObj.options[selObj.selectedIndex].value+"'");
    if (restore) selObj.selectedIndex=0;
}
//-->
</script>
<div align="center">
<p><strong>WELCOME! Choose who you are. </strong></p>
<form action="" name="form1" id="form1">
<select name="menu1" onchange="MM_jumpMenu('parent',this,0)">
<option>Operator Select Network</option>
<option value="celtelinput.php">CELTEL</option>
<option value="gloinput.php">GLOMOBILE</option>

```

```

<option value="mtninput.php">MTN</option>
</select>
<a href="subscriber.php">Subscriber</a> <a href="search.php">User</a>
</form>
</div>

```

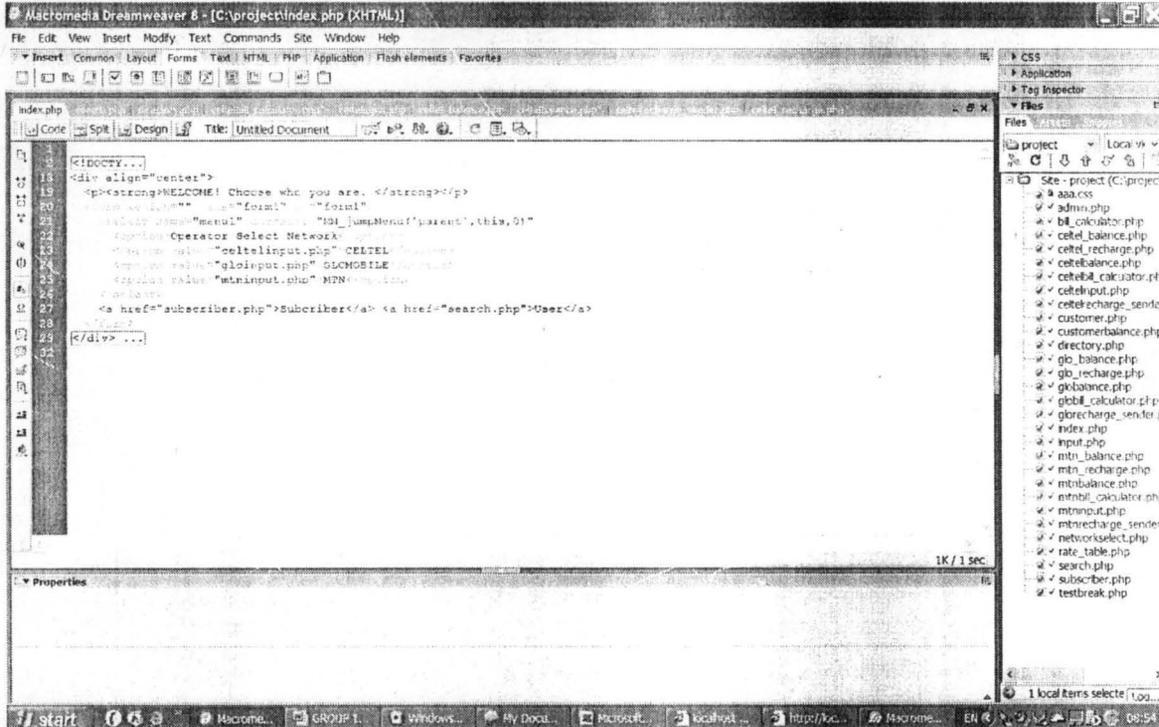


Figure 28: Capture of index form.

### CELTEL PROVIDER INPUT PAGE

```

<table width="250" border="0" cellpadding="0">
<form action="celtelbill_calculator.php" enctype="application/x-www-form-urlencoded"
method="post">
<tr>
<td colspan="2" nowrap><div align="center">input form </div></td>
</tr>
<tr>
<td nowrap>caller phone number </td>
<td><input name="caller" type="text" id="caller"></td>
</tr>
<tr>
<td nowrap>called phone number </td>
<td><input name="called" type="text" id="called"></td>
</tr>
<tr>
<td nowrap>service</td>
<td><select name="service" id="service">
<option value=" ">select</option>

```



## CELTEL BILL CALCULATOR

```
<?php
session_start();
// connect to woteva database here
$user="root";
$password="";
$database="project";

mysql_connect("localhost","$user","$password");
@mysql_select_db($database) or die( "Unable to select database");

// 2. if service is call then do these...
if($_POST[service]=="CALL")
    { // AB
        // process calls here... wot do u know i just ate iyan with beef [cos no goat meat,
        fake esthers restaurant]..

// i will use this to know which subscriber is calling
    $new_sub=substr($_POST[caller], 1, 3);

        if ($new_sub==802 || $new_sub==808)
        {
            $phone_code="CELTEL";
        }
        else if ($new_sub==803 || $new_sub==806)
        {
            $phone_code="MTN";
        }
        else if ($new_sub==805 || $new_sub==807)
        {
            $phone_code="GLOBACOM";
        }
        else if ($new_sub==804)
        {
            $phone_code="MTEL";
        }
        else { echo "<br><br>invalid phone number"; exit; }

        // this keeps the phone service provider's name so i can use it later
to call for anytin in db
        $_SESSION[psp]=$phone_code;

        // next is to confirm if number called is local or intl

        if(strlen($_POST[called]) <= 11) // B
        // less than 11 xcter then its by default local
```

```

    {
    $_SESSION[rate_type]="LOCAL";
    }
    else
    {
    // greater than 11 xcters, then its intl, but some naija dummies stil
    put +234 on their fone number... so we have to filter..
        $called_sub=substr("$_POST[caller]", 1, 4);

        if ($called_sub==234)
            {
                $_SESSION[rate_type]="LOCAL";
            }
        else
            {

$_SESSION[rate_type]="INTERNATIONAL";
            }
    } // B
    // next thing is to check for somethings from the database and also
    keep them as sessions
        $rate_query = mysql_query("SELECT $_SESSION[rate_type]
    from provides where provider_name='$_SESSION[psp]");

    $_SESSION[rate]=mysql_result($rate_query,0,"$_SESSION[rate_type]");

    // now calculate the amount and balance for pre paid..
    // justice to the date

        //$tomorrow=time()+1209600;
        //$newdate=date("j of F Y","$tomorrow");
    if ($phone_code!="CELTEL"){
        echo "Number not on the network";
    }
    else {
        $query2="SELECT balance from accountceltel where
    telephone_num='$_POST[caller]";
        $result2=mysql_query($query2);
        $balance_old=mysql_result($result2,0,"balance");
        $total_bill_now=$_POST[duration] * $_SESSION[rate];
        $new_balance=($balance_old)-($total_bill_now);
        if ($balance_old<$total_bill_now) {
            echo "You can not make this call! Reason:Insufficient credit";
        }
    }
}

```

```

    }
    else{
        $query3="UPDATE accountceltel SET balance='$new_balance'
where telephone_num='$_POST[caller]";
        mysql_query($query3);
        $day=getdate();
        $time=time();
        $today="$day[year]-$day[mon]-$day[mday]";
        $query7="INSERT into celtelbill
(bill_id,cost,day,telephone_num,time) values
('$total_bill_now','$today','$_POST[caller]','$time)";
        mysql_query($query7);
        $person_id=substr("_POST[caller]", 7, 4);
        $query8="INSERT into calls
(call_id,call_type,telephone_num,person_id,duration,date) values
('$_SESSION[rate_type]','$_POST[caller]','$person_id','$_POST[duration]','$today)";
        mysql_query($query8);
        echo "JOB well done, check if details below is correct:<br>
caller: $_POST[caller]<br>
called: $_POST[called]<br>
caller subscriber of: $_SESSION[psp]<br>
call type: $_SESSION[rate_type]<br>
Call rate: $_SESSION[rate]k/sec.<br>
Bill now: $total_bill_now kobo<br>
Balance: $new_balance kobo<br>
Person_id: $person_id<br>
this line mite b deleted later, its just to b sure we are feedin db
with good stuffs...";
    }
}
// so from here u can choose to enta the computed detail and the
rest of em into the database
} // end AB
// 1. if service is text, then do these
elseif($_POST[service]=="SMS")
{ // AA
// i will use this to know which subscriber is calling
$new_sub1=substr("_POST[caller]", 1, 3);

if ($new_sub1==802 || $new_sub1==808)
{
$phone_code="CELTEL";
}
else if ($new_sub1==803 || $new_sub1==806)
{
$phone_code="MTN";
}
}
}

```

```

    }
    else if ($new_sub1==805 || $new_sub1==807)
    {
    $phone_code="GLOBACOM";
    }
    else if ($new_sub1==804)
    {
    $phone_code="MTEL";
    }
    else { echo "<br><br>invalid phone number"; exit; }

    $_SESSION[psp]=$phone_code;
    $_SESSION[rate_type]="SMS";
    $rate_query1 = mysql_query("SELECT $_SESSION[rate_type] from provides
where provider_name='$_SESSION[psp]");
    $_SESSION[rate]=mysql_result($rate_query1,0,"$_SESSION[rate_type]");
    $text=strlen("$_POST[sms]");
    if ($text<=160){// DD
    if ($phone_code!="CELTEL"){
        echo "Number not on the network";
    }
    else {
        $query2="SELECT balance from accountceltel where
telephone_num='$_POST[caller]";
        $result2=mysql_query($query2);
        $balance_old=mysql_result($result2,0,"balance");

        $total_bill_now=1* $_SESSION[rate];
        $new_balance=($balance_old)-($total_bill_now);
        if ($balance_old<$total_bill_now) {
            echo "You can not make this call! Reason:Insufficient credit";
        }
        else{
            $query3="UPDATE accountceltel SET balance='$new_balance'
where telephone_num='$_POST[caller]";
            mysql_query($query3);
            $day=getdate();
            $time=time();
            $today="$day[year]-$day[mon]-$day[mday]";
            $query7="INSERT into celtelbill
(bill_id,cost,day,telephone_num,time) values
(',$total_bill_now',$today','$_POST[caller]',$time)";
            mysql_query($query7);
            $person_id=substr("$_POST[caller]", 7, 4);
            $duration="1 text message";

```

```

        $query8="INSERT into calls
(call_id,call_type,telephone_num,person_id,duration,date) values
('$SESSION[rate_type]','$POST[caller]','$person_id','$duration','$today)";
        mysql_query($query8);

        echo "JOB well done, check if details below is correct:<br>
        From: $_POST[caller]<br>
        To: $_POST[called]<br>
        From subscriber of: $SESSION[psp]<br>
        call type: $SESSION[rate_type]<br>
        Text rate: 10naira/text<br>
        Bill now: $total_bill_now kobo<br>
        Balance is :$new_balance<br>
        Length of SMS: $text";
    }
}
} //end DD
elseif ($text>160 AND $text<=320){ // EE
    if ($phone_code!="CELTEL"){
        echo "Number not on the network";
    }
    else {
        $query2="SELECT balance from accountceltel where
telephone_num='$_POST[caller]";
        $result2=mysql_query($query2);
        $balance_old=mysql_result($result2,0,"balance");

        $total_bill_now=2* $SESSION[rate];
        $new_balance=($balance_old)-($total_bill_now);
        if ($balance_old<$total_bill_now) {
            echo "You can not make this call! Reason:Insufficient credit";
        }
        else{
            $query3="UPDATE accountceltel SET balance='$new_balance'
where telephone_num='$_POST[caller]";
            mysql_query($query3);
            $day=getdate();
            $time=time();
            $today="$day[year]-$day[mon]-$day[mday]";
            $query7="INSERT into celtelbill
(bill_id,cost,day,telephone_num,time) values
('$total_bill_now','$today','$POST[caller]','$time)";
            mysql_query($query7);
            $person_id=substr("$POST[caller]", 7, 4);
            $duration="2 text messages";

```





\*The same line of reasoning is used for other operators (GLOBACOM AND MTN).

### CELTEL BALANCE FORM

```
<form name="form1" method="post" action="celtelbalance.php">
  <input name="telephone_num" type="text" id="telephone_num">
  <input type="submit" name="Submit" value="CHECK BALANCE">
  <input name="balance" type="hidden" id="balance" value="ok" />
</form>
```

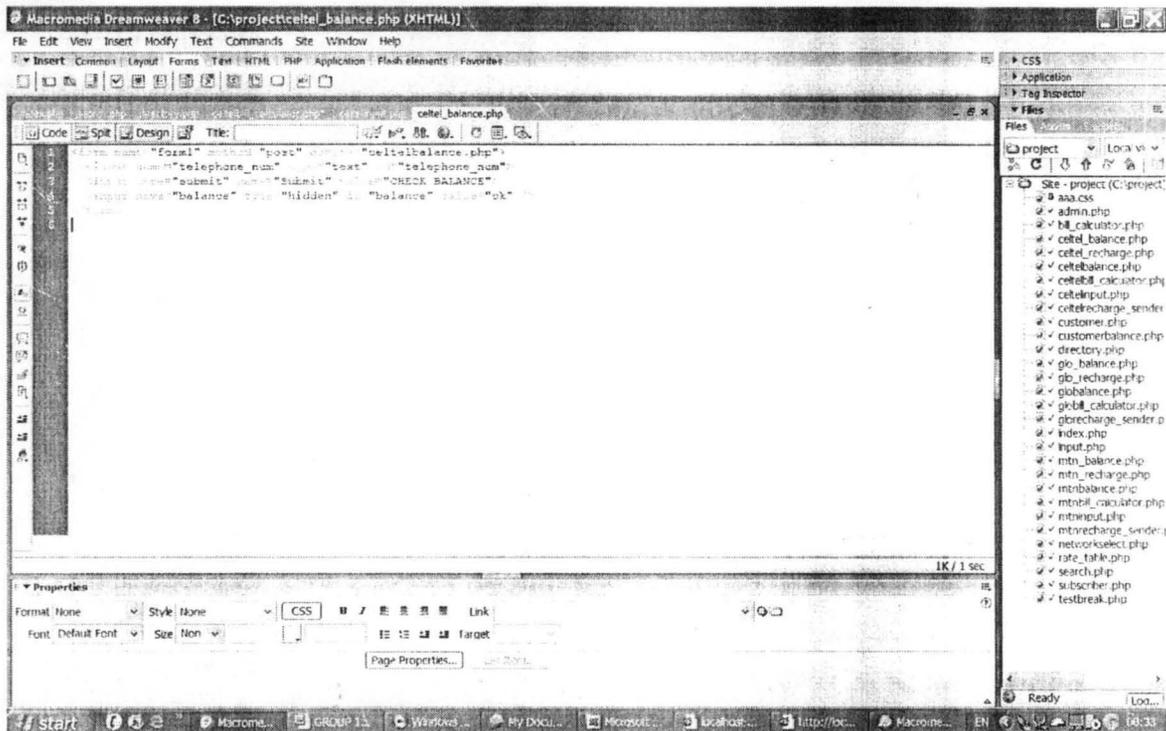


Figure31: Capture of the form for balance checking.

```
<?php
$user="root";
$password="";
$databse="project";

mysql_connect("localhost","$user","$password");
@mysql_select_db($databse) or die( "Unable to select database");

// searching
if ($_POST[balance]=="ok")
{
  $new_sub=substr($_POST[telephone_num], 1, 3);

  if ($new_sub==802 || $new_sub==808)
  {
    $phone_code="CELTEL";
  }
}
```

```

else if ($new_sub==803 || $new_sub==806)
{
$phone_code="MTN";
}
else if ($new_sub==805 || $new_sub==807)
{
$phone_code="GLOBACOM";
}
else if ($new_sub==804)
{
$phone_code="MTEL";
}
else { echo "<br><br>invalid phone number"; exit; }
if ($phone_code!="CELTEL")
{ echo "Application unknown";
}
else {
$query = "SELECT balance from accountceltel where
telephone_num='$_POST[telephone_num]'";
$search_result=mysql_query($query);
$num=mysql_num_rows($search_result);
if ($num==0) { //..c
// if you are not a subscriber of the network
echo "Not a subscriber";
$_POST[telephone_num]="";
//echo '<meta http-equiv="refresh" content="0;URL=customer.php">';
} // ..end c
else{ // cc
$balance=mysql_result($search_result,0,"balance");
$naira_balance=$balance/100;
echo "JOB well done, check if details below is correct:<br>
Balance=: $balance Kobo OR $naira_balance Naira<br>";
} // end cc
}
}
?>

```



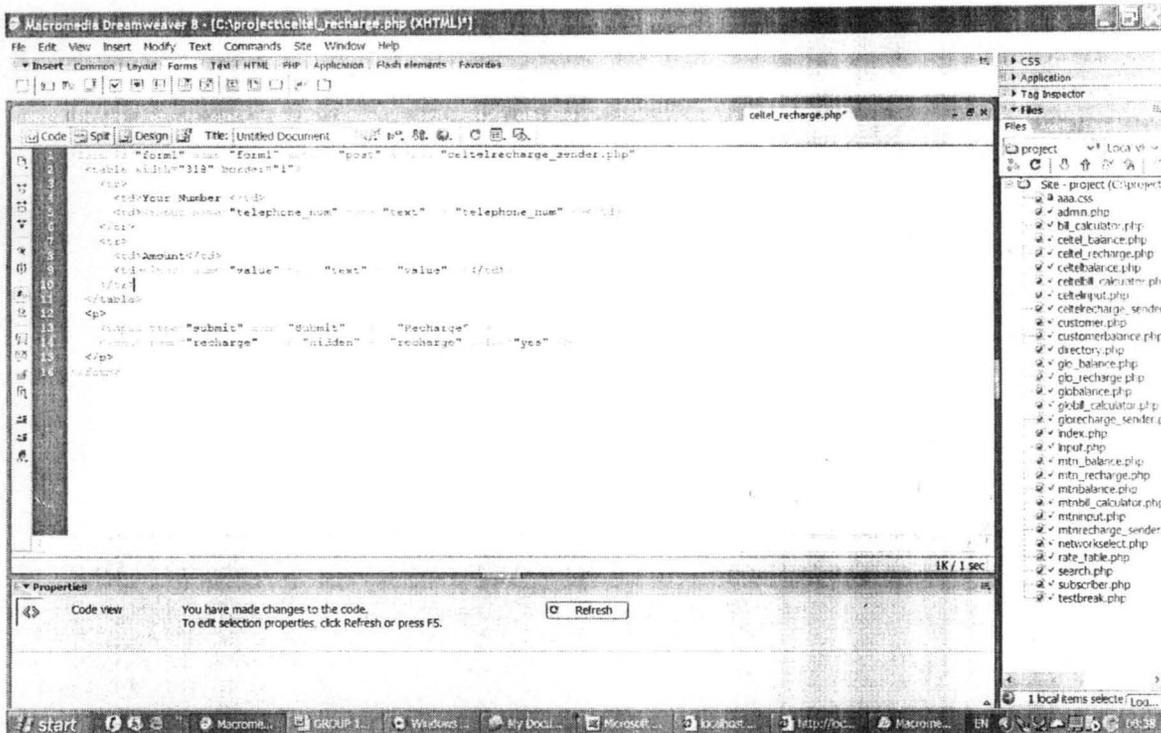


Figure33: Capture of the form

### CELTEL RECHARGE VALUE SENDER

```

<?php
session_start();
// connect to woteva database here
$user="root";
$password="";
$databse="project";

mysql_connect("localhost","$user","$password");
@mysql_select_db($databse) or die( "Unable to select database");

// 2. if service is call then do these...
if($_POST[recharge]=="yes")
    { // AB
        // process calls here... wot do u know i just ate iyan with beef [cos no goat meat,
        fake esthers restaurant]..

// i will use this to know which subscriber is calling
        $new_sub=substr($_POST[telephone_num], 1, 3);

        if ($new_sub==802 || $new_sub==808)
        {
            $phone_code="CELTEL";
        }
        else if ($new_sub==803 || $new_sub==806)
    }

```

```

    {
    $phone_code="MTN";
    }
    else if ($new_sub==805 || $new_sub==807)
    {
    $phone_code="GLOBACOM";
    }
    else if ($new_sub==804)
    {
    $phone_code="MTEL";
    }
    else { echo "<br><br>invalid phone number"; exit; }

    // this keeps the phone service provider's name so i can use it later
to call for anytin in db
    $_SESSION[psp]=$phone_code;
    // now calculate the amount and balance for pre paid..
    // justice to the date

    //$tomorrow=time()+1209600;
    //$newdate=date("j of F Y", "$tomorrow");
    if ($phone_code!="CELTEL")
    {
    echo "APPLICATION UNKNOWN";
    }
    else {
    $query3="SELECT balance from accountceltel where
telephone_num='$_POST[telephone_num]";
    $result3=mysql_query($query3);
    $balance=mysql_result($result3,0,"balance");
    $value_torecharge=$_POST[value]*100;
    $new_balance=$balance+$value_torecharge;
    $naira_new_balance=$new_balance/100;
    $naira_old_balance=$balance/100;
    $query2="UPDATE accountceltel set balance='$new_balance'
where telephone_num='$_POST[telephone_num]";
    mysql_query($query2);
    echo "Your account recharge was successful,<br>
Your old balance is : $balance kobo OR $naira_old_balance
Naira, <br>
Your new balance is : $new_balance kobo OR
$naira_new_balance Naira";
    }
    }
?>

```

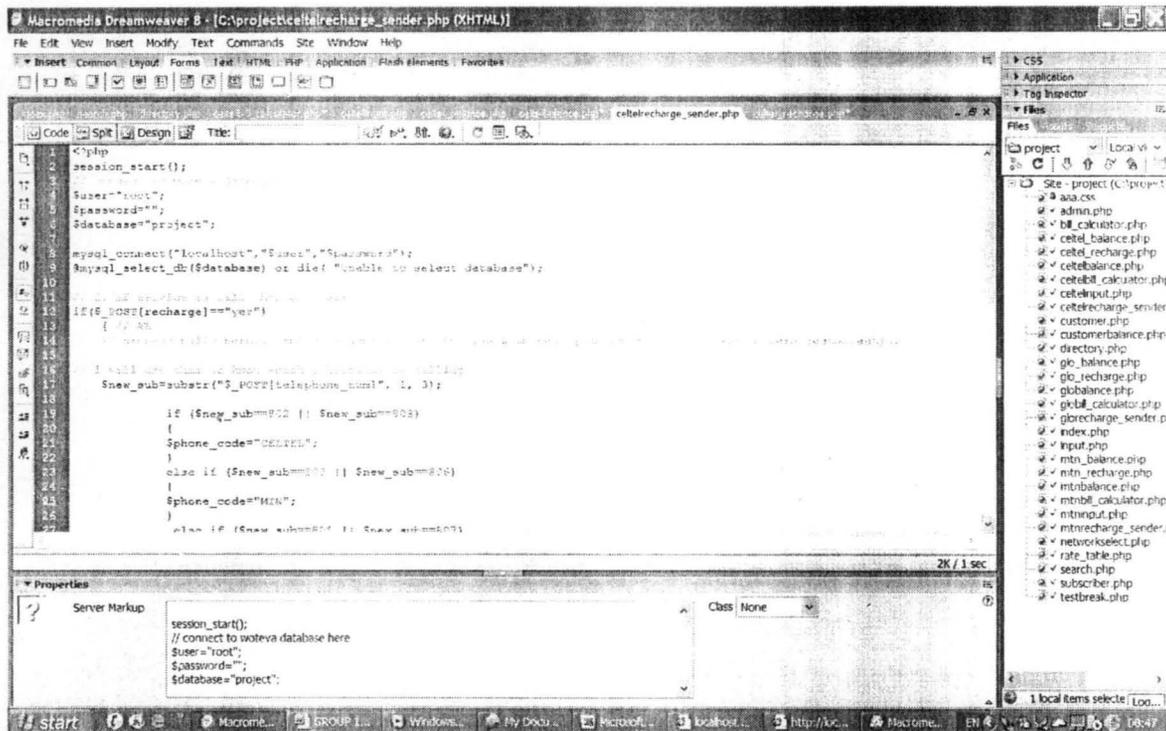


Figure34: Capture of the recharge value sender.

\*The same line of reasoning was used for other providers.

#### FORM FOR SEARCHING THE DIRECTORY

```

<form name="form1" method="post" action="directory.php">
  <p>
    <input name="fname" type="text" id="fname">
    <input type="submit" name="Submit" value="search by firstname">
  </p>
  <p>
    <input name="Lname" type="text" id="Lname">
    <input type="submit" name="Submit2" value="search by lastname">
  </p>
  <p>
    <input name="telephone_num" type="text" id="telephone_num">
    <input type="submit" name="Submit3" value="search by number">
    <input name="search" type="hidden" id="search" value="ok">
  </p>
</form>

```

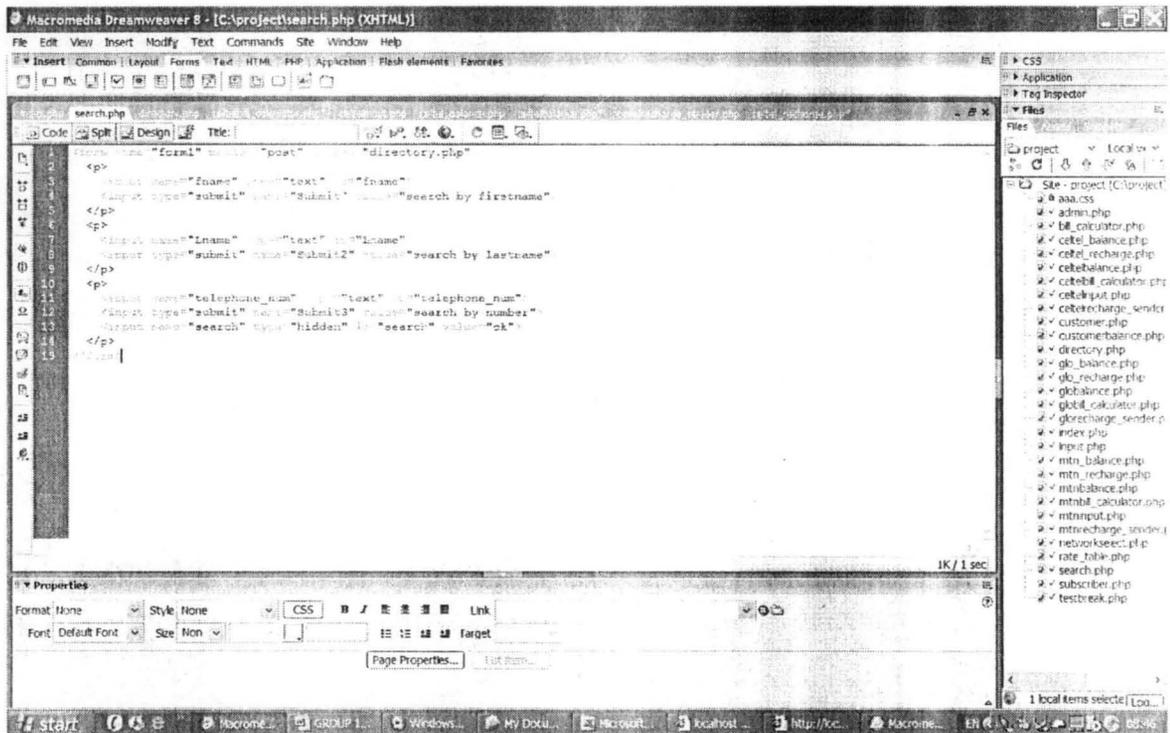


Figure35: Capture of search form.

#### CODE FRO DIRECTORY SEARCHING

```

<link href="aaa.css" rel="stylesheet" type="text/css" />
<?php
//session_start();
// connect to woteva database here
$user="root";
$password="";
$database="project";

mysql_connect("localhost","$user","$password");
@mysql_select_db($database) or die( "Unable to select database");

// searching
if($_POST[search]=="ok")
{
$query = "SELECT * from directory where fname='$_POST[fname]' ||
Lname='$_POST[Lname]' || telephone_num='$_POST[telephone_num]";
$search_result=mysql_query($query);
$num=mysql_num_rows($search_result);
if ($num==0) { //..c
echo '<span class="aaa"><center>no record found</center></span>';
$_POST[fname]="";
$_POST[Lanme]="";
$_POST[telephone_num]="";
//echo '<meta http-equiv="refresh" content="0;URL=search.php">';
}
}
}

```

```

} // ..end c
else{ // cc
$firstname=mysql_result($search_result,0,"fname");
$lastname=mysql_result($search_result,0,"lname");
$telephonenumber=mysql_result($search_result,0,"telephone_num");
$address=mysql_result($search_result,0,"address");
echo "JOB well done, check if details below is correct:<br>
      First Name: $firstname<br>
      Last Name: $lastname<br>
      Telephone Number:$telephonenumber<br>
      The Address:$address<br>
      THANK YOU FOR USING UNIVERSAL DIRECTORY";
//<a href="search.php">Back</a>;

} //..cc
}
?>

```

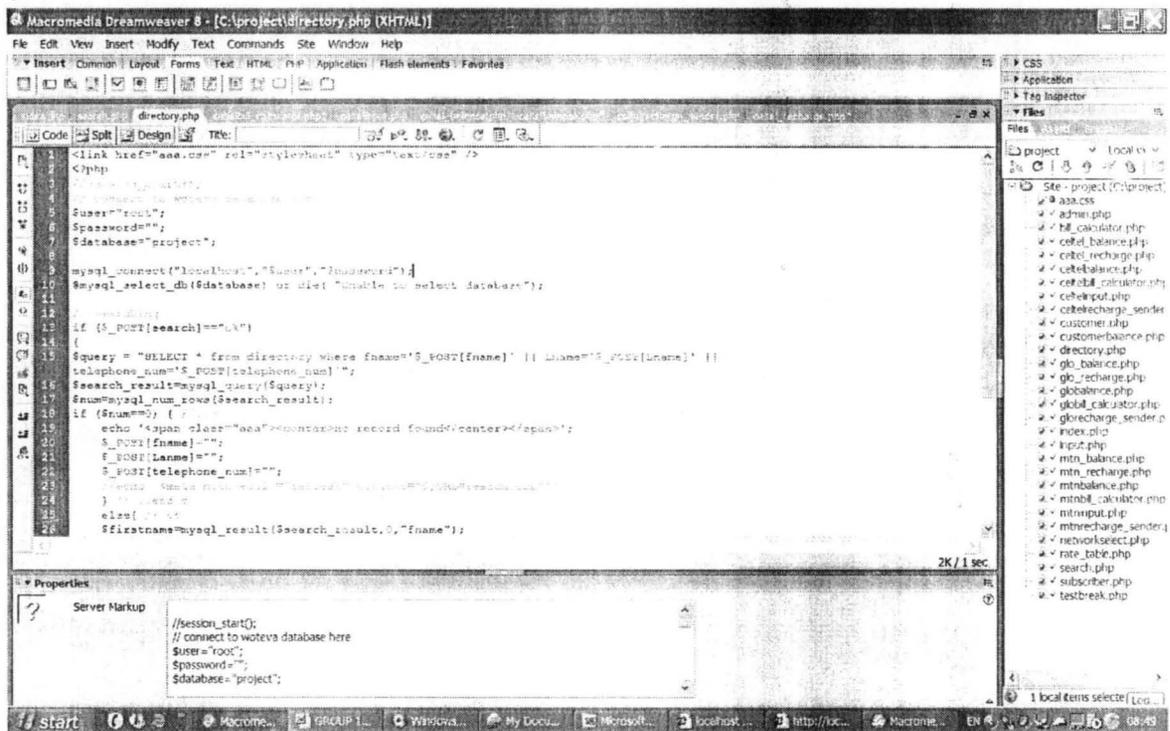


Figure36: Capture of the directory search code.

## SUMMARY

We observed that the rate of calls( local or international) and sms is taken from a table called “provides” in the database. This will give us the opportunity to change the rate in the database without affecting the code.

The database is well structured that what one need to do if there is another subscriber to be added is to insert the record for the subscriber in all necessary tables.

localhost >> localhost >> project >> provides | phpMyAdmin 2.6.3-pl1 - Microsoft Internet Explorer

Server: localhost • Database: project • Table: provides

InnoDB free: 3072 kB

Showing rows 0 - 3 (4 total, Query took 0.0005 sec)

SQL query:  
 SELECT  
 FROM `provides`  
 LIMIT 0, 30

[Edit] [Explain SQL] [Create PHP Code] [Refresh]

Show 30 row(s) starting from record # 0  
 in horizontal mode and repeat headers after 100 cells

Sort by key: None

	service_id	provider_name	LOCAL	INTERNATIONAL	SMS	MMS	rate
<input type="checkbox"/>	1	MTN	80	100	1500	2500	0
<input type="checkbox"/>	2	MTEL	70	64	1500	2000	1
<input type="checkbox"/>	3	CELTEL	80	100	100	2000	4
<input type="checkbox"/>	4	GLOBACOM	80	100	1500	2500	6

Check All / Uncheck All With selected: 0

http://localhost/phpmyadmin/sql.php?lang=en-utf-8&server=1&collation\_connection=utf8\_general\_ci&db=project&table=provides&goto=

Figure37: The rate table.