SOFTWARE DEVELOPMENT AND IMPORTANCE OF GEOGRAPHICAL INFORMATION SYSTEM IN DATA MANAGEMENT.

(A Case Study of FCT Water Board Abuja.)

A PROJECT SUBMITTED
TO
THE DEPARTMENT OF MATHEMATICS/
COMPUTER SCIENCE

By

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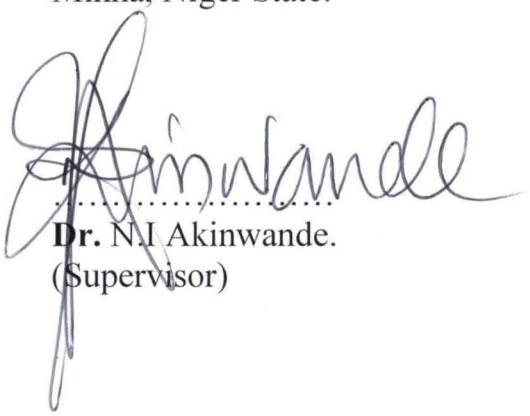
CERTIFICATION

I certify that this project entitled **" Software Development and Importance of Geographical information System in Data management. A Case Study of FCT Water Board, Abuja "** Meets the regulations governing the award of Post graduate Diploma in computer Science of Federal University of Technology, Minna, Niger State.



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(Head of Department) Date.

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(External Examiner) Date.

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DECLARATION

I solemnly declare that this project is an original work, and that no part of it thereof was copied from any project in the department or any other departments from this University or any other University.

Adedokun R. Ademola.
April 2002..

DEDICATION

This project is dedicated to Almighty God.

ACKNOLEDGEMENT

An Important man, man of substance is the one who treats you friendly and makes you feel important when you are with him. Therefore, I am very grateful to my project supervisor (**Dr**. N.I. Akinwande) for his amiability, understanding and friendly treatment. I am also Grateful to all my Lecturers in this Department: Prof. K.R. Adeboye (Dean Of Science), Mr. L.N. Ezeako (Acting HOD), Mr. Isah Audu (Coordinator), Dr. Yomi Aiyesimi, Mr. Hakimi Danladi and others. They are all dedicated to ensure that we acquired knowledge through them. May Almighty God bless all of them.

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Finally, I thank Almighty Allah (SWA), most gracious, for giving me the courage, ability, Strength and all that it takes for successful completion of this work.

Adedokun R. Ademola.

ABSTARCT

The feasibility study conducted for the proposed software development for FCT Water Board is Customer Enumeration. It's the result from the enumeration that is used in the system design. It's ensured that the enumeration covered all necessary information needed through a well structured questionnaire administration.

Visual Basic programming Language, a classic databases management systems for microcomputers that allows graphics and interaction with data through menu selections is used.

The system is designed to provide management with timely information, responsive service to meet customers needs, simplify the process of meters reading with the aid of geographical information system and reduce the case of illegal connections, under billing and over billing.

The implementation of the proposed system will ensure general improvement in the customer services in terms of reliability, effectiveness and efficiency.

Chapter 1

1.0 INTRODUCTION

Software development is an act that's necessitated by the dynamic nature of activities of some individuals, organization and institutions. A number of companies specialize in the development of software or application packages; But in most cases these ready-made packages may be deficient and not suitable to the specific task an organization wants to carry out. In this situation, a phenomenon where user found a ready-made package unsuitable, he can choose to produce or develop his own custom-made or tailor-made program called software to suit that specific task. Professional programmers and system analysts usually do this software development for effective data management.

In order to exhibit this act of software development, Federal Capital Territory Water Board, Abuja is taken as my Case Study for this project. If one puts into consideration what it takes to satisfy water consumers in the FCT, one will definitely realize the essentiality and imperative of software development for such an organization to carry out efficient customer services. FCT Water Board has among all other things the following services or tasks to render to its customers:

❶ Regular supply of quality water to the consumers.

❷ Maintenance of Equipment or Facilities.

❸ Prompt attention to consumers' complaints.

❹ Welfare of the Staff.

If all these services have to be carried out effectively and timely, it's on the availability of fund which is contingent on the internally generated revenue capacity of the Board because the Board has ceased getting subventions from government since 1998. In this case, the Board has to conduct customer enumeration exercise for the desired computerization, which entails Software development for effective Data management, to improve its internally generated revenue to the expectation. This exercise will consequently enable the adequate collection of the following information about the consumers.

- Name and address of consumers.
- Proper classification of consumers into Domestic, Commercial, Industrial and Institutional so as to ensure appropriate tariff.
- Identification of accounts receivable that are thought to be Un-collectible and others.
- Identification of illegal Connections.
- Identification of metered connections.

Having all these information for the process of its effective, automated Data management system will with no doubt, enhance the Board self-sustaining entity, improve its internally generated revenue status and ability to meet up with the challenges. More importantly, the prospects for a more independent existence will

be brighter. And if this computerization can be done it's hope to solve following problems facing the Board:

- Irregular Meter-Reading and update.
- Inconsistent Bill distribution.
- Ineffective Faults monitoring and management.
- Un-updated Tariff Structuring.
- Laxity on Complaints Processing.

FCT Water Board has five main departments in its organizational structure: Personnel, Finance & Supply, Commerce, Planning Operations and Rural Development. Besides, in order to ensure effective administration and close monitoring, eight Area offices have been established at the following locations: Usuma Dam, Gwagwalada, Kubwa, Garki, Wuse, Karu/Nyanya, Abaji, Bwari.

1.1 SOFTWARE DEVELOPMENT

There are two parts of an electronic digital computer system. All the electronic metals, panels, switches and screws that are scientifically joined together and can be seen physically as a component is known as **Hardware.**

However, without a sequence of instructions, hardware can not be put into effective use. This sequence of instruction is known as programs. Program is needed to be performed to accomplish a task. Therefore, Software as the second part of computer system is basically a program. Software enables the hardware to be put into effective use.

Without Software, hardware doesn't know what to do, it can not do anything constructive or profitable.

The focus of this project is on software development, at the same time I will enumerate the types of software. There are three types of software used in a computer:

1. System Software 2. Utility Software 3. Application Software

System software are program written usually by computer manufacturers, they contribute to effective control and performance of the computer system. E.g. operating system and Language translator.

Utility software - They are redeveloped programs that can accomplish a particular task. They are standard packages that are developed by software organizations E.g. Microsoft and Wordstar. These are add-ons to make the operating system perform some functions such as *disk formatting, Defragmentation, reassembling damaged data files or repairs of spoilt disks.* Examples include Dr. Solomon Anti-Virus kits, Norton Ant-Virus, McAvee Virus Scan and so on.

Application software- Applications Programs may be provided by the computer manufacturer or supplier but in many cases the user produces his own application programs called user program E.g. Payroll programs, Stock control programs, Customer services programs. Most application programs can only work if used in conjunction with the appropriate systems programs.

Software development in the case of this project is directly concerned with application software. It's the primary concern of most users of computer systems

because it constitute the immediate interface with anyone, which enable to solve a problem or perform a useful task, based on need or want.

It's the application software that most computer users have to work with virtually all the time. This is so because they allows users to directly request computers to perform specific task such as payroll processing, Order request, automated customer services or financial analysis and produce results in most accurate and timely manner.

Most application software are sold as ready-made packages for immediate installation and use. A number of companies specialize in the development of this software. But notwithstanding, users can choose to produce or develop their own custom-made or tailor-made program.

Professional programmers and system analysts usually involve in this in-house software development. This category of user-specific packages is tailored to the needs of a specific user, company or institution. Many examples of such user-specific software and the company or institution that may required them are:

- **Library** - Library management system.
- **Medicine-** Hospital management, pharmacy and billing system.
- **Finance-** Payroll and stock control system.
- **University-** Students record system and so on.

In Nigeria, large organizations such as NEPA, JAMB, NECO, NITEL, BANKS and so on develop most of their own application in-house.

Therefore, this project is to develop software, an in-house application, for effective

Data management; in the Federal Capital Territory Water Board as a Case Study.

1.2 PLAN FOR THE NEW SYSTEM

The plan for the new system involved Customer Enumeration and analysis of the data collected from the field. This will be actually carried out by Questionnaire administration. In this respect, well structure questionnaire will be designed for that purpose and the result will be used in designing the new system.

1.3 THE NEW SYSTEM

The new System will be designed in such a way that customer will be assigned a unique account and plague numbers. The plaque numbers have to be generated by area (from Base map) to avoid duplication of numbers.

Data gathered from the enumeration Survey would be processed to form the customer register. The register shall be designed as a data management system for effective and efficient storage, organization and easy update of information.

It shall also act as Customer Information Service or Inquiry Processor which will give the customer immediate information about his status.

The Customer Register shall be compatible with the billing program in order to obtain customer information, updating of the Customer Master Register to serve as a guide in knowing consumption and charge rates and also for statistics.

1.4 IMPLEMENTATION OF THE NEW SYSTEM

Subsequent to the system design, the proposed software will be menu-driven, the user will select the activity or task to be carried out such as:

- Data Entry.
- Inquiring
- Editing (add or delete Consumers)
- Complaints Processing
- Reports

The user will be able to view or screen the numbers of consumer by category, or class, district and area. This implementation will involve acquiring some Computer System for the installation of software. There will also be training of staff to enable them understand how to use the proposed in-house software (new Data base Management System). The implementation is expected to assist the board to:

- Have permanent file for each consumer, both existing as well as new ones.
- Build a functional tariff structure.
- Identification of illegal connections.
- Devise means to minimize losses.
- Have effective billing and collection system to be fully computerized.
- Have efficient faults monitoring and management information system incorporated into the system.

Chapter 2

2.0 LITERATURE REVIEW

Preamble

The role of water in the life of any nation cannot be over emphasized. The existence of human being leans on water. There is an adage that says, ***"Water is life"***. This shows how important water is. Every other things in life has alternative, there is none for water. Water occurs naturally on earth's surface. One characteristic property of free natural water is its continual motion, impacted primarily by input of radiant energy from the Sun, which cause evaporation, and subsequent condensation, which fall back as rain. Perhaps this essentiality of water accounts' for the mention in the report of the ***Justice Akinola Aguda*** Committee on the relocation of the federal capital that:

> *"We are fully conscious of the necessity for the existence at or quite close to the location for the capital of adequate water supply. In our view this is most desirable, but what is, perhaps, of great importance is the possibility for 'manufacturing, and delivering the required water of the right quality and in sufficient quantity for efficient functioning of the Capital Territory (meeting needs). We are well aware of the fact that in some countries water is transported across the long distance (say up to 180 kilometer as in New*

York) for use in the Capitals'. A location where there is an adequate natural water supply of the right quality or a location near such a place is most desirable".

And thus began the journey of Abuja and its Siamese component of water needs. From inception in 1976 water Supply in the City was managed by a sub – directorate in the Department of Engineering services of the federal Capital Development Authority (FCDA).

The supply of portable water to Abuja the nation's new federal Capital started with construction of Jabi Dam 1981: This is necessary since the natural water located in the new federal capital territory cannot be consumed without treatment. The output of the Jabi Treatment Plant was 340m^3/hour. This Dam supplied water to the FCT up to 1986.

In October 1989, the federal Capital territory water Board (FCTWB) was created specifically to:

1. Control, manage, install, maintain all water works and services vested or to be vested on the Board by the Minister of the Federal Capital Territory.
2. Ensure the supply of portable water of adequate quantity and quality for the territory at the economic rate. Harness all water resources of the territory for economic development.
3. Encourage the conduct of research for the purpose of carrying out its functions.

Submit the result of such research to Hon. Minister for Policy formulation relating to water supply and population control in the territory.

SOURCE OF WATER

The main source of drinking water in the FCT is the USMAN Dam Water Works. The Dam reservoir has a maximum capacity of 100million cubic meters. The main dam is 1,300meters long with a saddle dam of 350 meters long.

WATER TREATMENT

There are two water treatment plants at the Usuma dam that serve the needs of the FCT. The first treatment plant has a capacity of 5000cubic meters per hour and came into operation in March 1987 while the second treatment plant, which is a mirror image of the first, followed rather lately 13 years after. Hence the second treatment plant was completed in year 2000. *See appendix 1*

QUALITY CONTROL

The FCTWB can boast of good laboratory for its quality control. The physiochemical and biological monitoring units take it as responsibility that the treated water must be checked to be in conformity with the world health organization (WHO) recommendations before distribution to various storage tanks in the territory; to ensure water cleanness, its effect in health, laundry and so on

Despite all these facilities on the ground, FCTWB is still facing a lot of challenges, which need to be addressed before the situation will get out of hand. The following are the challenges:

- The quantity of the water supply has to increase to meet up with present demand of water, which is caused by high inflow of people into Abuja. The population has been on geometrical increase since the exit of military juntas from power.
- The board has to improve its internally generated revenue to meet up with its finance since it has ceased to take subventions from government.
- Faults monitoring and Management has to be improved.
- There should be drastic improvement on handling of consumer complaints.
- Training of staff particularly in the area of computer knowledge to meet up with the present information technology.
- Regular planning and research to fulfil its role in the FCT especially in the areas of industrial development, foreign investment and the social welfare of the citizens.

In order to overcome all these challenges, an efficient Data Management System has to be embarked on. However the aim of this project is to provide such management system for the board by developing in-house software for its effective Data Management.

FCT Water Board has five main departments in its organizational structure:

1. **Personnel:** In charge of general administration and staff matters.
2. **Finance & Supply:** Control the Board's finance, store inventory among others.
3. **Commerce:** In charge of billing and distribution of bills and revenue generation.
4. **Planning & Operations:** In charge of water connections and maintenance of pipelines, planning and monitoring of budget water treatment, production, distribution and quality control.
5. **Rural development:** In charge of rural water supply and rural mobilization.

Besides, in order to ensure effective administration and close monitoring, eight Area offices have been established at the following locations: Usuma Dam, Gwagwalada, Kubwa, Garki, Wuse, Karu/Nyanya, Abaji, Bwari.

2.1 IDENTIFIED PROBLEMS OF FCTWB

FCTWB is beset with a myriad of problems. This project, however, focuses on those related to customer services, namely, customer enumeration meter- Reading, Tariff Structuring, Bill Distribution, Complaints Processing, Faults Monitoring and Management.

Billed distribution continues to present a serious problem to the overall revenue generation system. This can be attributed to several factors including outdated customer records, absence of mapping data for bill distributions, Irregular street

addressing and property numbering system, Inability to identify and locate unregistered consumers.

Poor and outdated Tariff Structuring Systems for un-metered properties makes it extremely difficult to accurately compute the levels of consumption and consequently determine appropriate bills for such properties; The result of this is massive underestimation of water consumption rates or needless customer antagonism in the case of over- estimations.

Fctwb's negative publicity can be attributed to the absence of an effective machinery for the

Management of complaints, which leaves customers with the impression that, the officials are deliberately unresponsive to their predicament.

The pervading dissatisfaction arising from such feelings results in a general reluctance to settle bills and increases the tendency for illegal connections.

Acts of vandalisation such as meter theft can also be attributed to the lack of an adequate enumeration data base which makes it virtually impossible to trace and double-check the serial numbers of installed meters, relating these where necessary to the meter owners without the need for actual field verification.

It's however, hoped that with this proposed software development for effective data base management system of FCTWB, all the problems listed above will be a thing of the past.

2.2 DATA BASE MANAGEMENT CONCEPTS

Data elements represent unstructured facts. But the terms information and data represent different things. Information is an output of processed data.

In the software market today, there are many database systems available. The main store of early database management software was COBOL. Its implementation was found to need a number of additions in the control of a report writers (*A program that provides facilities for editing totally, formatting and performing other related task*). In addition to this, there were needs for powerful sort facilities, or packages. A search for this led to development of such facilities and report writer, which were handed in program report generation.

The solution to the problem of basic access method on operating system via sequential, direct, index sequential methods was developed and data dependence became serious as well as increase in the problem relating records. As a result of this, a file management system evolved.

In file processing environment, files of the same type are grouped together into files with each file having its own application for processing of the data. For instance, consider a data processing for FCTWB record concerning information about consumers are grouped in one file, records about the staff are contained in another file and a third file contains geographical information about the properties connected to FCT water Board. Having three different types of files implies that three different applications systems will be developed such that each application will be accessing in a single file. This typical of file processing environment where

users requirement are treated in isolation with application program operating almost independently imposed organization barrier with regards to the data. However, in most informational system, it is desirable to have the ability to jump over this barrier. This led to the introduction of data environment in data processing where the integrated data of different types are linked by logical relationship through a complex software system known as DataBase management System (DBMS).

What is Data Base Management System (DBMS)?

A database is an organized and integrated collection of data. A telephone book is a simple example of a database, it organizes data about people and business into categories- names, telephone numbers and address.

A database is expected to be used by a number of users in a number of ways.

The software used for this database is Database Management Systems (DBMS), which handled the many accesses to the database. The DBMS will store the data and the data relationships on the backing storage devices. It must also provide an effective means of retrieval of that data when the applications require it, so that important resource of the business, the data resource, is used effectively.

Now, the word DBMS can be defined as software packages, which manage large and complex File Structures. And make database available to a large number of users by which the sharing of data increases access.

In this, project, Visual Basic (VB) will be used as Database management systems software. In relational database such as Dbase, data is organized into tables. A

database can contain a single table or multiple tables that are related to each other. Each table is a distinct file when one uses Microsoft access for database.

For instant, a Sales database might include one table for customer information, one for orders and one for inventory.

Table consists of fields and records. In a table, all the data about one customer makes up one record. That's to say in a table, a record occupies one row. A field is a category of information that partially describes a record, such as customer number, however in a table, a field occupies one column.

Once the data have been divided into tables, one decides how to link tables together in useful ways. One can links or relates the data in one table to the data in another so that one can work with both tables at once. To link tables, the tables must have a common field, such as customer Number. Both customer and Building Number have a Customer Number field.

If information about the Building is needed, Visual Basic Program will check the Customer number in Building Number and then finds the record in Customer with a matching Customer number. Relating tables is such a powerful tool; it's well worth the time to plan relationships carefully. While tables primarily store and classify data, other files enable one to see table data from different perspectives.

Queries, forms and reports enable one to see and edit just the data one wants. Queries are used to retrieve and manipulate data from one or more tables. With a query, you can specify the data you want to work with such as a group of records that meet certain criteria. One can design a form for entering and editing data in

ones tables. So, also reports to print out table information in presentable and useful formats.

Why Database Approach?

The database provides the data resources for the organization. The database management system (DMBS) is the software, which manages this resource. In the 1970s, number of large firms with mainframe computers adopted the database approach. There were a number of reasons for example to:

- Reduce data duplication
- Reduce inconsistency
- Increase its share ability
- Increase the speed in implementing systems.
- Increase the integrity of the data
- Improve the standards of the systems developers.
- Increase data independence.
- Provide a management view of the organization.

2.3 GEOGRAPHICAL INFORMATION SYSTEM (G I S)

As the name implies, this is an information system that implores the use of geographical map to be logically related to the database. It is a digital map that enables graphical identification of consumers based on generated queries with the use of proper Geographic Information System (GIS) database management software. It is possible to generate identifier numbers corresponding to the

geographical location of each building/property and incorporate it into the computerized map. One may not be able to discuss GIS in isolation without mentioning AutoCAD. AutoCAD is the software that allows a lot of flexibility in geometric drawings. It provides a User – defined coordinate system that defines the orientation of the X, Y and Z-axes in 3D space. This is software that simplifies the digitalization of area map used for this project. Each property has a unique number generated from the coordinates of the digitized map. This number was engraved on a plaque and fixed at the entrance of each building for property identification by the field staff. *See appendix 2.*

2.4 IMPORTANCE OF GEOGRAPHICAL INFORMATION SYSTEM

As Database management system is concerned, it involved all necessary information that may be needed to accomplish a particular task. Geographical information in this regard is very imperative in the proposed computerization of Customer Services of FCTWB. Geographical Information System will definitely help in the following ways to achieve this effective data management system:

- It makes the geographical location of consumers easier.
- It allows logical relation of data without going out to visit any particular property.
- It makes Bill distribution more convenient having the opportunity to distribute bills with digitized map that contains property identification number which has been already fixed to each property.

- It improves faults monitoring and management.
- It reduces, if not entirely eliminated the problems of illegal connections since each property can be easily located.

Chapter 3

3.0 FEASIBILITY STUDY

The feasibility study conducted for the proposed software development for FCTWB is Customer Enumeration. It's the result from the enumeration that is used in the system design. It's ensured that the enumeration covered all necessary information needed through a well-structured questionnaire administration.

3.1 PROBLEM DEFINITION

In order to avoid loss of focus, the problem at hand is defined as follow for purpose of this project:

"Software Development and importance of Geographical Information System in data Management" A case study of FCT Water Board, Abuja.

3.2 OBJCTIVES

Considering some identified problems and in view of some challenges facing the FCTWB; Software development for the Board has become essential to enable efficient data Base management system and render quality and prompted services to its numerous, ever increasing consumers base on the following Objectives:

- To provide responsive service to meet customers needs.
- To eliminate Poor handling of consumer complaints processing.

- To improve faults monitoring and management.
- To improve tariff structuring systems.
- To simplify the process of meters Reading and bills distribution, with the aid of geographical information system.
- To reduce the cases to illegal connections.
- To eliminate the cases of under- Billing and over-billing.
- To be able to compute the level of consumption via regular meter-reading and consequently determine appropriate bills for each consumer.
- To Increase the Board internally generated revenue in order to be self-sustaining corporate entity and prospects for a more independent existence in the future.
- To enable efficient planning, research and training of the staff to meet up with future challenges.

3.3 METHODOLOGY

The techniques employed for the purpose of collecting relevant data on every customer is interview through questionnaire Administration. This is house-to-house survey used to identify, classify and categorize the consumers. Customer coding number was given to each consumer. Properties with existing connections were identified in the field by fixing plaques or displayed code numbers.

The sample survey (Customer enumeration) was carried out in the service area of FCTWB to determine the consumption patterns in the high density

areas, medium density and low density areas, Customer enumeration raw data sheets (hardcopy) generated from the survey was given to the water board. *See appendix 3.*

3.4 CUSTOMER ENUMERATION CONCEPTS AND DEFINITION OF TERMS.

The basic tools used in the preparation of the consumer register as an output of the enumeration survey are:

- Existing Register of consumers and their account numbers.
- Legal edit that empowers FCTWB to enter consumer's premises.
- Updated town maps.
- Codes for various classes of consumers
- Questionnaire.

1. Demarcation of Enumeration Areas:

There was demarcation of affected communities into enumeration area. The reason for demarcation is to ensure that there is no emission or duplication of buildings or households.

There are five districts, namely, Asokoro, Garki, Maitama, Wuse1 and Wuse 2. Garki and Wuse 1 are also subdivided into areas. In Garki, we have Area 1, 2, 3, 7, 8, 10 and 11, Wuse 1 is subdivided into Zones (Zone 1,2,3,4,5,6,and 7). In the process of demarcation, there are 143 EAs spread all over these districts. Two types

of map are used during the enumeration. They are supervisory are map (SA) and the enumeration Area Map (EA).

(A)S.A Maps is usually made up of about five EAs. The map is used by each supervisor to know the EA under his control.

(B)EA map was used by the enumerator. The map will clearly define the Area to be covered by an enumerator. The description below the map will allow the enumerator to understand the physical features that are used for the boundaries of his E.A. Physical features such as Land, Rivers, Footpaths, and Water tanks are feature you can find on the ground. *See appendix 2*

2. Questionnaire Design:

The designing of questionnaire is based on the following process.

(a) *Statement of the problem*: This will be extracted with a view to identifying the factors leading to the need for the assignment and the objective the service is expected to service.

(b) *Determination of Output*: There will be a meeting with the board to ensure that the outputs are mutually understood.

Once the above are established, an algorithm will be generated documenting the process and to ensure that the approach is appropriate, logical and consistent. The questionnaire will be pre-coded, highly structured, and those only questions whose exclusion will affect the result of the survey will be included. The questions will be in three parts:

Part 1: Introduction and customer enumeration.

Part 2: Technical information about the service connection

Part 3: Information about the interview

Part 1-3 will be administered 100% on all the respondents in the service area.

See appendix 3 for sample of questionnaire.

3. Questionnaire Pre-testing:

Preliminary questionnaire was pre-tested. The pretest would expose the problems that the enumerator might face in administering the questionnaires and will assist us to provide solutions for handling them. The popular "think aloud" procedure was used. At the end of each day's test, the entire field team assembled at their base to discuss experience in the pre –test, and recommendations for improvement with their supervisors who will collate these and forward the same to Zonal Coordinator.

After about one week of pretest, the questionnaire was finalized. The questionnaires will be finally designed not only so that enumeration can easily and accurately record responses, but also for transferring data to the computer (data entry). Coding forms was developed and used by editors so that responses can be quickly assessed and if found adequate, forward to data entry clerk for processing. *See appendix 3 for sample of questionnaire.*

4. What is an Interview?

The term interview means a process of social interactions between enumerators and a number of a household. This interview should be seen as a data-gathering phase

of the enumeration exercise. It is the foundation and focus of all enumeration activities. It must be said that interviewing is a difficult task, this may be easier or difficult depending on the environment. All the same every enumerator can improve his/her skill by learning to avoid certain errors by being alert and aware that the purpose of the interview is to conduct a successful enumeration.

However, the type of interview adopted for this exercise is structure interview.

5. Breaking Barriers to Interview Resistance:

Interview resistance is a situation whereby the respondent is unwilling to cooperate with an enumerator. 'Oh! I am too busy now', 'come back some other time'. Under this condition, the enumerator is expected to decide whether the respondent is actually busy or he is just trying to avoid interview; He should still try and enlighten the respondent on the need to ensure the question being asked.

And if a respondent is making an in-factual statement and one is in doubt, enumerator can probe further by "dancing around the question"

Besides, all answers should be recorded immediately they are given and their certainty before moving to the next question and crosscheck all responses before leaving the household.

6. Ending the Interview:

The way an enumerator end an interview should be as good as the way it was started. The enumerator should leave a good impression of himself/herself. He/she must make sure he/she says***' thank you'*** at the end of the interview. If offered any

refreshment, he should decide to accept or reject on the spot. If he must reject, it must be in a polite manner.

DEFINITION OF TERMS.

- **Locality:** A locality is the lowest administrative space within the operational structure of the FCTWB. This means the zonal offices of FCTWB.
- **Building:** A building is any free standing structure comprising of one or more rooms, covered by a roof. It may or may not be enclosed within external walls. A building may be used for Residential, Commercial, Industrial, Institutional or combination of one or two purposes earlier mentioned.

A residential building is a bungalow when it contains only one floor, but when it has more than one floor, it is called a story building.

- **Compound:** A compound is a premise having one or more structural units with a wall for security reasons. Such a compound should be treated as such.
- **Consumer Household:** A consumer household connotes a person or a group of person living or working together under the same roof or in the same building compound sharing the same source of water and collectively responsible for the settlement of water Bills.

There are five major categories of consumers and these are:

a. Private or residential

b. Industrial

c. Commercial

d. Institutional

e. Government agencies and parastatals.

- **Contact Person:** This may be any adult recognized by residential consumers as their focal person. He bears the major responsibility of the maintenance of the house connection and takes decisions regarding the settlement of their bills.
- **Enumeration Area:** An Enumeration area is a small compact area, carved out of a bigger settlement or a group of settlements with a well defined and identified boundary. Its an area which an enumerator is expected to cover during the pre- test, main enumeration survey. The areas are carved out avoid omission and duplication of counts.
- **Special Enumeration Area:** It is an area made up of institutional buildings or household such as Estates, Barracks, Prison yards, Boarding houses and Institutions.
- **Questionnaire:** A questionnaire is a survey or Enumeration document containing series of questions with spaces provided for possible responses in form of prose or checklist for the respondent to answer.
- **Customer Enumeration:** It is total, analyzing and publishing social, financial and technical data pertaining to all water consumers of FCT delaminated or part of it.

- **Sample Survey:** It is a process of collecting, compiling processing, more detailed information, a subset of the population.
- **Post Enumeration:** It is a sample survey usually carried out on a fraction of the population after enumeration has taken place. A different questionnaire usually longer than the one used for the real survey is administer on the individual in the selected Enumeration Area after about two weeks of the completion of the main exercise.
- **Enumerator:** Is one of the functionaries in the execution of this exercise. His/her dedication to this assignment is essential for the success of the enumeration. His main responsibility is to collect information from the field. He should work in contact with his supervisor for necessary instruction and collection of enumeration materials such as a sketch map, House list form, Questionnaire, writing materials, call back cards, Identity card, Stickers for house numbering and sheet of papers for map enlargement.

How enumerator should behave:

An enumerator should be polite, courteous and friendly to all the people. He should not do any thing that can cause fear or panic for people to suspect him of any foul play. Hence he should ensure the following:

- His dressing should be simple and smart
- He should knock before he enters any house.
- He greets all the people in a jovial manner.

- He should ask for the head of household or any other elderly person and explain the purpose of the interview.
- He should ensure he obtains all relevant information.
- If there is any resistance, he should contact his supervisor for assistance.

Duties of an Enumerator:

An Enumeration will perform the following duties:

- He should check the map and boundaries of his EA and ensure that there is no omission, or overlapping.
- He should record all fully and partially occupied buildings and number them accordingly.
- He should ensure that each questionnaire is completely filled and submitted to the supervisor.
- He should ensure that all necessary materials are collected from the supervisor and report to him when he is running short of any of them.
- He should report any problem encountered during the course of the interview to the supervisor.

- **Supervisor:** He is the person in charge of supervisory area. A supervisory area contains 5 or 6 Eas depending on the situation. That's to say, a supervisor is controlling, monitoring and supervising about 6 enumerators.

He distribute materials and collects field returns from them. However, He too is subjected and accountable to the zonal coordinator. A supervisor must choose a convenient place as a meeting point within the supervisory area so as to carry out his assignment with his enumerators.

It is at this point enumerator should meet him always unless he went for field inspection which he must have informed all his enumerators before they are dispersed to their various enumeration area. He should also make all necessary correction on the field returns submitted to him before handing the same to the zonal coordinator.

- **Zonal Coordinator:** He is in Charge of at most 2 supervisory areas. He coordinates all the Activities on the field. He is charged to inspect any enumeration area to ensure accuracy.

He is the last person that check field returns before editor and data clerk start processing.

3.5 ENUMERATION PROCEDURE

Public Enlightenment:

Enumeration publicity and public enlightenment are very important task and essential instrument in enumeration of this kind. This is to get maximum cooperation from the people to enhance the smooth running of the customer enumeration.

If proper awareness is given to the people through media such as radio, television, newspapers, postal and handbills, then enumerator will not have any or much problem with the respondents in respect of interviewing the respondent. However, in this exercise, appropriate themes for the enumeration campaign was carefully selected and selectively used at various times and for various segment of the population.

Procedure:

The procedure used during the exercise is the canvasser method. It is the movement from one house to another, completing the questionnaire. The enumeration would meet the focal person in the household and administered the questionnaire. During this exercise, the "defacto" method of interview was adopted and enumerators are not allowed to hand over the questionnaire to the respondent to fill in the answers themselves.

Identification of Enumeration Area (EA)

The first thing an enumerator has to do on the field is to locate his E.A from the map through his supervisor who is holding S.A map. S.A map is usually made up of about five EAs. It is from SA that he would locate his Enumeration Area (EA). He should locate his position on the ground in relation to the map. This is called ***"map orientation"*** he should align the street on the map with that on the ground so that the North arrow on the map will point to the actual North on the ground. *See appendix 2 for sample of EA map.*

Furthermore, he should follow the EA description and make sure that all the boundaries in the EA are identified on the ground.

The next thing is to locate the starting point on the ground. The starting point is indicated on the E.A map with a star (*) and it is usually a road junction.

Enumerator should walk round the boundary and acquaint himself with all the buildings and other roads within the EA. He Should also liase with his colleagues in the adjoining EAs and agree on the common borderlines as shown in his EA map and on the ground. This will guide against overlapping or omission, which may occur as a result of wrong boundary identification.

If there's any overlap, he should report to his supervisor who will take appropriate action to report to Zonal Coordinator. An overlap occurs when a Structure falls in between two EAs. The Enumerators and their supervisors have to agree on a common boundary. This may lead to the amendment of the two EA Boundaries.

Map Updating:

The EA maps are more than ten years old and therefore there may be many changes in the EA for example, there could be

- Localities not shown on the EA Map.
- New Roads, footpath etc.
- Rivers and streams without names.
- Wrong spellings of names, Street, Rivers etc.
- New building

Enumerator should check for features that are no longer in existence on the ground but are on the map. If there's any like that, he should draw X on them. If it is wrong spelling he should draw a neat line on the old names and write new name with red pen.

Map Enlargement:

After identifying and updating EA, Enumerators are required to insert all the buildings standing within the EA into their position on the EA map. This may not be possible and therefore the need to enlarge the map.

Enumerator should decide on the scale of his enlargement and this depends on the size and form of his format. He should:

- Fill in the identification particulars of his EA in the space provided on the enlargement format.
- Prepare the draft of the enlarged EA taking into consideration the size and form of the EA.
- Transfer all the information in the fair drawn map on his enlarge map.
- Locate all the building in the EA including the one's under construction on the enlarge map. He should us block of about 0.5cm square to represent each building in the EA and us capital letter U to represent building under construction.
- He should number all the building on the enlarge map in a " Serpentine" order or in a any way convenient for him.

- He should proceed to attach numbers to all the buildings in the EA using the enlarge map as a guide.

House Numbering:

The following are the procedures for house numbering.

- All buildings below foundation level must not be numbered.
- All partly dilapidated or abandoned structure should be numbered but their peculiarities must be indicated against them.
- Buildings with a few other structures such as boy's quarters must carry a single number since Town Planning will give it only one number.
- When a compound or an estate consists of many buildings that are owned by a single person with or without tenants, the buildings must carry different numbers.
- The palace of a traditional ruler often consists of more than one building, but occupied by different household. All the buildings within the palace must be number separately.
- In case of school premises, all buildings must be numbered separately and the purpose they are used for indicated against them. The same applies to a market environment, Church and Mosque premises.

Questionnaire Administration:

After House numbering the next thing is consumer listing and questionnaire administration simultaneously. The first part of this contains the identification particulars of the EA i.e.

- L.G.A & FCTWB Zone
- District & Section.
- Enumeration Area codes.
- Street Address.
- Building serial number & purpose.
- Name of Enumerator.
- Signature.
- Name of Supervisor.
- Signature.
- Date.

See appendix 3 for example.

After the EA identification, consumer listing begins. This is divided into seven columns:

Column 1: Serial number of building/compound. Enumerator should write down the serial number of building or compound in the space provided. This must correspond with the numbering on the enlarged map and the same with the one on the enumeration questionnaire.

Column 2: Purpose for which building is used. He should write down the purpose for which building is used in the space provided. If a mosque or church, write mosque or church.

Column 3: Address of building. He should also write down the street address or name of owner of the building or compound. He should write the one that is applicable in the space provided. E.g Plot 248, Malanje Street, wuse zone 4, or Alhaji Ademola's house zone 3.

Column 4: Serial number of consumer. Write down the serial number of consumer within a building or compound in the space provided. For example 001, 002, 003, 099,100,111 and so on this number should terminate with the last consumer in the EA.

Column 5: Focal Person

Identify and write the name of focal person against their households.

Column 6: Category of Consumer.

Record the Category of Consumer in this Column. Enter 1 if residential, 2 if Commercial, 3 if Industrial, 4 if Institutional, 5 if Government agencies and, 6 for others.

Column 7: Remarks.

This is to indicate whether the consumer is connected, disconnected or unconnected to FCTWB.

To conclude consumer listing exercise in a building within an Enumeration area, a sticker containing the serial number of the Building and EA Code must be pasted at least Six Feet (6ft) from the ground so that it will be out of reach of children.

The following are the materials used for house numbering and consumer listing.

- House numbering and consumer listing form.
- House numbering stickers.
- Biro, pencil, erasers, bag envelopes, cellotapes.
- Drawing paper for enlarging EA Sketch Rule sheets for rough work.

Close of Enumeration:

Before closing the work for the day, enumerator should check through all completed questionnaires to make sure that there are no omissions, duplications or inconsistencies. If any of this is detected, the enumerator should go back to the affected house and make necessary correction. Summary sheet at the end of the interview should be completed if enumerator has ensured that all answers recorded are correct and completed. Therefore, he should return all the materials used to the supervisor who will in turn hand them over to the zonal coordinator.

After questionnaire administration and submission to zonal coordinator, then consistency checks, quality Check and coverage check. After which Data Entry & Processing begins and finally report generation. *See appendix 5 for flow chart of enumeration procedure.*

3.6 REPORT ON DATA ANALYSIS.

Upon completion of the whole exercise, the following reports shall be presented:

- Customer Register.
- Illegal customer registers.
- Customer Classes by area.

- Customer Classes by Districts.
- Record of Metered connections.

Apart From the report listed above, The information system will also be designed in such a way to be capable of documenting the particular of each consumer as follows:

- Name of Customer
- Account Number of Customer.
- Address of the User with accurate geographical reference e.g. Zone, districts, section and street.
- Location Code, Category of consumer and mode of building.
- Name and Address of payer (if different from User). *See appendix 8.*

The new register will be deposited with the commercial department or other unit, which oversees the new connections and the accounts receivable section for records, regularization of illegal connections and for future updating. It is same department that will be in charge of updating the consumer file through the new customised system. It's worth mentioning here that, the reliability and sustainability of any system or scheme depends on its operation, maintenance and management.

3.7 RECOMMENDED COMPUTER SYSTEM AND SPECIFICATIONS.

Personal computers are recommended. Actually, the computing requirements of the business profession are vary demanding. There is now urgent need for greater performance to run more sophisticated software at faster speeds and for early access to the corporate, mainframe, on -line remote and on- line public, information database.

Though the operation of this system has only to learn a relatively simple sequence of keyboard operations since the processing operations are menu driven, well-trained staffs are necessary. This will definitely ensure improvement and innovations into the system. *See appendix 6 for main menu.*

Specification: Initel celeron

Processor: Pentium II,

- 120 MB RAM (Random access memory)
- 6.5 GB HDD (hard disk drive)
- 1.44 MB FDD (floppy disk drive)
- CD ROM DRIVE (at least 48x)
- 56K FAX MODEM
- 15" SVGA (Monitor)
- Enhanced keyboard + Mouse.

Other Hardware Facilities:

- LaserJet Printer (1100 Series)
- CD Writer (HP 8200 Series)
- Ups and Scanner

Operating Software:

Microsoft Visual Basic (VB)

Microsoft Access, Words & Excel.

AutoCAD

3.8 COST AND BENEFIT ANALYSIS.

The Computerization of customer services of FCT Water Board entails a lot of things among which are customer enumeration (House to House Interview of consumers), System Analysis, Purchase of Computer System and other Hardware facilities, and so on. The cost of all these things can be analyzed as follows:

Cost Analysis:

Cost of package (Software)	=N= 200,000.00
System Analysis Cost	=N= 300,000.00
Labor Cost	=N= 200,000.00
Cost of Computer System & other facilities as Specified in page 42	=N=200,000.00
Cost of Change over to new System	=N=150,000.00
Miscellaneous	=N= 100,000.00
Total Cost	**=N= 1,150,000.00**

BENEFIT ANALYSIS.

Although the cost of implementing the new system is over one million Naira, but the benefit the FCT Water Board will derive will be much more than what it costs. If the new computerization system is adopted the following are the expected benefits for the FCT Water Board among many other advantages:

- Have permanent file for each consumer both existing as well as new ones.
- Identification of illegal connections.
- Devise means to minimize losses and have a reliable revenue generation.
- Have effective billing and collection system to be fully computerized.
- Have efficient faults monitoring and management information system.
- Build a functional tariff structure.

In addition, with the adoption of database approach, the board will be able to overcome data duplication, inconsistency and increase the integrity of the data among other things. However, the implementation of the new system will ensure reliability, security, effectiveness and above all privacy.

Chapter 4

4.0 SYSTEM DESIGN AND DEVELOPMENT.

Considering some identified problems and in view of some challenges facing the FCT Water Board during the analysis of its Customer Services, software Development for the board has become essential to render quality and prompted services to its numerous, ever increasing customers. This computerization will surely simplify the process of Meter Reading and Bill distribution with the aid of geographical information system.

4.1 MANAGEMENT INFORMATION SYSTEM

Management information System is a formal information network using computer capabilities to provide management with information necessary for making decisions. No matter what types of operations an organization performs, its management information System must provide: -

- Reports that are decision oriented that is; Reports that provide information that is accurate timely, complete concise and relevant.
- Room for expansion and growth: The survival and growth of an organization depends on how well it adapts to a changing environment. Therefore, the MIS must be flexible enough to handle the information's changing needs.

- ❖ Results that the user needs MIS can not be successful if it does not meet the user's requirements.

However, one of the strategies for MIS design is the data base approach, which has been adopted for the project. This involves the collection, storage and maintenance of a large pool of data. It should be detailed enough to contain all that is required for the operational and managerial control of the organization.

Sophisticated software called DBMS such as Microsoft Visual Basic has been developed which maintain the database. *See appendix 9 for program text.*

4.2 INPUT OF DATA

In data input process, the user works with a screen based image of a form. This has blanks in which data can be entered. It is for the user to enter data at any point on the form. *See appendix 6 and 8.*

4.3 DATABASE

The system is a complete database System. A database is a collection of data usually files, arranged in such a way that it is independent of any particular program or application. its arrangement eliminates data redundancy. Access to files provided by a data base management system.

4.4 OBJECTIVES OF DATABASE SYSTEM

The objectives of database system are as follows:

- Reduce data duplication
- Reduce inconsistency
- Increase its share ability
- Increase the speed in implementing systems.
- Increase the integrity of the data
- Improve the standards of the systems developers.
- Increase data independence.
- Provide a management view of the organization.

4.5 THE SYSTEM DEVELOPMENT

Here, the project will consider the followings:

① Input, output and processing requirements.

② Data files

③ System management.

4.6 DATABASE FIELD DESCRIPTION

There are two-database files in use, namely:

1. Customer Register Database file. *See appendix 10*

2. Base Map. Database file.

Customer Register Database File.

This is the master file that contains all necessary and required information about each consumer, which can be updated at any particular time by modifying the register. Some of the fields are building serial Number, Type of household, name and address of the customer, consumer serial number, and so on.

Base Map Database File.

This is the file that contains all the property identification for easy location during field operation such as bill distribution and meter reading.

4.7 OUTPUT DESCRIPTION

There will be computer print out on the following:

- Monthly bill
- List of disconnected consumers
- Outstanding balances
- Complaints monitoring.
- Illegal Consumers and so on. *See appendix 6 for main menu*

Chapter 5

5.0 CONCLUSION

FCT Water Board Abuja is a big parastatal, its Services call for efficiency and quick response to the need of consumers. The board as facing a lot of problems such as Tariff Structuring, Bill distribution, Complaints processing faults monitoring and management.

Most importantly, Bill distribution continues to present a serious problem to the overall revenue generation System. This can be attributed to several factors including outdated Customer records, irregular Street addressing and property numbering system, inability to identify and locate Unregistered consumers and absence of mapping data for bill distributions.

Considering, all these problems and the anticipation for effective management to enhance quick response to consumer needs, FCT Water Board, Abuja with no double needs to Computerized the Customer Services to meet the present technological advancement. Hence, the need to develop Software, an in-house application, for effective Data management.

The beautiful thing about this Software is that it is a menu driven and it's a complete user friendly. The user will select the ability or task to be carried out such as:

- Data Entry
- Viewing
- Search
- Complaints
- Reports and so on

The Software enables the user to view or screen the numbers of consumers by category or class, district and area.

The system is designed to provide management with timely information and to ensure proper customer Services. The Implementation of the proposed System is expected to assist the board to:

- Have permanent file for each consumer both existing as well as new ones.
- Identification of illegal connections.
- Devise means to minimize losses.
- Have effective billing and collection system to be fully computerized.
- Have efficient faults monitoring and management information system incorporated in to the system.
- Build a functional tariff structure.

In addition, with the adoption of database approach, the board will be able to overcome data duplication, inconsistency and increase the integrity of the data among other things. However, the implementation of the new system will ensure reliability security, effectiveness and above all privacy.

5.1 RECOMMENDATION

Under the circumstances it was tested, the project has been found to work effectively and efficiently. However, for implementation, a Pentium II (350A) of 64MB RAM, 6.5GB hard disk drive, 1.44MB floppy disk drive, CD ROM drive at least 48X, 56 x150 SVGA (monitor) and enhanced key board + mouse is expected. There is also need to procure a printer. LaserJet Printer (1100 Series) is recommended. The bill reports should be generated on monthly basis so as to know the monthly-generated revenue. This will be achieved by regularly meter reading which will involve staff from house to house to read the meter. Any consumer that found without account Number is automatically unregistered consumer connected to FCT Water board illegal and should be immediately disconnected and necessary action taken against such a person.

Any subsequent person working on this project should concentrate mostly on maintenance and expansion of the System.

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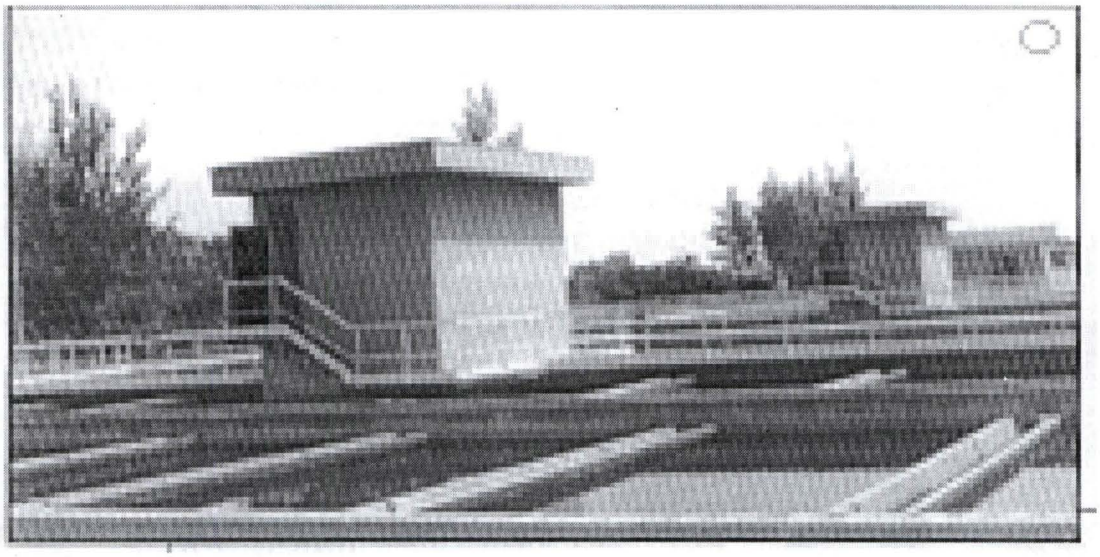
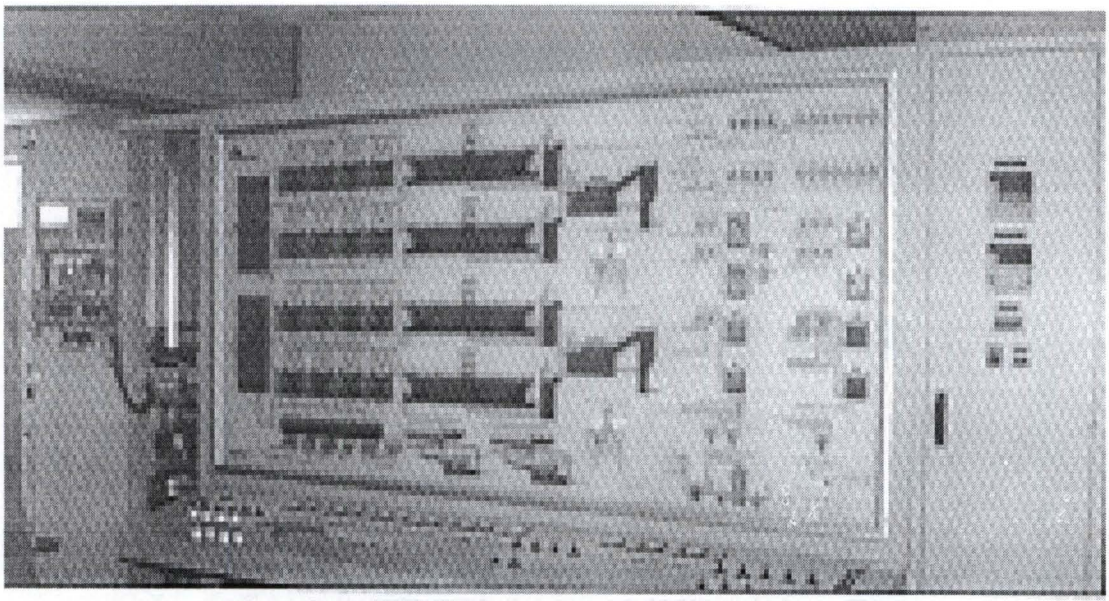
Appendix 1.

The FCT Treatment plant at Usman Dam.



The 1st Treatment Plant



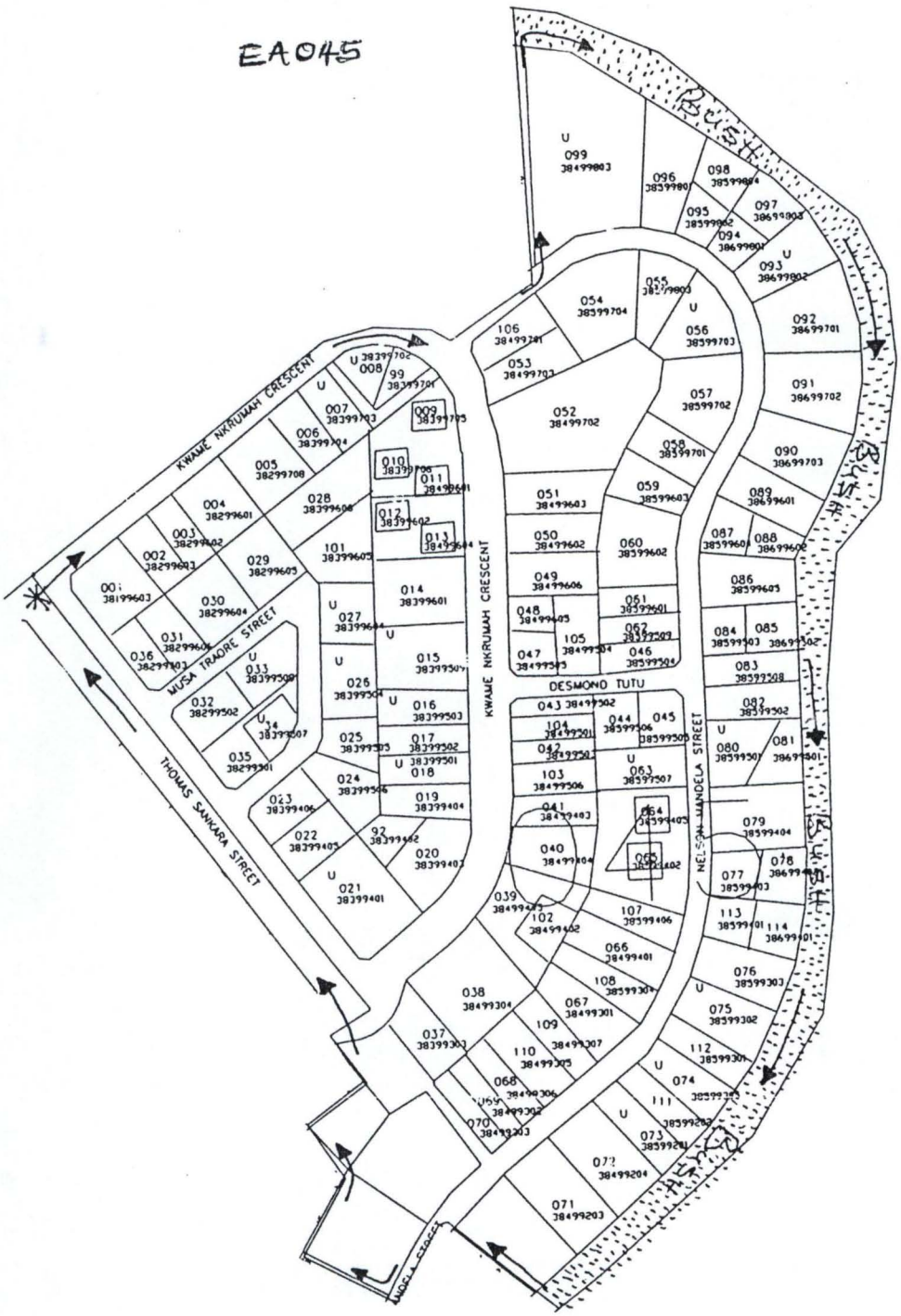
PANEL ROOM OF THE TREATMENT PLANT

Panel Room of the Treatment Plant.

Appendix 2.

Sample of Enumeration Area Map.

FEDERAL CAPITAL TERRITORY WATER BOARD



NUMERATION AREA DESCRIPTION

rting from the junction of Thomas Sankara Street and Kwame Nkuruma Crescent, walk along the Crescent crossing Nelson Mandella to a footpath. Take the footpath to the edge of th sh, turn right, walk along the edge of the bush to another footpath linking Thomas Sankara Street. Turn right, walk along Thomas Sankara Street via the footpath back to your starting nt.

Appendix 3.

Sample of Questionnaire.

1999 FCTWB CUSTOMER ENUMERATION – RESIDENTIAL

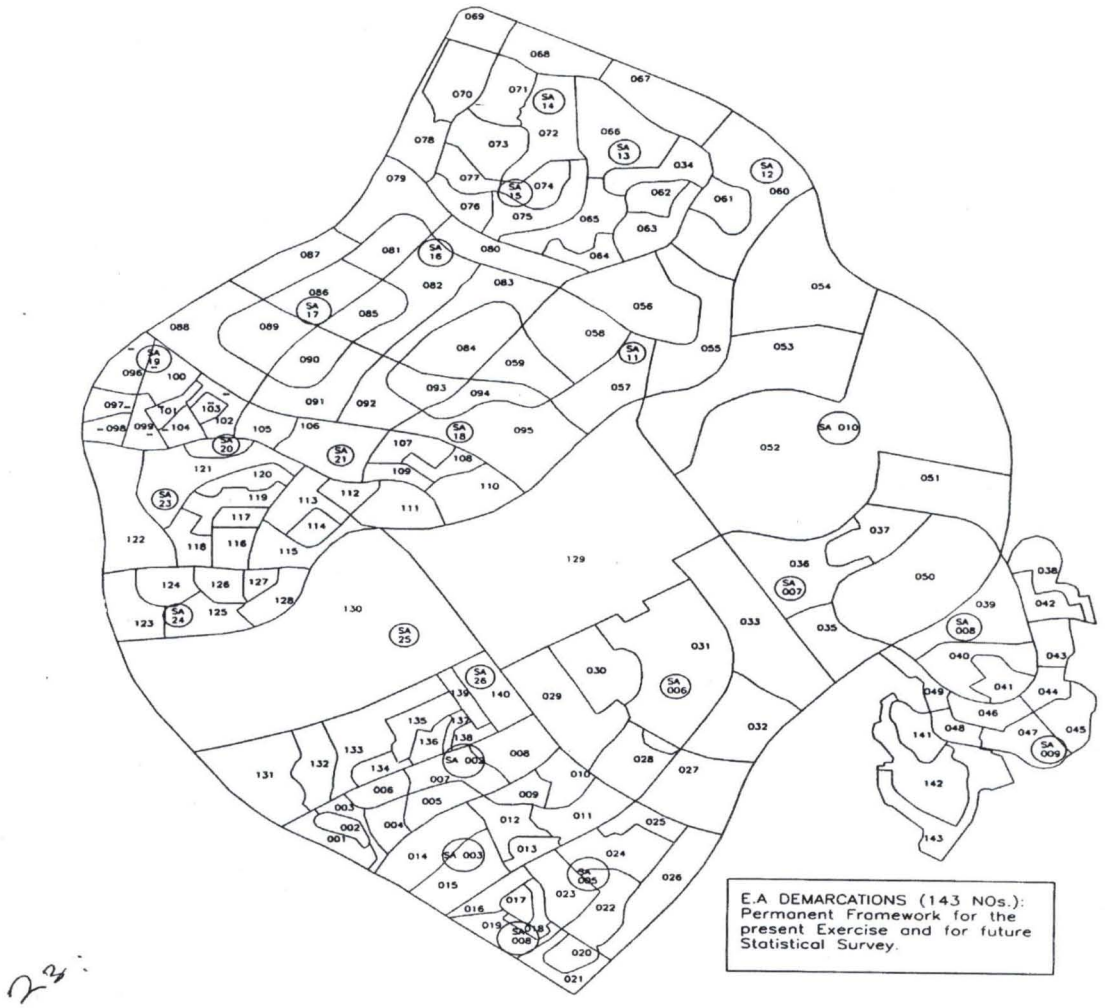
Decision	Language	Status of Respondent		No of Persons
101	**102**	**103**	**104**	**105**
Are you willing to be interviewed?.	Language used for interview	What is your status in this building?	Name of Head of Household occupying housing unit.	No of persons living in housing unit
Yes … 1 No…. 2	English …….. 1 Pidgin …….. 2 Other (specify) 3.	Land lord/lady (owner occupier)… .. 1 Husband/Head of tenants…….. 2 Tenant/Wife of tenant…….. 3 Other relationship to occupant of Premises (state)…….. 4 Proprietor/M.D/Head of Corporate Body (state) …….. 5 Other relationship to Corporate body (state) …….. 6		
IF YES GO TO 102 IF NO EXIT		If 5 or 6, go to 107	RECORD ACTUAL NAME	RECORD ACTUAL NO.
☐	☐	☐	Surname Last name	☐☐
☐	☐	☐	Surname Last name	☐☐
☐	☐	☐	Surname Last name	☐☐
☐	☐	☐	Surname Last name	☐☐
☐	☐	☐	Surname Last name	☐☐
☐	☐	☐	Surname Last name	☐☐

Purpose	Location of property	Status	Name of Owner	Address of Owners	
108	**109**	**110**	**111**	**112**	**113**
Purpose for which building is used	House No. and Street address of property	Status of the address	Name of owner of property	Address of owner of property	property
Residential ..... 1 Commercial .... 2 Industrial ..... 3 Institutional..... 4 Government - Establishment ..... 5 Other Specify.... 6		Way ..... 1 Road..... 2 Street..... 3 Crescent..... 4 Close..... 5			Low density Med. density High density
			LAST NAME FIRST		
☐		☐	Surname First name		☐
☐		☐	Surname First name		☐
☐		☐	Surname First name		☐
☐		☐	Surname First name		☐
☐		☐	Surname First name		☐
☐		☐	Surname First name		☐

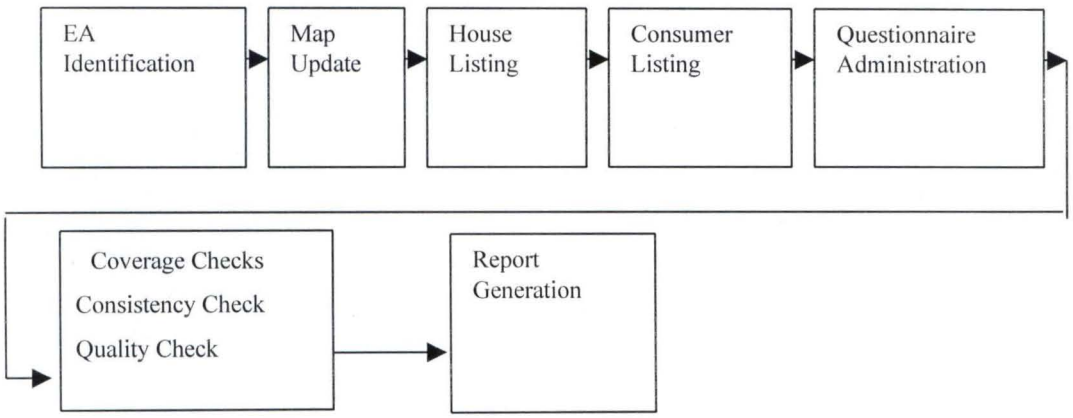
201	202`	203	204	205	
Source of Water	Connection date	Frequency of supply	Quality of supply	Additional sources	
Is your house/premises connected to FCTWB?	When was it connected?	How often do you get water from FCTWB?	Is the quantity of water received from FCTWB mains sufficient for your needs?	Which of the following is your main source of additional source of water to that received from FCTWB?.	
Yes..... 1 No..... 2	Don't, know 9	Regularly..... 1 Daily but not for 24 hours..... 2 Every 24 hours.... 3 Twice a week... 4 Once a week... 5 Others (specify).... 6		Water seller/Borehole.1 Yard well/borehole... 2 Public stand pipe.... 3 Mobile tanker water. .4 Yard shared pipe..... 5	
IF NO GO TO 205	(RECORD ACTUAL DATE)		IF 1, GO TO 301		

Appendix 4.

Sample of Base map showing Enumeration Area demarcation and Supervisory Areas



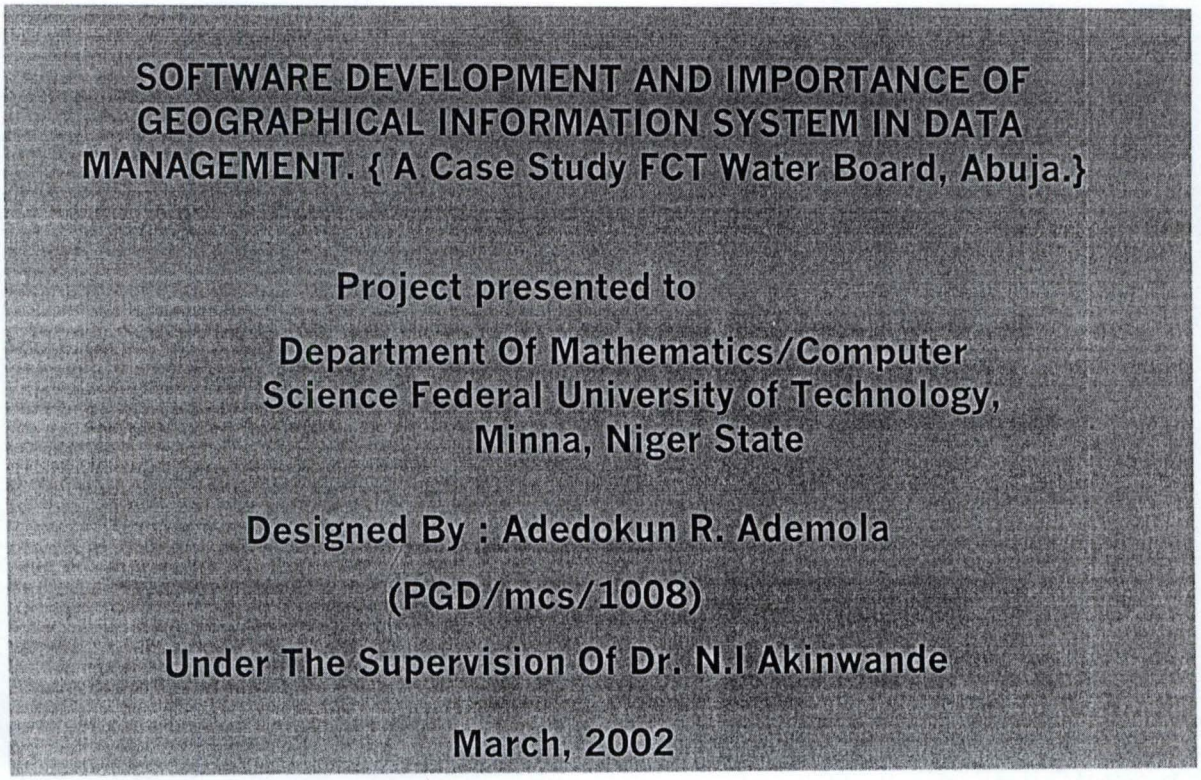
Appendix 5.

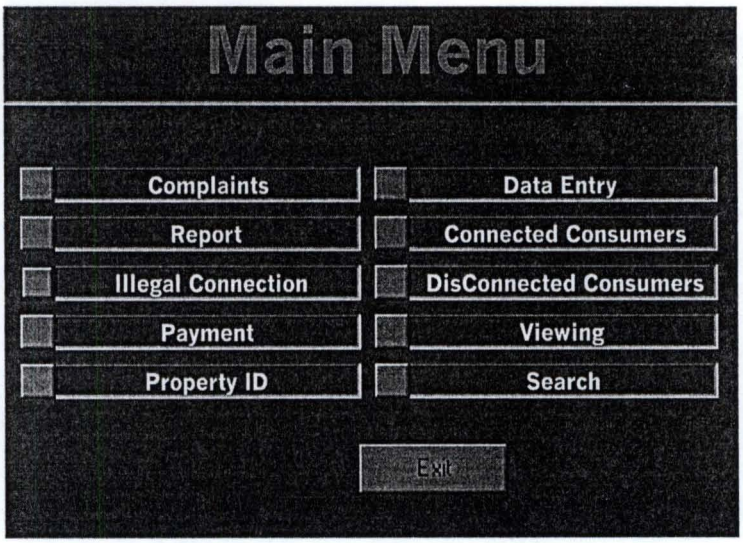


Flow Chart of Enumeration Procedures.

Appendix 6.

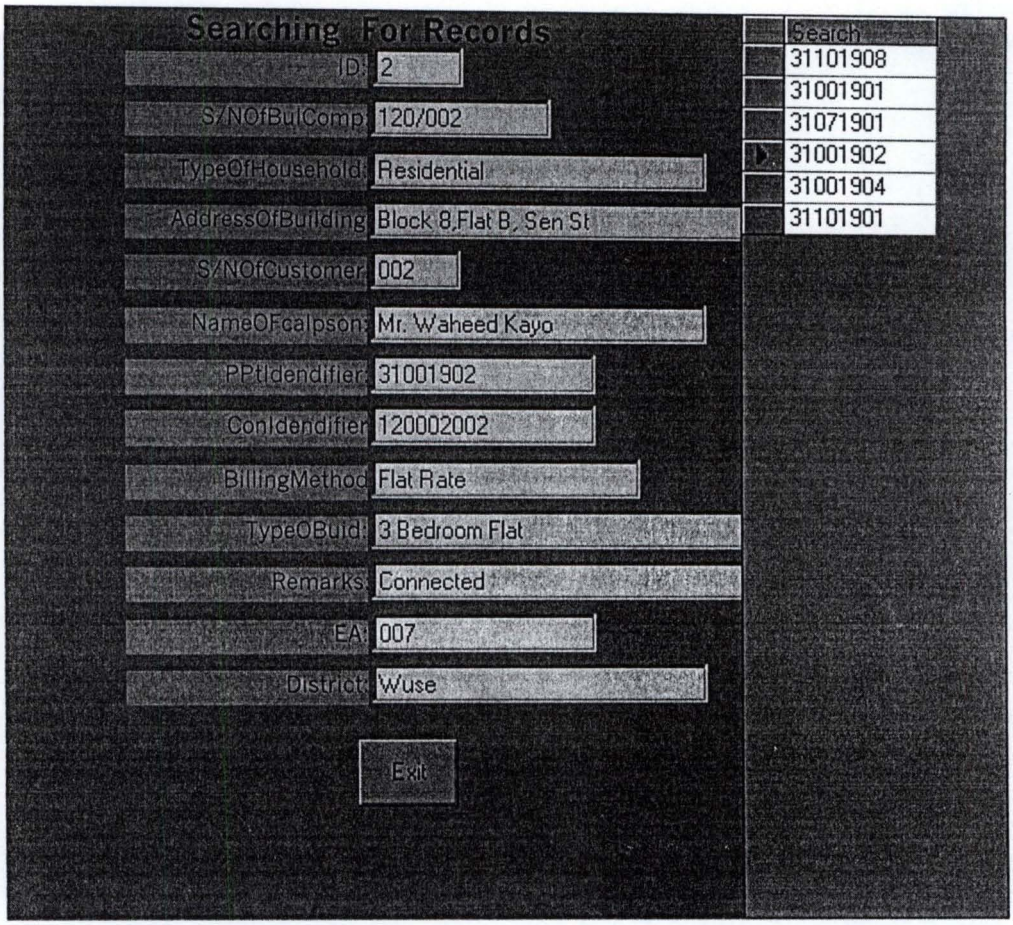
Welcome Page and Main Menu of the Software.





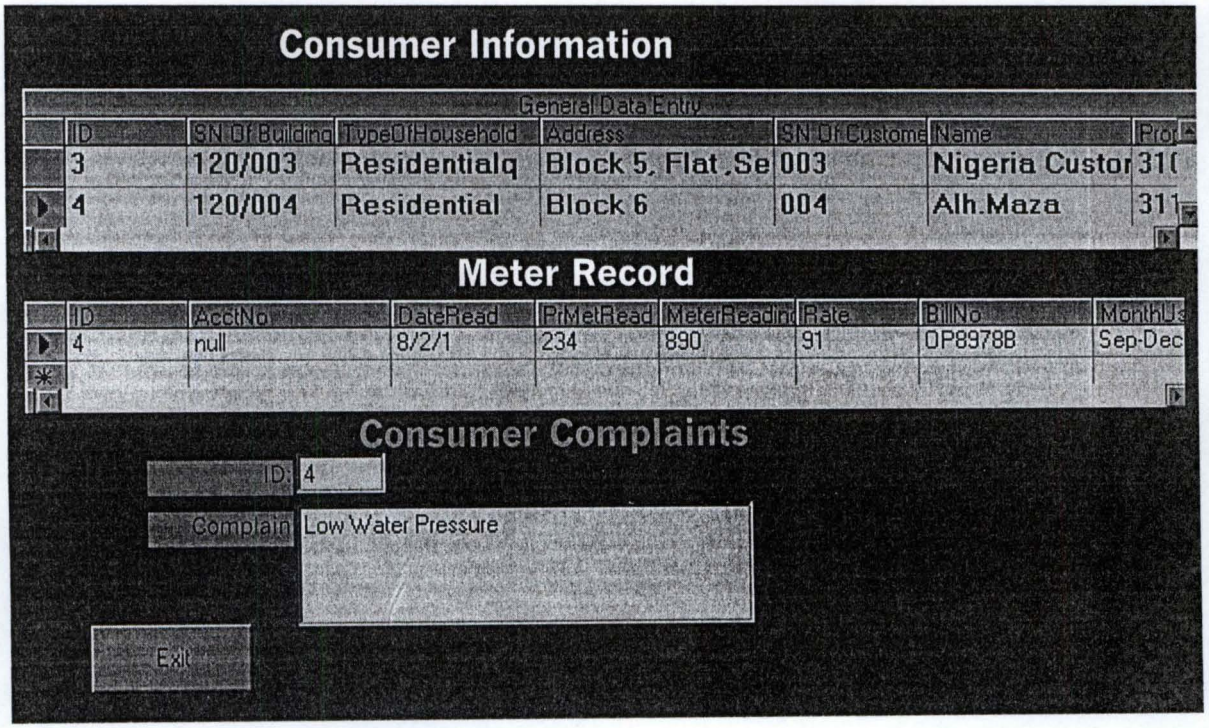
Appendix 7.

Sample of Search for Record form of the Software.



Appendix 8.

Sample of Data Entry menu, Meter Record, Consumer Complaints and Viewing of Consumer forms of the Software.



Appendix 9.

Program Text.

```
Private Sub exitt_Click()
 Unload Me
 frmMenu.Show
End Sub
Private Sub Next_Click()
 If DataEnvironment1.rsCommand1.EOF Then
 MsgBox "You're Moving Beyond Record "
 Else
   DataEnvironment1.rsCommand1.MoveNext
   If DataEnvironment1.rsCommand1.EOF Then
   DataEnvironment1.rsCommand1.MoveLast
   End If
   End If
End Sub
Private Sub Prv_Click()
 If DataEnvironment1.rsCommand1.BOF Then
 MsgBox "No Record available"
 Else
 DataEnvironment1.rsCommand1.MovePrevious
 If DataEnvironment1.rsCommand1.BOF Then
 DataEnvironment1.rsCommand1.MoveFirst
 End If
 End If
```

```
End Sub
Private Sub Timer1_Timer()
 Dim i As Integer
 For i = 1 To Timer1
 Next i
 Unload Me
 Load frmPa
 frmPa.Show
End Sub
Option Explicit
Public LoginSucceeded As Boolean
Private Sub cmdCancel_Click()
   LoginSucceeded = False
   Me.Hide
End Sub
Private Sub cmdOK_Click()
   If txtPassword = "FCTWB" Then
      LoginSucceeded = True
      Me.Hide
   Else
      MsgBox "Invalid Password, try again!", , "Login"
      txtPassword.SetFocus
      SendKeys "{Home}+{End}"
   End If
End Sub
```

Appendix 10.

Sample of Report of Consumer Register.

Consumer Register

TypeOfHouseholl	Residential	**Address**	Block 7
SN of Building	150/005	**SN of Consumer**	005
Property ID	31101908	**Name**	Peace Magba
Consumer ID	120005004	**BillingMethod:**	Flat Rate
Remarks:	Disconnected	**TypeOBuid:**	6 Bedroom
EA:	004	**District:**	Awokoro

TypeOfHouseholl	Residential	**Address**	Block 7,Flat
SN of Building	120/001	**SN of Consumer**	001
Property ID	31001901	**Name**	Alh.M Jimoh
Consumer ID	120001001	**BillingMethod:**	Metered
Remarks:	Connected	**TypeOBuid:**	3 Bedroom Flat
EA:	008	**District:**	Wuse

TypeOfHouseholl	Residential	**Address**	
SN of Building	121/009	**SN of Consumer**	
Property ID	31071901	**Name**	
Consumer ID		**BillingMethod:**	
Remarks:		**TypeOBuid:**	
EA:	006	**District:**	Wuse

TypeOfHouseholl	Residential	**Address**	Block 8,Flat B, Sen
SN of Building	120/002	**SN of Consumer**	002
Property ID	31001902	**Name**	Mr. Waheed Kayo
Consumer ID	120002002	**BillingMethod:**	Flat Rate
Remarks:	Connected	**TypeOBuid:**	3 Bedroom Flat
EA:	007	**District:**	Wuse

Appendix 11.

Sample of Report of Consumer Bill.

Consumer Bill

ID:	NameOFcalpson	Rate:	DateRead:
6	Peace Magba	21	12/12/12

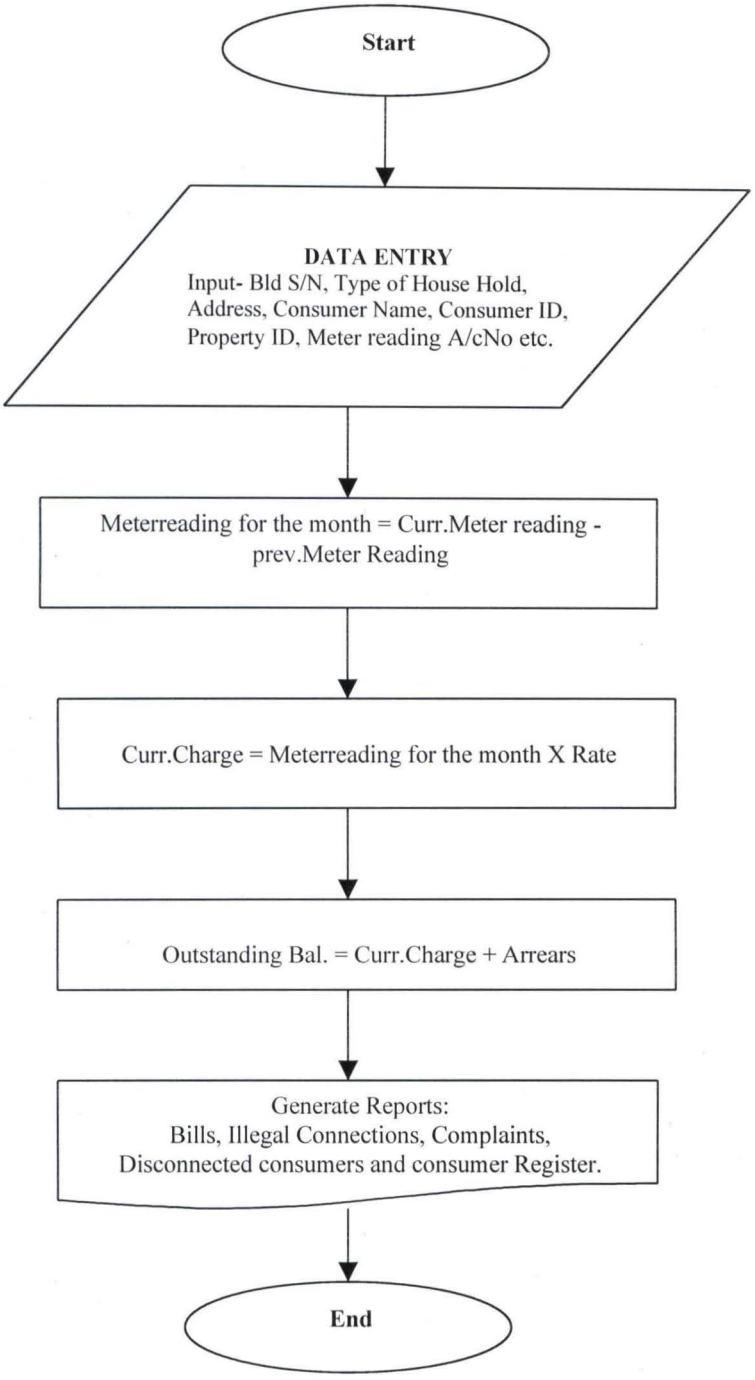
PrMetRead:	MeterReading:	AmountDue:
3454	74	1554

PPtIdendifier:	UnitUsed:	CurCharge:
31101908	-3380	-70980

Arrears:	OustStg:
-67526	-138506

Appendix 12.

Flow Chart of the new system.



Appendix 13.

Appendix 14.

FCT Digitized Map used for geographical Information System.