

**AN ONLINE WEB BASED E-BILLING WATER SYSTEM  
CASE STUDY: NATIONAL WATER AND SEWERAGE  
CORPORATION (NWSC)**

**By**

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## DECLARATION

We Mundu Robert and Aksanti Ntabaza Gisele do hereby declare that this Project report is original and has not been published and/or submitted for any other degree award to any other University before.

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## DEDICATION

To my beloved parents Mr Muhindo Kyamaiso Michael and Mrs Muhindo Agnes Kabatooro

**Robert**

To my beloved parents Mr Emmanuel Ntabaza and Mrs. Mapendo baluza

**Gisele**



## ACKNOWLEDGEMENT

All praises be to Almighty God the most merciful for his abundant love that has enabled us to complete this challenging task.

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**MAY THE ALMIGHTY GOD BLESS YOU ALL**

## LIST OF ACRONYMS

DFD	Data Flow Diagram
EERD	Enhance Entity Relation Diagram
GB	Giga Bit
GHz	Giga Hertz
GIF	Graphic Interface Format
GPL	General Public License
HTML	Hyper Tex Makeup Language
HTTP	Hyper Text Transfer Protocol
ICT	Information and Communication Technology
JPG	Joint Photographic Group
MBps	Mega Bits per Second
OS	Operating System
PHP	Hypertext Preprocessor
PNG	Portable Network Graphics
RAM	Random Access Memory
SQL	Structured Query Language
UGX	Uganda Shillings
UNIX	UNiplexed Information and Computing System
UNWSC	Uganda National Water and Sewerage Corporation

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## ABSTRACT

Along with the changes in the world's technology, Water became the backbone of industrialization and almost all the activities we carry out, rely on Water supply and demands of customers also change as well which has become more demanding and knowledgeable than ever before. "Water is life". Consumers who consume Water units and Water services today are active and more critical in Water service delivery. This in turn made the management to shift their focus on the clients or customers so as to register success in the business today. For a good performance, quality services are the most important exercises for any Organization. Organizations like NWSC has kept the standard of their service and try to maintain their customer in the market by providing satisfactory services as expected of them.

There are a number of problems being faced by the service provider (NWSC). Customers themselves are seriously complaining to the services provider (NWSC) of in-accurate meter reading and estimations, resulting in overcharging of customers by the company. Sometimes this would result in under payment by customers to the company. This study will have to come up with a way of solving the problem by introducing an on line web based water billing system for viewing bills and pay them promptly using credit cards, Phone or visa by the help of internet.

This study is aimed at developing a web-base billing system for Water given that Water uses metering and billing manually, this has led to inaccuracy, high operational costs and unnecessary delays.

Nonetheless, we as the researchers will recommend the following:

Introduction of remote automated Water metering by the company that should be connected to the system in order to have a complete cycle of water trade.

# CHAPTER ONE

## INTRODUCTION

### 1.0 Introduction

This chapter contains the background of the study, statement of the problem, main objective, specific objectives, research questions significances of the study, scope of the study and conceptual frame work.

### 1.1 Background

NWSC was formed in 1972 by decree, to serve the urban areas of Kampala, Entebbe and Jinja. In 1995, NWSC was re-organized under the NWSC Statute. The company was given more authority and autonomy and the mandate to operate and provide water and sewerage services in areas entrusted to it, on a sound, commercial, and viable basis. In 1988, NWSC took over water and sanitation services in Mbale, Tororo, Masaka, and Mbarara. In 1997, Kasese and Fort Portal were handed over to NWSC, followed by Kabale in 1999. As of June 2009, the rest of Ugandan cities and towns receive services from NWSC.

### 1.2 Problem Statement.

Water delivery utilities are charged with transporting Water from the generating companies to their respective customers distributed over wide spread areas. The manual approach to metering and billing involves staff moving around physically reading each meter and delivering the data to a central location for another manual process of billing. This is prone to human errors, delays, inaccurate reports as observed by Al-Rousan and Al-Ali (2006). The human error is resulting to over and under-charging of clients; delay in payment of the bill by the customers, hence wrong report is rendered to the stakeholders. Therefore, this project seeks to utilize database viewing of clients' bills and web-based technology. Prototype of a web based tool which will provide timely billing and invoicing of Water used by the customers.



### **1.3 Objectives of the Study**

The main objective of the project was to develop a web based database billing system for Water.

#### **1.3.1 Specific Objectives.**

- i. To investigate the current billing system in NWSC.
- ii. To Identify and analyze requirements for the proposed system.
- iii. To design and develop a web based database for billing system in NWSC.
- iv. To gather information about problems experienced by the clients/customers.
- v. To reduce congestion of customers during billing and payments at the head office or any NWSC branch.

#### **1.3.2 Research Questions**

- i. What is the current billing system does NWSC offer to its clients?
- ii. What are the requirement needs, for web based database billing system for NWSC?
- iii. How can I develop web based database for NWSC?
- iv. Will the design of web based billing system improve on the management system of clients using databases?
- v. Will the design of the computerized web based system help to reduce congestion of clients during payments?

### **1.4 Significance of the Study.**

1. The web based database improved on accurate and Timely Meter Reading.
2. The system reduced the human errors and increase the speed of metering.
3. In most cases the errors made in the course of untimely and inaccurate meter reading leading to overcharging and under-charging of customers instantly reduced when the new system was put in place.
4. The system automatically updated its customers by receiving monthly statement on the company's web site.
5. NWSC as a company benefited in the project because it reduced complaints of customers about poor billing system and wrong metering and low responses of customers in payment process.

6. The system attracted more customers to the service provider, which generated a lot of revenue to NWSC Company and to Government through tax collections from NWSC.

7. The research work helped other future researchers as a source of information for their literature review. Those who will be doing research on the same area of study will use the study as part of their literature review, where they can use some of the information for their research.

### **1.5 Scope of the study.**

#### **1.5.1 Geographical scope.**

The study was conducted at the NWSC headquarters located at Plot 39, Jinja Road, Kampala and its city branch offices.

#### **1.5.2 Content scope.**

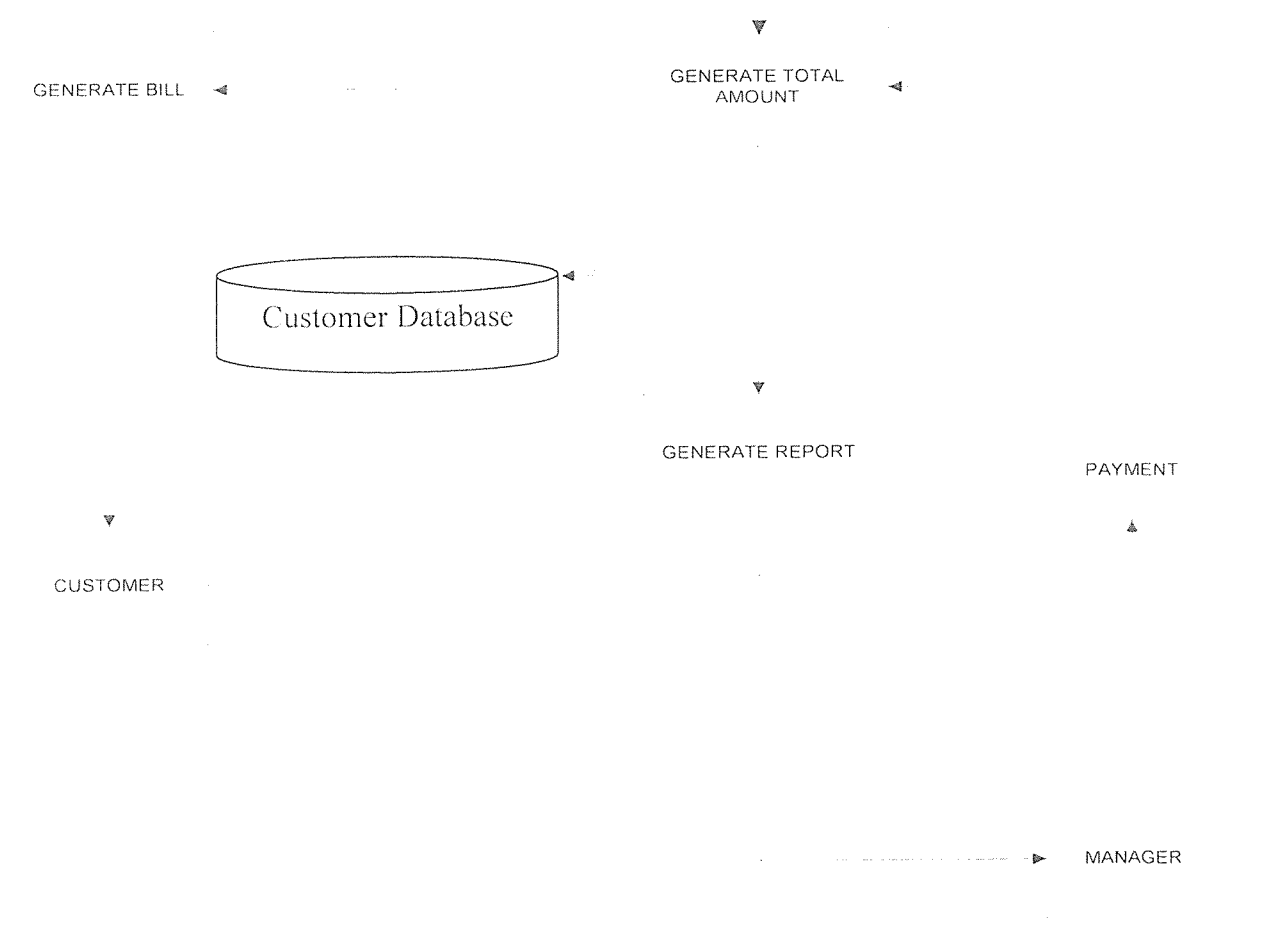
The study was carried out with the reference to billing system where customers could view their outstanding bills, particularly the accrued charges.

#### **1.5.3 Time scope**

The study was conducted for six (6) months starting from March 2012 and ending in July 2012.

1.6 CONCEPTUAL FRAMEWORK

The conceptual Framework was given to illustrate how the system worked.



Therefore, this chapter helped us, as researchers, to discuss the back ground of the study, statement of the problem, objectives of the study, purpose of the study, research question, and scope of the study, significance and organizational structure of the data base.

## CHAPTER TWO.

### LITERATURE REVIEW.

#### 2.0 Introduction

The cycle of web based Water utility service is a cycle of measuring, computing, billing, and paying on the web. On the Internet, customers are able to find out exactly how much water they have used during a certain period by logging in to the water utility company's web server. Also, customers can request information related to their usage of goods and services and obtain the results themselves. The systems offered the customers several convenient ways to pay the bill.

#### 2.1 E-Business for Water Utilities.

Mullen (2000) insists that established water companies are extending their web infrastructures beyond basic information presentation adding online customer service features such as electronic bill payment, access to account information, and historical water usage. Kennedy and Sabin (1999) reported a more cost-effective way to use the web for the utility company. Some utility companies have found that the Internet provided a cost-effective way to disseminate the information to key customers, the finding here indicated that it only handled key customers to the company. However, the study has focused and taken into consideration the entire customers of the service provider.

Monitoring and reporting systems tied to the Internet has been linked to just a few or a few hundred water quality monitors. Size and scope is dictated by the monitoring needs of the power provider and its customers. At the heart of such a monitoring system, is a server computer, optimized for database management and analysis. The server will provide file management, database administration and access to databases via the World Wide Web. Seine (2000) explained that the e-commerce water supply has suddenly flashed on in the utility industry. After a slow start, many utility companies were stamped into the e-business world in an effort to cut costs, improved service and lure potential new customers in deregulated markets to their web sites. To maintain their competitive edge, many utility firms offered a variety of front-end capabilities to customers on Web sites. Potential back-end office savings are examples the reason behind the March 2000 decision by 15 major US water and sewerage utilities that formed an Internet-based business-to-business procurement exchange to coordinate the purchase of billions

of dollars of products and services. However, web exchanges were not the only e-business play in the utility industry. Many of the existing examples of e-business are simple front-end operations.

## **2.2 Security threat.**

Dysart (2000) explained the hacker attacks on water utility company. With the Internet community still unnerved by the demonstrated vulnerability of the Net to hacker attacks, each utility firm has taken precautions to bulletproof its Web site. Now that more water utility mainframes, networks, and PCs are linked to the Net via high-speed always-on Internet 695 connections, hackers may enjoy a 24-hr window of opportunity breaking into Internet-based systems. It is difficult for Internet system administrators to stay current with the latest Internet security options. John Cox (2000) cited security of middleware as one example. An e-business application that moved data between clients and servers on the Internet can traverse scores of computers, which has offered the chance for compromising the data. Mallde and Gavurin (1999) concluded that to Web-enable a legacy system, the following issues were considered: (1) Operating System (OS) and platform, (2) middleware and component model, and (3) network performance and security. Architectural options, which were discussed in detail, should include: (a) web-enabled terminal emulation, (b) web-capability using middleware and component models, and (c) web access to legacy data stores and warehouses.

Dysart and John (2009) had mentioned about the threat posed by hacker in the process of transacting business or communications. They did mention preventive measures which should be employed a utility company like water. However, they did not mention other methods that could have been used to protect data in the communication process. The system took into consideration encrypting of data and usage of strong password when transferring data from branches to the main database. Authentication and password verification is put in place for the users to access the site for their monthly bill statement.

### **2.3 Customers Applications online.**

Harmon and Matthews (1999) developed the Internet application and application server. An application server is designed to support applications with transaction processing or with complex decision processing requirements and was termed as enterprise application servers for clarity. The enterprise applications servers are discussed in detail. Slater (2000) explains the needs of middleware. Essentially, middleware is software that connects applications allowing them to exchange data. Different types of applications and integration needs are best served by different middleware systems. Spinner in Ogden (1998) researches various middleware solutions such as Web Proxy Caches, Replication and cache modeling. A Web cache is an application residing between Web servers and clients. Cache server watches requests for Web objects (html pages, images and files). Caching alone cannot solve problems related to document retrieval latency time, objects availability, reduction in data transferred and redistribution of network accesses. Replication has been suggested in order to increase availability of data while it imposed the need for Web object changes propagation between the original and replicated site

Recently, trading desks and portfolio management organizations have begun implementing various middleware solutions allowing market data as well as transactional data to be integrated and delivered to a plethora of mission-critical applications. Now, the challenge is to determine how to manage many different fragmented forms of middleware in order to ensure that data are rapidly distributed to the correct applications in the proper format and that data integrity is maintained. Middleware functions aimed at transforming and distributing data are being quickly incorporated into common database platforms.

### **2.4 User Requirement**

User requirements are those variables that are needed by the system to facilitate the interaction between the user and the system. Though different names will be used by the authors, the concepts being measured are often identical. Therefore, we are going to group these identical concepts and give them one name.

#### 2.4.1 Variables concerning Users

Appreciation, Trust and privacy issues, User experience, User satisfaction, Usability  
User behavior, User performance, Intention to use, Perceived usefulness, Appropriateness of adaptation, Comprehensibility, Unobtrusiveness (*The Knowledge Engineering Review*, Vol. 23:3, 261–281, \_\_ 2008)

#### 2.4.2 High-Level Application Design

An online water billing System is intended to follow the design principles of a decision support system (Carter, Murray, Walker, and Walker, 1992.), i.e. software that assists in updating customers information, but does not necessarily solve, the decisions made by human experts. The web based billing composed of five main components: a database, storing all information related to customers billing information, viewing of the bill, online application and so forth; a model base storing all information related to the algorithms that generate customers bill; a user interface comprising all code associated with screens that process user inputs and display system outputs: reminders and reports, formatted system outputs intended for permanent paper storage, and a dialogue management system, comprising code that allows all of the system components listed previously to share data and which translates requirements of one component, e.g. reports, into elements that another component, e.g. database, can understand.

#### 2.5.0 Test and Maintenance.

When a system is developed, it is expected that it performs properly. In practice, some errors always occur. The main purpose of testing this system is to find the errors and correct them. A successful test is one, which finds an error. The main objectives of this system testing are:

- ❖ To ensure during the operation that the system performs as per specified in the design phase.
- ❖ To make sure that the system meets user requirements during operations
- ❖ To verify that the controls incorporated in the system functions as intended
- ❖ To see that if correct inputs are fed into the system, it provides perfect output
- ❖ To verify that during operation incorrect input processing and output will be deleted.

Software testing is a critical element of software quality assurance and represents the ultimate review of specification, design and coding. As a second benefit, testing documents that the

software function appears to be working according to the specification and the performance requirements appear to have been made.

The scope of the system test should include both manual operations and computer operations. System testing is a comprehensive evaluation of the programs, manual procedures, computer operations and controls.

## **2.6 System Implementation**

A relational database system capable of entering and storing large and versatile volumes of data was built. The database was developed in MySQL due to the fact that it was capable of storing very large tables. The Client-side (interface) was designed using HTML (Hyper Text Markup Language) and PHP to allow users submit their information via HTML pages which were stored in the web server. The Server-side (logic) were designed using Java Servlets and MySQL (for data storage) (Kumar *et al.*, (2005). HTML allows one to customize site looks by adding a background image, or an image-based logo.

The most commonly used image file formats are JPEG/JPG (Joint Photographic Experts Group), GIF (Graphics Interchange Format) and PNG (Portable Network Graphics). GIF is a lossless compression technique and it supports 256 colors. PNG is an improvement to the GIF technique because an image in a lossless PNG file can be 5%-25% more compressed than a GIF file of the same image. And JPG is a lossy compression technique that is designed to compress color and images. JPG images support 16 million colors and are best suited for photographs and complex graphics, hence JPG is suitable and used as file format for the web based billing images which contain a lot of detail and color that should not be lost when compressed (Webopedia, 2006).

In this chapter, we the researchers, looked at how other researchers argued their points on the particular topic of concern and how they differ from one researcher to the other. This chapter basically studied the past literature and reviews of other researchers on the subject under study (web-based billing system).



## CHAPTER THREE

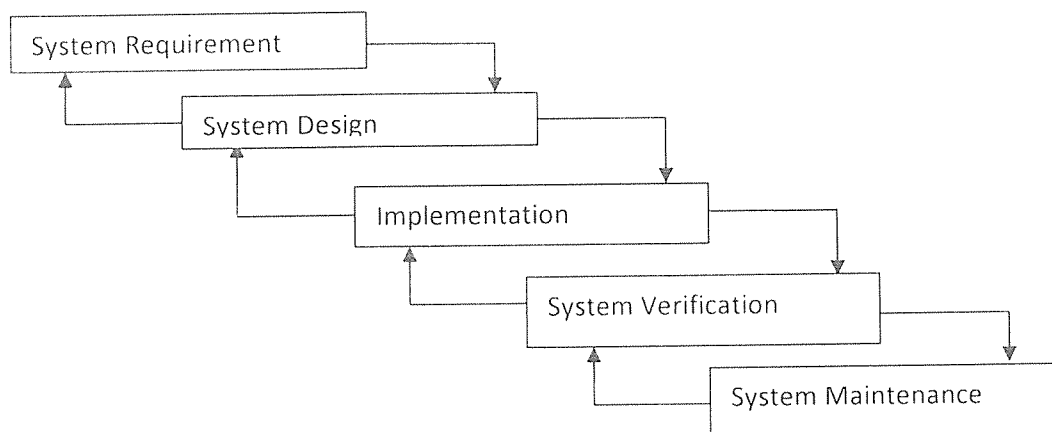
### METHODOLOGY

#### 3.0 Introduction

The chapter focused on methodology that described the steps and procedures that were undertaken in order to accomplish the project. The study was conducted as follows:

#### 3.1 System Study and Investigation

In this section the researcher was able to study the existing system to establish its weak and strong points. The information that is acquired from this study was to give the basis for the design of the new system.



**Fig. 3. 1 System Life Cycle.**

A number of steps, procedures and tools were employed as shown below:

#### 3.2 Research Instruments

This study adopted two main research instruments: the questionnaire and the interview in the process of collecting data.

##### 3.2.1 Interviews

The researcher conducted face-to-face interviews with some of the selected stake holders. Manager, System Administrator and Record staffs were interviewed so as to fully understand their experiences about the existing system and gauge their insights for the proposed system intervention.

Also an interview guide with open ended questions was prepared and administered to the respondents so as to enable them to give their views freely. As Bell (1992) this technique was therefore chosen because:

- It permits clarification of questions
- Has high response rate than written questionnaires
- It is suitable for use with both literate and illiterates
- Get full range and depth of information
- Develops relationship with client
- Can be flexible with client

However, on the other hand interview has some disadvantages as follows;

- Interview guide is particularly useful in obtaining information that cannot be obtained by other methods.
- It covers a small group of people

### **3.2.2 Questionnaire.**

A questionnaire collected data from respondents by letting them answer a fixed set of questions, either on paper or on screen. Items on these questionnaires were closed (participants were permitted to choose one of the multiple choices available) and open (participants freely answered by filling in space provided), see appendix I. One of the advantages of questionnaires is the large number of participants that were able to be accommodated (Compared with interviews or other methods). If a sample group is small, it is difficult to generalize findings (*Weibelzahl, S. Lippitsch, S. & Weber, G. 2002*). A small number of respondents limit the statistical processing, and possible presumed relations, that could have been significant with a larger sample size, may turn out to be insignificant.

### **3.2.3 Document Review**

A thorough review of the documents was done in the billing system with the intention to understand how billing was administered and discover areas where improvement was necessary. A number of documents were reviewed including reading of customers' meters, calculating the

bill, payment procedure, customer application for any service that could be offered by UNWSC and periodic reports to the administration among others. This method was used because of its advantages, which included:

- It is inexpensive because the data is already there
- It permits retrieval of the previous bill for customers or administration over the past months for verification when arises.
- There are few biases about information
- It reduces congestion at the office of UNWSC headquarters or branch
- It saves time

### **3.3 Research Procedure.**

The research supervisor wrote an introductory letter which served as letter of permission for the researcher to be taken to the Organization where the researcher collected his/her data. On receiving the introductory letter, the concerned Organization wrote back the letter of acceptance to the University which indicated that they had acknowledged the letter and accepted the researcher.

On acceptance of the researcher by the organization, the researchers distributed questionnaires to be filled by respondents. After , filling the questionnaire' forms, they were collected by researchers for analysis and study of the existing system. The analysis and study determined the report writing and recommendation to the panelists according to the data analyzed.

### **3.4 System Analysis**

#### **3.4.1 Existing System critically analyzed**

The existing system use affirmative language to be manual, i.e. customers' information is captured by reading the meter, calculating bill manually which can be a going for error generation in individual record.

The proposed system helps in meter reading, calculating, and enters in the database from different branches to the main database automatically for processing by database administrator.

The system helps customers to apply on-line for any service that is entitled for them by the services providers and also on-line payment of their bill to avoid a lot of queues in the process.

The system generates information concerning particular customer automatically all the branches and stores it in the main database.

### **3.4.2 Checking for problems of Existing System**

Considering the previous section, they use affirmative language problems associated with the existing system, they include the following:

- It is evident that there are lots of errors generated in meter records and billing of the customers because of the system being manual. For example there may happen recording wrong meter reading of one customer to the other at beginning by those who are concerned with meter record taking.
- There is the problem of calculating customers' bill and managing database.
- Information retrieval from these previous sources (database) is not easy to obtain by customers.
- Customers are always waiting in queues for a long time while applying for service and making payments.

## **3.5 Requirements Analysis**

### **3.5.1 User Requirements.**

It is very important to get users of the system fully involved such that they are aware of the benefits and can prepare for any eventualities just in case. The stake holders, who are using the system therefore will be approached during the study and will be asked what they are expecting of the system.

According to their insights, it was established what is required:

- A system that is easy to learn, use and is convenient
- A system that is fast in processing and producing customers' bills.
- An error free system but one validates a customer's identity, i.e. one that prompts the user on entering unusual command or data format inconsistent with the database.

- A flexible system that is faster in processing and producing customers' bills.
- A system that stores data and produces reports timely and accurately.
- A system that restricts access to information to only authorized personnel.

### **3.5.2 Functional Requirements.**

Functional requirements will capture the intended behavior of the system. This behavior will be expressed as services, tasks or functions the system is required to perform. Therefore the system is to be able to:

- Capture the customers' information in the process of a new applicant for service, storage and retrieval at the time of need.
- Present the users with a real-time display of the number of records in a database.
- Allow the sharing of the database by different users.
- Generate reports accurately and timely.
- Search and display customers' bill.

### **3.5.3 Non-functional Requirements.**

Non-functional requirements are requirements specifying criteria that will be used to judge the operation of a system, rather than specific behaviours. This is contrasted with functional requirements that specify specific behavior or functions. The System exhibited software quality attributes, such as accuracy, performance, cost, security and modifiability plus usability, i.e. ease to use for the intended users. Non Functional requirements help to achieve the functional requirement of a system.

Thus, the system would do the following:

- The system would be accurate and reliable. The times between failures and repairs would be limited and accuracy is very high.
- The system has user-friendly interfaces. This would then ensure the ease with which the system can be learned or used. It would be a system that allows users to install and to operate it with little or no training.

- The system has enable to handle the ever growing amounts of work in a graceful manner as can be readily enlarged i.e. The ease with which this system can be modified to handle a large increase in users, workload or transactions .
- The system prevents unauthorized access, with user authentication via a log-on system.

### **3.5.4 System Requirements.**

#### **1. Software Requirements**

Software Component System Requirement that will be used

- Operating System for the server Windows 2007
- Operating system for the client computers Windows 7
- Firewall software.
- Web Browser Mozilla Firefox and Google Chrome.
- Database Management System Mysql server.
- PHP script for the relation of database and web page.
- WAMP SERVER and Apache

#### **2. Hardware Requirements**

Hardware Component System Requirement that were used.

- Processor Intel Pentium IV of processor Speed 2.6 GHZ or above
- Fire Wall.
- 2GB RAM.
- Disk Space 250 GB or above.
- Bandwidth 100MBps Network card speed.

### **3.6 System Design**

#### **3.6.1 Data Flow Diagram.**

Data flow diagrams (DFDs) will be used to illustrate the flow of information in the new system.

They demonstrated the information and how it flows between specific processes in a system. They provided one kind of documentation for reports. These diagrams help to show how data moves and how changes through the system are made in a graphical top-down fashion. They also

help to give graphical representation of the system's components, processes and the interfaces between them.

In order to convey how data flows through the system (and how that data were transformed in the process); Data Flow diagrams are the method of choice over technical descriptions for three principal reasons:

- DFDs are easier to understand by technical and non-technical audiences.
- They provide a high-level system overview, complete with boundaries and connections to other systems.
- They provide a detailed representation of the system components.

### **3.6.2 Entity Relationship Diagrams.**

Entity Relation diagram (ERD) will be used to identify the data that will capture, store and to be retrieved in order to support the activities that are being performed. The diagrams will be used to show the relationships between the entities involved in the current system together with their attributes and indicate the number of occurrences an entity exist for a single occurrence of the related entity. Entity Relationship Diagrams will illustrate the logical structure of database.

Entity relationship diagrams will be used because they are relatively simple, user friendly and can provide a unified view of data, which is independent of any data model.

## **3.7 System Implementation**

System implementation is going to be achieved by using MySQL for database design and integrated to PHP for the connectivity of the web site accessing. Macromedia Dreamweaver 8 and Macromedia Fireworks 8 for web and design and graphic images respectively.

### **3.7.1 MySQL**

MySQL, is a popular database with Web developers, which am going to use because of the following advantages:

- It is faster.
- It is inexpensive.
- MySQL is free

- It is easy to use. A few simple statements in the Simple Query language (SQL) are needed to build and interact with a MySQL database.
- It can run on many operating systems. MySQL runs on a wide variety of operating systems - Windows, Linux, Mac OS, most varieties of UNIX and others.
- Strong Data Protection: MySQL offers exceptional security features that ensure absolute data protection. In terms of database authentication, MySQL provides powerful mechanisms for ensuring only authorized users have entry to the database server, with the ability to block users down to the client machine level being possible.
- It supports large databases. MySQL handles databases up to 50 million rows or more.
- It is customizable. The open source GPL license allows programmers to modify the MySQL software to fit their own specific environments.

### **3.7.2 Database Design**

The data base of the system will be designed according to the requirements of the users who from time to time interact with the system to access their bills or accrued bills and even new client of UNWSC can apply on line for connection of their new houses and make effective payment.

### **3.7.3 Relational Database Design**

After completing the design of all decision trees associated with database protocols, the researcher will consolidate all customers entities and attributes defined explicitly (i.e. updated at a decision point) or implicitly (i.e. used in queries whose responses will be used as inputs to decision points). Typical common entities will include "Customers", view of outstanding bill", payment on-line, and so on. Discussions with the UNWSC regarding the business rules that govern current operations of the system to allow users to identify problems and get solution to it will be held. Such business rules include: Each customer can visit the web site on different occasions; the visit can result in responding to the identified problems by service provider.



### **3.8 Validation and Reliability**

The research tool validity will be content validation where experts will be reviewing the questionnaire items, this review will give the opportunity to find out whether it meets users requirements. For example the system should be able to view the bill of every individual customer on line to confirm to their debit and credit balances or to confirm correct entry of their meter reading. The consistency of the research work will be established by test- retest method. The researcher will give the questionnaires to his/her class mates to answer them, after some few days the same questionnaires will be given back to the same people. This will help to prove whether the previous answers given were the same. After establishing the two third of the results were the same, then the researcher will rely on the research work.

### **3.9 Ethical Considerations.**

- As a researcher the following ethical considerations will be noted before carrying at the research and these will give an opportunity for the researcher to carry out a successful research.
- Letter of introduction was written by Head of department of information technology, school of Computer Studies of Kampala International University to the authority of UNWSC. This letter will serve to introduce the researcher to the authority about the purpose of the research for legal acceptance and consideration of the researcher.
- The identity of the respondents from whom information will be obtained in the course of the Project will be kept strictly confidential. At the end of the project any information that will reveal the identity of the individual respondent who was subject of the research will be destroyed. No information revealing the identity of individual will be included in the final report, unless the individual consented in writing beforehand. The respondent will be given a free will to choose to respond to the research questions or not.
- The researchers will take in consideration recognizing the work of other researchers by mentioning them in his/her research work as source of his/her information. This will avoid incidence of plagiarism by the researcher, who may claim the work of other researchers to be his/hers.

### **3.10 Data Analysis.**

Data will be analyzed after collecting questioners from respondents. The questionnaires will be given codes for easy grouping according to the point of interest, computation of the data and graphical presentations. Data will be analyzed mainly by descriptive statistics.

### **3.11 Limitation of the Study**

Unwillingness to release information to the researcher by those who are first hand information providers due to fear of releasing sensitive information to outsiders who may not be part of the organization. This will lead to lack of sufficient data and therefore it may affect the result by not so big percentage for having not collected enough information. This may happen in spite of the researcher having explained to the respondents the purpose of the research to the information providers to understand why such data collections are needed from them.

Limited access to high quality data that will be timely and accurate. This can be seen as a challenge of access as well as a challenge of resources to finance the collection of meaningful data. The researcher will maximize the available resources and take time into consideration in order to come up with accurate and timely research work.

Limited availability of structured, current, machine-readable and locally relevant data for public consumption. Though, it may be time consuming, in data collection due to lack of machine readable data, the researcher will gather the data manually and come up with a solution by interviewing people concerned and studying the system closely.

Misplacement and loosing questionnaire by respondents. This may affect the research result greatly by at least 5% because other relevant information may not be presented and the sample size may be reduced, hence the expected results may not be achieved as planned by the researcher.

In summary, this chapter basically reflected on how the project was done in order to achieve the intended objectives. It includes problem conception, procedures and techniques that was used in the data collection, analysis, design, implementation, development methodology, the browser that was used and tested to develop an online web based system. The new web based system provided the customers/clients and the management of UNWSC, better operational services, like speed, less time wasting, minimize information loss to mention but a few, hence optimizing the available resources.

## CHAPTER FOUR

### SYSTEM ANALYSIS, DESIGN AND IMPLEMENTATION

#### 4.0 Introduction

This chapter focused on the state of data flow and the relationships to other entities. The logical and conceptual schemas are the representations of the data in their way of relationship and occurrence.

This chapter also analyses the information got from the field. It shows the general information and the answers of the research questions .the system design and the implementation of the system is done and its maintenance. It shows all the implementation process procedures in snapshots of the web pages.

The findings represented and discussed in the chapter were got from primary sources of data and are discussed in line with the research objectives. As stated in the analyzing of data, the information got from the field was presented in form of tables and figures.

#### 4.1 Primary Source of information.

Manager, System Administrator, Record staffs and some population/customers were interviewed so as to fully understand their experiences about the existing system and gauge their insights for the proposed system intervention.below were their responses.

## 4.2 respondents

The table 1 below, shows the summary of facts collected from the stakeholders that responded both in the questionnaires and interviews. Sixty five (65%) of the total target number of stakeholder responded as follows.

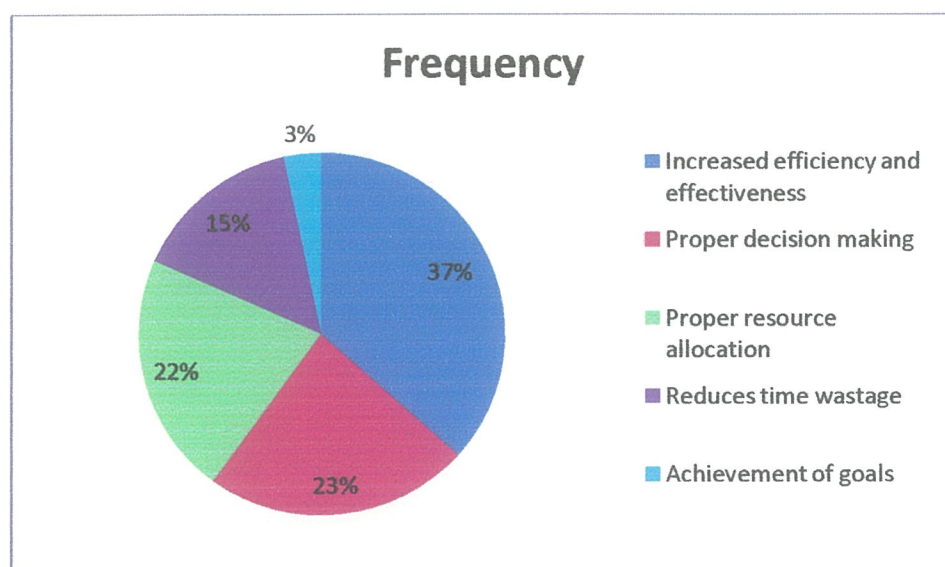
**Table 1: A summary of findings from the respondents.**

Respondents	Yes		no		not answered		total
Question		%		%		%	
Is there a an online water billing system at NWSC?	39	60	26	40	0	0	65
If no at question 6, do you think there is need for a an on line water billing system?	33	51	4	6.2	28	43	65
Have you ever used that on line water billing system?	46	71	12	18	7	11	65
Does it take you more than one hour to get an answer for your query?	29	45	26	40	10	15	65
Do the above mentioned means provide you with all the details given from the system regarding your query(s).	24	37	30	46	11	17	65
Do you think the mentioned system meets your user requirements?	25	38	30	46	10	15	65
Does the information stated at the system representatively cover all the vital sections and departments of the company (NWSC)?	17	26	34	52	14	22	65
Are you satisfied or comfortable with the current system?	5	7.7	44	68	16	25	65
Do you think there is need to improve on the current water billing system?	48	74	6	9.2	11	17	65

**Table 2: Showing the roles of a new system on employee performance**

Category	Frequency	Percentage
Increased efficiency and effectiveness	22	37
Proper decision making	14	23
Proper resource allocation	13	22
Reduces time wastage	9	15
Achievement of goals	2	3
<b>Total</b>	<b>60</b>	<b>100</b>

*Source: Primary data*



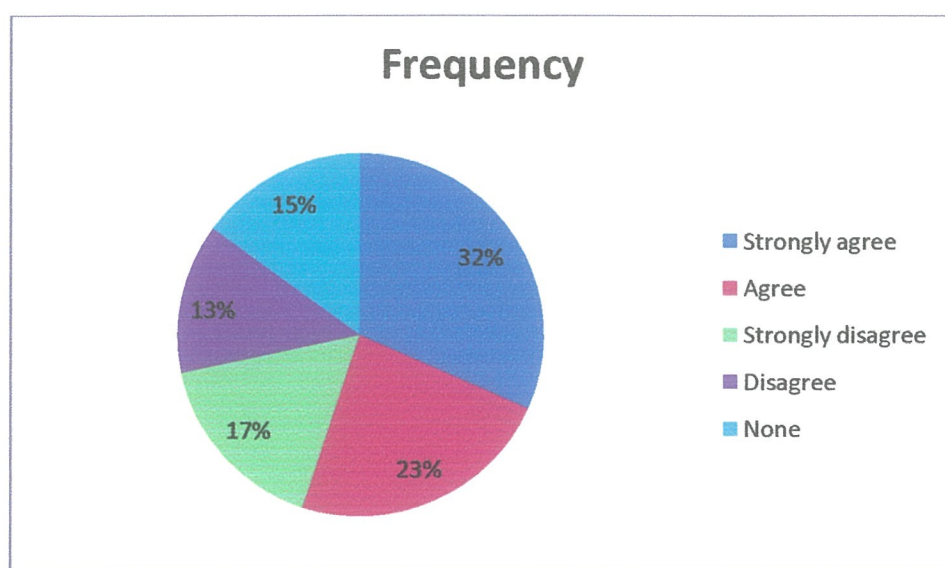
With reference to table 2, 37% claimed that a new system increased efficiency and effectiveness of employees since they continued to get clear information from their customers in time. 23% said that it enhanced proper decision making, 22% showed that there was proper resource allocation, 15% said that it reduced on time wastage in the company and 3% said that it stimulated achievement of goals in the company.

Basing on the research findings carried out, many employees claimed that a new system played a vital role towards employee performance.

**Table 3: Showing the relationship between a new system and employee performance**

Category	Frequency	Percentage
Strongly agree	19	32
Agree	14	23
Strongly disagree	10	17
Disagree	8	13
None	9	15
<b>Total</b>	<b>60</b>	<b>100</b>

*Source: Primary data*

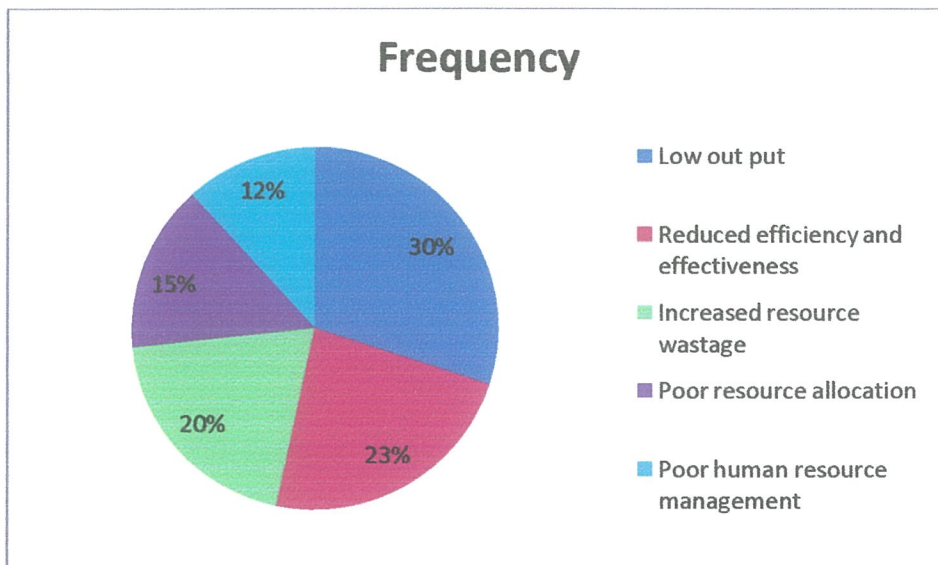


With reference to the table 3, 32% strongly agreed, 23% agreed, 17% strongly disagreed, 13% disagreed and 15% did not know.

**Table 4: Effects of lack of a new system on employee performance**

Category	Frequency	Percentage
Low out put	18	30
Reduced efficiency and effectiveness	14	23
Increased resource wastage	12	20
Poor resource allocation	9	15
Poor human resource management	7	12
Total	60	100

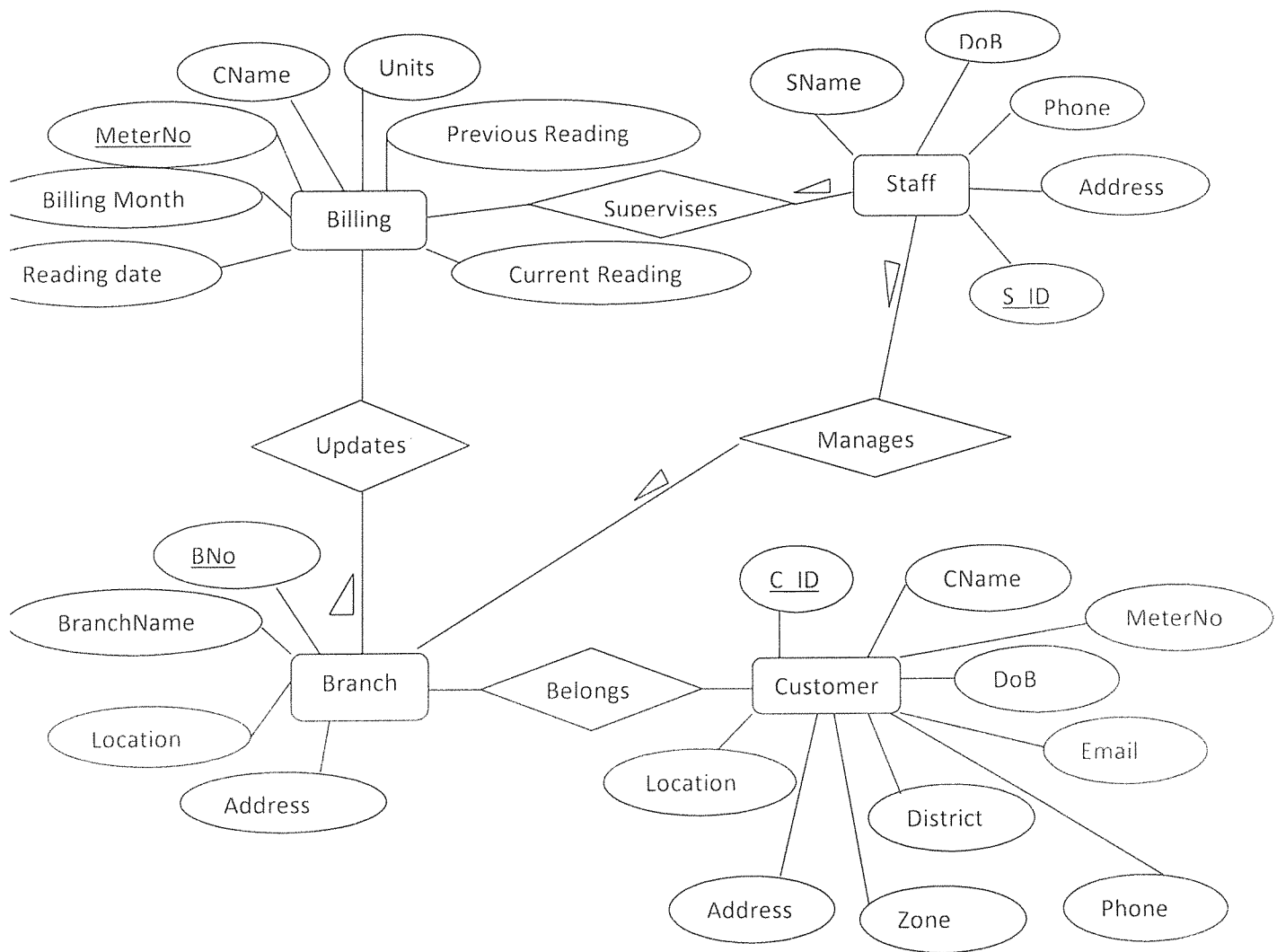
*Source: Primary data*



According to table 4, 30% said that lack of a new system led to low out put in the company, 23% said that it reduced on efficiency and effectiveness, 20% claimed that it resulted into resource wastage, 15% said that it resulted into poor resource allocation and 12% said that there is poor human resource management in the company the researcher noted that communication was a vital element in any company.



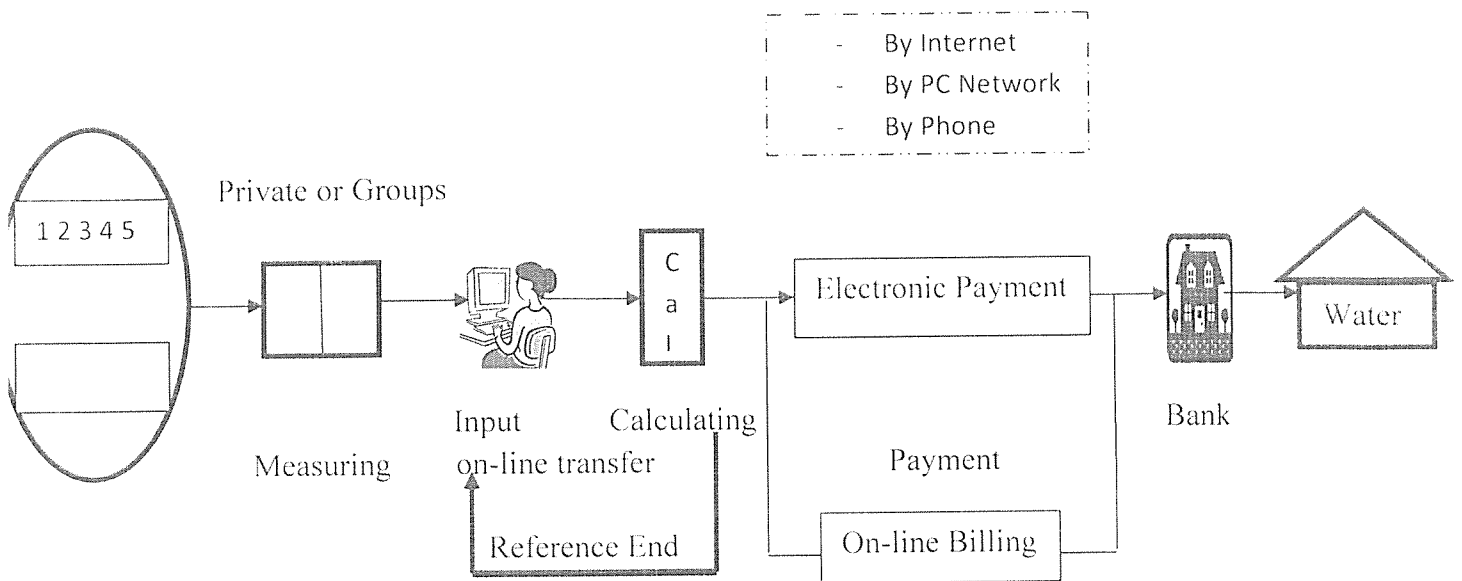
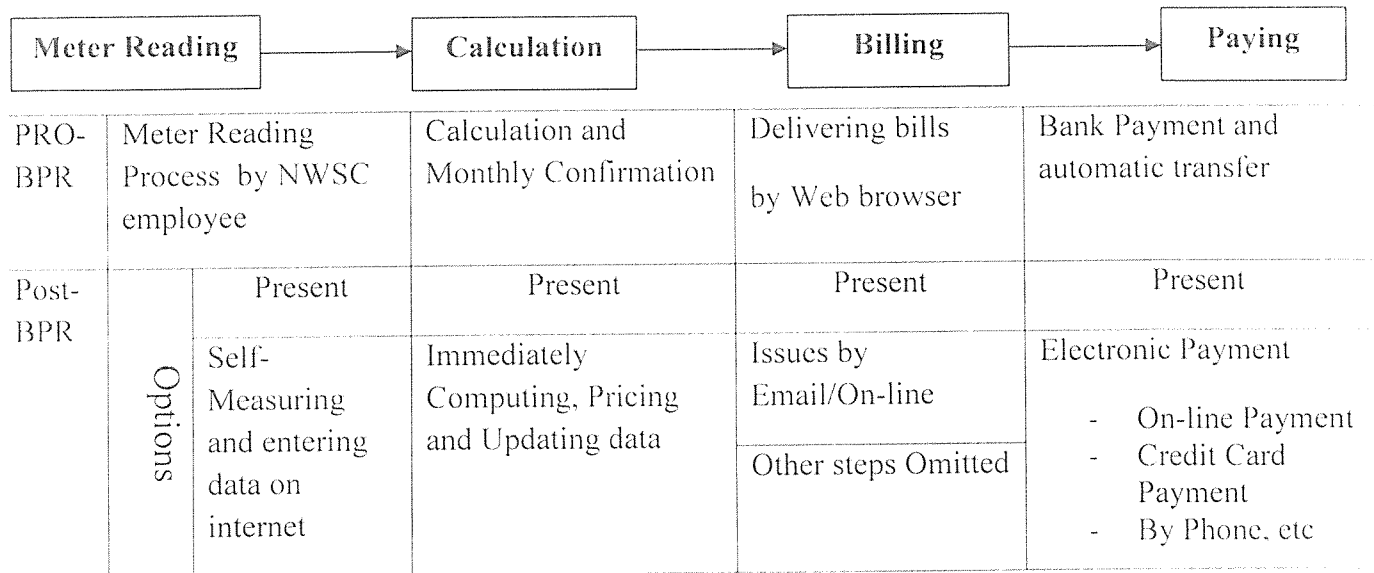
Fig. 4.1 Entity Relation Diagram (ERD)Model.



The diagram above shows a graphical representation of entities and their relationships to each other, in regard to the organization of data within databases or information systems. An entity is a piece of data-an object or concept about which data is stored. A relationship is how the data is shared between entities.

## 4.1 Physical Design

Fig.4.2 Water Billing Trade Cycle



## 4.2 Data Design.

**Table. 5 Bill**

BILL		
COLUMN NAME	DATA TYPE	DESCRIPTION
Meter No	VARCHAR(30)	Primary Key
Date of _Operation	VARCHAR(30)	
Previous Reading	VARCHAR(30)	
Current Reading	VARCHAR(30)	
Units	VARCHAR(30)	
Rate	VARCHAR(30)	
Amount due	VARCHAR(30)	
Voltage Capacity	VARCHAR(30)	

**Table. 6 Branches**

BRANCH		
COLUMN NAME	DATA TYPE	DESCRIPTION
Branch _Name	VARCHAR(30)	
BranchNo	VARCHAR(30)	Primary Key
Manager	VARCHAR(30)	
PhoneNo	VARCHAR(30)	
Address	VARCHAR(30)	
Location	VARCHAR(30)	

**Table. 7 Notices**

Notice		
COLUMN NAME	DATA TYPE	DESCRIPTION
n_ID	int(09)	Primary Key
Sender	VARCHAR(50)	
Receiver	VARCHAR(50)	
Topic	VARCHAR(50)	
Information	VARCHAR(3000)	
Pay_id	int(09z)	

**Table.8 User**

CUSTOMER		
COLUMN NAME	DATA TYPE	DESCRIPTION
user_id	VARCHAR(50)	Primary Key
Password	VARCHAR(50)	
Fname	VARCHAR(30)	
Lname	VARCHAR(30)	
Gender	VARCHAR(6)	
email	VARCHAR(50)	
Contact	VARCHAR(50)	
Location	VARCHAR(50)	
Plot no	VARCHAR(50)	

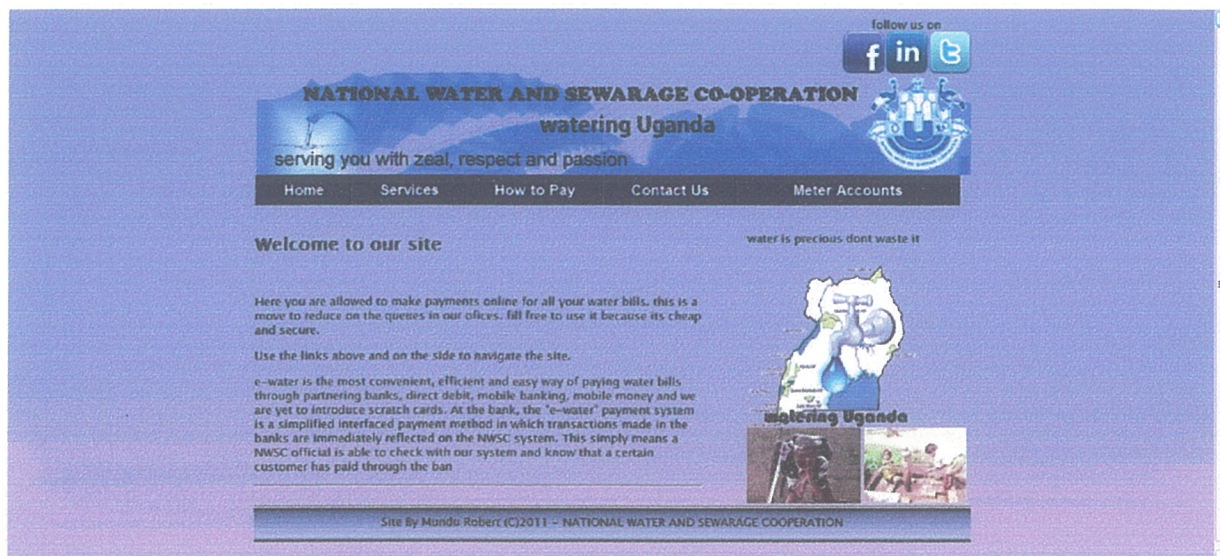
**Table.9 Employee**

EMPLOYEE		
COLUMN NAME	DATA TYPE	DESCRIPTION
E_id	VARCHAR(30)	Primary Key
EmployeeName	VARCHAR(30)	
PhoneNo	VARCHAR(30)	
Address	VARCHAR(30)	
Location	VARCHAR(30)	
BranchName	VARCHAR(30)	

#### **4.3 Snapshots of Web Design.**

The below is the current billing form that NWSC use for serving their customers in hard copy. This form is brought to the customer after taking the current reading which is read from the meter box. the form show the units consumed and the rate and Amount (UGX) for the customers to make payment of the consumed Water. However, the current system is making customers to access their bills online wherever they may be. This system has reduced the stress experienced by NWSC employees due to ups and downs movement to read the meter and later delivering the bill to the respective customers.

**Fig.4.3** below shows the home pages of the web based system or web browser that has been designed to manage the electronic billing system for customers. From this point you can proceed to other pages to access services, how to pay, contact us and meter readings or bills, or give comments about our services. This page also is used as contact us page that displays all the possible contacts of the company in case of any emergency call to be attended to by customer care office.



**Fig.4.4** below is the login page for customers to easily access their information concerning bills through the web browser. After login a customer will be able to view balance due or weather the payments made, are updated by the administrator.

**NATIONAL WATER AND SEWAGE CO-OPERATION**  
**watering Uganda**  
serving you with zeal, respect and passion

[Home](#) | [signup](#) | [Admin Login](#)

**Watering Uganda**

**Welcome and login to your account**

Water ID/Phone

PASSWORD

[Signup for an account](#)

Copyright © 2012 Mundu Robert



**Fig 4.5** This is a page to enter your payment information in order to clear your bill without any hindrance, feel at home to pay your bills.

**NATIONAL WATER AND SEWERAGE CO-OPERATION**  
watering Uganda  
serving you with zeal, respect and passion

Home View Payments Add payments Sign Out

Welcome to online payment site

Customer names:  
Account Number:  
Account Name:  
Bank Name:  
Bank Branch:  
Amount:  
Date:  
Month: <select>  
Year: <select>  
Bank Slip Upload: Browse...  
Transaction number:  
Pay Up Clear

water is precious dont waste it

watering Uganda

Site By Mundu Robert (C)2011 - NATIONAL WATER AND SEWERAGE COOPERATION



Fig. 4.6 This is the site that a customer Mundu Robert has used to pay his online bills.

follow us on  
f in G

**NATIONAL WATER AND SEWAGE CO-OPERATION**  
watering Uganda  
serving you with zeal, respect and passion

Home View Payments Add payments Sign Out

Welcome to online payment site

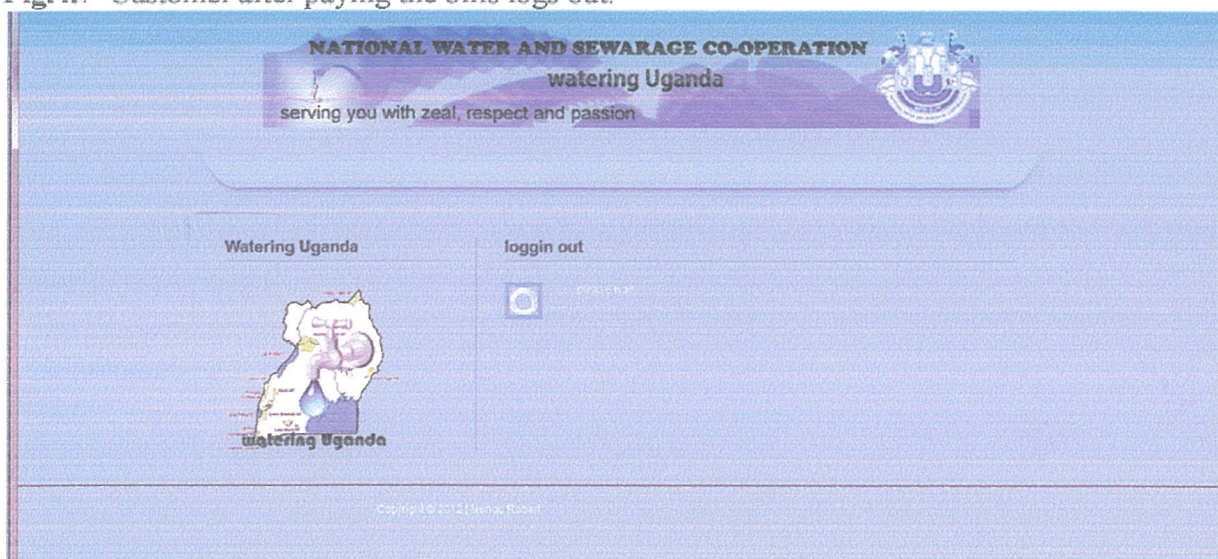
Customer names:  
Mundu Robert  
Account Number:  
123456  
Account Name:  
Mundu Robert  
Bank Name:  
CERUDEB  
Bank Branch:  
Kabalagala  
Amount:  
20,000  
Date:  
2012/07/24 Select Date  
Month:  
JULY  
Year:  
2012  
Bank Slip Upload:  
C:\Users\Mundu\Picture Browse...  
Transaction number:  
1000  
Pay Up Clear

water is precious dont waste it

watering Uganda

Site By Mundu Robert (C2011) - NATIONAL WATER AND SEWAGE COOPERATION

Fig.4.7 Customer after paying the bills logs out.





**Fig. 4.8** An administrator logs in here to check for those who have paid or defaulters. This site is only accessible by an administrator.

The screenshot displays the homepage of the National Water and Sewerage Co-operation (NWSCO) Watering Uganda. The header features the organization's name and logo, along with the tagline "serving you with zeal, respect and passion". Navigation links for Home, Signup, and Admin Login are provided. The main content area is divided into two sections: "Watering Uganda" on the left, which includes a map of Uganda, and "Admin Login area" on the right. The Admin Login area contains input fields for "Water Number" and "Password", a "Login" button, and a link to "Signup for an account". The footer indicates the copyright year as 2012 and credits Mundu Robert.

**NATIONAL WATER AND SEWERAGE CO-OPERATION**  
watering Uganda  
serving you with zeal, respect and passion

Home Signup Admin Login

**Watering Uganda**

**Admin Login area**

Water Number

Password

Login

[Signup for an account](#)

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**Fig.4.9** This site below is only accessible to the system administrator, it is a protected area. The system administrator logs in to view payments site for clients and password is only with him/her and not known to any unauthorized user.

**NATIONAL WATER AND SEWAGE CO-OPERATION**  
watering Uganda  
serving you with zeal, respect and passion

Home | Logout

Watering Uganda

**Welcome to your Administrative account**

You are: mundu robert  
Gender: (M/M) | Email: mundu.ruben@yahoo.com | Contact: 0772697880

Sent Bills | Pending Payments | **Cleared Payments** | Add Bill

**Cleared payments**

Copy | CSV | Excel | PDF | Print

Search:

Month / year	Bill	Amount	Balance
feb/2012	shs 90000 view bankslip	shs 91600	shs 1000 paid in full with excess of 1000
jan/2012	shs 56000 view bankslip	shs 56000	shs 0 paid in full

Showing 1 to 2 of 2 entries

First | Previous | 1 | Next | Last

Copyright © 2012 | Mundu Robert



**Fig.4.10** This page is where the system administrator confirms the payments and posts all the data for payments of all the customers to the database. This site is protected from outsiders accessing the information. It is only accessible by authorized users



**NATIONAL WATER AND SEWERAGE CO-OPERATION**  
watering Uganda  
serving you with zeal, respect and passion

[Home](#) | [Logout](#)



**Watering Uganda**

**Welcome to your account**

You are mundu@wco.co.ug  
 Name: mundu | Gender: Male | Email: mundu@wco.co.ug | Contact: 0775507590 |  
 Location: Kampala | PIN: 01234

[Your Bills](#) | [Your Payments](#)

**Your Bills**

Copy CSV Excel PDF Print

Search:


Month / year	Meter Readings	Amount	Status	Pay Bill
feb/2012	Previous Reading: 678 kw/h Current Reading: 789 kw/h Difference : 111 kw/h	shs 90000	paid in full with interest of 1000	payment verified
jan/2012	Previous Reading: 456 kw/h Current Reading: 678 kw/h Difference : 222 kw/h	shs 56000	paid in full	payment verified
mar/2012	Previous Reading: 4780 kw/h Current Reading: 6789 kw/h Difference : 2009 kw/h	shs 345000	paid with balance of -45000	Pay bill

Showing 1 to 3 of 3 entries

First Previous 1 Next Last

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**Fig.11** This page is for viewing the payments posted by the system administrator for the customer. This can be done by the user because he/she is the one with the password.



**NATIONAL WATER AND SEWERAGE CO-OPERATION**  
watering Uganda  
serving you with zeal, respect and passion

[Home](#) | [Logout](#)

**Watering Uganda**



**Welcome to your account**

You are: mundu robert  
 Meter Number : m1234 | Gender : Male | Email: mundurobert@yahoo.com | Contact : 0775697650 |  
 Location : k ans ariga | Plot no : p1234

[Your Bills](#) | [Your Payments](#)

**Your payments**

[Copy](#)
[CSV](#)
[Excel](#)
[PDF](#)
[Print](#)

Search:

Month / year	Bill	Amount	Balance	Notes
feb/2012	shs 90000 view bankslip shs 56000	shs 91000	shs 1000 paid in full with excess of 1000	Receipt
jan/2012	view bankslip shs 345000	shs 56000	shs 0 paid in full	Receipt
mar/2012	view bankslip	shs 300000	shs -45000 paid with balance of -45000	Receipt

Showing 1 to 3 of 3 entries
 

[First](#) | [Previous](#) | [1](#) | [Next](#) | [Last](#)

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## Data base design

```
mysql> DESC billing;
```

Field	Type	Null	Key	Default	Extra
id	int(10)	NO	PRI	NULL	auto_increment
customer_name	char(50)	NO		NULL	
meter_no	varchar(15)	NO		NULL	
month	char(17)	NO		NULL	
reading_date	date	NO		NULL	
previous_reading	int(10)	NO		NULL	
current_reading	int(10)	NO		NULL	
units	int(10)	NO		NULL	
rate	int(10)	NO		NULL	
amount	int(10)	NO		NULL	
branch	char(10)	NO		NULL	
branch_no	varchar(15)	NO		NULL	
meter_type	char(20)	NO		NULL	
voltage_capacity	int(10)	NO		NULL	

14 rows in set (0.01 sec)

```
mysql> DESC branch;
```

Field	Type	Null	Key	Default	Extra
BranchName	varchar(30)	YES		NULL	
BranchNo	varchar(30)	YES		NULL	
Manager	varchar(30)	YES		NULL	
PhoneNo	varchar(30)	YES		NULL	
Address	varchar(30)	YES		NULL	
Location	varchar(30)	YES		NULL	

6 rows in set (0.01 sec)

```
mysql> DESC customer;
```

Field	Type	Null	Key	Default	Extra
Cust ID	varchar(30)	YES		NULL	
MeterNo	varchar(30)	YES		NULL	
Date of birth	varchar(30)	YES		NULL	
Email	varchar(30)	YES		NULL	
PhoneNo	varchar(30)	YES		NULL	
Address	varchar(30)	YES		NULL	
Location	varchar(30)	YES		NULL	
District	varchar(30)	YES		NULL	
Zone	varchar(30)	YES		NULL	
MeterType	varchar(30)	YES		NULL	

10 rows in set (0.01 sec)

```
mysql> DESC comments;
```

Field	Type	Null	Key	Default	Extra
id	int(4)	NO	PRI	NULL	auto_increment
email	varchar(25)	NO		NULL	
comment	char(100)	NO		NULL	

```
mysql> DESC members;
```

Field	Type	Null	Key	Default	Extra
member_id	int(11) unsigned	NO	PRI	NULL	auto_increment
Firstname	varchar(100)	NO		NULL	
lastname	varchar(100)	NO		NULL	
login	varchar(100)	NO			
passwd	varchar(32)	NO			

5 rows in set (0.01 sec)

```
mysql>
```

This shows the database that is existing in the MySQL server.

Therefore, this chapter covered introduction of the chapter, primary source of the information where respondents were interviewed about the expectations of the new system, data design where tables were used to show information, snapshots of the web design and databases.

## CHAPTER FIVE

### DISCUSSION, RECOMMENDATION AND CONCLUSION

#### 5.0 Introduction

This chapter concludes the report of our project .it has got the Documentation and maintenance of the overcoming the limitation that the researcher encountered and we finally outlined the methods and tools that we found important our project.

#### 5.1 Discussion

The discussion of the findings involved the forms of electronic billing used in NWSC, effects of this electronic billing and solutions to poor electronic billing system at NWSC.

This project has turned out to be challenging in many ways. Each stage has presented its own problems to be overcome.

When collecting information from the sources, as covered by the first objective, we expected a lack of response. Previous experience had taught us that only a small percentage of sources are likely to respond at all. We tried to compensate this by applying to many varied sources, to improve the chance of receiving varied answers, which could typify a cross-section of the community. What was not prepared for, however, was the lack of ideas on how to improve the existing system.

The general consensus of opinion of those who replied seems to be that an online billing system is not required for the most part, as the people/customers in this field are not computer literate. In hind sight, it may have been better to also apply to some personnel not directly involved with the system, who would have less knowledge of the technicalities whilst still having an interest in their use. This could have highlighted more of a need for an online billing system. The responses we received, however, introduced some other problems we had not envisaged, such as system crash supplied with new application. When running more than a few of these simultaneously, difficulties can arise when there is a need to move data between different software systems.

Although OLE (object linking and embedding) has been designed with this in mind, it is not always possible to transfer data if the structure is foreign to that recognized by other systems.

## 5.2 Limitation of the study

The following were the limitation of the study:

Ambiguity of the requirements. Most of the respondents did not know what a computer is and some think that a computer is a TV set. Cooperation of the respondents was also very poor in that some researchers did not want to reveal some information.

Transport means from Kampala to various locations of allocation was not easy. This was not done only once, but several times each time, the researcher needed some important data, they could travel. Also Language barrier was another problem. One the researcher did not know local language that was used who did not understand the local language in different districts.

The research was done concurrently with the university programme i.e. going in lecture rooms which inconvenienced with the daily lecture routine. The researchers even missed some tests while they were at the field researching the data

Lack of funds that even some respondents did not receive the full questionnaires because the questionnaires were not enough to all respondents. Some respondents especially in the public did not know how to read and write which led to poor answering and interpretation of the questions

Some respondents could give false information in that when you again investigate from some were else, you release the information which was given first was false.

Finally some of the respondents were very lazy to fill all the questionnaires.

## 5.3 Recommendation.

Thorough investigation and fact finding was carried out by the researcher about the system. the following are recommended for the stake holder to adopt in order to improve the system according to the taste of the users and more profiting to the organization.

- Introduction of remote automated electric metering by the company that should be connected to the system in order to have a complete cycle of electric trade. The automated gadgets can be attached to individual meter box in such a way that it reads and registers it to the database of the system instantly.



- NWSC can introduce a telecast system in order to effectively update their customers. This system shall work only on internet infrastructures, but there can be automatic updates on customers' Phones.
- Government should support the program of the company by subsidizing on their tariffs to give opportunity to improve on their services.

#### 5.4 Conclusion

The web based database electronic billing system contributes to the company of NWSC, the following: first, less disputes and less customer inquiries will occur due to "exact billing" in accordance with the amount "actually used." Higher consumer confidence about water bills will occur because customers will receive a detailed report on the current electricity usage which can be obtained at anytime through the web browser. Also, the customer may choose the payment method. The contribution to the electric utility firm will include:

- The company can reduce large amount of fixed costs such as the expenses of meter readings and delivering the hard copy of the bill to the customer.
- As a result, improved management is expected in proportion to the increase in the customer's rate. As the customer's data can be used immediately, the response time for management will be faster and information quality will be enhanced in terms of reliability.
- The electronic payment results in better cash flow since the collection period is shorter, especially, since companies can often receive payment the same day via electronic transfer.

If a remote automatic measuring system is developed and linked to this system, the cycle of the electric trade, meter reading, bill delivery and bill payment may be completed totally by automation on the web. Consequently, the system will contribute to the innovation of management techniques.

Concerns to be expected when the system is used are imperfect computer access/internet access by customers and security which can be controlled with a strong security system. Also, the users can change their password. Fraud/wrong input data by customers is covered by a company's manual check-up once or twice a year.

The key factor in deciding whether the system is considered successful is to encourage more and more customers to use it. However, customers may avoid using the proposed web based database system for the following reasons:

- The imperfect computer access/internet access.
- Uncertainty of the system and procedures on the web, and
- Complex steps to register and input the amount measured. Thus, incentives for customers are strongly suggested.

The more informed customers are, the more they will participate in value-added service. Finally, the attempt to connect public sectors with private sectors in web based database electricity system has been examined.

### **5.5 Future Research Area.**

- Automatic disconnect communication.
- Automatic service promotion communication.
- Automatic fraudulence notification.
- Due to some unavoidable limitations, it was not possible to include all functionalities in the developed system. The researcher developed only a system, it is recommended that the security of the system be improved and the credit unit system be implemented and the customers paying their bills also is improved include the application form of the customers to carry out their transactions with NWSC while at home at any time.

12. Slater, D., The Integrated Enterprise: Middleware Demystified CIO. *Information SyManagement*, 13(15), 2000, pp. 126-132.
13. Spinner Michel, K Nguyen, A Rosenstein and L Zhang: Adaptive Web Caching: Towards a New Global Caching Architecture Proceedings of the 3rd International WWW Caching Workshop, Manchester, England, Jun 1998
14. The Knowledge Engineering Review, Vol. 23:3, 261–281. \_ 2008, Cambridge University Press doi:10.1017/S0269888908001379 Printed in the United Kingdom
15. Weibelzahl, S., Lippitsch, S. & Weber, G. 2002. Advantages, opportunities, and limits of empirical evaluations: Evaluating adaptive systems. *Ku“nstliche Intelligenz* 3(2), 17–20.

## APPENDICES

### APPENDIX 1

#### INTERVIEW GUIDE QUESTIONNAIRE

KAMPALA INTERNATIONAL UNIVERSITY,

P.O.BOX 20000,

KAMPALA, UGANDA.

Dear Sir/Madam,

We are third year, second semester students at Kampala International University pursuing Bachelors degree in Information Technology. We are conducting a research on Web based Database Water Billing System. The Research is purely for Academic purposes which will lead to the award of Bachelor Degree in Information Technology. The study aims at

- i. Investigating the current billing system in UNWSC.
- ii. Identify requirements for the design of a web based billing system in UNWSC

We therefore, request you kindly to answer these questions freely and without any influence or fear.

You are kindly requested to submit your questionnaire to.....

Thank you

**Mundu Robert and**

**Gisele Aksanti**

**Researchers.**

## SECTION A

This section intends to capture data about the current system you are using. Select options as guided below. Circle against the correct answer.

1.1 Our system is

- a) Automated, b) manual, c) semi automated, d) none of these.

1.2 Our current system is meant for

- a) Billing, b) metering, c) both, d) none of them

1.3 The current system provides

- a) On-line payment and billing, b) only on-line payment, c) only on-line bill, d) non of these

1.4 Our current system is

- a) Very good, b) good, c) not sure, d) poor

1.5 The state of our current system is due to

- a) No database, b) no network, c) a lot of data, d) difficult to operate.

1.6 We are interested in the current system due to

- a) Customers' need, b) cheap to maintain, c) no technical people, d) no idea

1.7 The current system is

- a) Accurate, b) easy to use, c) commits a lot of error, d) expensive.

1.8 The current system is

- a) Efficient, b) effective, c) very slow, d) very fast

1.9 The current system needs to be

- a) Changed, b) Adjusted, c) not sure d) Leave as it is.

## **SECTION B**

This section is about user requirements of the proposed system. Don't attempt this section if you choose 1.8 (d)

2.1 The proposed system requires

a) Manual operation, b) both manual and automated, c) Prepaid Service, d) Not sure

2.2 The requirement in (2.1) is chosen because

a) Accurate, b) efficient, c) User friendly, d) none of the above

2.3 The requirement of the system helps to

a) To build database, b) to access bill, c) on line application, d) write complains.

2.4 The system requires to be

a) Networked, b Virtual Private Network, c) None of them, d) Remote access.

2.5 The system should be user

a) User friendly, b) compatible, c) not sure, d) a and b.

2.6 The system requires

a) Web based database, b) database only, c) web site only, d) all are applicable

**End.**

## APPENDIX II

### INTERVIEW GUIDE

We are honored to meet you; our names are Mundu Robert and Gisele Aksanti, students of Kampala International University, Uganda, pursuing a Bachelors Degree in Information Technology and Bachelor of computer sciences. The purpose of our visit to your office is to gather some of the information for our research work.

1. May we please know your name?
2. In which department do you work?
3. What software do you use for your database?
4. How do you find the software with your system?
5. Does your organization have the idea to change the current system?
6. Would you please specify the kind of database you have for your clients?  
(In-house or outsourced).
7. How has this office contributed to the development of web based data base billing system?
8. Does current billing system face any challenge while effecting organizational plan?
9. May you please suggest some solutions to these problems?

## APPENDIX III

### SAMPLE CODE:

#### Sign up code

```
<?php session_start(); ?>
<?php require_once('config.php'); ?>
<?php
    $count_sql = "SELECT count(user_id) FROM admin";
    $result = mysql_query($count_sql);
    $count = @mysql_result($result, 0, "count(user_id)");
?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<title>Welcome to National Water & Sewarage Cooperation</title>
<link href="templatemo_style.css" rel="stylesheet" type="text/css" />
</head>
<body>
<div id="templatemo_container">

    <div id="templatemo_top_panel" style="height:150px; background:url(images/TOP.png) center
no-repeat ;">

</div> <!-- end of top panel -->

<!-- end of banner -->

<div id="templatemo_menu">

    <ul>
        <li><a href="index.php" class="current">Home</a></li>
        <li><a href="signup.php" class="">Signup</a></li>
        <li><a href="admin_login.php" class="">Admin Login</a></li>
        <li <?php if ($count > 0) echo "style='display:none;';?>><a href="Admin_signup.php"
class="last">Admin Signup</a></li>
        <!-- <li><a href="#">Development</a></li>
        <li><a href="#">Clients</a></li>
        <li><a href="#">About Us</a></li>
        <li><a href="#" class="last">Contact Us</a></li> -->
    </ul>

</div> <!-- end of menu -->
```



```

<div id="templatemo_content">
  <?php
    if( isset($_SESSION['ERRMSG_ARR']) && is_array($_SESSION['ERRMSG_ARR']) &&
count($_SESSION['ERRMSG_ARR']) >0 ) {
      echo '<ul style="" class="error">';
      foreach($_SESSION['ERRMSG_ARR'] as $msg) {
        echo '<li><font color="red">',$msg , '</font></li>';
      }
      echo '</ul>';
      unset($_SESSION['ERRMSG_ARR']);
    }
  ?>

  <div id="content_left">

    <div class="content_title_1">Watering Uganda</div>
    
    <div class="cleaner">&nbsp;</div>

  </div> <!-- end of content left -->

  <div id="content_right">

    <div class="content_title_1">Welcome and login to your account</div>
    <p>
      <form action="loginexec.php?action=login" method="post">
        <label >Meter Number</label> <br />
        <input name="login2" type="text" id="login" /> <br />
        <label>Password</label> <br />
        <input name="password2" type="password" />
        <br />
        <input type="submit" value="Login" />

        </form>

      </p>
      or <br />
      <a href="signup.php" title="Signup for an account">Signup for an account</a>
    </div>

    <div class="cleaner">&nbsp;</div>
  </div> <!-- end of content right -->

  <div class="cleaner_h30">&nbsp;</div>
</div> <!-- end of content -->

<hr />

<div id="templatemo_footer">

```

```

    Copyright © 2012 | Mundu Robert
</div> <!-- end of footer -->
</div>

</body>
</html>

```

### Codes for payments

```

<?php if (empty($session)) { session_start(); } ?>
<?php
include("config.php");
include("session.php");
$mn= $_GET['mn'];
$yr=$_GET['yr'];
$mt=$_GET['mt'];
$bi=$_GET['pid'];
?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<title>Welcome to National Water & Sewarage Cooperation</title>
<link href="templatemo_style.css" rel="stylesheet" type="text/css" />
<link href="js/themes/pepper-grinder/jquery.ui.all.css" rel="stylesheet">
<style type="text/css" title="currentStyle">
    @import "media/css/demo_page.css";
    @import "media/css/demo_table_jui.css";
    @import "media/css/TableTools.css";
</style>
<script type="text/javascript" src="js/jquery-1.7.1.js"></script>
<script type="text/javascript" src="js/webforms2-0.5.4/webforms2-p.js"></script>
<script type="text/javascript" src="js/ui/jquery.ui.core.js"></script>
<script type="text/javascript" src="js/ui/jquery.ui.widget.js"></script>
<script type="text/javascript" src="js/ui/jquery.ui.mouse.js"></script>
<script type="text/javascript" src="js/ui/jquery.ui.accordion.js"></script>
<script type="text/javascript" src="js/ui/jquery.ui.autocomplete.js"></script>
<script type="text/javascript" src="js/ui/jquery.ui.button.js"></script>
<script type="text/javascript" src="js/ui/jquery.ui.datepicker.js"></script>
<script type="text/javascript" src="js/ui/jquery.ui.dialog.js"></script>
<script type="text/javascript" src="js/ui/jquery.ui.tabs.js"></script>
<script type="text/javascript" src="media/js/jquery.dataTables.js"></script>
<script type="text/javascript" charset="utf-8" src="media/js/ZeroClipboard.js"></script>
<script type="text/javascript" charset="utf-8" src="media/js/TableTools.js"></script>
<script src="js/jquery.tooltip.js" type="text/javascript"></script>

```

```

<script type="text/javascript" charset="utf-8">
    //var oTable = $('table.display').dataTable( {
        $(document).ready(function() {
            oTable = $('table.display').dataTable({
                "bJQueryUI": true,
                "bPaginate": true,
                "sDom": '<"H"Tfr>t<"F"ip>',
                "sPaginationType": "full_numbers"
            });
        } );

```

```

</script>

```

```

<script type="text/javascript">

```

```

    $(function() {
        $(".datepicker").datepicker({
            dateFormat: 'dd-mm-yy ',
            firstDay: 1,
            changeMonth: true, changeYear: true,
            showOtherMonths: true,
            mandatory: true
        });
    });

```

```

    $(function() {
        $('#datepicker').datepicker();
    });

```

```

    $(function() {
        $("#tabs").tabs();
        $("#tabs2").tabs();
    });

```

```

});

```

```

$(function() {

```

```

    // select all desired input fields and attach tooltips to them
    $("form :input").tooltip({

```

```

    // use the built-in fadeIn/fadeOut effect
    effect: "fade",

```

```

    // custom opacity setting
    opacity: 0.7

```

```

});

```

```

});
</script>
</head>
<body>
<div id="templatemo_container">

    <div id="templatemo_top_panel" style="height:150px; background:url(images/TOP.png) center
no-repeat ;">

    </div> <!-- end of top panel -->

<!-- end of banner -->

<div id="templatemo_menu">

    <ul>
        <li><a href="index_user.php" class="current">Home</a></li>
        <li><a href="logout.php" class="last">Logout</a></li>
        <!-- <li><a href="#">Development</a></li>
        <li><a href="#">Clients</a></li>
        <li><a href="#">About Us</a></li>
        <li><a href="#" class="last">Contact Us</a></li> -->
    </ul>

</div> <!-- end of menu -->

<div id="templatemo_content">
<?php
    if( isset($_SESSION['ERRMSG_ARR']) && is_array($_SESSION['ERRMSG_ARR']) &&
count($_SESSION['ERRMSG_ARR']) >0 ) {
        echo '<ul style="" class="error">';
        foreach($_SESSION['ERRMSG_ARR'] as $msg) {
            echo '<li><font color="red">',$msg , '</font></li>';
        }
        echo '</ul>';
        unset($_SESSION['ERRMSG_ARR']);
    }
?>

<div id="content_left">

    <div class="content_title_1">Watering Uganda</div>
    
    <div class="cleaner">&nbsp;</div>

</div> <!-- end of content left -->

<div id="content_right">

```

```

        <div class="content_title_1">Add your payment Details for <?php echo $mn. " ". $yr . " | ". $mt. "
Shs"; ?></div>
        <p>
        <?php
// Display Code sa Profile
$query = "SELECT * FROM user WHERE user_id='$user'";
$result = mysql_query($query);

while($row = mysql_fetch_assoc($result))
{
    ?>
    <?php $names="{ $row['fname'] } " . "{ $row['lname'] } " ;
    echo "<strong>You are:</strong> { $row['fname'] } " . "{ $row['lname'] } <br>" ; ?>
    <?php
    echo "<strong> Meter Number :</strong> { $row['user_id'] } |";

    echo " <strong>Gender : </strong>{ $row['gender'] } |" ;
    echo " <strong>Email: </strong>{ $row['email'] } |" ;
    echo " <strong>Contact : </strong>{ $row['contact'] } |" ;
    echo " <strong>Location : </strong>{ $row['location'] } |" ;
    echo " <strong>Plot no :</strong> { $row['plotno'] } " ;
    echo "<br/>";
    }

    ?>
    <div id="tabs">
    <ul>
    <li> <a href="#t1">Add your payment for <?php echo $mn. " ". $yr . " | ". $mt. " Shs"; ?></a></li>

    </ul>

    <div id="t1">
    <form action="payexec.php?mn2=<?php echo $mn;?>&yr2=<?php echo $yr;?>&bi2=<?php echo
$bi;?>&bi3=<?php echo $mt;?>" method="post" id="pay" enctype="multipart/form-data" name="pay">

        <div>Account Number:</div>
        <div><input name="acctno" type="text" id="acctno" size="40"></div>

        <div>Account Name:</div>
        <div><input name="acctname" type="text" id="acctname" size="40" value="<?php
echo "$names" ; ?>"></div>

        <div>Bank Name:</div>
        <div><input name="bank" type="text" id="bank" size="40" /></div>

        <div>Bank Branch:</div>
        <div><input name="bankb" type="text" id="bankb" size="40" /></div>

```

```

<div>Amount:</div>
<div><input name="amount" type="text" id="amount" size="40"></div>

<div>Bank Slip Upload:</div>
<div><input name="slip" type="file" id="slip"></div>
<input name="MAX_FILE_SIZE" value="" type="hidden">
<br />
<div><input type="submit" name="Submit" onClick="return
checkmail(this.form.email)" value="Pay Up" /> <input type="reset" name="Reset" value="Clear" />
</div>
</form>
</div>

</div>

</p>

</div>

<div class="cleaner">&nbsp;</div>
</div> <!-- end of content right -->

<div class="cleaner_h30">&nbsp;</div>
</div> <!-- end of content -->

<hr />

<div id="templatemo_footer">
    Copyright © 2012 | Mundu Robert
</div> <!-- end of footer -->
</div>

</body>
</html>

```

#### CODES FOR ADMIN LOGIN

```

<?php
    //Start session
    session_start();

    //Include database connection details
    require_once('config.php');

    //Array to store validation errors
    $errmsg_arr = array();

```

