

**A SYNCHRONIZED ONLINE DATABASE SYSTEM FOR A SUPERMARKET
A CASE STUDY OF UCHUMI SUPERMARKET
UGANDA.**

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**A REPORT SUBMITTED TO THE COLLEGE OF APPLIED SCIENCE AND
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UNIVERSITY**

SEPT,2012

DECLARATION

I Nakimera Joan declare that this research report is my original work and has not been published and / or presented to any university for a ward of academic Certificate (Degree) or anything similar to such. I solemnly bear and stand to correct any inconsistency.

Signature

...*Nakimera Joan*.....

Date

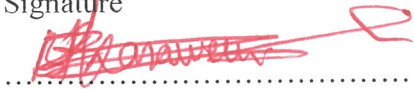
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APPROVAL

This is to acknowledge that this Dissertation has been under my supervision as a university supervisor and is now ready for submission.

MR. KASAWULI FAIK

Signature


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Date

21st Sept 2012 .
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DEDICATION

This research report is dedicated to my parents Mr Kawalya Nelson and Mr Kitenda Micheal who has supported us all the way since the beginning of our studies. Also, this research report is dedicated to our course mates who have been a great source of motivation and inspiration. Finally, this research report is dedicated to all those who believe in the richness of learning.

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ABBREVIATIONS

PHP	- PHP Hypertext Programming
DBMS	- Database Management System
KNTC	- Kenya National Trading Corporation
KWAL	- Kenya Wine Agencies Limited
ICDC	- Industrial Commercial & Development Corporation
LAN	- Local Area Network
CASE	- Computer Aided Software Engineering
SDLC	- System Development Life Cycle
DFD	- Data flow Diagrams

ABSTRACT

The project report was undertaken in order to learn and use the features that PHP and MySQL offer. In particular, it was suggested from the researchers and the main goal was to design and implement an online database platform to hold information for all supermarket products that Uchumi supermarket sell nowadays. This database communicates with a Web interface; to allow Internet users to order products and find all the information they need about the product from anywhere, where there is an Internet connection.

As the developers had no previous knowledge of PHP/MySQL and generally web applications, they aimed at becoming experts in its use.

The research that the researchers made concentrated on three different areas. The first area was to understand the technology behind PHP/MySQL and the web applications. The second area was to find out the currently available features of such systems. Finally, the last area was to find new features for the new system.

This report describes the features of online database systems that are used around the world, the technical information relating to the project, the methodology that the developer used, the functional and non functional requirements, the features of the new system, the implementation of the system and finally the testing that was used.

This project was extremely helpful for the programmers because it gave them the opportunity to learn a software development tool and to consider a software product from the legal point of view. It also provided them with inestimable experience for his future carrier.

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CHAPTER ONE

INTRODUCTION

1.0 Introduction

Most of the services i enjoy on the Web are provided by web database applications. Web-based email, online shopping, forums and bulletin boards, corporate websites, and sports and news portals are all database-driven. To build a modern website, one needs to develop a database application. The most popular database management system used in these solutions is MySQL, a very fast and easy-to-use system distributed under an Open Source license by its manufacturer; MySQL AB. Web-based Database management system refers to the software that handles all access to the database that stores record of an organization or individuals. The user issues an access request, using some particular data sublanguage (PHP) which stands for PHP Hypertext Programming and MySQL which is a database language. The Database Management System (DBMS) intercepts that request and analyses it. The DBMS inspects, in turn, (the object version of) the external schema for that user, the corresponding external/conceptual mapping, and the storage structure definition. The DBMS executes the necessary operation on the stored database.

1.1 Background

Uchumi is a public limited company incorporated in 1975 under the Companies Act (Cap 486 of the Laws of Kenya). Its main objective is to have an enterprise for equitable distribution of essential commodities, affordable prices whilst creating an outlet for the local manufacturers. On 17th December 1976, Uchumi shareholders- Industrial Commercial & Development Corporation (ICDC), Kenya Wine Agencies Limited (KWAL) and Kenya National Trading Corporation (KNTC) - all Government owned parastatals entered into a management contract with Standa SPA of Italy. Standa, a leading supermarket group with a presence in Europe and vast retail experience was given the task to manage and train Kenyan personnel who would eventually take over the running of the organization. In 2002, Uchumi crossed the Kenya borders and set up a store in Kampala, Uganda. The store located in Kampala's Nakasero suburb has been an instant hit amongst the residents of the metropolis. Uchumi emphasizes growth away from city centers,

focusing instead on the residential shopper, enabling them to remain closer to the hearts (and ultimately the pocket and purse) of the consumers.

1.2 Statement of the problem

Due to the increasing work complexity and uncertainty, the crucial task was to improve data storage and individual satisfaction by provision of high quality data and service in the most reliable way.

In addition to the above, there are reports of poor storage of data, data redundancy, lack of data integrity, high cost of data maintenance, and higher rate of data dependency, reduced data quality and deteriorating data management capability and this is the reason why i carried out this study.

Based on the problems stated above, the purpose of the study was to evaluate the effect of implementing a data management system for Uchumi Supermarket.

1.3 Objectives of the study

1.3.1 General objectives

The main objective was to develop and implement a data management system to enable data accessibility and sharing of resources in order to reduce the cost of operation for the supermarket.

1.3.2 Specific objectives

- To assess the role of shared data management systems on data security at Uchumi supermarket
- To examine the role of shared data management systems on data /information integrity
- To evaluate the role of shared data management systems on reduced data redundancy and cost on data storage.

1.4 Research Questions

- What are the roles of shared data management system on data security for Uchumi supermarket?
- What are the roles of shared data management systems on information/data integrity for Uchumi supermarket?
- What are the roles of shared data management systems on reduced data redundancy and cost of storage of data for Uchumi supermarket?

1.5 Scope of the study

The study covered how to design and implement a sharable database system for Uchumi supermarket. It further covered the technology required to access the database via a local area and wide area network.

The study was carried out in the accounts' department where the accounts clerk gave information concerning customers' payments, administration where the administrative members gave the future plans about the supermarket, to enable the system work for a long time, and information on whether the supermarket was capable of supporting the project, from the procurement and customer service departments, where goods and services are handled from the supermarket and customers' perspective. Also, accompanying information was collected from other staff member as well as supermarket regular customers using mainly questionnaire approach in coupled to other fact finding techniques.

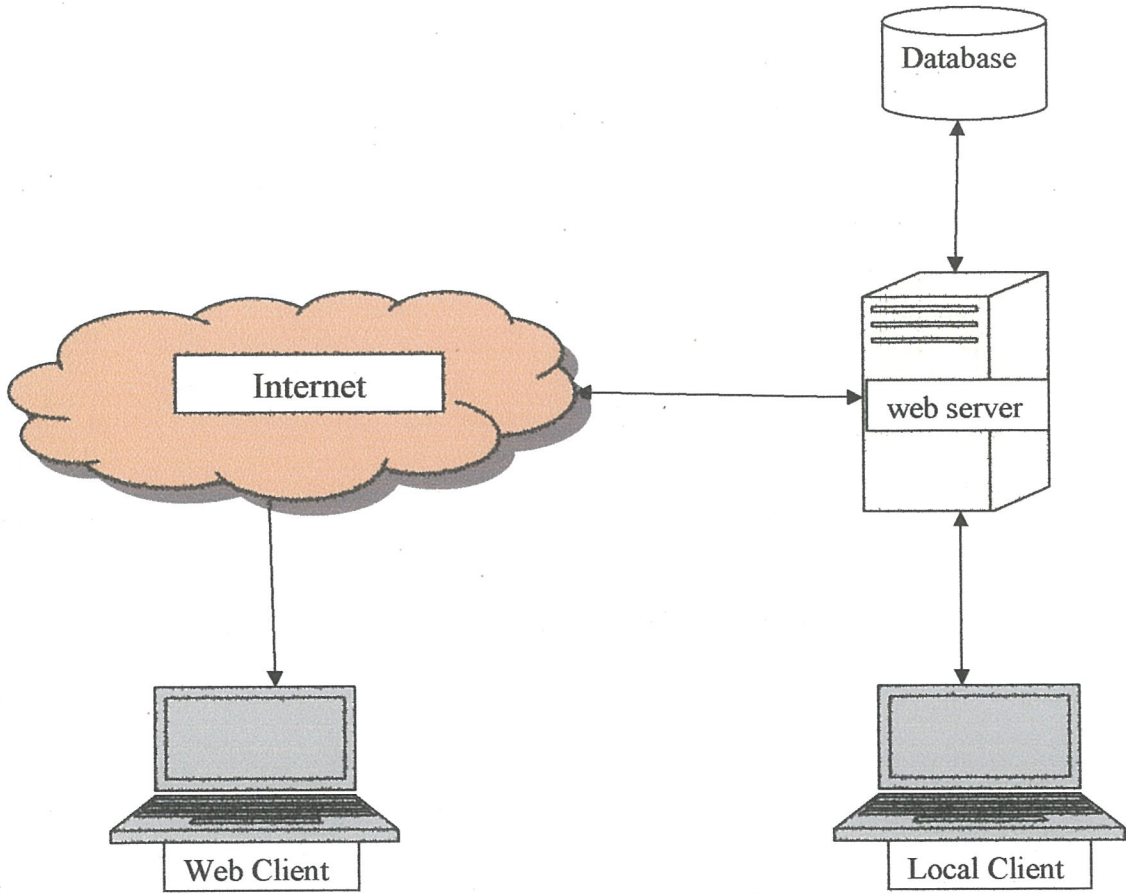
1.6 Justification of the study

The study addressed problems like; redundancy, insecurity, high cost of operation and a lot of time wasted.

The supermarket was in position to produce high quality documents like reports, receipts to their customers anywhere at any convenience.

The study demonstrated that Uchumi supermarket could replace most of the human labor and actually do things in a more efficient way. The study was important because it enabled the researchers to acquire skills of data analysis, and development and implementation of database system and this can be our source of income.

Fig: 1 showing the Conceptual frame work for the new system to be proposed



Perhaps the most important component any organization is data and thus it has got to be used (handled) with care.

The figure above shows a graphical conceptual representation of the new system and the relations between its components. First of all i needed a database, which constituted the backbone of our system. The database was to hold all the information needed for such a company to exist - product, order, customer, and staff details. The design and implementation of a database for an online company is complex and time consuming but i implemented it as efficient as possible. The database served the two clients that the system has, the Web-Client (customers) and the Local-Client (members of staff and administrators). The customer communicates with the database via the Web Server. In that server, an application was run, which was part of the application that i developed. This application's job was to formalize the appropriate requests and orders from the Web-Client to the appropriate table in the database and the corresponding replies from the database to the clients' Internet browser. On the other hand, the client that served the staff of the company requests communicated through the web server with the whole database through a Local Area Network (LAN).

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The aim of this chapter was to explore the in depth of the concept of a shared computer based database system. The purpose was to find out and suggest procedures that are recommended to build and operate such a system. This information was mainly extracted from published database system books, internet and previously published journals and dissertations for example (Long, 1989), Hutchinson et al, 2000) et al.

2.1 Scope of the literature review

The literature about the system developed dueled so much on information systems that make use of databases (Long, 1989,p.249), knowledge from books about how to set and operate networks and in particular Ethernet cabled LANs. The review put into consideration related systems that have previously been developed. It dug deep into how databases could be designed, how an interface could be created, and how such system could be put into use and maintained.

It also covered problems anticipated and how they could be troubleshot.

It further looked at how the client /server network could be set up and the technology that could be used to share the different resources. It also covered the kind of computers and other devices that could be reliably used in setting up a network that would enable sharing of the database.

It suggested the different areas where such a system could be applied and the problems that such a system could be used to solve. The review further tackled the different techniques that could be used in collection of data, how to analyze the data, how to develop the system itself by suggesting various methodologies and tools that could be used (Laudon, 2002).

Finally it looked at different development tools such as different operating systems, programming languages, DBMS, servers etcetera.

2.2 Data management system

According to Long (1989), Data management, encompasses the storage, retrieval, and manipulation of data. Many existing information systems are designed using traditional approaches to data management but the trend has shifted to the use of database approach to develop new information systems. The database is the resource for all computer based information systems. A database, “Is a collection of files that are in some way logically related so that data redundancy is minimized” (Long, 1989, p.249).

2.2.1 Benefits of database environment

Greater access to information the structure of an integrated database provides enormous flexibility in the type of reports that can be generated and type of online inquiries that can be made.

Better control. A database management system allows data to be centralized for improved data security. By centralizing data, advanced data structures can be used to control redundancy. Data structures,” refers to the manner in which the data elements and records are related to each other” (Long, 1989, p.259).

More efficient software development and programming techniques are more readily available and data are independent of the application programmes.

2.2.2 Approach to database management

According to Long (2002), there are three fundamental approaches to design database system namely;

- Hierarchical approach
- Network or CODASYL DBMS approach
- The Relational DBMS approach.

Hierarchical DBMS approach

Although network and relational DBMS technologies are considered superior to the hierarchical DBMS technology, the hierarchical approach remains the most commonly used.

This is more as a result of momentum than choice. Information management system a hierarchical product was by 1968 the game on shelves and this made it become more popular. It can be run on today's hardware.

It does not have the scope of features of more sophisticated network and relational DBMS'. Never the less, all new developments in the area of database management system use network or relational technologies.

Hierarchical DBMS is based on three data structures, actually an uprooted tree turned upside down. They are easy to understand and conceptualize.

Network or CODASYL DBMS

This approach to data management carries the hierarchical approach to the next level of sophistication by permitting children to have more than one parent. This approach minimizes redundancy and therefore allows for more queries to be made.

Relational DBMS

The relational approach to database management systems has been gaining momentum through the 1980's. In contrast, to the network DBMS, here data is accessed by content rather than by address. This approach uses the computer to search the database for the desired data rather than accessing data through a series of indices and physical addresses, as with both hierarchical and network DBMS.

Here the data structures are defined in logical rather than physical attempts until recently; relational DBMS have been slow to be effective in the real world, especially in transaction oriented environments.

However, for applications where the transaction value is low and the need for flexibility is high, relational DBMS outperform network DBMS because "relational structure provides greater

flexibility in accessing information”. And provide companies with greater opportunities to increase productivity.

2.3 Advantages of using computer based databases

Reduced data redundancy: In file management systems, some of the same data files are repeated in different files; in databases, by contrast the information appears just once but information is made available to different users moreover concurrently and this loirs down the expenses of space.

Improved data integrity: Reduced redundancy increases the chances of data integrity. Data that is accurate, consistent, and up to date because each updating change is made in only one place.

More programs independent: With a database, the program and file formats are the same, so that one programmer or even several of them can spent less time maintaining files.

Increased user productivity: Database management systems are fairly easy to use, so that users can get their requests for information answered without having to resort to technical manipulations.

Increased security: Although various departments may share data in common in, access to specific data information can be limited to selected users. Thus, through the use of passwords, a student’s financial, medical, and grade information in a school is made available only to those who have a legitimate need to know.

Although there are clear advantages to having databases, there are still some disadvantages;

Cost issues: Installing and maintaining a database is expensive particularly in a large organization.

Data vulnerability issues: Although a database can be restricted access, it’s always possible unauthorized users will get passed the safeguards.

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Privacy issue: A database may hold may hold unsanctioned information that may be used for unintended purposes this puts peoples lives at a risk. (Hutchinson and Sawyer, 2000)

2.4 Area of application

Database management systems are applied in all corners of development. It is mainly used in financial institutions for example banks, corporate institutions and educational institutions name it all.

2.4.1 Accuracy and completeness of data

Databases including public databases such as; Lexis, Dialog, and Dow Jones News/Retrieval can provide you with more facts and faster facts but not always better facts. Penny Williams, professor of broadcast journalist at Buffalo state College in New York and formerly a television anchor and reporter, suggests there are five limitations to beat in mind when databases for research. And these are;

You can't get the whole story. For some purposes, databases are only a foot in the door.

It's not the gospel: Just because you see some thing on the computer screen it doesn't mean all is accurate. Numbers, names, and facts may need to be verified in other ways.

Know the boundaries: One database service doesn't have it all.

Find the right words: you have to know which key words to use when searching a database for data.

History is limited: Most public databases, Davis says, have information going back to 1980, and a few into the 1970s, but have information earlier.

2.4.2 Analysis and design

Once data was gathered, the researcher needed to present it in away that could easily be interpreted. Many analytical tools or modeling tools are available. Modeling tools enabled the

analyst to come up with pictorial representation of a system. Examples are CASE tools, dataflow diagrams, flow charts, connectivity diagrams, grid charts, decision tables and many others.

CASE tools: (computer aided software engineering) is software program that automate many activities in the System Development Life Cycle (SDLC) and are also used to analyze various aspects of a system.

Data flow Diagrams (DFD): A data flow diagram also known as process model, graphically shows the flow of data through a system that is, the essential processes of a system along with inputs, outputs, and files. (Hutchinson et al, 2000, chapter.9.12).

System flow charts: Also called the system flow diagram a system flowchart diagrams the major inputs, outputs, and processes of a system. In some cases a systems flow chart can be used in place of DFD; in other cases it is useful to supplement.

Grid charts; this shows the relationship between data on input documents and data on output documents.

Decision tables: This shows the decision rules that apply when certain conditions occur and what actions to take. That is, it provides a model of a simple, structured decision-making process. It shows which conditions must occur in order for particular actions to occur.

2.5 Data collection techniques

2.5.1 Interview

“An interview is an oral administration of a questionnaire or an interview schedule”, (Olive and Abel, 1999, p.83). Interviews are face to face encounters. To obtain accurate information through interviews, a researcher needs to obtain maximum cooperation from respondents. Thus, one must establish a friendly relationship prior to conducting an interview. Interviews, offer the following advantages:

They provide in depth data which is not possible to get using a questionnaire.

It is possible to obtain data required for specific objectives.

The researcher can clarify on certain questions and thus they are more flexible compared to other methods.

Unlike questionnaires, the interviewer can get more complete and honest information.

High response since the respondents can refuse to answer completely.

However, demerits such as high cost, need for high level of interpersonal skill, bias, small sample size, responses being influenced are always expected.

Like questionnaires, interviews are also of two types that is structured interview and unstructured interview where, structured questions usually categories and the interviewer simply checks the respondent's response while unstructured questions, the interviewer asks questions or makes comments intended to lead the respondent towards giving data to meet the study objectives.

2.5.2 Questionnaires

Questionnaires are commonly used to obtain important information about the population. Each item in the questionnaire is developed to address specific objective. And therefore, a questionnaire must be well thought of so as to avoid cases such as;

Confusing respondents as to the nature of information required.

Also a bad questionnaire discourages respondents to the extent of discarding the questionnaire and this may leave out important information required in the study.

Questionnaires can be two types that are; open ended and closed ended questionnaires.

Closed ended questionnaires carry with them the following advantages:

They are easier to analyze since they are in an immediate usable form.

They are easier to administer since each question is followed by possible answers and they are economical in terms of space, time, and money.

However, they are more difficult to construct and normally responses the limited and respondents compelled to answer according to the researcher's choice.

Open ended questionnaires on the other hand give the respondent complete freedom to answer the way he/she wants, permit greater depth of response, and it is easy to formulate compared to closed ended questionnaire, and really gives ones feelings about a given study.

However, there's a tendency of respondents giving information that does not answer the questions at hand and responses are difficult to analyze and can be time consuming and expensive compared *to* closed ended questionnaires.

The fact that i will be interested in specific data from respondents, i recommend that closed ended questionnaires be used to make it easy for us to analyze the data.

2.5.3 Document analysis

The first document the analyst should seek out is the organization's organization chart to enable him/her study and understand the flow of authority and information.

The analyzer may further read document that describe the problem at hand such documents can include; documentation of the current system, constitution, enrolment records, accounting records, brochures showing fees structures and any other relevant reports. All these can enable the analyst to get a view of the kind of information to be used and reports to be printed and many others, (Whitten, Bentley, and Dittman, 2001).

Given all the above data collection techniques, the researcher must look at the exact problem to be addressed and the prevailing conditions and thereafter choose out which method to use or where possible he/she can as ill choose to integrate all of them.

2.6 Development Methodology

System analysis and design is a six phase problem solving procedure for designing an information system and improving it. The six phases make up what is system development life

cycle. The system development life cycle (SDLC) is defined as “The step by step process that many organizations follow during systems analysis and design” (Williams, et al, 1999, p.476).

The number of phases may vary from one company to another, and even the name of the process may differ (application development cycle, structured development life cycle, for instance). The six phases of systems analysis and design may be said to be as follows:

Preliminary investigation: Conduct preliminary analysis, propose alternative solutions, and describe the costs and benefits of each solution. Submit a preliminary plan with recommendations. If you are doing a systems analysis, and design, it's safe, even preferable to assume that you know nothing about the problem at hand. In the first phase, it's your job to mainly ask questions, do research and try to come up with a preliminary plan.

Systems analysis: Gather data; analyze the data using tools of written documents, interviews, questionnaire, observations, and sampling. Analyze the data using CASE tools, data flow diagrams, systems flow charts, connectivity diagrams, grid charts, and decision tables and write a report.

Systems design: Make a preliminary design and then a detailed design using CASE tools, prototyping tools and project management software among others. Do a detailed design, defining requirements for output, input, storage, and processing and system controls and backup finally write a report?

Systems development: Acquire the hardware and software and test the system. In the make or buy decision, you decide whether you have to create a program or have it custom written or buy it meaning simply purchase a system software package. If you decide to create a new program, then the question is whether to use the organization's own staff programmers or higher outside contract programmers (Outsource it). Which ever way you go, the task could take many months. Having made a decision, the hardware to run it must be acquired or upgraded or buy new hardware.

Systems implementation: Convert the hardware, software, and files to the new system and train the users. Convert using any of the following conversions; parallel, phased or pilot. Compile final documentation and train the users.

Systems maintenance: Audit the system, request feedback from its users, and evaluate it periodically.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter provided the methodology that was used to develop a shared database system. It covered the following key areas of project development organization units that ire studied, the population that was used, sample size, research instruments, how data was collected and analyzed to get the user requirements., development of the system, design techniques and tools that ire used.

3.1 Organization units that ire studied

The organization to be studied was Uchumi supermarket, a public limited supermarket branch in Uganda. This supermarket was chosen because its size had grown very fast and the file based system that was currently used had become inefficient. That is why the researchers had chosen to come up with a more efficient database system. Their database system would store, manipulate information, and provide means for retrieval. It would also allow reports to be printed. These reports include accounts reports such as receipts, report cards; student's and staff member's whereabouts among others.

The areas that ire studied included: the administration, accounts, customer service, and the reports that the supermarket prints.

3.2 The population that was used in the research

The population studied included:

Administration: the director of the supermarket, mangers and supermarket clerks ire interviewed. A total of at most ten regular customers ire interviewed. Information that was collected from them explained how they measured the growth rate of the supermarket, and their future expectations about the supermarket.

From the accounts department, the information to be collected included; account dues paid, customer installments that are pending, and the means of payment that was used by the supermarket.

3.3 Sample selection

The researchers used random sampling to select respondents from the supermarket clerks and customers however, for the directors and managers, it was by virtue of the positions that they held. In each of the departments, at least one respondent was taken and interview was the main data collection tool to be used.

Questionnaire approach helped to fact find relevant customers within the sample space.

3.4 Research procedure that ire used

Prior to the study, a letter was submitted to Uchumi supermarket seeking permission to carry out the study. This was done in order to establish a good relationship with the supermarket in addition to showing the urgency of the study. After the delivery of the letter the researchers ire ready to know whether their request was granted.

3.5 How data was collected

Data was gathered from the sample given above. The major techniques used included interviews with limited questionnaires and document analysis. The choice of the method depended on the information needed and the time available for the various respondents.

From the director and manager, interviews ire used exclusively, from the accountant, both interviews and document analysis ire used, and from the rest of respondents, questionnaires ire used exclusively. Interviews ire conducted one on one where as for those that used questionnaires, they ire given four days to complete the documents. After that period of time, the researchers collected the documents that ire later taken for analysis.

3.6 Tools used in collection of data

The tools that are used to collect information are interview guide, questionnaire, document analysis and observation accounting differently within the study.

3.7 Development methodology (Systems development life cycle)

The following steps are used to develop the system under study.

Preliminary investigation: this phase was conducted for the purpose of determining the cost of operation on the old system and the cost expected for the new system. The problems with the old system are identified through interviews and questionnaires. Finally, a suggestion to develop computerized system was made and a report submitted to management.

Systems analysis: the data to be gathered from the above phase was arranged and prioritized. From the findings of the study, a system's specification was made stating what the system should do to meet the supermarket goals.

Systems design: logical design for the system that meets the user requirements was made. This was done by use of a sequence diagram.

3.8 Problems anticipated in the study

The area of study was wide since Uchumi customer's are scattered and had to be interviewed. The interviews(s) are also busy during the interview hours and thus the interview interfered with their regular programs. Another problem was limited funds; this affected the sample size since the researchers are not able to reach interviewers who stayed far away. Thus careful purposeful selection had to be made for the qualitative data to ensure that the findings are a representative body of knowledge. However, after designing and implementing the system a special training was required for the users to adopt and be able to use the new system effectively

3.9 Conclusion

The main objective of the research was to solve the problems of the existing system by developing a system that was reliable and competent. As a way of developing and understanding how the new system works it took serious and critical study of the existing system. This was achieved by the researchers giving clear and precise information about the system to be developed on the conceptual model.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS, DESIGN AND IMPLEMENTATION

4.0 Introduction

This chapter presents the outcome from the study that i carried out. In the study, I used interviews and questionnaires as the major techniques.

4.1 Data presentation

Most data presented and illustrated was analyzed from the 30 respondent questionnaires gathered from the survey at Uchumi supermarket Uganda branch.

4.1.1 The age distribution of respondents

The findings on the age distribution are presented in the table below.

Table: 1 showing age distribution of respondents

Respondents age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	15-20	3	10.0	10.0	10.0
	20-25	12	40.0	40.0	50.0
	25-30	10	33.3	33.3	83.3
	30 and above	5	16.7	16.7	100.0
	Total	30	100.0	100.0	

Source: primary data

Majority of the respondents' age are in the range of 20 to 25 and 25 to 30. This was so because the study was aimed at getting ideas of different customers and supermarket users about the system.

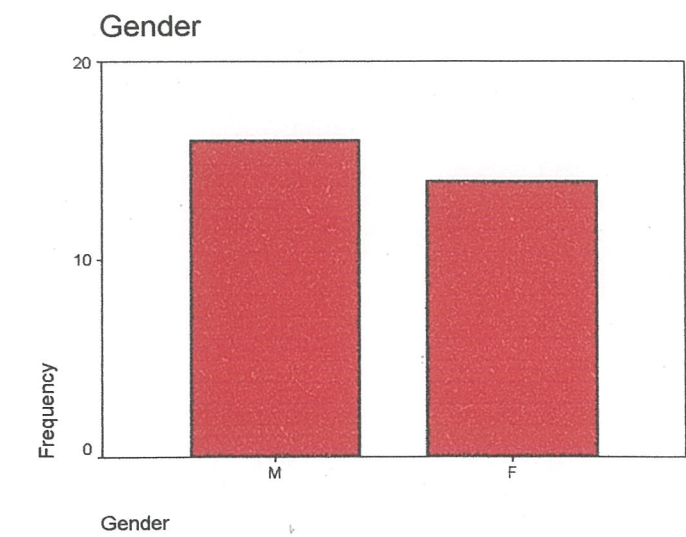
1.1.2 The gender of respondents

Below are the findings on the sex of respondents

Table: 2 showing the gender of respondents

		Gender			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	M	16	53.3	53.3	53.3
	F	14	46.7	46.7	100.0
	Total	30	100.0	100.0	

Fig: 2 showing the gender of respondents



Source: primary data

The majority of the respondent's are male representing 53.3%.

4.1.3 Occupation of respondents

Table: 3 showing the occupation of respondents.

Respondents occupation					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Student	11	36.7	36.7	36.7
	Employed	8	26.7	26.7	63.3
	None	6	20.0	20.0	83.3
	Others	5	16.7	16.7	100.0
	Total	30	100.0	100.0	

Source: primary data

Majority of respondents' occupation are students followed by employed ones.

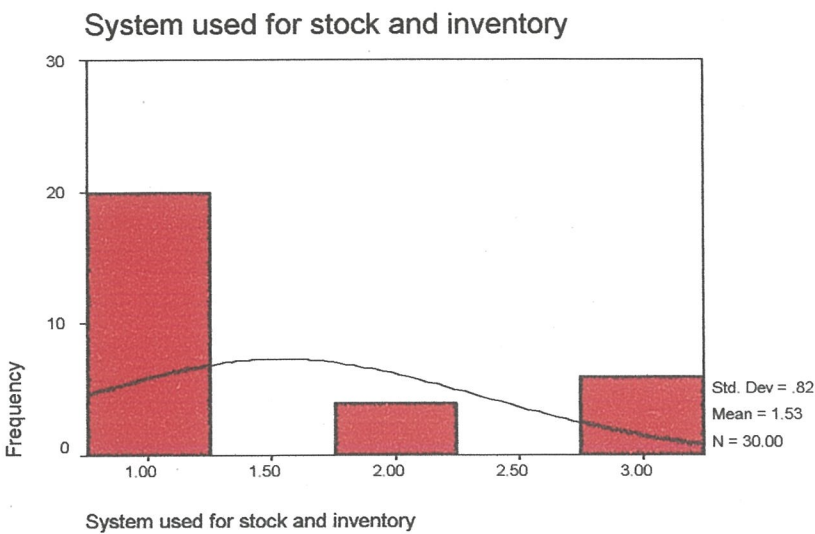
4.1.4 Respondents' view about the system used for controlling stock and inventory

The views showing how stock and inventory in the supermarket is handled are represented in the table and figure below.

Table: 4 showing the Respondents' view about the system used for controlling stock and inventory

System used for stock and inventory					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Manual	20	66.7	66.7	66.7
	Computerized	4	13.3	13.3	80.0
	Both	6	20.0	20.0	100.0
	Total	30	100.0	100.0	

Fig: 3 showing the Respondents' view about the system used for controlling stock and inventory



Source: Primary data

The outputs show that the supermarket is using a manual system to control stock and inventory thus the need for a computerized system seconded by us.

4.1.5 Respondent's view about the efficiency of the current system

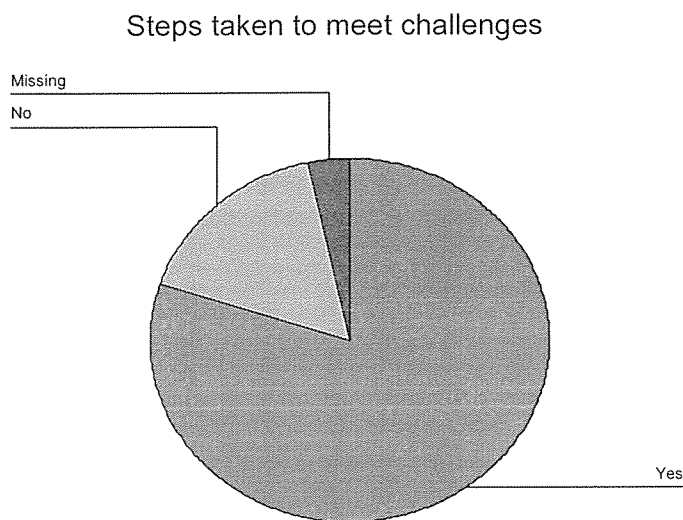
Table: 5 showing the efficiency of the current system

Steps taken to meet challenges					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	24	80.0	82.8	82.8
	No	5	16.7	17.2	100.0
	Total	29	96.7	100.0	
Missing	System	1	3.3		
Total		30	100.0		

Source: Primary data

The output should that respondents look at challenges in the supermarket's existing system are high at frequency of 24 thus the need for improvement through seconding for a computerized MIS.

Fig: 4 showing the efficiency of the current system



The majority 80% of the respondents recommended the system to having challenges that degraded the business functions of the supermarket thus a proposal for the new system. The rest couldn't second the existing system to stand on its own. This is so probably because of the low literacy level in peoples understanding of information systems. From observation of the findings, current system is average and therefore there's need to come up with a system whose majority efficiency rating will be good to excellent.

4.1.6 Findings on the Customer conduct and backing up of supermarket records

Table: 6 showing the customer conduct and backup information

**Customer conduct * backup copies of information
Crosstabulation**

Count		backup copies of information		Total
		Yes	No	
Customer conduct	good	8	4	12
	bad	3	1	4
	excellent	11	3	14
Total		22	8	30

Source: primary data

Summing up the survey, customer conduct was excellent and good overall and the current system maintained a system of backing up record but the new system will maintain and increase the expectations of the customers as ill as the administrative users.

4.2 System analysis

According to Mugenda O and Mugenda A [10], system analysis is a problem solving technique that decomposes a system into its component pieces for the purpose of studying how ill those components work and interact to accomplish their purpose. It is this part of the development life cycle that identifies both functional and non-functional requirements that are required for the current or the system to be constructed to work efficiently.

4.3 Feasibility study

This is where the problems with the manual system and requirements for the current system to see whether the researchers ire in position to solve them. This was looked at from three different perspectives. That is operational, technical, and economic perspectives.

Technical feasibility was aimed at finding out which equipment the supermarket has in place and which will be needed to implement the new system. It also checked whether the researcher had potential to design a system that would solve the problems that are identified in the old system. It was found out that the researchers had skills in all the tools that are required to develop the system.

Operational feasibility was aimed at studying the environment where the current system works. This was important to ensure that the non functional requirements of the system would be applicable these included; availability of space, electricity and safety of the system equipments in coupled to supermarket users' knowledge concerning the use of the new system.

Economic feasibility was put in place to determine whether the management of Uchumi supermarket had the ability to fund the project.

4.4 weaknesses of the current system

From what was gathered, it was clear that most of the problems with the old system originated from inefficiency in record tracking, storing, retrieval and manipulation when required. A lot of time was normally wasted while trying to carry out all these and hence there was need for a new system that would solve problems of data redundancy, time wasting, reduce search time, allow easy data manipulation, with ability to sort information, print out reports among others.

4.5 System specification

This part constitutes the design document of our new system. A well-structured design document is the groundwork for a successful system.

4.5.1 System requirements

In any system, there are two different types of requirements that have to be defined before the implementation begins. These are the hardware and software requirements. Every application and/or system that is offered in the market has its minimum and recommended hardware and software requirements. These are going to be defined in the next two sections.

4.6 Hardware Requirements

The system was implemented in a Personal Computer with an Intel Pentium IV at 1.3GHz processor and 1GB of RAM but the minimum requirements for our system will be a Personal Computer with an Intel Pentium IV or AMD at 1.3 GHz processor and 512MB of RAM. These are the minimum requirements for our system since that technology is already out-of-date. From the supermarkets' side only a machine is necessary with at least the above minimum specification for each member of the staff or administrator that is going to have access in the system. I assume that the supermarket has sufficient space of storage in order to extend its database with the tables that i will create. On the other hand, from the customers' side the only extra thing that they need except from a computer of any kind (PC or Macintosh) is a modem with minimum speed of 36Kbs, which is quite straightforward since they will have to access the Internet. There are no other hardware requirements for our system.

4.7 Software Requirements

For the software point of view, the list of requirements is much bigger. First of all i start with the required operating system. The system will be developed under Microsoft Windows XP. However, the system will be able to work under all versions of Microsoft Windows 95, 98, 2000 and NT. Since PHP/MySQL is open source, it will be supported on a variety of Web servers running under Microsoft Windows, Linux or Mac OS, Sun Solaris, WEBM AIX, Hewlett Packard HP-UX operating systems.

From the customers' side, the only software that their machines need to have installed is an Internet browser, that is to say Internet Explorer, Mozilla or Netscape Navigator. If this system had been built a few years ago in the software requirements, i would include also an application that can send and receive emails, for example Microsoft Outlook, Pegasus Email and others. However, the last few years a lot of companies offer free email addresses. For example, Yahoo, Hotmail, and Excite and others, currently offer free email addresses without any requirements from the users. This made us to remove this requirement from our system.

The supermarket, on the other hand, need to have installed an Internet browser, that is Internet Explorer, Mozilla or Netscape Navigator since the system for the members of staff and

administrators will be Internet browser base. In addition, i should note that i assume that the supermarket has already a domain name in the Internet and an E-Mail Server.

Moreover, the supermarket needs to have installed a database package. Our project will be developed using MySQL an open source industrial relational database management system (RDMS) designed to house large amounts of data while providing high performance access to it using the Standard Query Language (SQL)

4.8 System's Components

Here, i described informally the main components that our system will consist of.

4.8.1 Database

It is totally sensible to assume that every online company has already a backbone database like almost any other business. The database design for our shopping cart is quite simple. Below is the summary of what tables i need for this shopping cart plus the short description of each table.

Table: 7 showing database entities.

Table Name	Description
ss_categories	Storing all product categories
ss_products	The products of the cart
ss_ordered_carts	When the shopper decided to put an item into the shopping cart will add the item here
ss_orders	This is where i save all orders
ss_special_offers	Stores new items to be showcased

4.8.2 Web-Server

The basic component in any online shop is the web-server. This is a system that provides us with a domain name in the Internet. I assume that such a web-server exists and is running. During the implementation of our system i will test our progress in a virtual web-server using wampServer version 2.0 in the Microsoft Windows XP environment.

The web-server is going to be placed in the application that is going to serve the customers and the company's staff. The task of this application is to transfer requests from the client to the database and the corresponding responses from the database to the client. In reality, this is a remote application, which is going to run in a single machine, but is going to serve requests from users that their machines might be anywhere in the world. Clearly, this Web-Client application must run on a daily basis 24 hours per day. At this point, i suggest that whenever the web-server will be shut down for maintenance, the customers will be notified prior to that date. The way of notification has to be chosen by the system's administrator.

4.8.3 Clients

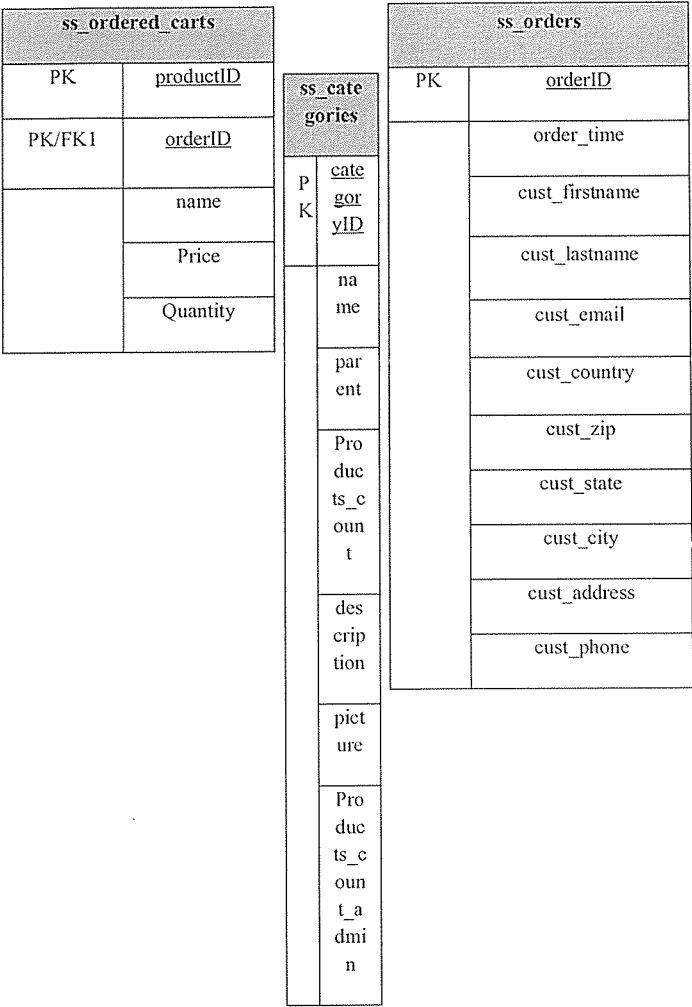
It is obvious that the customers will access the new system via the Internet. Our main goal is to provide a single web page that the customers will be able to do everything they need in the same environment. In other words they will not have to use several applications, links and windows in order to find information about the company's products and order the appropriate products for them. All they will need to do is simply to enter the URL address that the supermarket will provide them in their favorite Internet browser. If i take as an example the Jungle.com, then the URL address that the company has is the <http://www.jungle.com>.

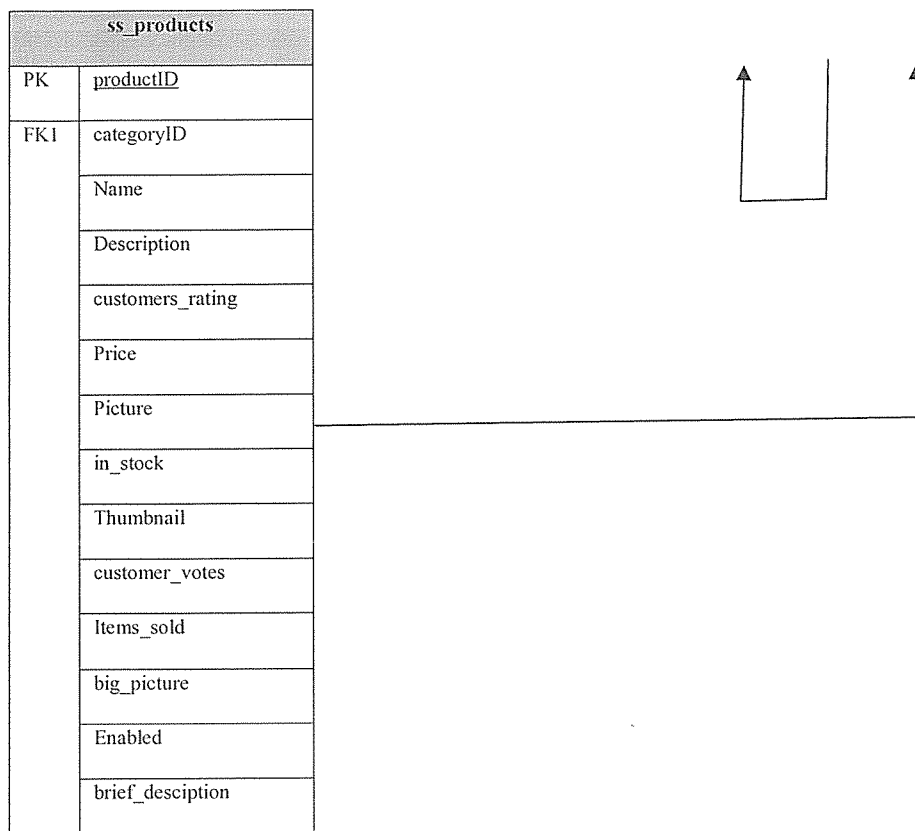
In our system, the index site will be the only URL address that the researchers will use. However from this site, the supermarket must provide a link that will allow the customers to login to the system. Following this link the customers will be able to login to the system.

On the other hand, there is nothing to say at this point for the Local client, which will be used by the members of staff and administrators. This client has to be implemented like any other client

application that is used in an organization. In addition, the system has to verify the authorization access of the user (login name/password) in order to allow him/her to proceed to the features of the application. When the authorization access of the user is established he will be able to access the system.

Fig: 5 showing the ER (Entity Relationship) diagram





ss_special_offers	
PK	<u>offerID</u>
FK1	productID
	sort_order

4.9 Physical design of the database

Below are structures of tables that are in the database. Tables include; ss_categories, ss_products, ss_ordered_carts, ss_orders and ss_special_offers.

Fig: 6 showing the table ss_categories

ss_categories

Table comments: InnoDB free: 4096 kB

Field	Type	Null	Default	Comments
<u>categoryID</u>	int(11)	No		
name	varchar(255)	Yes	NULL	
parent	int(11)	Yes	NULL	
products_count	int(11)	Yes	NULL	
description	text	Yes	NULL	
picture	varchar(30)	Yes	NULL	
products_count_admin	int(11)	Yes	NULL	

Fig: 7 showing the table ss_special_offers

ss_special_offers

Table comments: InnoDB free: 4096 kB

Field	Type	Null	Default	Comments
<u>offerID</u>	int(11)	No		
productID	int(11)	Yes	NULL	
sort_order	int(11)	Yes	NULL	

Fig: 8 showing the table ss_products

ss_products

Table comments: InnoDB free: 4096 kB

Field	Type	Null	Default	Comments
<u>productID</u>	int(11)	No		
categoryID	int(11)	Yes	NULL	
name	varchar(255)	Yes	NULL	
description	text	Yes	NULL	
customers_rating	float	No		
Price	float	Yes	NULL	
picture	varchar(30)	Yes	NULL	
in_stock	int(11)	Yes	NULL	
thumbnail	varchar(30)	Yes	NULL	
customer_votes	int(11)	No		
items_sold	int(11)	No		
big_picture	varchar(30)	Yes	NULL	
enabled	int(11)	No		
brief_description	text	Yes	NULL	
list_price	float	Yes	NULL	
product_code	char(25)	Yes	NULL	

Fig: 9 showing the table ss_ordered_carts

ss_ordered_carts

Table comments: InnoDB free: 4096 kB

Field	Type	Null	Default	Comments
<u>productID</u>	int(11)	No		
<u>orderID</u>	int(11)	No		
name	char(255)	Yes	NULL	
Price	float	Yes	NULL	
Quantity	int(11)	Yes	NULL	

Fig: 10 showing the table ss_orders

ss_orders

Table comments: InnoDB free: 4096 kB

Field	Type	Null	Default	Comments
<u>orderID</u>	int(11)	No		
order_time	datetime	Yes	NULL	
cust_firstname	varchar(30)	Yes	NULL	
cust_lastname	varchar(30)	Yes	NULL	
cust_email	varchar(30)	Yes	NULL	
cust_country	varchar(30)	Yes	NULL	
cust_zip	varchar(30)	Yes	NULL	
cust_state	varchar(30)	Yes	NULL	
cust_city	varchar(30)	Yes	NULL	
cust_address	varchar(30)	Yes	NULL	
cust_phone	varchar(30)	Yes	NULL	

4.9.1 Description of the database tables

ss_categories table

This table stores the description of the category, the number (categoryID) which is the primary key in the table, that the category has been clicked from the customers, parent category, product count, description, pictures and products count admin. Here i have to mention that the subcategory have an extra field, the parent that stores the parent category.

ss_products table

This table stores the product's name, category id, description, customer's rating and price, in stock customer votes, items sold, big pictures, small images and thumbnail. It may not be enough if you want to show a picture of you product from multiple angles so i plan to improve this on future version.

When adding a product image in the admin page i don't need to upload the thumbnail too. The script will generate the thumbnail from the main image.

ss_special_offers table

This table will store all new items currently for showcasing to the customer. Here i have sort order, productID and offered as fields.

ss_ordered_carts table

When a customer makes an order, all ordered items are put here. It consists of productID and ordered as a composite key, inclusive of name, price and quantity fields of an item.

ss_orders table

Finally when the customer finally places the order, the new order is added in this table. This table also stores the orders details of each customer, shipping and payment information that the customer provided during checkout.

4.10 Requirements Analysis

4.10.1 Who is the user?

This system is to be built for an e-commerce supermarket and consists of two sub-systems that is the Web-Client (customers) and the Local-Client (members of staff and administrators). The first sub-system deals with the customers and the second with the employees/administrator(s). There are three basic users. This includes the customers, the employees and the administrator(s).

4.10.2 What knowledge is required?

The system will be user friendly and so the user should not have a problem handling the system if they have some basic background knowledge of computers or if they have used a PC before. Some basic training can be provided though for those who are computer illiterate or for those who are not, on the main features of the system and how the system works on a whole.

This training should not take more than two-three hours and can be done in groups. Different users will require different training, so three types of training modules will be needed.

4.10.3 How a user gets started

Each user will have to visit the systems main interface (home page of Uchumi supermarket Uganda) and tours around it through the different links on it. Each user will be able to log on from the main login page from any where they are as long as they have internet connection. On the other hand employees/administrator(s) can log in to the local-client system (backend). All users according to their privileges, they will only have access to certain sections of the system, database and actions that they can perform.

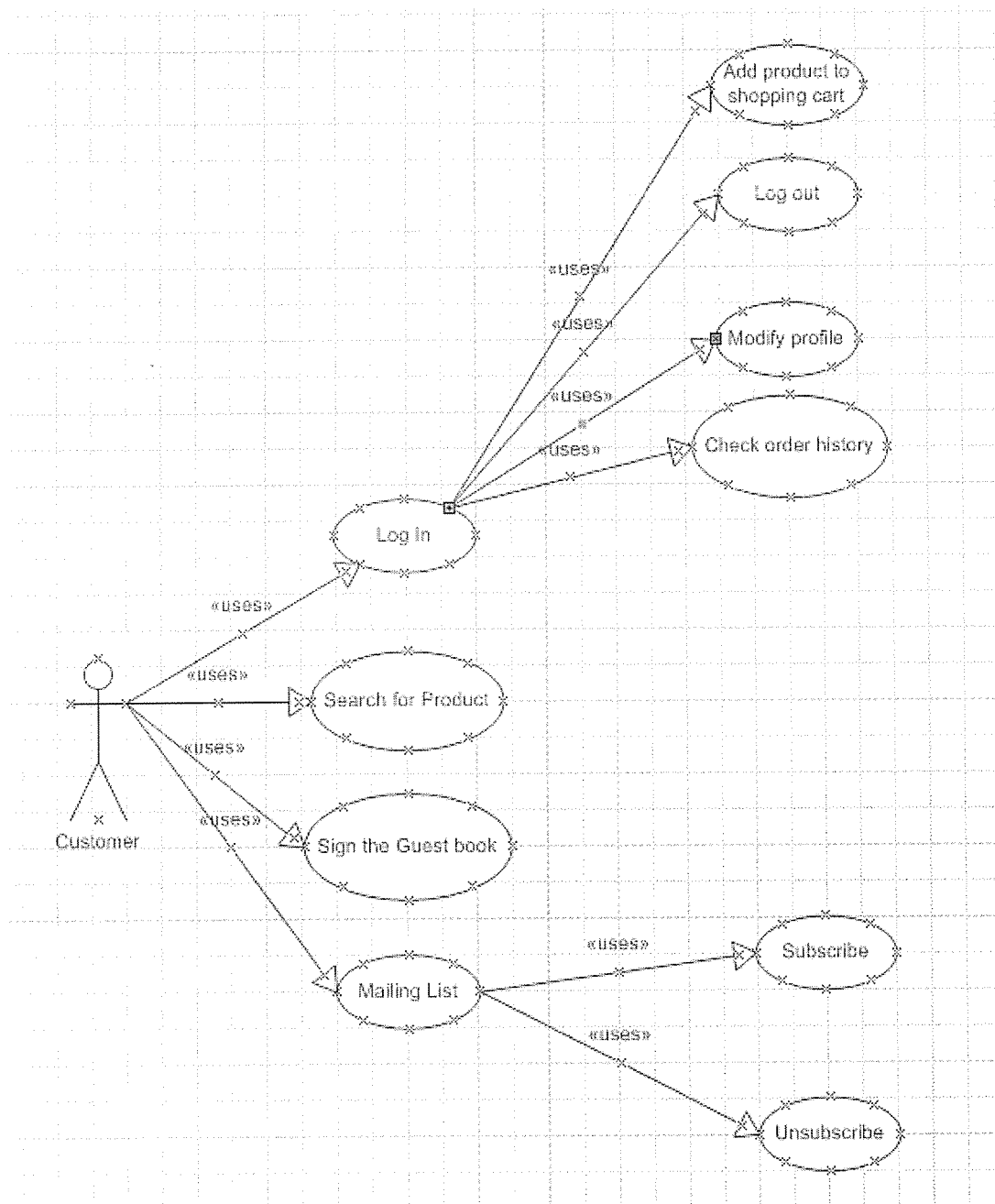
4.10.4 The role of each user

As mentioned above the three basic users are: Customers, Employees, Administrator (s).

There will be three levels of access into the database:

Customers - No identification is needed, as this is the default mode of operation. The customer simply connects to the web page and access online only the items that can be shopped. If a customer decides to buy a product, all she/he needs is to provide the necessary details about the customer and probably payment methods.

Fig: 11 showing customer use case diagram

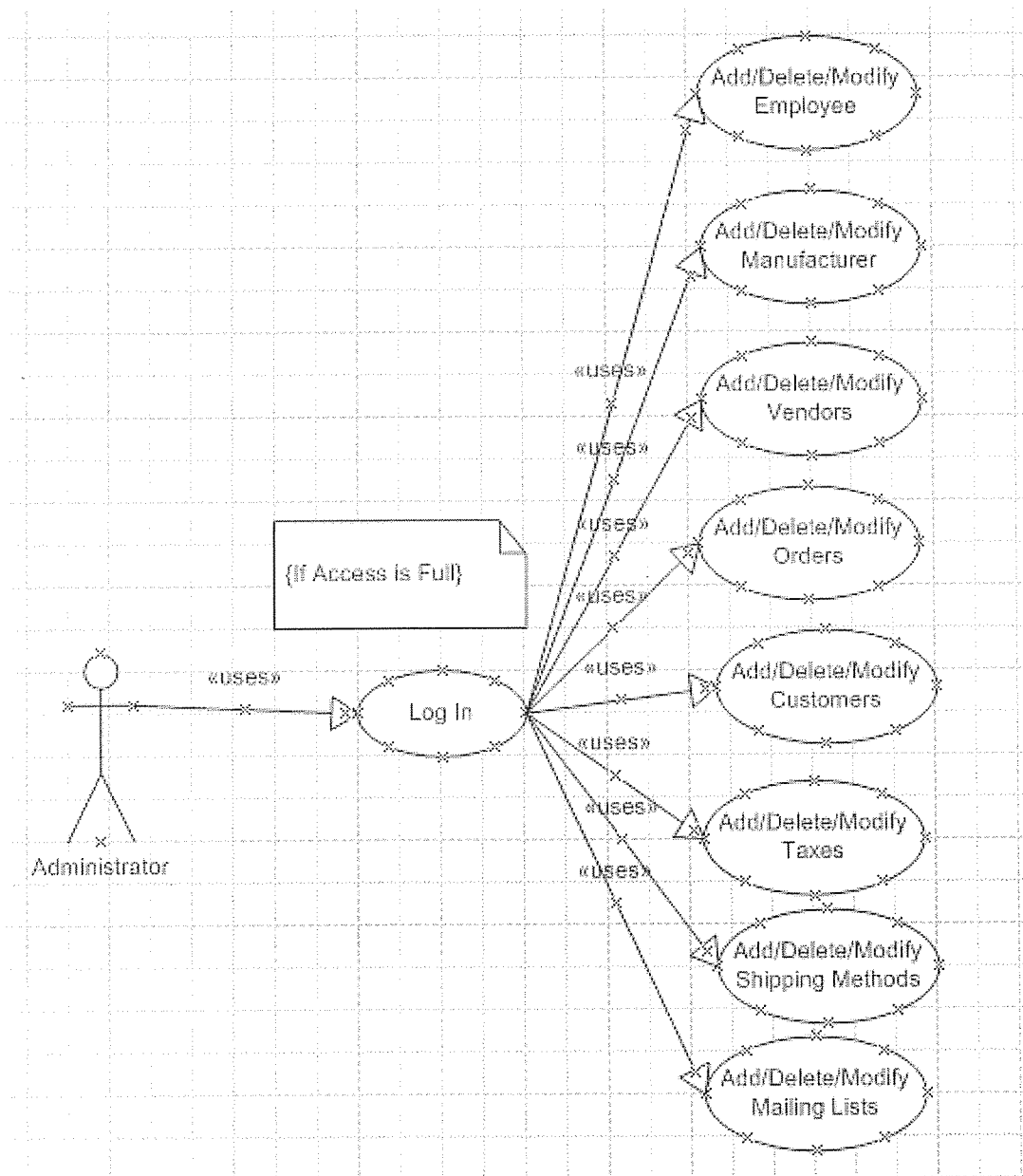


Employees - Members of staff identify themselves by entering their username and password. User-levels access within the database will be set by administrator and the staff will have a limited amount of access, such as which tables they will be able to access and to what extent of access they will have on them, depending on the level access. There are four types of employees:

- Sales Employee
- Sales/Warehouse
- Manager Marketing Employee
- Accounting Employee

Administrator(s) – Administrator(s) is being identified by entering their username and password. Administrators have full access within the database and they will be able to access all the tables of the database. The Administrator could be the manager, who will require some sort of computer knowledge. It might also be the technician. This person will have access to all areas, including the ability to update and maintain the system.

Fig: 12 showing administrator use case diagram



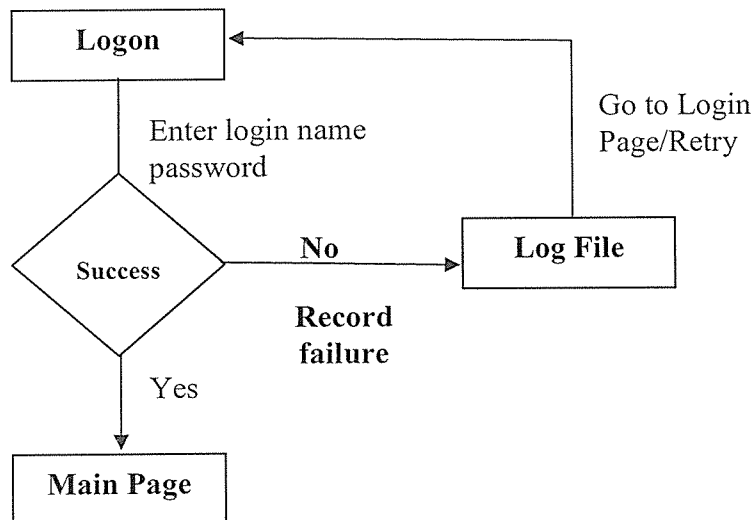
4.11 Functional Requirements

The functional requirements specify what the system needs to provide and how it should behave. The following is what is required from this system to work correctly.

4.11.1 User Logon

Mostly system administrators will be required to login to the system to organize categories, analyze different orders as well as put new items for showcasing. So a user login system will be required in order for something of this sort to occur. Each user has a unique user name, and a password. A login screen will be the first thing that a user with administrative rights view and should be prompt with on their screen once the system is up and running.

Fig: 13 showing login procedures



4.11.2 Security

The system must be secure from internal users such as staff, who must have authorization to specific sections to the database and only to that section. This is done in order to protect the information on the database from being tampered with and to keep peoples privacy. A log file might need to be kept, where by invalid login names or password entries are recorded, so that the administrator can check whether someone is trying to break into the system

4.12 Testing Plan

Testing is an important part of the systems design. It involves checking for correctness, which is one of the focuses of the project. The way to test to see if the system is working correctly is to use black box testing (or functional testing). What black box testing does is to feed in inputs and obtain relevant outputs. These inputs and outputs are then studied and checked to make sure that they are the desired result, in order to make sure that the system is behaving properly.

The testing process in systems like the one that i will attempt to build is not an easy job. I will not build a simple application. I will build a whole company (supermarket) system, which consists of sub-systems. I are planning to perform test in parallel with the implementation of the new system and i are going to follow some testing procedures described in the software engineering literature.

I will first build our database and i will insert sample data in it. Note that even if the data that i will put are sample, they are going to be taken from the real company (Uchumi Supermarket Uganda branch). Here i have to mention that i will have of course a smaller in physical size database, than in a real environment, but the most important is the quality of the sample data. And this quality will be the quality of a real environment. The functionality of the database will be tested with sample operations, such as queries, updates, insertions and deletions.

Then i will build the Web-Client's application. I will start from the user-interface in order to identify the components and objects that i will need. Then i will define the appropriate classes and methods. I will test with sample data the operation of each method independently, and inside

its class. Then, I will test the functionality of each class with my database. The same testing approach i will follow with the Local-Client subsystem.

4.13 Testing Schedule

In this part i am going to analyze the testing schedule and the techniques that i are planning to use.

4.13.1 Code Walk-through

The programmer who developed it inspects the code for each part of the system. This is seen as far better to find a problem at this low level rather than later in the testing cycle where several components have been joined together.

These should be completed as soon as the developer completes the code for a section of the system. Things to look for in the code are: syntax errors, incorrect function / variable names, inefficient data structures. Once the changes are completed a second walk-through should occur to check for any problems created by changes made to the code.

4.13.2 Component testing

This should occur on the development machine, immediately after the code has bee given the ‘all clear’ in the code walk-through. The code for the individual function is compiled and executed to see if it completes the function that it was designed to. If a section of code does not produce the required outcome then the code should be checked against the requirements specification given for that section, and rewritten as required.

4.13.3 Bottom-up integration test

Integration testing is where all the components will be combined together and checked to see if they work correctly. If they don’t, then there are problems with the code and unit testing will have to be reviewed again in order to pinpoint the problem and correct it. According to Sommerville (2001), the integration test should ideally be completed on a machine that was not used during production of any individual sections of code.

4.13.4 System Test

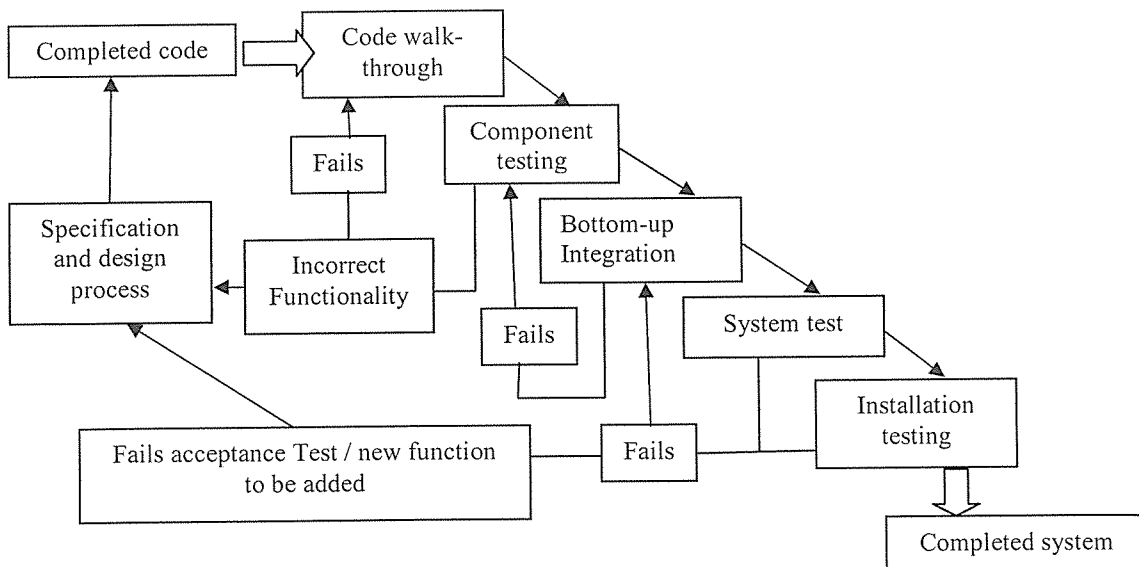
Here the objective is to make sure that the system can perform the way the customer has asked it to and that the system design has been implemented correctly. The two major issues that need to be taken into consideration here are:

- Functional testing
- Performance testing

Functional testing checks that once the system has been integrated together, it works as desired, by checking that the functional requirements have been satisfied.

Performance testing checks that the non-functional requirements have been satisfied. This will include security matters, speed, accuracy, and reliability.

Fig: 14 showing Testing process of the system



4.14 System Implementation

This part of the system development life cycle is concerned with the actual construction of the proposed system, testing to see that it does what it is supposed to do, delivery the system into day to operation, user training and finally commissioning of the system into operation.

The system was designed using PHP and MySQL programming languages with PHP able to create user friendly web interfaces and ease linkage with the database created using MySQL. They are both open source software and are easy to integrate with various operating system platforms.

4.14.1 Interfaces

The interfaces of the system should allow:

- Staff/administrator to update (add/delete/modify) and alter the attributes held in the database.
- Staff/administrator to search the entire database quickly and easily using the predefined searches.
- Customers to search any item in the product database using predefined searches.
- Customers to order product(s) online
- Staff to predict and highlight trends in the database.
- Users to be provided with online help.

The graphical user interface (GUI) will need to be simple, non-complex that is will need to take into account a lot of human computer interaction (HCI) factors, such as form filling techniques, coloring, and help guidance. The interfaces of the system will satisfy Nielsen's usability heuristics. According to Nielsen the user interface must satisfies the following:

- The interface must be simple and use natural dialogue
- Match be taken system and the real world

- Speak the users' language
- Minimize the users memory load
- Consistency
- Aesthetic and minimalist design
- Feedback
- Shortcuts
- Good error messages
- Prevent errors
- Help and documentation

4.14.2 Security

Any form of information being passed through the Internet or through an Intranet, needs to be encoded for security purposes. Hackers these days like to eaves drop on connection lines and if the information passing through is in plain text, then they can easily use that information to cause damage to a system.

For a system like the one that i built, it is important that no unwanted guests are able to obtain any information, such as credit card information, or customers' information or even the passwords and user names of staff.

Basically there are three main security methods that i targeted this research on. There are a lot more but these three are the most relevant to the project. They include HTTP Authentication, Digital Certificates and Secure Sockets Layer (SSL).

4.14.3 Quality Assurance

Data retrieval and data insertion should be done at relative fast speeds. The system should be able to detect invalid data entry and prompt user with a warning. Imperative data should be marked with an asterisk (*) to indicate that a field must be filled in that section.

displayed. Another check will be made to see if a large image has been uploaded too. If such picture is available, the 'view' link will be displayed.

The system includes facilities for accessing relating products and the products of the supermarket of the current product. The system supports stock quantity tracking for items. The total of each item will be adjusted each time any are purchased and items where the stock has reached zero will automatically display as 'out of stock', preventing further users from adding these to their order.

Fig: 15 showing products

Highest rated products:



[more info...](#)

IBM ThinkPad T30 2366-89G



List price: ~~\$3400.00~~

Price: \$3170.00

You save: \$230.00 (7%)

P-IV 2000GHz, 14.1" TFT, 256MB, 40.0GB, 16MB AGP, DVD-ROM, 56E, 10/100 Eth, wireless, WinXP Pro

Compaq iPAQ H3760



List price: ~~\$377.00~~

Price: \$365.00

You save: \$12.00 (4%)

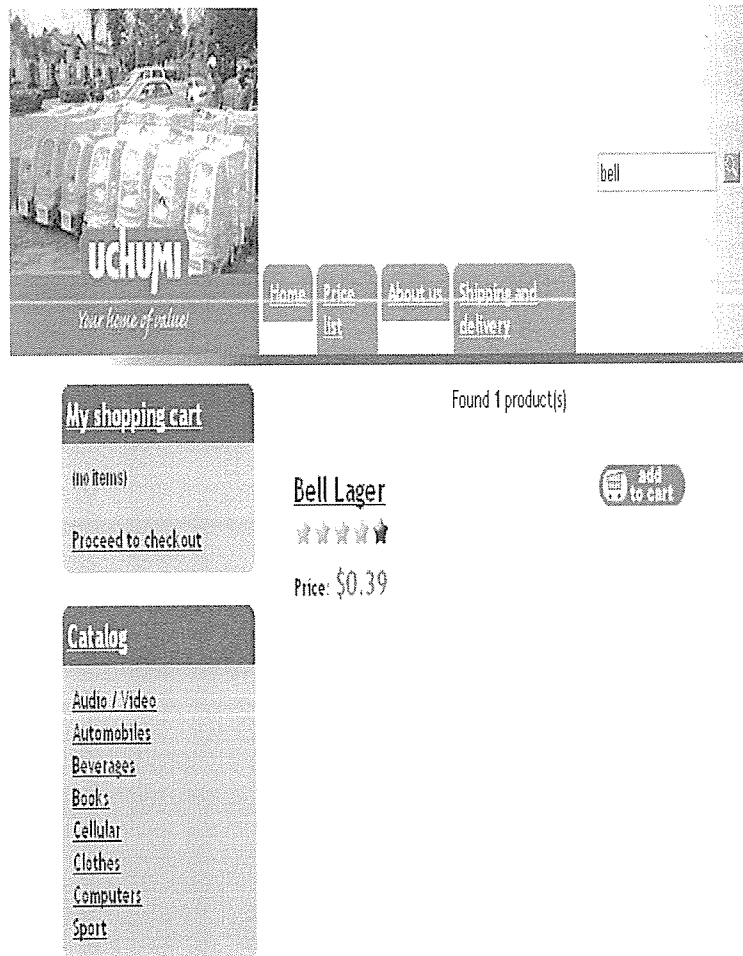
3.8", 240 ÷ 320, 206MHz, 64MB, 32MB ROM, MS Pocket PC 2002

The system will allow users to search the site is to find products that they would like to buy. With this information that is retrieved from the database (price, details, if there exists in stock), the system will allow to the user to make a complete online purchase. The customer will be able to search:

- By keyword
- By category of products

By manufacturing (brand)

Fig: 16 showing search options



The system also will allow users to see the feature products/special offers either in the front page of the web site or in the beginning of the category pages. The featured products can be either product that is on sale or advertisement products. The following figure shows two featured products in the front page.

Fig: 17 showing special offered - Featured Products



My shopping cart

(no items)

[Proceed to checkout](#)

Welcome to Uchumi Supermarket Uganda!

The supermarket of choice in the Eastern African Region.
Browse through our products and make a choice of your own.

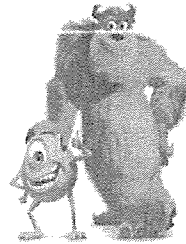
Catalog

[Audio / Video](#)
[Automobiles](#)
[Beverages](#)
[Books](#)
[Cellular](#)
[Clothes](#)
[Computers](#)
[Sport](#)

Special offers



Pay it to the bone
\$14.49



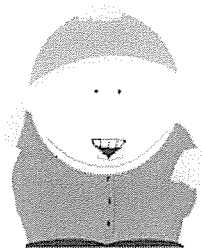
Monsters inc.
\$14.49

Need more web design?

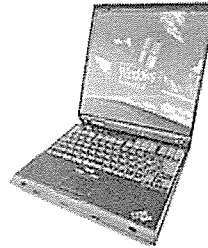
Contact Najjuka Victor and
Nabakooza Leatitia for all
facilitation @ KIU School of
Computer Studies:

www.victor-leatitia.com

From \$139



South Park
\$12.00



IBM ThinkPad T30 2366-89G
\$3170.00

Finally, i have to mention that the system allow to users to see the top selling products.

Fig: 18 showing price list and top selling products

Price list

Audio / Video	
DVD	
007 - Gold Finger	\$15.99
007 - The world is not enough	\$15.99
13th floor	\$19.90
15 minutes	\$15.99
51th state	\$18.35
American Pie	\$15.99
American Pie 2	\$15.99
Charlie 's angels	\$15.99
Devil 's advocate	\$15.99
Face/Off	\$22.99
Fast and furious	\$14.49
Frequency	\$15.99
Gone in 60 seconds	\$13.10
Lara Croft - Tomb raider	\$15.99
Memento	\$15.99
Monsters inc.	\$14.49
Planet of the Apes	\$15.99
Scary movie	\$15.99
Shipping news	\$15.99
South Park	\$12.00
XXX	\$19.60
Home theatres	
mp 3-players	
Diamond Rio Volt	\$149.00
Duo MP3	\$170.00

14.15.1.2 Orders

The customer will be able to order as many different items he wishes if those products are in stock. The customer will have all the facilities (and even more) that he/she would have when at in the shop itself. This implies that s/he will have a virtual shopping cart where things will be added along the way and stored there temporarily, until the customer proceeds to the checkout point to pay for the goods.

Fig: 19 showing shopping cart

My shopping cart: [✖ clear](#)

Product name	Quantity	Cost	
Pants	<input type="text" value="2"/>	\$19.00	✖

Total: **\$19.00**

Fig: 20 showing customer information

Proceed to checkout

CONTACT INFORMATION

* required

* First name:

* Last name:

* Email:

Phone number:

Address:

* City:

* State:

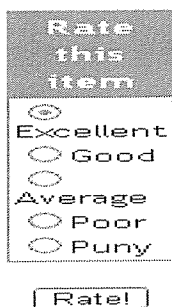
* Zip code:

* Country:

14.15.1.2 Marketing Research

The user has the option to contribute to the marketing research that the company will do. The marketing research is one of the most important fields that all companies take care. The customer opinion about the quality of services, prices, company policies and deliveries are important to the success of all companies. An online company must find a way to get this information online in order to survive.

Fig: 21 showing weekly poll

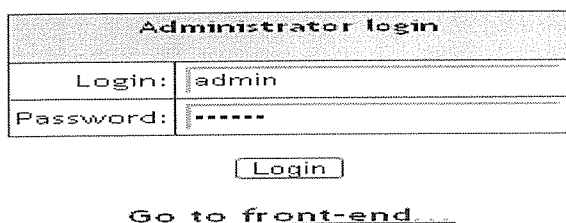


Rate this item	
<input checked="" type="radio"/>	Excellent
<input type="radio"/>	Good
<input type="radio"/>	Average
<input type="radio"/>	Poor
<input type="radio"/>	Puny
<input type="button" value="Rate!"/>	

4.16.1 Local Client Features

The local client application is used by the shop owner or operator to add, modify or delete products, categories and other items. When the user is log in to the system (see following figure) he/she will be able to access the options of the main menu depending on their access level.

Fig: 22 showing Administrator/Employee Log In



Administrator login	
Login:	admin
Password:	*****
<input type="button" value="Login"/>	
Go to front-end...	

The following figures will show the roles the supermarket administrator performs.

Fig: 23 showing categories and products management



Categories and products

Categories

Root (0)

Audio / Video

(0)

[edit]

DVD

(22)

[edit]

Home theatres

(0)

[edit]

mp3-players

(4)

[edit]

Automobiles

(0)

[edit]

Lamborghini

(1)

[edit]

Lexus

(2)

[edit]

Lotus

(1)

[edit]

Mercedes

(2)

[edit]

Toyota

(1)

[edit]

Beverages

(0)

[edit]

Alcohol

(3)

[edit]

Alcohol free

(2)

[edit]

Books

(1)

[edit]

Design

(1)

[edit]

Harry Potter

(3)

[edit]

Programming

(2)

[edit]

Cellular

(0)

[edit]

Ericsson

(4)

[edit]

Nokia

(11)

[edit]

Accessories

(1)

[edit]

Products

Root:

All products in the root directory are not shown to users!

no products

[Add]

55

Fig: 24 showing orders management



New orders

// prices are actual for the time of the order //

Order ID	Customer	Email:	Address:	Phone numbers:	Ordered products	Order total	Order time	
4	Nalwanga Juliet	naljulie5@gmail.com	P.O.Box 111 Katikamu, Mubende Mubende Mubende 256 Uganda	07021334345	Pants x 1: \$19.00	\$19.00	2010-06-13 23:35:41	
3	Nabakooza Leatitia	leatitia@yahoo.com	Kansanga, kla kla kla 256 Uganda	0782920728	007 - Gold Finger x 1: \$15.99 Professional PHP programming x 1: \$15.00	\$30.99	2010-06-13 10:53:12	
2	sam w	ws@yahoo.com	Kla p.o.box 123 kla kla 256 uganda	2222	IBM ThinkPad T30 2.66-89G x 1: \$3170.00	\$3170.00	2010-06-11 12:54:55	
1	Naijuka victor	vicki@yahoo.com	muyenga,kampala p.o.box 222 kampala kampala 256 uganda	0789112111	Nokia 6250 x 1: \$273.00 Bell Lager x 1: \$0.39	\$273.39	2010-06-10 05:42:21	

Fig: 25 showing products add management

localhost:3000/products.php

Create new product

Parent:

Product name:

Product code:

Price, USD (number only):

List price, USD (number only):

In stock: ☒

Picture: No file chosen
(picture not uploaded)

Thumbnail: No file chosen
(picture not uploaded)

Enlarged picture: No file chosen
(picture not uploaded)

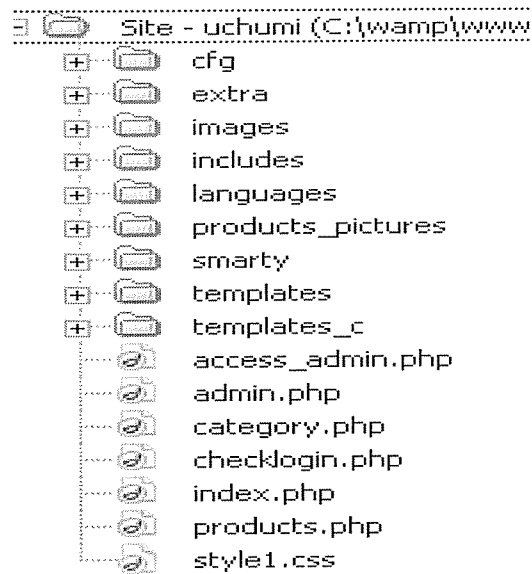
Description (HTML):

4.17 Site Structure

Usually, when a website is developed, little consideration is given to problems that will be faced when they become medium or large sized. Developers who begin their construction with a well organized and easily navigable site structure are already one step ahead. The system consists of four mutually integrated parts:

- The database file that stores all the real-time information for the company.
- PHP pages for web-client system
- PHP pages for the local-client system
- Common files
- Images of the system

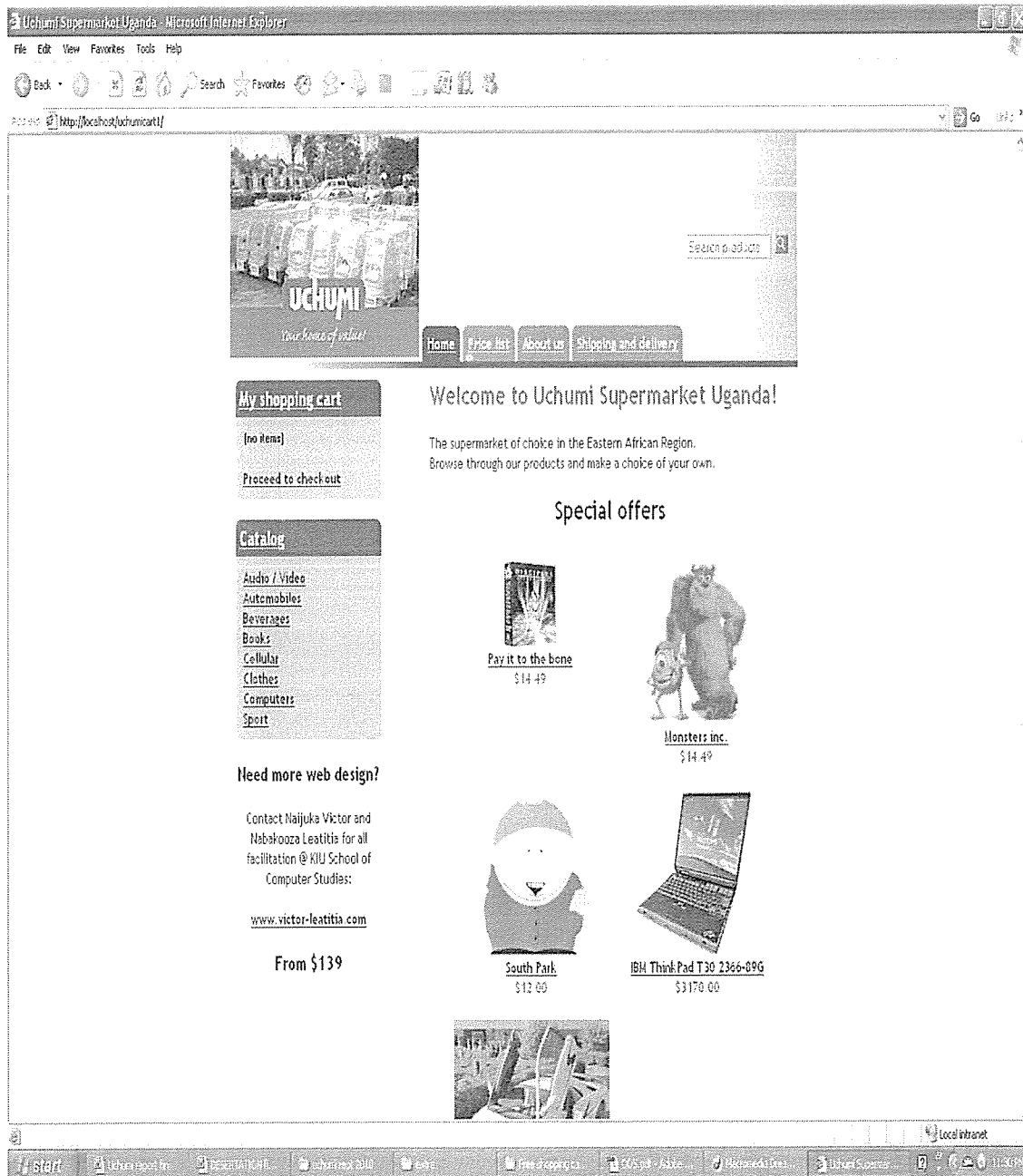
Fig: 26 showing Site Structure



4.18 Front Page

The front page of the system will display the following:

Fig: 27 showing Home Page of Uchumi Supermarket Uganda



CHAPTER FIVE

LIMITATIONS, RECOMMENDATIONS AND CONCLUSIONS

5.0 Introduction

This part of the report concludes the report on our study. It has outlined recommendations on how to use the system, suggests ways of overcoming the limitations that researchers encountered and i finally outline the methods and tools that i found useful in our study.

5.1 limitations

In the study the following ire limitations.

5.1.1 Limitations to the study

There ire many limitations to the study that included;

- Lack of funds, this was evident when it came to printing questionnaires. Instead of the previously suggested 50 copies only 40 ire printed. The response was poor. This can be seen from the fact that out of the 40 questionnaires that ire distrwebuted, only 30 ire returned and out of the ten respondents scheduled for interviews only five attended.
- Ambiguity in requirements. Most of the respondents ire totally green about what a computer can do.
- Transport means ire not good because researchers had to travel to uchumi supermarket in Kampala town amidst tight jam.
- Language barrier among respondents was another problem.

5.2 Suggestions to the above problems;

Here are some of the solutions suggested to solve the above problems:

- Funds should be put aside before the start of the study.
- More time should be dedicated to requirement collection.
- Clients need to be sensitized about the domain of the system.

5.3 Recommendations

The researchers recommend that in addition to suggestion given above, whoever picks interest in working on related projects should have a clear understanding of the problem, develop a clear understanding of development tools like questionnaires, interviews, observation, document analysis, and many others. He/she needs to know which tool is appropriate given the available circumstances for example.

Interviews could be the only if the researcher has enough time, when qualitative information is required, and when the number of respondents is not very large.

Questionnaires could be used in situations where the respondents are geographically scattered, and when the sample size is very large compared to the available time.

Observation could also be used especially in cases where problems of language barrier exist. However, this will yield good results when it is used along with another data collection method.

I recommend that the system development life cycle be used as the main development methodology because it is easier to follow than other methodologies like prototyping, which require special, expensive and even hard to use tools.

Whenever a project is to be taken up, a ill detailed schedule is needed to guide the researcher through out the study.

5.4 Conclusion

Finally, the study has not been easy as out lined in the limitations section above and the biggest problem was lack of funds and the researchers had to go extra miles in doing research to acquire skills that are necessary for the success of the project.

On the good side of it all, the researchers have acquired skills in project management and programming and at least researchers can make claims of having a minimal experience designing database systems. Most exiting is that the researchers are through with their graduation project.

REFERENCES

Books

1. Andrew B. Whinston, Ravi Kalakota, 2001, *Frontiers of Electronic Commerce* Low price Edition, Addison Isley publishers (Singapore).
2. Avison D. and Hanifa S. (1999). The Information Systems Development Life Cycle New York: McGraw-Hill Walther S. and Levine J. (2000). Teach Yourself E-Commerce Programming With ASP. Indianapolis: Sams.
3. C, J DATE, (2001), an introduction to database management system, 7th edition, Pearson education publishers New Delhi, India.
4. Deitel, H.M., Deitel, P.J. & Nieto (2000). Internet & World Wide Web–How to Program. Prentice Hall
5. Design Methods 5th Edition, McGraw Hill Irwin Publishers.
6. Gareth Downes-Poill, Tim Green and Bruno Mairlot (2003), *Dreamiaver MX-PHP Web Development*.
7. Grady Booch, James Rumbaugh and Ivar Jacobson (1999). The Unified Modelling Language User Guide. New York: Addison Isley, 1999.
8. Jeffrey A. Hoffer, Joey F. George, Joseph S. Valecich *Modern system analysis and design*
9. Jeffrey L. Whitten, Lonnie D. Bentley, Kelvin C. Dittman, 2000, *System Analysis and* .
10. Julie C Meloni (2002), *Sams Teach Yourself PHP, MySQL™ and Apache in 24 Hours*
11. Kaner C., Falk J. and Nguyen H. (1993). Testing Computer Software-2nd Edition. New York: International Thomson Computer Press.
12. Kenneth C. Laudon, Jane P. Laudon, 2000, *Management Information Systems* 6th Edition, Prentice-Hall International
13. Sarah E. Hutchinson, Stancey C. Sawyer, 2000, *Computers Communications Information*, McGraw Hill Irwin Publishers.

APPENDICES

APPENDIX A

A Sample Uchumi Supermarket questionnaire

Dear respondent,

. I kindly request you to fill this questionnaire below to facilitate the research study to a success and helpful to the supermarket.

- PLEASE feel free and give the important information as required to make the project feasible.
- Your information will be treated and kept with a lot of confidentiality, great care and will be highly appreciated.

Much regards:

1) Your occupation

- Student
- Employed
- None
- Others

.....

2) Age bracket

15 – 20 , 20 – 25 25 – 30 0 and above

3) Gender

- Male ☐
- Female ☐

4) How did the supermarket begin? (Please tick where appropriate)

- Started as a supermarket ☐
- ☐
- Started as a shop ☐

5) Which system do you use for controlling the stock and inventory? (please tick where appropriate)

Manual System ☐

Computerized System ☐

Both Systems ☐

- If manual, what problems do you encounter? (Please out line)

.....

If computerized, which System?

- And what problems do you experience? (Please out line)

.....

How do you keep your records? (Please tick where appropriate)

File bases System ☐

Database system ☐

I don't know ☐

If database, choose the application. (Please tick where appropriate)

Microsoft Access ☐

Mysql ☐

Oracle ☐

6) Is there any step that has been taken to meet the challenges? (please tick where appropriate)

Yes ☐ No ☐

- If yes please state it (them)

.....

7) What is the hierarchy of the organization (Supermarket)? E.g. [Manager, Ass-Manager...].

.....

8) What is the conduct of the customers? (please tick where appropriate)

Good ☐

Bad ☐

Excellent ☐

9) What problems do you face with customers?

.....

10) Do you have backup copies for your information? (please tick where appropriate)

Yes ☐ NO ☐

- If yes state the kind of the information you back up, and where it is stored.

.....

What kind of products do you sell? (please tick where appropriate)

Locally produced items ☐

Imported Items ☐

Both local and imported items ☐

11) Please out line some of the products sold in here.

.....

.....

12) How do you market your products?

.....

APPENDIX B

Sample PHP codes used

Database functions

```
<?php

//      database functions :: MySQL

function db_connect($host,$user,$pass) //create connection

{

    $r = mysql_connect($host,$user,$pass);

    if(preg_match('/^5\./',mysql_get_server_info($r)))db_query('SET SESSION
sql_mode=0');

    return $r;

}

function db_select_db($name) //select database

{

    return mysql_select_db($name);

}

function db_query($s) //database query

{

    return mysql_query($s);

}

function db_fetch_row($q) //row fetching

{

    return mysql_fetch_row($q);
```

```

}

function db_insert_id()

{

    return mysql_insert_id();

}

function db_error() //database error message

{

    return mysql_error();

}

?>

/ front-end homepage

//get root categories to be shown in the front-end homepage

$q = db_query("SELECT categoryID, name, products_count, picture FROM
".CATEGORIES_TABLE." WHERE categoryID<>0 and parent=0 ORDER BY name") or die
(db_error());

$root = array();

while ($row = db_fetch_row($q))

{

    if (!file_exists("./products_pictures/$row[3]")) $row[3] = "";

    $root[] = $row;

}

//get subcategories of root categories

$query = "SELECT categoryID FROM ".CATEGORIES_TABLE." WHERE
categoryID<>0 ";

```



```

$result = array();

for ($i=0; $i<count($root); $i++)

{

    $q = db_query("SELECT categoryID, name, products_count, parent FROM
\".CATEGORIES_TABLE.\" WHERE categoryID<>0 and parent=\".$root[$i][0]) or die
(db_error());

    while ($row = db_fetch_row($q))

        $result[] = $row;

}

$smarty->assign("root_categories",$root);

$smarty->assign("root_categories_subs",$result);

//special offers

$result = array();

$q = db_query("SELECT productID FROM \".SPECIAL_OFFERS_TABLE.\" order by
sort_order") or die (db_error());

while ($row = db_fetch_row($q))

{

    $q1 = db_query("SELECT productID, name, picture, Price FROM
\".PRODUCTS_TABLE.\" where productID=$row[0]") or die (db_error());

    if ($row1 = db_fetch_row($q1))

    {

        if (trim($row1[2])!="" && file_exists("./products_pictures/$row1[2]"))

        {

            $row1[3] = show_price($row1[3]);

            $result[] = $row1;

```