

CUSTOMSTEEL TRADING E-CUSTOMER SERVICING AND EXPERT SYSTEM



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BY

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Abstract

The aim of research study is to construct a web based system that enables customers to order products and services online. This study aims to make products and services availability a must to all customers in need of the service.

The project was guided by objectives listed below:

- To develop a system that facilitate real time processing capabilities by enabling customers to register online and receive their login details on their mobile phones.
- To develop a system that have a robust database handling ability that keeps track of which customers buy which products and then send them promotional alerts through email or sms.
- To create a system that provides built in tracking and reporting metrics.
- To allow customers to view products, services and prices online.
- To equip customers with a Multiple Payment Mode Compatible system then upload proof of payment though the system
- The system must enable the users to prioritize the requests. Different problems require different priorities.
- To create a system with an online helpdesk with a single point of contact to end users.

Data was collected from system users using information gathering techniques which include interviews, questionnaires, and observations. The collected data was then converted into meaningful information (during the analysis phase) with the use of tables and diagrams as well as explanations to shed more light on the pictorial presentations. The system design used the client server architecture to implement the inference mechanism while the database component was implemented using MySQL. The user interface was implemented using HTML and PHP. Testing and validation techniques were applied to make sure the system meets its intended purpose and also satisfy user requirements.

Declaration

I James Masunungure declare that I am the sole author of this document. I authorise the Midlands State University in Zimbabwe to lend thesis to other institutions or individuals for the purpose of scholarly research.

Signature.....

Date.....

APPROVAL

This dissertation entitles Customsteel Trading Customer Support and E-Servicing Expert System by James Masunungure meets the regulations governing the award of the Bsc Information Systems Honors Degree of Midlands State University, and is approved for its contribution to knowledge and literal presentation.

Supervisor.....

Date.....

Acknowledgements

Firstly I would like to thank God the Lord my Creator and Sustainer of my life for being with me since I started this project up to the end of it. I would like to thank the staff at Customsteel Trading, and the contributions I got from my Supervisor, MSU lecturers and students to help me gather information I had been looking for during my research.

May God bless them all.

Dedication

I dedicate this project to my wife Wendy Masunungure. May God bless you.

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List of Acronomy

MSU	Midlands State University
3G	Third Generation Mobile Network
HTTP	Hyper Text Transfer Protocol
NPV	Net Present Value
WWW	World Wide Web
PHP	Hyper Text Pre Processor

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Chapter 1: Introduction

1.0 Introduction

Customsteel Trading is a small enterprise indigenous company which deals in security gates fabrication, gates automation and intercoms, fencing and related products. To achieve a big foot print in this industry, the company needs to develop strategic IT systems that will meet the current market technologies hence the need to develop a web based E-Customer Servicing System.

1.1 Background of The Study

Customsteel Trading is an entrepreneurial company with potential to grow and requires an efficient and convenient way of servicing its customers. Information systems play a vital role in an organizations' overall performance. They provide many advantages to their users which range from simple transaction processing at the operational level to difficult tasks such as making important and competitive decisions at the strategic level of the organization. Several roles played by information systems in an organisation can be identified but O'Brien and Marakas (2008) have identified three fundamental roles played by information systems in businesses. These are; Information Systems support business processes and operations. Secondly, they support decision making of employees and managers and lastly, they support strategies for competitive advantage. These three fundamental roles encompass any other roles played by information systems in an organisation. From this background, it is fundamental that Customsteel develop a system that will harness its full potential.

1.1.1 Background of The Organisation

Customsteel Trading is a wholly owned Zimbabwean company which deals in fabrication and installation of sliding gates, both residential and commercial, automation and intercoms, fencing which includes but not limited to palisade fencing, swimming pool fencing, razor wire fencing, electric fencing and diamond mesh fencing.

Customsteel Trading was formed on 15 February 2015 and started operating in Waterfalls in Harare. Its customer base is continuing to grow as they are providing customers with quality products at best value. The company has over hundred customers and provides services to both corporate and individuals.

ORGANISATIONAL STRUCTURE FOR CUSTOMSTEEL TRADING

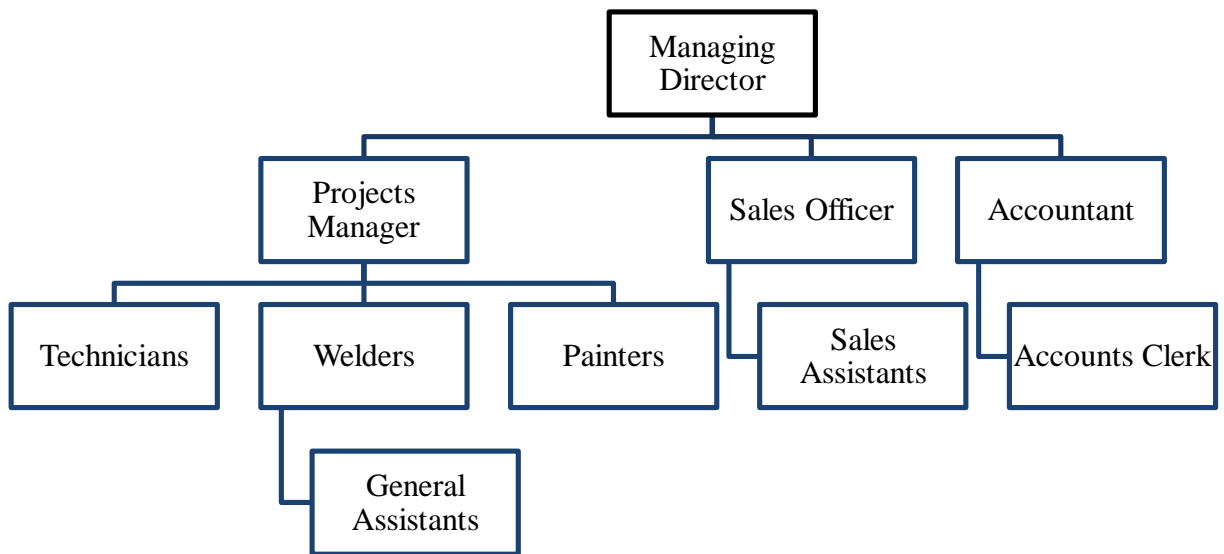


Fig 1.1: Organogram

1.1.2 Vision

To be the most preferred supplier of welding, fencing, gate automation and intercoms and related technologies in Zimbabwe.

1.1.3 Mission Statement

To provide quality custom made solutions in the field of welding and fabrication, fencing, gate automation and intercoms and related technologies at best value to our customers without compromise on our employees' safety.

1.2 Problem Definition

The problems with the current system are as below:

- Lack of an online help desk.
- Difficulty in job task tracking.
- Slow processing method of customer queries
- Reduced advertising strategies.
- Delays in allocating tasks to technicians.

1.3 Aim

The aim of the research is to develop a web-based application which will allow customers to request services online as well as processing the services up to completion on a centralised platform.

1.4 Objectives

The objectives of the proposed system are as below:

- To develop a system that facilitate real time processing capabilities by enabling customers to register online and receive their login details on their mobile phones.
- To develop a system that have a robust database handling ability that keeps track of which customers by which products and then send them promotional alerts through email or sms.
- To create a system that provides built in tracking and reporting metrics. The system must allow registered customers to request for services or products online, and Track their request(s), Produce the reports for all requests open and solved. This will enable an easier method of determining most frequent queries since the system will be tracking the information.

- To provide a One-Stop help for customers. The system will pair with a portal that gives clients a single place to create new query (submit a problem), view the status of open query and close out issues that are no longer present.
- To allow customers to view products, services and prices online. Customers must be able to submit their own customised product description and specifications of a product they intend to purchase.
- To equip customers with a Multiple Payment Mode Compatible system. The system payment compatibility must be flexible, when the customer is ready to pay the product they can use Mobile Money (Eco-Cash, Tele-Cash), credit card information (Visa or MasterCard) or Bank Transfer.
- The system must enable the users to prioritize the requests. Different problems require different priorities. When technicians can be more easily visualised, important requests are less likely to fall through the cracks.
- To create a built-in knowledge base. The system must have a good knowledge base for storing helpful tips and articles. Not only does this act as a great self-help resource for customers, but also a nice reference for employees as well.
- To create a system with an online helpdesk with a single point of contact to end users.

1.5 METHODS AND INSTRUMENTS

The instruments which are going to be used to develop the system are as listed below:

- Internet
- Books
- Articles
- Journals
- MySQL Server
- PHP

- Ozeking

1.6 Justification

In this age of technology where everything is now operated electronically, introducing an E-Customer Servicing System will save a lot both to management, sales staff, technicians and customers as well.

1.7 Conclusion

The introduction of the E-Customer Servicing System will bring value and a new exciting experience and benefits to both Customsteel Trading employees and customers.

Chapter 2: Planning Phase

2.0 Introduction

The planning phase considers the business value of the system being developed. It checks on why the system should be developed. According to Laudon (2012) planning is a process that reduces future risks which is minimising the unknown and maximising the known. The stage looks at the business value of the system whether or not it is profitable as well as benefits and payback of the project to Customsteel Trading

2.1 Why build the system?

The system is supposed to be built in order to improve operations and efficiency of the organisation that are at the moment not so excellent. Many competitors are in the same business so there is need to scare away competition and remain viable in business. The idea of developing the new system will increase revenue realised from the business. The business will become more accessible to clients and more marketable. The system should be built as a value addition to customers. Using this system will see an improvement in the overall operations of Customsteel Trading

2.2 Business value

The new system should provide convenience in terms of customer service and satisfaction. It will also reduce query to response and order to response slag time. Flexible ordering and a interactive platform for Customsteel products and services will see a better and a professional business environment

Business value

- ✓ Reduced employee workload
- ✓ Increase efficiency of order processing
- ✓ Order records securely stored and accessible
- ✓ Availability of services remotely
- ✓ Increase Customer Relationships with the Organisation
- ✓ High standard are met and quality service achieved.
- ✓ Reduction of paperwork
- ✓ Enhanced customer satisfaction.

2.3 Information Gathering Methodologies

Methods which include Interviews, Observations and Questionnaires were used to obtain valuable data on how the current system works. Gathering data is a critical stage since it helps in grasping the present setup argues McLean (2006).

2.3.1 The Interviews

According to Laudon (2012) an interview is a way of facts identification where the researcher gathers necessary data by meeting different people one by one.

Why interviews

- They are useful when solving difficult questions.
- It is easy to understand body language.
- They provide immediate answers to problems.
- They allow researcher to ask as many as possible questions.
- Non-verbal means of communication provide certainty of information.
- Irrelevant questions can be filtered out.

- Interviews give quick feedback.

Setbacks of interviews

- Skills of the researcher determine success of the interview.
- Not all interviewee are easily accessible.
- The process is time consuming
- It is costly due to travelling.

2.3.2 Observation

An observation is a fact finding method wherein the system analyst, either participates or watches a person performing activities to learn about the system. According to MacLean(2006) observation is a good way to check the validity of information gathered from sources such as, interviews and questionnaires, and this allowed the researcher to get a personal view of the current system. This methodology allows the observer to see the current system as it operates in the actual environment. However it requires patience and attention.

Advantages of observations

- It uses basic equipment hence the researcher has an understanding of the processes, functions and operations on how the current system is working.
- It allows the analyst to discover the relevant information himself without probing it from someone else.
- It is very cheap as there were no special arrangements carried out.
- It does not interrupt the work of those being observed.
- Data gathered based on observations can be very reliable.

Setbacks of observations

- It is possible to omit some useful observations.
- Normally people change their normal behavior when they realize that they are being observed resulting in compromised results.
- Different conclusions from observed data is a common problem.

2.3.3 Questionnaire

According to Kendall (2007), a questionnaire is a special purpose document that allows the analyst to collect information and opinions from respondents

Advantages of questionnaires

- The respondent had time to consider their responses before writing them down.
- Responses can be tabulated and analyzed quickly.
- Respondents can answer questionnaires more openly expressing their views since they were made to be anonymously filled.
- It is cost effective and saves much needed time, since the questionnaires are distributed at once to various people.

Disadvantages

- There is no guarantee that an individual will answer or expand on all of the questions.
- The number of respondents is often low.

- There is no immediate opportunity to clarify a vague or incomplete answer to any question.
- Questionnaires tend to be inflexible. There is no opportunity for the system analyst to obtain information from individuals or to re-word questions that may have been misinterpreted.
- Unambiguous questionnaires will in most cases be left out.

2.4. Tangible Benefits

According to Hoffer et al. (2002) systems analysis and Design, tangible benefits and benefits derived from the creation of an information system that can be measurable in dollars and with certainty.

Table 2.1: Tangible benefits

Description	2016 Amount	2017 Amount	2018 Amount
Advertising costs reduced	1300	1450	1450
Expansion of the sector	2000	2150	2150
Material costs reduced	3 50	4 50	5 00
Total	3650	4050	4100

2.5 Intangible Benefits.

According to (Drury, 2006) in Systems Analysis and Design intangible benefits are benefits derived from creation of an information System that cannot be easily be measured in dollars or with certainty. These are;

- Efficiency ordering process
- Easy measurability of customers purchasing habits
- Feedback from customers through online customer care services
- Easy management of customers

- Customers getting solutions quickly through FAQ & knowledgebase platform

2.6 Feasibility Study

Bentley (2007) argues that feasibility study is an analysis of the ability to complete a research project successfully, taking into account the legal, technological, economic, scheduling and other factors. The study allows Project Managers to discover benefits and negative sides of an investment on time. The study generates guide lines to the company whether to proceed with a project or not. Important risks are easily picked up and addressed on time when the project has been approved. Feasibility study actually investigates the information needs of the intended user and balances with resource requirements of the intended system being constructed.

2.6.1 Technical Feasibility

Bentley (2007) defines technical feasibility as the analysis of a problem to determine whether it can be solved effectively. The operational aspect (will it work), economic (benefits and costs), and technical (can it be developed) all contribute to technical feasibility. The study checks whether the users have enough technical training and know-how. The developer also must be familiar to the software requirements to produce the required system.

Technical Requirements:

Adobe Dreamweaver CS3-	-Platform to develop web based applications, used for graphical user interface.
MySQL5	-Relational database management system (RDBMS) that runs as a server providing multi –user access to a number of databases.
XAMPP Server	
PHP	-A server script language
PhpMyadmin	-A web server for running web applications
Java Script	-Available Software

Table 2.1 Software Requirements

HARDWARE REQUIREMENTS	
Pentium 4PC	Available
Keyboard and Mouse	Available
2GB RAM Memory	Available
Cabling Interface	Available

Table 2.2 Hardware Requirements

The necessary equipment is available; the organisation has a very strong IT department, so the system is technically very feasible.

2.6.2. Economic Feasibility

Drury (2006) Economic feasibility involves the feasibility of a project to generate economic benefits. It also refers to cost/benefit analysis of a state agency's proposed electronic payment acceptance and disbursement project that should illustrate economic net benefit of the intended system. Generally economic feasibility looks the financial impacts of the system under design. Economically the system is feasible because it will increase customer satisfaction, increase revenue generation through air time purchase on line. A break even analysis may be required in evaluating economic feasibility of a project. This element addresses variable and fixed costs as well as sales forecasts of a product.

Net Present Value (NPV)

Bob et al (2005) describes net present value as the determination of profitability of the proposed project in dollar value. The formula for **NPV** is:

Present Value= Value in n year t

$$(1+r)^t$$

Where **r**=discount rate in decimal value

t= number of years into the future life of the cash flow.

Discount Factor= 1

$$(1+r)^t$$

A project that indicates a positive NPV becomes a favourable choice for adoption by the use of extra selection criteria where several options are to be considered.

An example below will highlight the NPV Technique in Cost-Benefit Evaluation.

Year	Project 1 Cash Flow(\$)	Discount Factor @ 5%	Discounted Cash Flow
0	-10 000	1.0000	-10 000
1	5000	0.952380	4762
2	5000	0.90703	4535.2
3	10000	0.86384	8638
4	20000	0.82270	16454
5	30000	0.78353	23506
Net Profit	60 000	NPV	47895.2

Table 2.3 NPV Calculation Example

In the above example the NPV is a positive value and such a project can be pursued.

2.6.3 Operational Feasibility

The term is defined as the willingness and ability of employees, suppliers, customers and management to support, operate, and use a proposed system.

-economic aspect was considered so as to reduce costs and increase business profits

-the system should provide required and reliable service

2.7 Risk Analysis

Hoffer (2003) Risk analysis is the systematic study of uncertainties and risks we encounter in business, engineering, public policy, and many other areas. Risk analysts seek to identify the risks faced by an institution or business unit, understand how and when they arise, and estimate the impact (financial or otherwise) of adverse outcomes.

The electronic recharge system can have the following risks

- Risk of unacceptance
- Risk of failure
- Risk of not meeting customer requirement
- Risk of fraud
- Risk of network failure

2.8 Work Plan

This covers the time frame from project start to the final phase. Bentley (2007) alludes to the fact that a work plan determines time claims from start to end of project activities. A Gantt chart illustrates start and finish dates of elements. Some will show dependency relationships.

STAGE	BEGIN DATE	END DATE	DAYS	WEEKS
Project Proposal	31/01/2016	06/02/2016	7	1
Planning	07/02/2016	13/02/2016	7	1
Analysis	15/02/2016	28/02/2016	14	2
Design	29/02/2016	19/03/2016	21	3
Implementation	20/03/2016	27/02/2016	7	1
System Review	28/03/2016	04/04/2016	7	1
Total			63	9

Table 2.2 Project Schedule

<u>ACTIVITY</u>	1	2	3	4	<u>WEEKS</u> 5	6	7	8	9
Proposal									
Planning									
Analysis									
Design									
Implementation									
System Review									

Fig 2.3 Gantt chart

This is a visual representation of the project schedule.

The developer will continue with the project and the next stage is Analysis.

2.9 Conclusion

After analysing the feasibility of the project considering all cost and the project plans it is necessary to move to the next stage of project development which is the analysis stage where analysis of the current system inputs, processes, outputs and dataflow will be carried out

Chapter 3: Analysis Stage

3.1 Introduction

This stage is understood to be one of the best important phases in the developing a system. The analysis stage is a very significant stage indicating of how the old system works and how it can be fused in into the proposed system. This stage provides data on the users of the system currently, data handling procedures, information gathering methods, data presentation and process.

3.2 Methods used to gather information

Methods which include Interviews, Observations and Questionnaires' were used to obtain valuable data on how the current system works. Gathering data is a critical stage since it helps in grasping the present setup argues McLean(2006).

3.2.1 The Interviews

According to Laudon (2012) an interview is a way of facts identification where the researcher gathers necessary data by meeting different people one by one. During the interviews the researcher approached all departments and staff and started to get the information on how they the task allocation process goes and also how efficient it was. Other interviews were done to the sales department and technicians as well. The interview questions were made in such a way that would allow one to get as much information as could be obtained from the interviewees. Questions were also asked to get some of the technical information and processes.

3.2.1.1 Why interviews

- They are useful when solving difficult questions.
- It is easy to understand body language.
- They provide an immediate answers to problems.
- They allow researcher to ask as many as possible questions.
- Non-verbal means of communication provide certainty of information.
- Irrelevant questions can be filtered out.
- Interviews give quick feedback.

3.2.1.2 Setbacks of interviews

- Skills of the researcher determines success of the interview.
- Not all interviewee are easily accessible.
- The process is time consuming
- It is costly due to travelling.

3.2.1.3 Interview Results.

Those interviewed showed a great interest in the introduction of an e-customer servicing system. Even the Director indicated similar interests. They even wished the proposed system become operational as soon as possible

3.2.2 Observation

An observation is a fact finding method wherein the system analyst, either participates or watches a person performing activities to learn about the system. According to MacLean(2006) observation is a good way to check the validity of information gathered from sources such as, interviews and questionnaires, and this allowed the researcher to get a personal view of the current system. Observations were made to the sales department and technicians as well. This methodology allows the observer to see the current system as it operates in the actual environment. However it requires patience and attention.

3.2.2.1 Advantages of observations

- It uses basic equipment hence the researcher has an understanding of the processes, functions and operations on how the current system is working.
- It allows the analyst to discover the relevant information himself without probing it from someone else.
- It is very cheap as there were no special arrangements carried out.
- It does not interrupt the work of those being observed.
- Data gathered based on observation can be very reliable.

3.2.2.2 Setbacks of observations

- It is possible to omit some useful observations.
- Normally people change their normal behaviour when they realise that they are being observed resulting in compromised results.
- Different conclusions from observed data is a common problem.

3.2.2.3 Observation Results.

The researcher observed that there were some delays in informing technicians about some important updates which may require urgency. In addition, the allocating methods were very poor since at times technicians failed to get assignments in time. The buying and requesting process for services was taking too long. The admin were also having trouble in managing technicians duties which I saw introducing a system may help them a lot.

3.2.3 Questionnaire

According to McLean(2006), a questionnaire is a special purpose document that allows the analyst to collect information and opinions from respondents. These were sent mostly to the staff. Questionnaires designed were relatively consistent in style so that the respondent did not have to read instructions for each question before answering it. Questions, which generated interest, were started so that it grabs the respondent interest and induces them to answer it.”

3.2.3.1 Advantages of questionnaires

- The respondents had time to consider their responses before writing them down.
- Responses can be tabulated and analysed quickly.
- Respondents can answer questionnaires more openly expressing their views since they were made to be anonymously filled.
- It is cost effective and saves much needed time, since the questionnaires are distributed at once to various people.

3.2.3.2 Disadvantages

- There is no guarantee that an individual will answer or expand on all of the questions.
- The number of respondents is often low.
- There is no immediate opportunity to clarify a vague or incomplete answer to any question.
- Questionnaires tend to be inflexible. There is no opportunity for the system analyst to obtain information from individuals or to re-word questions that may have been misinterpreted.
- Some were left unanswered because they seemed ambiguous to the respondent.

3.2.3.3 Findings from Questionnaires

The technicians, sales department and engineers participated a lot in filling up the questionnaire document. Questionnaires were most successful because a lot responded very well. Some technicians explained that this will help them in managing tasks, they also claimed that this will see an improvement in overall allocation process. Sales also shows similar comments since they highlighted that this will save them in the ordering and servicing process.

3.3 Analysis of existing system

Using the data obtained by the use of the three information gathering methodologies mentioned above the analyst obtained the following processes in the current system. There was no system that has been designed to specifically facilitate tasks allocation. This really showed there is need for some improvements which will improve the learning structure as well as the information dissemination protocol.

3.4 Process analysis

According to Laudon (2012) process analysis is the study of processes to help understand their key characteristics and how such processes are performed in practice by the people involved. The process model is a way of representing how the system operates formally. This

model illustrates the processes and activities that are performed and how data moves among them. This can be better represented through the use of Activity Diagram of current system.

3.4.1 Activity Diagram of the current system

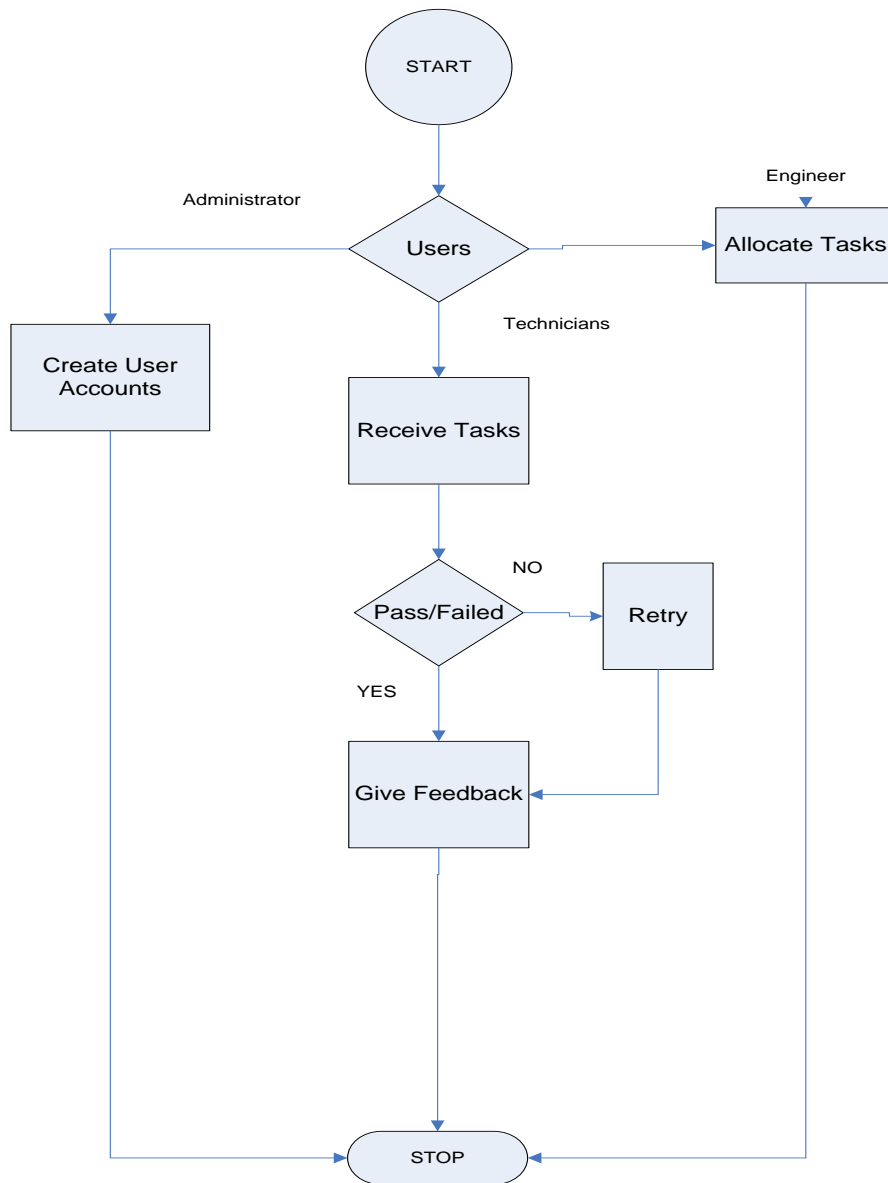
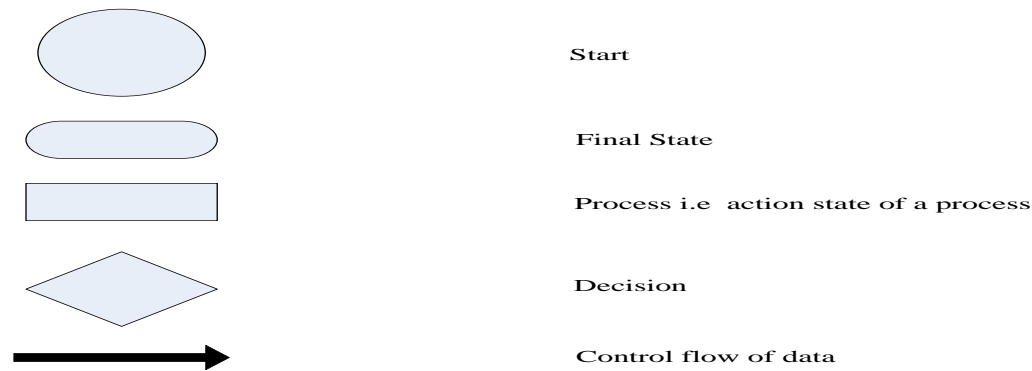


Fig 3.1: Activity diagram of the current system

Key



3.5 Data Analysis

McLean(2006) defines data analysis is a technique to improve a data model for implimentation as a database. Data analysis is the process inspecting, cleaning, transforming and modelling data with the goal of highlighting useful information, suggesting conclusions and supporting decision making. Data analysis has many different facets and approaches, encompassing diverse techniques.

3.5.1 Context Diagram of the current system

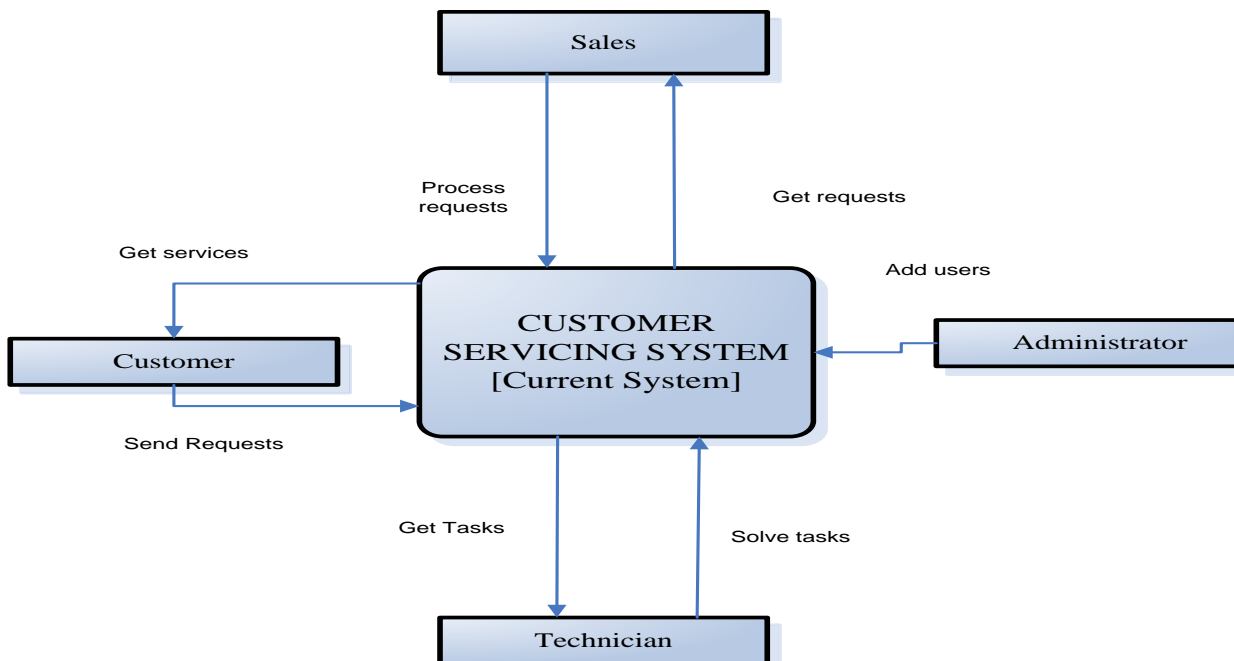
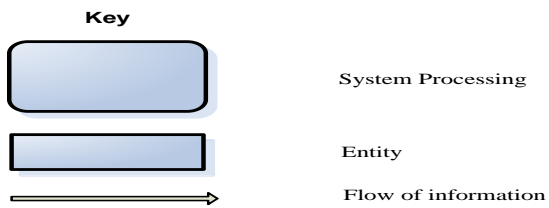


Fig 3.2: Context diagram of the current system.



3.5.2 Data Flow Diagram of the current system

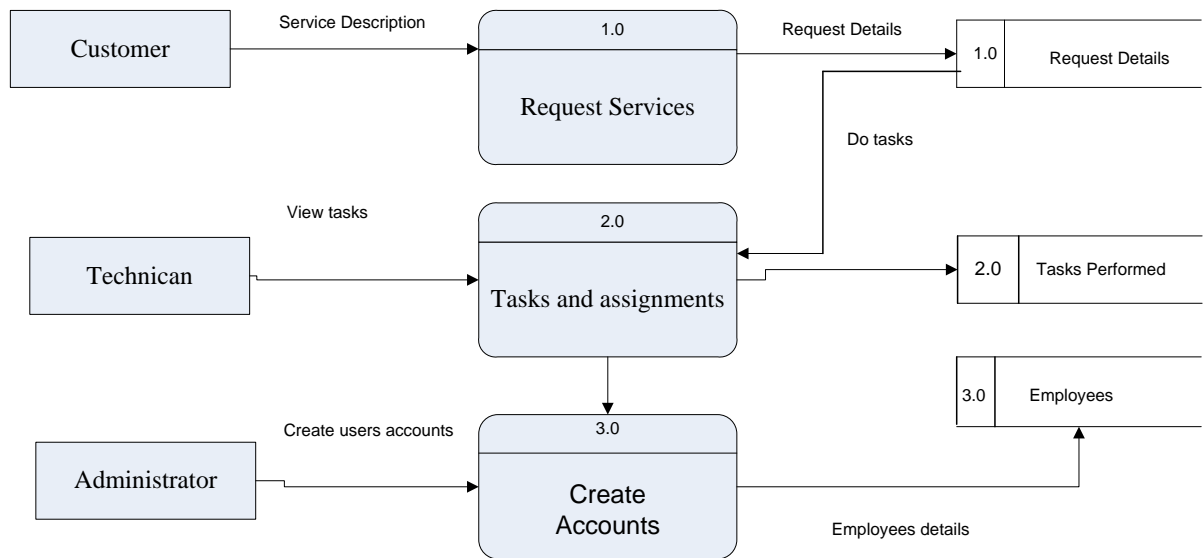
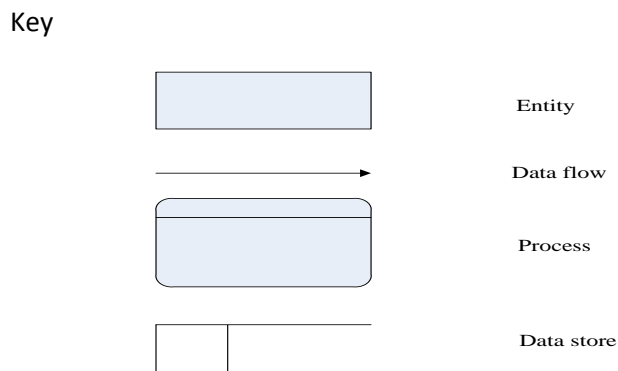


Fig 3.3:Data Flow Diagram of current system



3.6 Weaknesses of current system

- Services are limited to a number of people unlike if it was online
- The ordering process is slow
- Technicians are not able to get task allocated in time
- Easy loss of information.

3.7 Evaluation of alternatives

In a quest to resolve the problem identified there is a need to identify the alternatives that are available and that can improve the way the system performs. This process assists us to choose the best alternative that minimizes development costs. These alternatives include, outsourcing, improving the current system, developing an in-house software package.

3.7.1 Outsourcing

Outsourcing is a strategic use of outside resources to perform activities traditionally handled by internal staff and resources according to Laudon (2012). This process involves buying an already designed application package from vendors. In the case of buying developed packages locally there are very limited in terms of functionality, and most of them are not up to standard. The organization can approach some software development houses to handle the development workload on a short-term or long-term basis.

3.7.1.1 Advantages of outsourcing

- Requires less time to implement.
- Requires few technical staff, since the vendor will do the installation and implementation of the system.
- Lower capital expenditure such as purchase of hardware and software required for development purposes.

3.7.1.2 Disadvantages of outsourcing

- Training costs are increased i.e. since there will be a need to constantly refer to the developers for training.
- Maintenance of the system will be difficult for IT department, as in most cases the development tools will not be familiar to the staff members.
- Less managerial control - It may be harder to manage the outsourcing service provider as compared to managing your own employees.
- Updates will be needed from the contracted firm, every time resulting in additional costs
- Software packages are very expensive and might need quite high maintenance complications especially if the vendor of the software does not offer efficient support for the software.
- Most packages are difficult to customize to suit the specific company requirements.
- Periodic license fees may be prohibitively high.

3.7.1.3 Estimated costs of outsourcing software

Table 3.1: Estimated costs of outsourcing

Item	Costs(\$USD)
Buying Software(Software price)	900,00
Customizing to suit own needs	400,00
Maintenance from supplier	900,00
Licenses	900,00
Total costs	3100,00

3.7.2 Improvement of the current system

Harris et al (2003) define improvement as a process that involves identifying processes with weaknesses and enhancing them. By improving the current system it implies no change to the original operations but rather making some changes or improvements in areas of need.

3.7.2.1 Advantages of improvement

- Less costly- as there is no additional hardware, software and extensive training for the system users as they are already familiar with the existing system
- Time saving- since the system will not be developed from scratch so it will not take long to implement

3.7.2.2 Disadvantages of improvement

- Problem Inheritance – existing problems might creep into the system unnoticed and might cause undesired results later on.
- Complex Problems - Some of the problems encountered might be very difficult to rectify for example the performance of the system and the amount of data it can hold.

3.7.2.3 Estimated costs of improving the existing system

Table3.2: Estimated costs for improving current system

Item	Costs(\$USD)
Hire consultant firms	1800,00
Recruit more staff	400,00
Maintenance from supplier	400,00
Total costs	2600,00

3.7.3 In House Development

In house development involves the analyst gathering requirements of the system users, analysing them, design and develop a new system basing on what the users have specified as their desired functional and non-functional requirements. This means system development with what the users need in mind so as to best suit their needs. As the analyst will be doing this whole process, he will be documenting every aspect of the development process and produces the deliverable reports.

3.7.3.1 Advantages of in-house development

- User satisfaction- satisfies unique user requirements since the system will be tailor made as per the identified requirements.
- Competitive advantage – this will be gained since there will be unique differentiating features from the system operations of the competitors
- Easy system support- since documentation is produced at the end of the project, the system can be easily supported and maintained by other personnel rather than those who designed and developed the system.
- Problem elimination- developing a new system will meet constraints of the existing system and technology.
- Cheap in the long run- the cost of maintenance is within reach for the organization since the system will be developed by an internal IT staff.
- Resources development- It allows the development of internal resources and capabilities.
- Serves as a platform for staff training and development.

3.7.3.2 Disadvantages of in-house development

- Time consuming- because there are so many phases incorporated in system development so it takes time to develop.
- Additional costs-these are costs that arise from the acquisition of additional hardware and software at the initial stage of the project.
- User training –since the users will not be familiar with new system there is need for intensive user training.

3.7.3.3 Estimated costs of in-house development

Table 3.3: Estimated costs of in-house development

Item	Costs(\$USD)
Development time	250,00
Programmers	1000,00
User training	250,00
Updates and upgrades	500,00
Total costs	2000,00

3.7.4 Summary of Evaluation

3.7.4.1 Summary of total costs of alternatives

Table 3.4 Summary of cost of each alternative

Alternative	Costs(\$USD)
Outsourcing software	3100,00
Improving the existing system	2600,00
In-house development	2000,00

Given the problems that are being faced by the sales, technicians, engineers and the staff at present it can be safely concluded that it is worthy to develop a new system because of the associated benefits or advantages which are far outweighing the demerits pointed out. Considering the general advantages attached to the other alternatives it leaves developing a new in-house system as a better solution.

One of the main benefits that are to be enjoyed from developing the new system will be the satisfaction of unique user requirements as well as reduction in vendor dependency syndrome since the developers will be internal.

3.8 Requirements Analysis

This stage is meant to document the requirements for the proposed system based on the information gathered. It also takes into consideration the understanding that was gained about the functionality of the current system and the desired functions for the proposed system. These are divided into: functional requirements and non-functional requirements.

3.8.1 Functional Requirements

Functional requirements are statements of services the system should provide, how the system should react to particular inputs, and how the system should behave in particular situations. In some cases, the functional requirements may also explicitly state what the system should not do. These are the expected technical and operational task services that the system should offer.

The system should offer the following services and functions:

- Allow account creation for technicians, engineers and the administrator
- To provide a platform for engineers to allocate tasks remotely
- Provide a platform for technicians to receive allocation on their mobile phones
- To enable engineers to carryout performance analysis

3.8.1.1 Use Case Diagram for the proposed system

The case diagram captures who (actor) does what (interactions) with the system, for what purpose (goal). This is a set of interactions between entities and the system under consideration where a typical scenario is an illustration of a use case and represents a single path through the use case. Scenarios may be depicted using sequence diagrams.

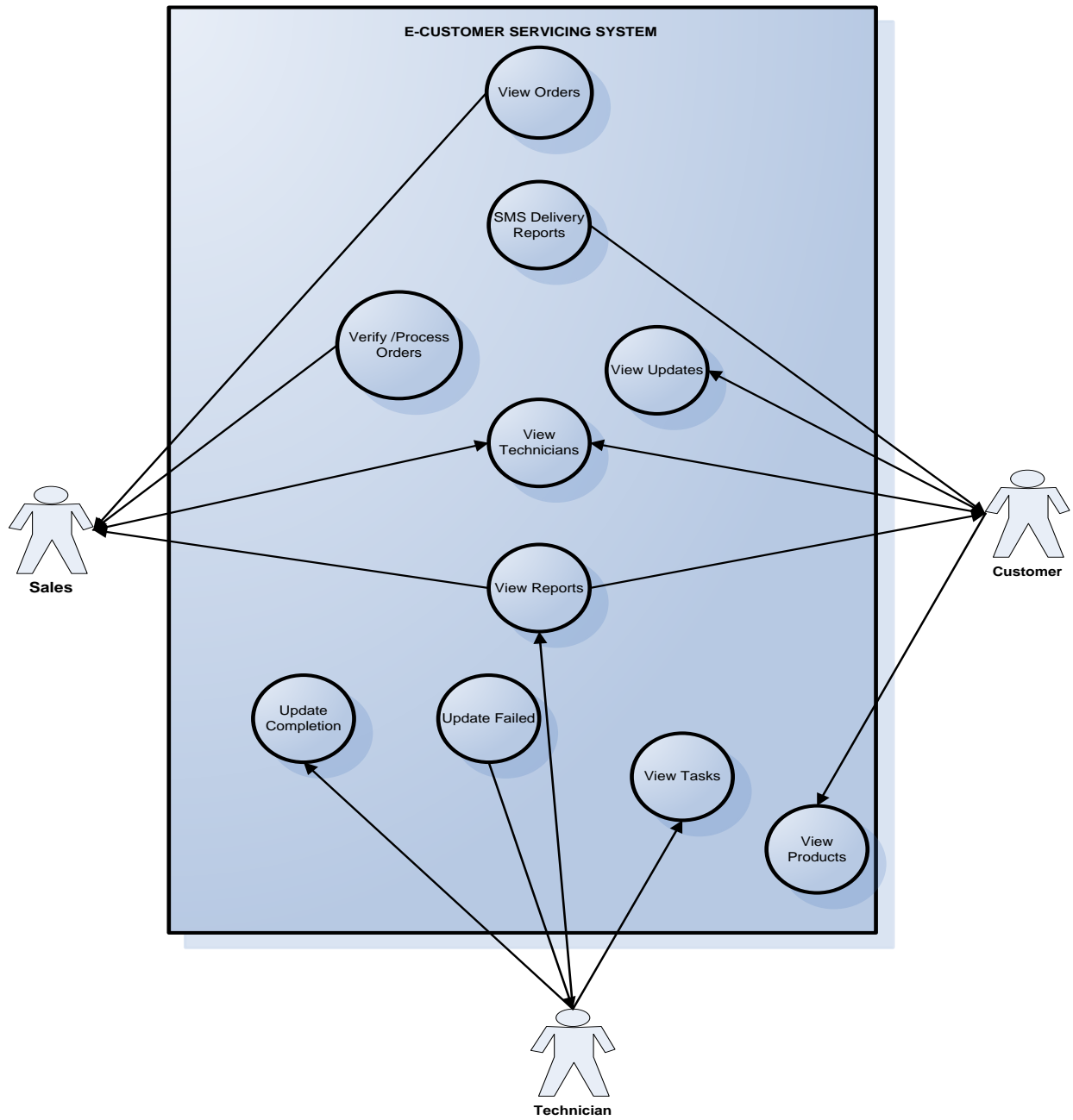
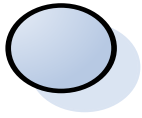


Fig 3.4: Use Case diagram of the proposed system.

Key



Actor



Use case



Data flow

3.8.2 Non-functional requirements

According to McLean (2006) non-functional requirements are requirements that are not directly concerned with the specific services delivered by the system to its users. They may relate to emergent system properties such as reliability, response time, and store occupancy. Alternatively, they may define constraints on the system implementation such as the capabilities of input/output devices or the data representations used in interfaces with other systems. Non-functional requirements define how a system is supposed to be. It can also be known as a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviours. Non-functional requirements can be divided into two main categories:

- i. **Execution qualities**- such as usability, which are observable at run time.
 - **Usability**- the system should be able to accept correct or valid information in the system.
- ii. **Evolution qualities**- such as testability, maintainability, extensibility and scalability, which are embodied in the static structure of the software system. Such requirements are:
 - **Real time response** - the system must have a log on password that must be strong enough.
 - **System efficiency and throughput**- the system should allow quick retrieval of data whenever needed and eliminate data duplication. It has to offer improved response times.

- **User Interface and Human Factors-** the system should be simple, user friendly and the user interface should be almost self-explanatory.
- **Security issues-** The proposed system must be more secure through, the use of secure authentication mechanisms such as passwords and access rights to system users, capturing the details of the user currently logged in to the system

3.8.3 Technical Constraints

In the development of the system it is anticipated that the following constraints can be encountered during the different stages of development;

We had time constraints because more time was needed to complete the project as it encompassed the amalgamation of many modules that will be used within the system. To curb this we increased the number of people and labor was divided according to expertise so that every module would be completed quickly.

3.8.4 Cost

The notable costs come from the consultation, making user manuals and training of these users that is the staff and the general public. These costs will be recovered in the long run.

3.9 Conclusion

This phase involved the analysis of the current system looking at issues like inputs, processes, outputs and dataflow of the system. The analysis phase provided the system functional requirements for the proposed system both functional and non-functional. A decision to develop the system in – house was made. The key requirements for the anticipated system were highlighted. A clear understanding of the requirements was gained and the decision at this stage is to proceed to the design phase. The design phase will focus on the development of the proposed system. It looks into the actual system design and clarifies how the system is going to work. Furthermore it will look into the Architectural, Physical, Database and program design of the system. Initial interface designs will be developed in this phase making sure that all functional requirements proposed in the previous chapter are met.

Chapter 4: Design phase

4.1 Introduction

This phase focuses on the development of the proposed system after successfully going through the analysis phase and fully understanding what is required in the new system. It looks into the actual system design and clarifies how the system is going to work. Furthermore it looks into the architectural, physical, database and program design of the system. Initial interface designs are developed in this phase making sure that all functional requirements proposed in the previous chapter are met.

4.2 System Design

Sommerville (2011) defines system design as a description of structure of the software to be implemented, the data models and structures used by the system, the interfaces between system components and, sometimes the algorithms used. A well designed system should have following characteristics:

Efficiency: The system should run operations in very short spaces of time. It should also enable the user to process jobs in a small number of commands and should be simple enough to allow novice user to easily find their way around the program quite easily.

Security: System must provide privacy and confidentiality and must be used by those who are authorized to do so.

Reliability: A process should not be lost in the case of power failures and database processes should not interfere with each other thereby reducing data integrity. The same process should not yield different results if faced with the same data. In the case of a system failure in whatever facet, it should be possible to return to the most recent steady state.

User friendliness: System must be used with minimal support and consultation.

Maintainability: it should be easy to maintain and update in line with technological changes in the environment or changes in the institution need.

4.2.1 Context Diagram of the proposed system

According to Laudon and Laudon (2004) a context diagram is a data flow diagram that shows the boundaries of the information system.

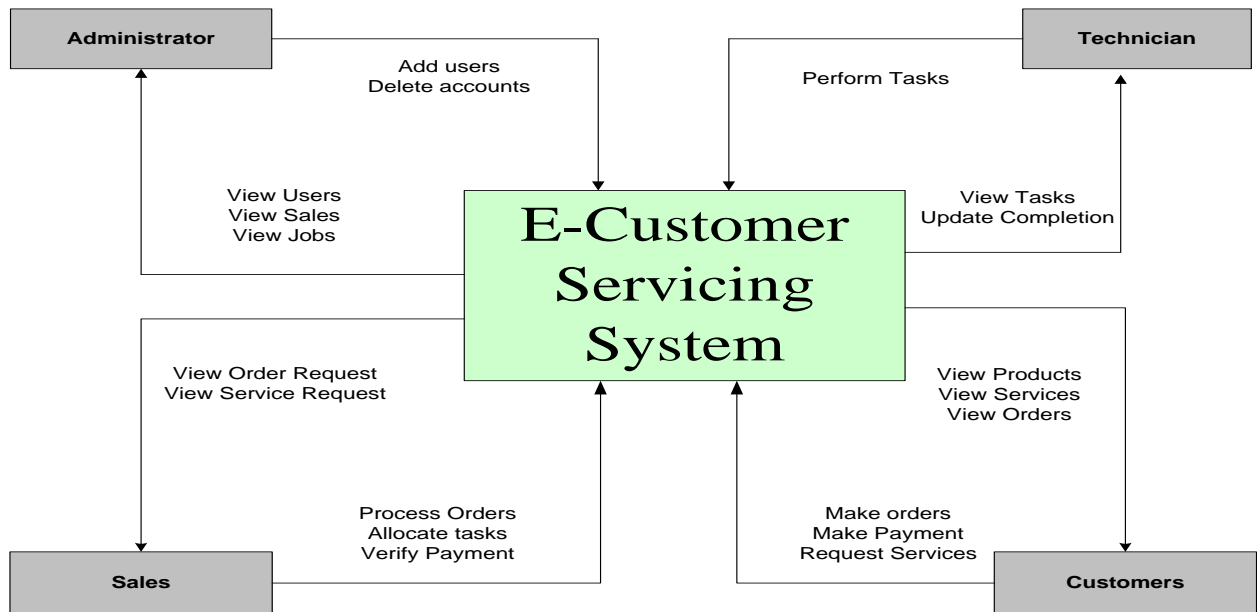
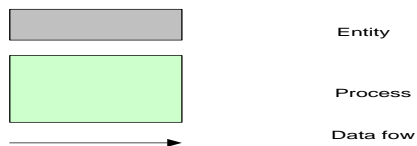


Fig 4.1: Context Diagram of the proposed system

Key



4.2.2 Data flow diagram of the proposed System

This show how information flows in the e-customer servicing system

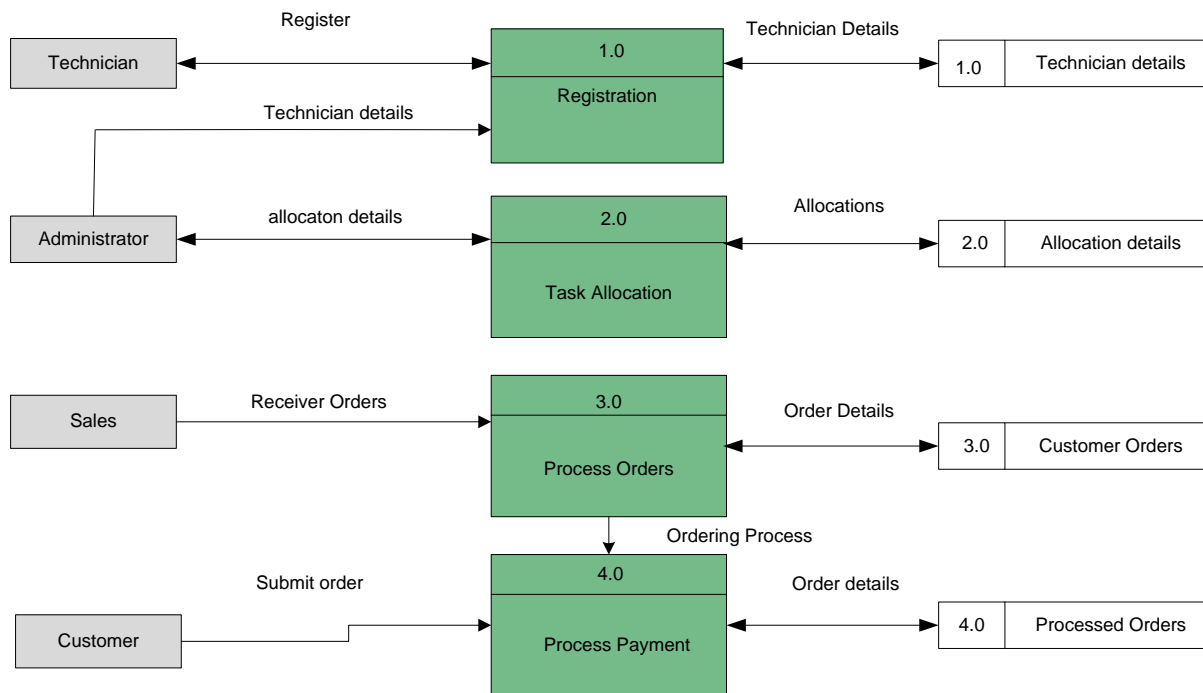
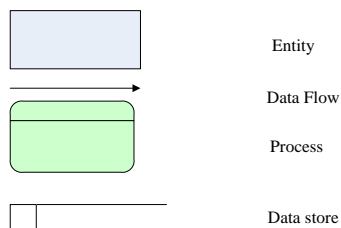


Fig 4.2: Data flow Diagram

Key



4.3 Architectural design

Architectural design is a way to represent the structure of data and program components that are required to build a computer based system. It considers the architectural style that the system will take, the structure and properties of the components that constitute the system, and the inter relationships that occur among all architectural components of the system.

4.3.1 Client-Server Architecture

The client-server architecture has been approved after comparing all the architectures because the client-server attempts to balance the processing between the system users and the services.

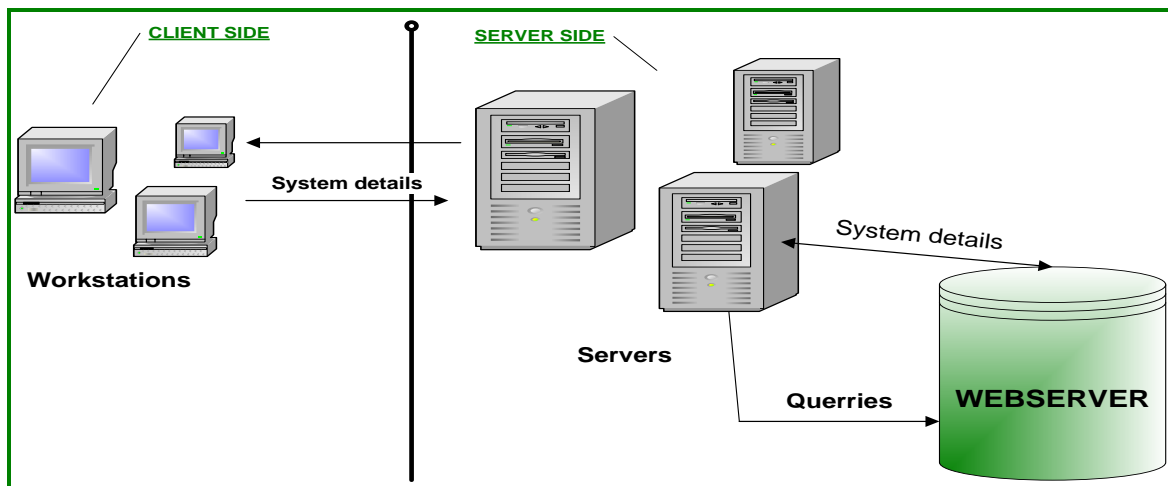


Fig 4.3: Architecture of the proposed system

The system is designed using the client-server architecture which consists of a client based programming language in this case PHP and in-built MySQL connectivity. The system will comprise of the following:

Web server-this is where the graphical user interfaced web pages are going to reside. These can be accessed via the web browser. The clients (workstations) will communicate with the database server requesting for information and transaction processing. In this case Apache web server will be made use of.

Database Server-all data and information required will be stored in the database and the necessary processing and modifications will be performed here so as to ensure consistency and data integrity. In this case MySQL database server will be made use of, which enhances database design.

Client Machines- these are the user workstations from anywhere in the country as long as you are connected to the internet. Clients will also be enabled to communicate with the data base server.

4.4 Physical design

This is concerned with the design of how the hardware and software components of the proposed system are going to be laid out and how are they going to be interacting. It was mentioned earlier on in the Feasibility Study that some hardware and software specifications have already been met and they are readily available for the new system to function well, thus no additional costs to the ones identified before. The database will be connected to the Wide Area Network (WAN) to enable easy access by the clients from different geographical locations so as to facilitate the carrying out of transactions successfully at the clients' convenience. The diagram below shows the overall physical and setup design for the new system. There will be one machine that will function as the application server; the users' workstations will be accessing this application server through the bank's LAN. It is the application server that communicates with the database server from which all the manipulations and data requirements will be handled.

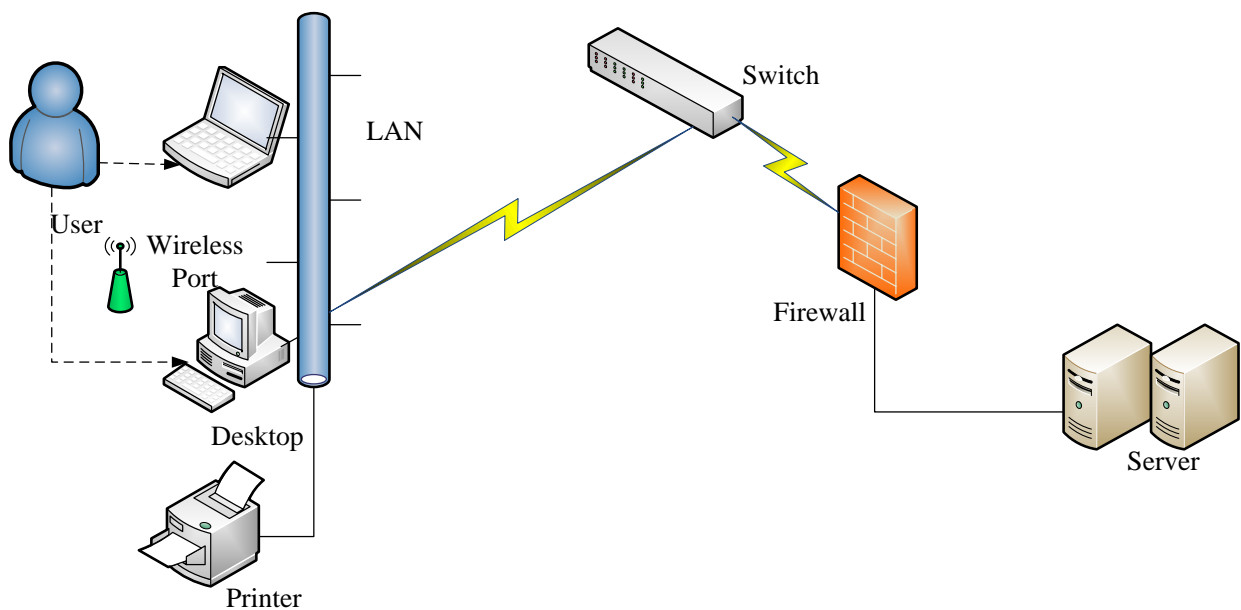
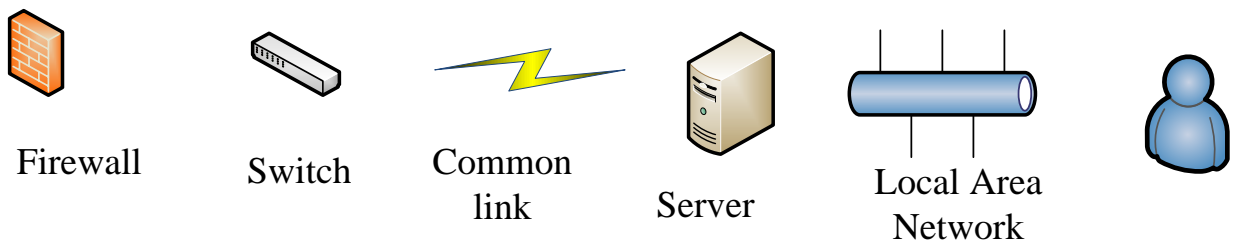


Fig 4.4: Physical design of the proposed system

Key



4.5 Database design

According to Sommerville (2011) database design is where you design the system data structures and how these are to be represented in a database. Database design is the process of producing a detailed data model of a database. It is a logical data model that contains all the required logical and physical design alternatives and storage parameters needed to generate a design in a Data Definition Language which can then be used to create a database.

4.5.1 Database schema design

The diagram below shows the database architecture.

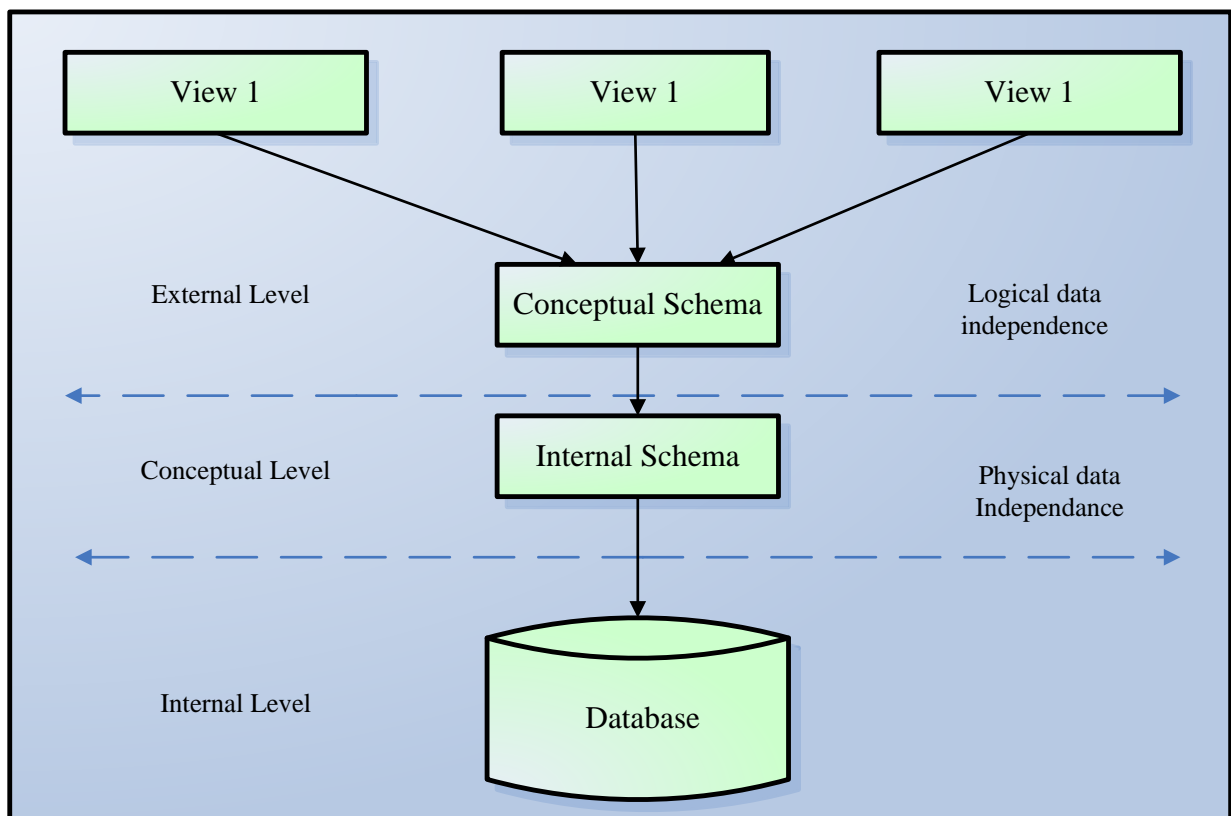


Fig 4.5: Database architecture

4.5.1.1 External level

The user's view of the database is customized to his/her interests. They only view the data that is relevant to them. This in away promotes security. In this case the client can only view the data pertaining to client's details and an Administrator can perform certain changes to the data stored in the database.

4.5.1.2 Conceptual level

This is the community view of the database, it describes the data stored in the database and the relationships among the data.

4.5.1.3 Internal Level

This level mainly depicts the way the RDBMS and OS perceive the data. It describes how data is stored in the database

4.5.2 Database architecture

The data in the system will be organized and sorted into logical components visible to users. The database will also be physically implemented as two or more files on disk. When using the (DBMS) Database Management System one works primarily with the logical components such as tables, views, procedures and functions. The physical implementation of files is largely transparent.

4.5.3 Reasons for using Relational Databases

A Relational database matches data by using common characteristics found within the data set. The resulting groups of data are organized and are much easier for many people to understand.

Benefits are:

They effectively support database manipulation operations such as updating, retrieving, deleting stored data.

Improved concurrence access as different users can access the same table in the databasesimultaneously.

4.5.4 Data Dictionary

A data dictionary is a listing of terms and their definitions for all items and data stores (files) within information. Data Dictionary serves as a single place where one can learn more about any piece of data in the system. It consists of data element definitions, data flows and data stores. Listed below are samples of tables in the database. This database will contain tables that will be used by the users of the system.

4.5.5 Database tables

Listed below are samples of tables in the database. The database has 5 tables in total that will make up the system database. These tables will contain information that will be used to operate the system as a whole.

Table 4.1: System users

Field Name	Data Type	Description
Field ID	Int(11)	Auto increment integer
Username	Varchar(15)	User identification
Password	Varchar(20)	User password

Table 4.2: Technician

Field Name	Data Type	Description
Field ID	Int(11)	Integer increased automatically
name	Varchar(15)	name
surname	Varchar(20)	Surname
id_number	Varchar(13)	National id number
cell	Varchar(10)	Phone number
address	Varchar(20)	Address for technician

Table 4.3: Tasks allocated

Field Name	Data Type	Description
id	Int(11)	Integer increased automatically
Allocated _to	Varchar(15)	Allocated to
Description	Varchar(20)	Work to be done
Date	Varchar(13)	Date

Table 4.4: SMS

Field Name	Data Type	Description
id	Int(11)	Auto increment integer
Recipient #	Varchar(15)	Cell of recipient
message	Varchar(20)	Message context
date	date	Date
time	time	Time

Table 4.5: Orders

Field Name	Data Type	Description
id	Int(11)	Auto increment integer
Order_id	Varchar(15)	Task id
Order Status	Varchar(20)	Task status
Order Description	Text	Order Description
Ordered By	Varchar(20)	Ordered By
date	date	Date

4.5.6 Enhanced Entity Relation Diagram

An enhanced entity-relation diagram further illustrates the inter-relationships between entities in a database clearly display how each entity is related to the other. The diagram following represents an enhanced entity relation diagram.

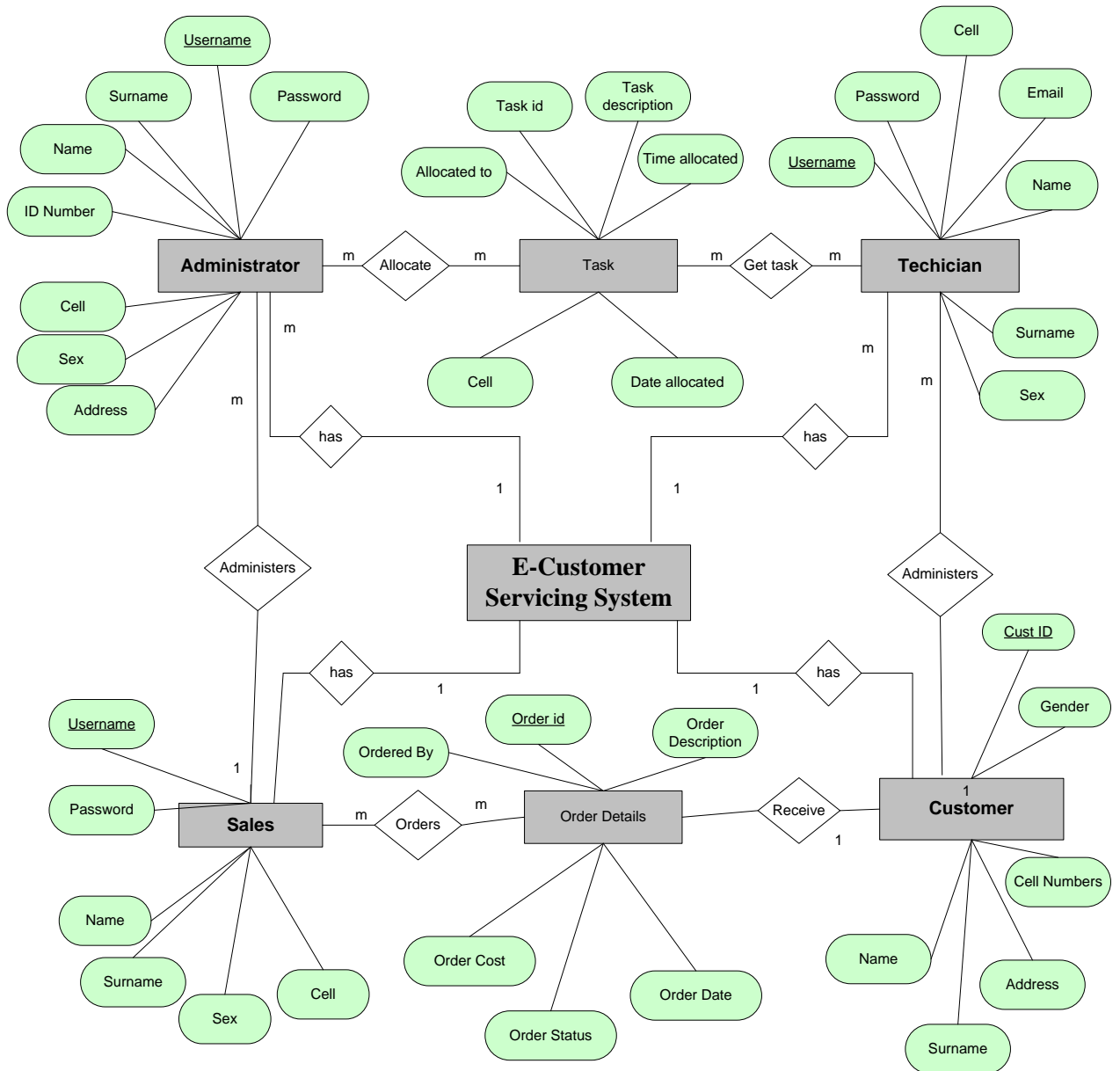
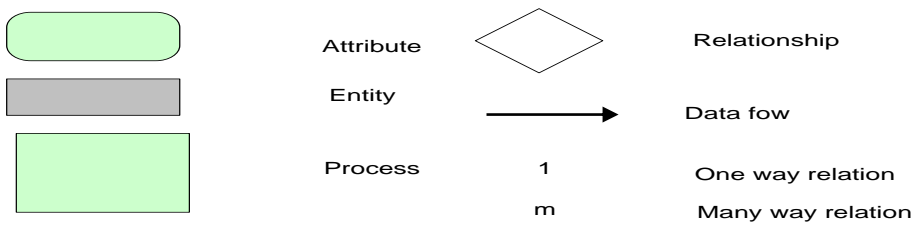


Fig 4.6: Enhanced Entity Relation Diagram

Key



4.6 Program design

PHP was used to develop the system. Program design involves the design of modules and classes in the application that is under development.

4.6.1 Package diagram

According to Sommerville (2011) A PackageDiagram is a modular structure of the system that depicts the breakdown of the system modules and their interaction. The different classes within the online recharge system were grouped into packages to reduce the complexity and thus enable the developers to have a better understanding of the proposed system.

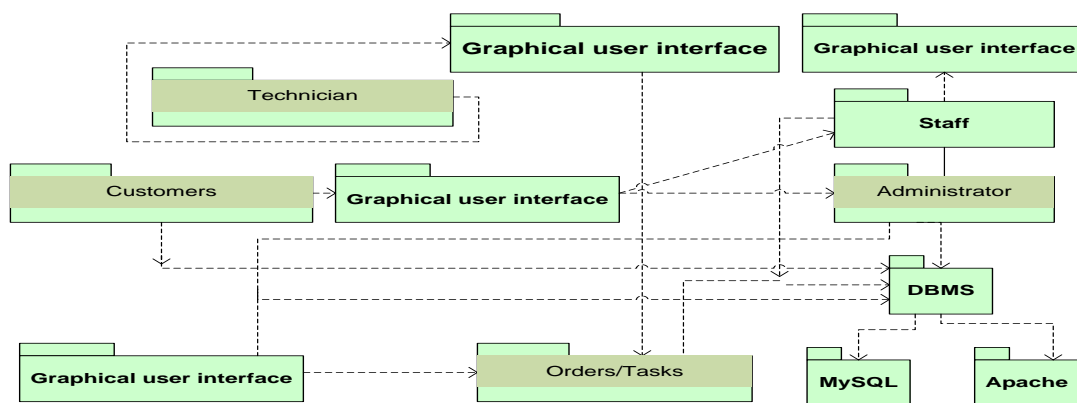
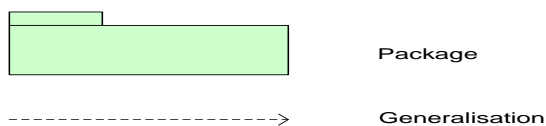


Fig 4.7 Package diagram

Key



4.6.2 Class Diagram

According to Shelly (2010) a class diagram is a logical model, which evolves into a physical model and finally becomes a functioning information system. The Class Diagram is at the core of object oriented development and design as it expresses both the persistent state of the

system and the behavior of the system. The Class Diagram below illustrates how the expected classes of the proposed system will operate.

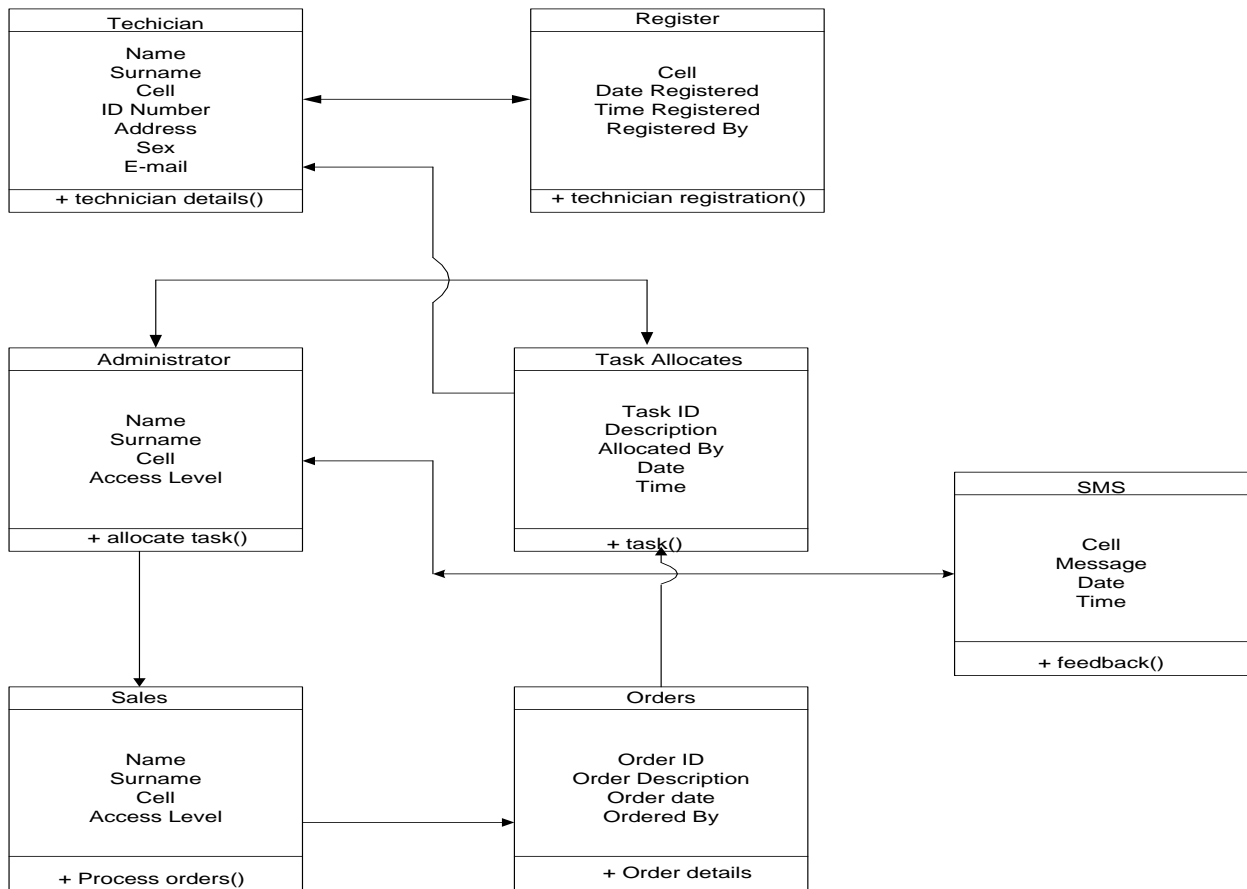


Fig 4.8: Class diagram

4.6.3 Sequence Diagrams

According to the internet website: <https://community.topcoder.com/>, a sequence diagram shows object interactions arranged in time sequence and it depicts the objects and classes involved in the scenario and the interactions between the objects needed to carry out the functionality of the system. Below is the compound sequence diagram of our system that we came up with to show the sequence of activities.

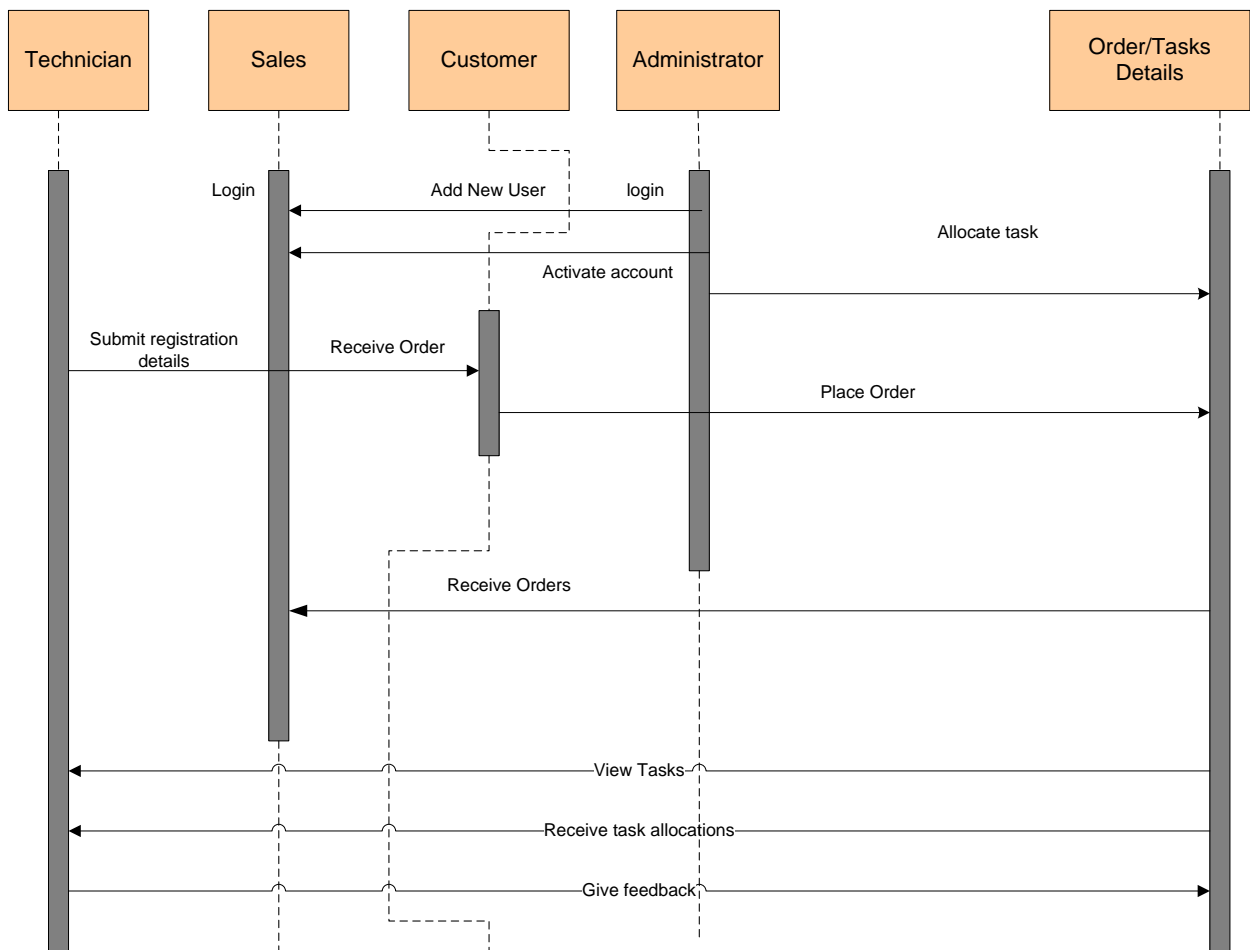


Fig 4.9 Sequence Diagram

4.7 The Interface design

According to Sommerville (2011) interface design is where you define the interfaces in between system elements. With a precise interface, an element can be used with no other element having the knowledge of how it is implemented. Once interface specifications are agreed, the components can be produced.

4.7.1. Menu Design

This show all menus that are used in the system. It include main menu designs as well as submenus (Steven, 2000).

4.7.1.1 Main Menu Design

The main home page is where the user first reaches when he/she runs the system. It offers options to login clients and the admin as well.

Login Form	
Username	<input type="text"/>
Password	<input type="password"/>
<input type="button" value="Login"/>	

Fig 4.10: Main Home Page design

4.7.1.2 Submenus

4.7.1.2.1. Administrator Home Page Design

The page below will be displayed when the Admin is logged in the system

Add User	View Users	View Reports	Delete User	Change Password	Logout
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Fig 4.11: Administrator home page design

4.7.1.2.2 Technician Home Page Design

The page below will be displayed when the technician logs in the system

Home	Update Tasks	Allocate Tasks	View allocations	Change Password	Logout
------	-----------------	-------------------	---------------------	--------------------	--------

Fig 4.12: Technician home page design

4.7.2 Input Design

This is the design of the user interface with data input screens or forms that users are going to use to input data into the system. Input design produces a user friendly interface and allows them to enter the defined details, thus interacting with end-users without showing any complexity.

4.7.2.1 Technicians Registration Form Design

Technicians will be requested to create accounts to enable them to access the services of the system. They will use the form below to enter details and submit them.

Name	
Surname	
Cell	
Address	
E-Mail	
Sex	
Register	

Fig 4.14: Registration form design

4.7.2.2 Add User Form Design

This form is used for adding user details to the system and their access levels.

Username	
Password	
Confirm Password	
Access Level	
Add User	

Fig 4.15: Add user form

4.7.3 Output Design

The output design will mainly focus on the outputs that are produced after the processing has been carried out. This design part mainly consists of the reports that will be produced by the

system. The major reports for the system will include such reports as the client purchase reports. The outputs will either be in the form of soft copies or hard copies (printed on paper).

<u>Order Report</u>				
Order ID	Order Description	Status	Date	Time
www	www	www	www	www
www	www	www	www	www
www	www	www	www	www
www	www	www	www	www
www	www	www	www	www

Fig 4.16: Order report

4.8 Security design

To enable security of the system a login form is provided to system users so that the system can know who has logged to the system and what activities has been done by the user. The form below shows the login form of a client.

Username	<input type="text"/>
Password	<input type="password"/>
<input type="button" value="Login"/>	

Fig 4.17: Login form

4.9 Conclusion

After going through the system design phase and coming up with the data flow paths the designer was able to come up with the physical, program and database designs of the proposed system. The design team then came together and designed a suitable interface of which everyone agreed was suitable for the system and the next step was to implement the system design. The implementation phase is the resolution application of the system. The emphasis of this phase is on implementing the developed system and finding out whether the objectives cited in the problem definition have been met. It entails how the proposed system was implemented and this involves: Testing of system, Pseudo code of the system, Validation, Verification, Installation, User training, System conversion and System operation.

Chapter 5: Implementation phase

5.1 Introduction

This chapter deals with codes and techniques used in the development process. It also covers testing of the new program, from the lower levels to the conceptual level of the system.

That is, the design starts from unit to individual modules, combining them into groups as we go up, until the whole system has been tested. The researcher did this to ensure that the design meets user requirements. It covers many issues such as system, security, validation and verification and finally testing.

5.2 Coding (Pseudo Code)

The coding process covered the conversion of program logic into actual instructions that are to be run by the computer system. Macromedia Dreamweaver CS5 and Apache server were used for the development of the software package. All the members in the data dictionary conceptualized during the database design were mapped into the relevant tables. Macromedia Dreamweaver CS5 was used to build the Graphical User Interface. The modules were finally integrated into a subsystem. Queries were made available using SQL. Main queries were the use of SELECT, INSERT and DELETE.

Login Pseudo Code

** Start **

Select your login form

Enter username, password

{ Enter the username and password to be able to login into the system *}*

If username incorrect

 Show warning message

 Invalid login

End If

Else if password is correct then

If user is admin then

Show admin profile

If option is client then

Show client homepage

else

Show main homepage

Client Account Creation Pseudo Code

Enter registration details

Submit information

if insufficient registration details

 Show warning message

 Complete blank details

End If

If username exists then

Show message

 Username already exists

End if

If all text boxes are correctly completed then

registration successful

End If

** End the program**

5.3 Testing

Laudon and Laudon (2012) define testing as a process conducted to ascertain whether the system generates the right results. The system was tested versus the entire project aims. This process was aimed at assuring whether the design was able to provide the initial objectives of the design and thus answer the problem of whether the issues currently faced by the organization are addressed.

5.3.1 Testing flow Process

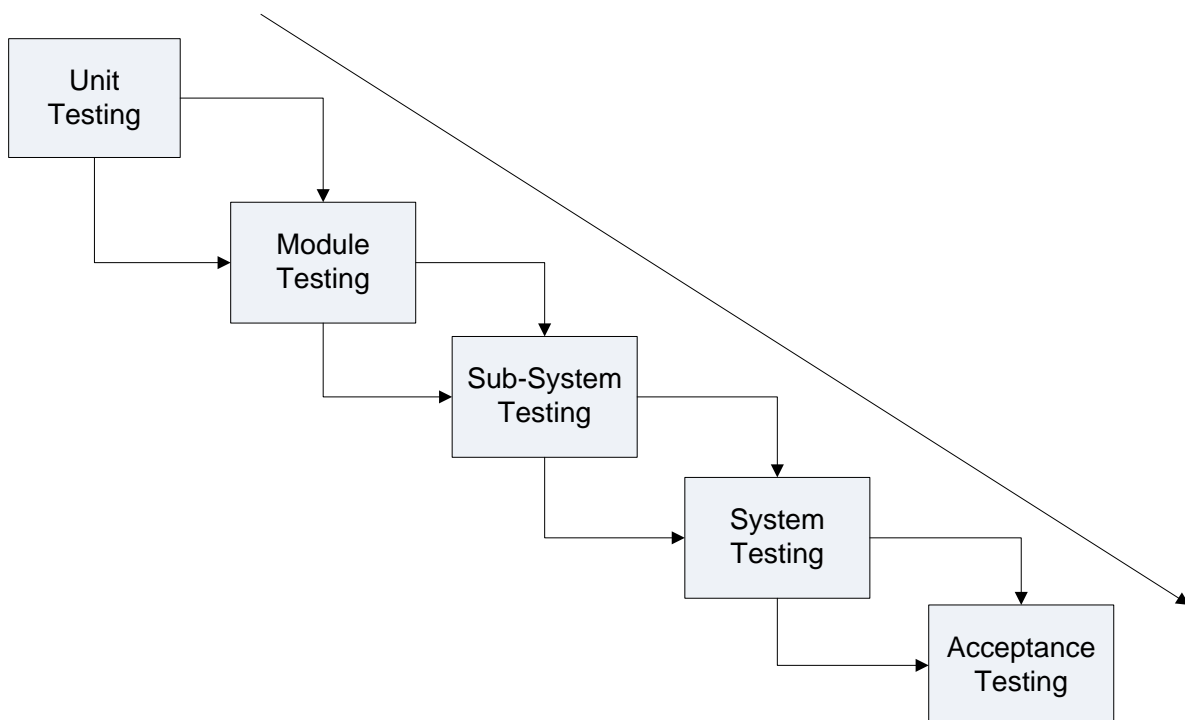


Fig 5.1: The testing flow process

5.3.1.1 Unit testing

According to Shelly (2012) Unit testing is the process of finding out whether a separate code or module operates according to specifications. This is done on the- lowest level program module (unit) in a separate medium before it is combined with the rest of the units to form upper level modules.

The trials were done in two different cases which are: 1. Functional testing/black box testing and logical

Logical testing /black box. A typical example is the login platform was tested to find out user's passwords.

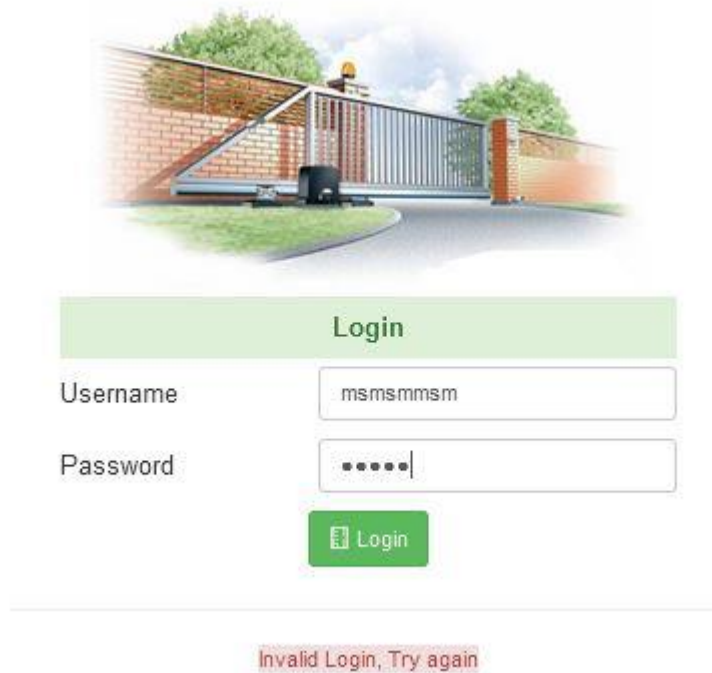


Fig 5.2: Screenshot for validation of user passwords

5.3.1.2 Logical testing (white box testing)

Sommerville (2011) describes white box testing as a technique used in programming where the tests are based on inside knowledge of the format of the program and its separate units. Access to original code is important for white-box testing where you look at the code of the design to find other possible tests. This has its focal point on the inner working detail of a unit and it will help find errors not easily identifiable by treating a unit as a black box.

Logical testing (white box testing) is dependent on the code derived from the program structure rather than its function. This technique pays detail to the internal processes of the system. It emphasizes on the internal working processes of a unit and picks on errors not shown through black box.

5.3.1.2.1 Advantages of white box testing

Enables identification of the inner state of the box after the test has been run. This enables the accurate state irrespective of the output being correct or not.”

5.3.1.2.2 What are disadvantages of white box testing

As inside information of code and internal structure is a prerequisite, an experienced tester is required to carry out the test which makes the test expensive.

5.3.1.3 Functional testing (Black box testing)

Black-box testing is an approach to testing where the testers have no access to the source code of a system or its components as defined by Sommerville (2011). The tests are derived from the system specification. This focuses on the overall functionality of the software. It uncovers faults like incorrect or missing functions, errors in any of the interfaces, errors in data structures of the database and errors related to the performance of the system. Black box testing is used to test the given program behavior against its specifications without making any reference to the internal structure of the program. It is concerned with the inputs and outputs of a unit only.

5.3.1.3.1 Advantages of black box testing

- Test is unbiased because the tester and the designer are independent of each other.
- The test is done from the point of view of user not the designer.
- The tester does not need knowledge of any specific programming language.

5.3.1.3.2 Disadvantages of black box testing

- Testing every possible input stream is unrealistic.
- Test cases are difficult to design.

5.3.1.4 Module testing

According to Scach(2011) module testing consists of supplying values to the input arguments and invoking the module and then comparing the values of the output arguments to the

predicted results of the test. This is the testing of a collection of dependent components in this case procedures and functions. A single module can be tested without the other system modules. In the proposed system the system developer tested each form for verification of desired performance. This can be referred to as integration testing. Such a test is necessary to simulate actual conditions and test the interface between programs.

5.3.1.5 Subsystem testing

Subsystem testing tests the interactions between units and the interactions between modules as well. Subsystem tests aid in fault isolation by testing specific functions within a subsystem to determine if they are generated correctly. In many cases, these tests check the transmission of data between the subsystem under test and associated subsystems.

5.3.1.6 System testing

According to Pressman (2001) System testing verifies that all elements mesh properly and that overall system function or performance is achieved. The system is validated to ensure that it meets both the functional and non-functional requirements. This stage involves the testing of all the integrated modules that make up a system in an effort to detect errors that result from the interactions of the subsystem. Functions such as security and output generation will be taken into account as users go through the system. There are also other issues that are taken into consideration such as the compatibility of the software to the hardware and how the system will adapt to computer threats.

5.3.1.6.1 Interface Testing

The interface of my home page shows much of the system before entering into the actual functionalities. This provides options to 3 system users to login into the system. The four system users are; the, customer, administrator and sales. The sales and administrator uses the same login panel but directing to different pages. The following fig shows the main home page of the system.



who we are ?

Customsteel Trading is Zimbabwean owned company which deals with fabrication and installation of sliding gates, both residential and commercial, automation and intercoms, fencing which includes but not limited to palisade fencing, swimming pool fencing, razor wire fencing, electric fencing and diamond mesh fencing. Customsteel Trading was formed on 15 February 2015 and started operating in Waterfalls in Harare. Its customer base is continuing to grow as they are providing customers with quality products at best value. The company has over hundred customers and provides services to both corporate and individuals.



Our Staff

We have employees with skilled expertise for the best of service. With use quality is guaranteed



Our Projects

One in all briefcase. Just mention it we provide multi disciplinary project delivery



Our Tools

We have the best tools for the job. Producing best services. We are up to date to modern technologies

Fig 5.3: Main Homepage

The home page allows the clients to view services, products, and the company gallery. For the Client to purchase products or request services the client need to register first then login to the system.



Client Login

Account #

Password

Login

Fig 5.3: Customer Login

All the interfaces and links were tested and they worked successfully and the design was very nice and smooth to look at.

5.3.1.7 Acceptance testing

According to Scach (2011) acceptance testing is when the software is delivered to the client, who tests it on the actual hardware, using actual data as opposed to test data. This is the final stage of the testing process before the system is accepted for operation use. The system is going to be tested with data supplied by the users rather than simulated test data. This is done so as to make sure that the system is working as per user requirements specified and it allows the users' view of the final system and enables revealing of errors, omissions and requirements difficulties in the systems requirements definitions. It must also reveal whether the system's facilities meet the user's needs.

Acceptance testing will be iterative until the system is proved to be in an acceptable implementation form. Acceptance testing was done by carrying out alpha and beta testing. For example, the client registration form was tested to find out if it is communicating with the database.



Account #	AC29045
First Name	Mike
Last Name	Moyo
Gender	Male
Occupation	Teacher
National ID	03-130699-H
Physical Address	233 Westwood, Harare
Phone Number	0775122374
E-Mail Address	mm@gmail.com
Password	mnsnnnsnsnsnsnsn

[- Register](#)

Username already exists, Try again

Fig 5.8: Screenshot to ensure link to database

5.3.2 Validation

According to Sommerville (2011), software validation is the process of checking that the system conforms to its specification and that it meets the real needs of the users of the system. The objective of this phase is to check that we are developing the right system for the specified problem. The new system is compared against the user requirements to ensure that it meets the requirements. Validation is achieved through the comparison of data entered and the output. This was to ensure that the data is captured as required and the output is as required. Validation mainly checks values entered in the textboxes if they corresponds the specified field type.

The add product form fields were tested to find out if they are validating.

The screenshot shows a form titled "ADD PRODUCT" with four input fields: "Product Name", "Description", "Price", and "Upload Image". The "Description" field is highlighted with a red border and a tooltip that says "Please fill out this field." The "Upload Image" field contains a "Browse..." button and the text "No file selected." Below the fields is a green button labeled "+ Add Product".

Fig 5.9: Screenshot for change password form validation

5.3.3 Verification

According to Sommerville (2011) Verification is the process of checking that a system meets its specification. It seeks to ensure that the implemented program meets the expectations of the application's users. Structured walk throughs and code reviews were used to verify the system. These techniques were used to detect and correct logic and syntax errors in the program. The system exhibited consistencies and correctness in its execution thus meeting its objectives.

5.4 Installation

Installation is when the developed system is being installed. Users are moved from using the old system to using the new system. In this phase the required software was installed on the appropriate hardware converting from the current system to the new system. A number of activities such as training, file conversion and system change over were carried out during this stage.

5.4.1 Database installation

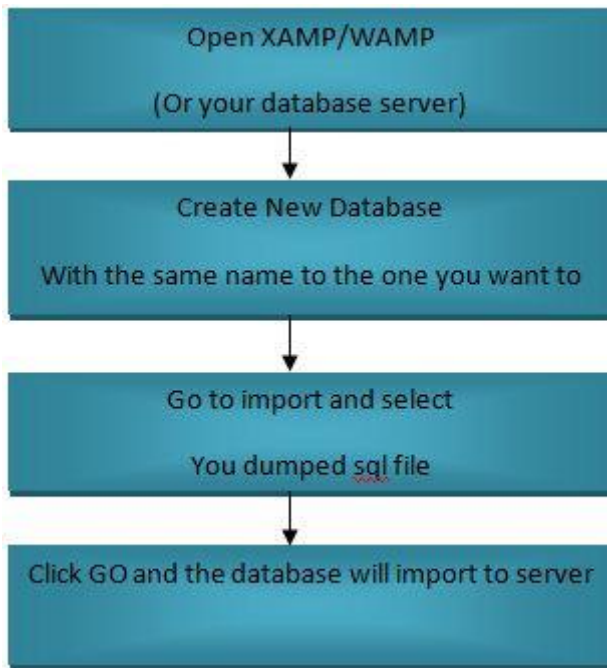


Fig 5.10: Database installation procedure

5.4.2 System installation

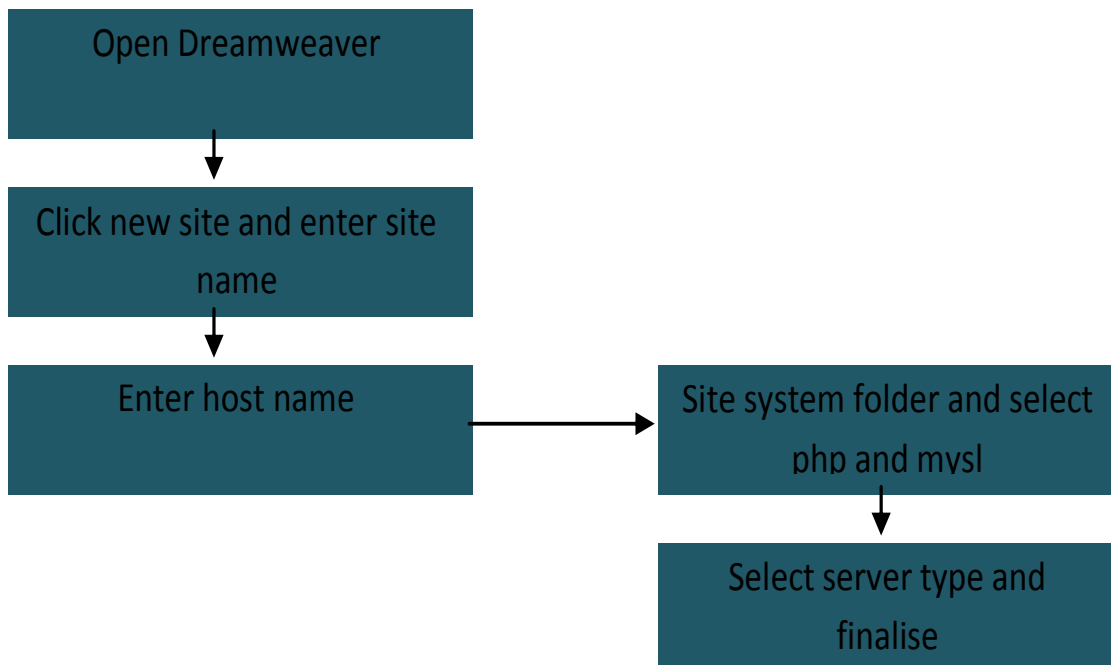


Fig 5.11: System installation procedure

5.4.3 User training

According to Shelly (2012) user training is the initial training that is performed when a new system is introduced. Additionally, new employees must be trained on the organisation's information systems. There was a development training plan for users, which included all the entities in interactive system. The training was mainly conducted to the staffs, that is the sales, administrator and technicians. For the customers it was difficult to make training for all so we just decided to send user manual online. The training was well structured as each module was demonstrated before proceeding to the next module. Questions were entertained from the trainees and test questions were also given so that users would become free to ask any queries they did not understand (interactive tutorials procedure). We concluded our training by conducting a full-scale simulation for the staff for them to gain experience and confidence. At the end of the training session users were given forms with questions to fill so that we could evaluate the impact of the training.

5.4.4 Operation environment

This was tested before the file conversion. Access was limited to users and we used live actual data and managed to verify all changes and we then obtained user approval. We examined all the system components that affect system performance such as:

- Hardware
- Software configuration
- Operating system programs
- Utilities
- Network resources

We found these to be functioning efficiently before and after loading programs.

5.4.5 File conversion

After the users had verified the results of the testing process the files were then transferred to the new system. Programs needed to be designed which would do this conversion process. As the users would be using the system during working hours, the files were in use, thus the conversion was done during the weekends and outside working hours. File conversion followed soon after operational environment had been established and training had been

conducted. Under the normal schedule we had set, it took us three weeks to transfer manual data into the new system.

5.4.6 System changeover

System changeover is the process of putting the new information system online and retiring the old system, Shelly (2012). It is the technical process by which the new system replaces the old system. There are a number of approaches to system changeover namely:

5.4.6.1 Direct change over

The old system ceases to function and is replaced immediately by the new system.

According to Kindall and Kindall (2007) direct changeover has the following advantages and disadvantages.

5.4.6.1 .1 Advantages of direct change over

- Efficient method in so far as it minimizes duplication of work
- Users have no possibility of using the old system rather than the new one
- Less costs as only one system would be in operation

5.4.6.1 .2 Disadvantages of direct change over

- New system may not be entirely correct
- Long delays might ensue if errors occur
- No adequate way to compare new results to old
- It is difficult to make the system operational when some errors are identified after changeover and need correction
- Requires careful planning , testing and attention to operational detail

5.4.6.2 Parallel running

The new and old system run in parallel for a short period simultaneously then the old one ceases operation after sometime.

Kendall and Kendall (2007) come up with the following advantages and disadvantages of parallel run.

5.4.6.2.1 Advantages of parallel running

- Low risk as a results can be verified and a backup option exists
- Feeling of security to users

5.4.6.2.2 Disadvantages of parallel running

- Relatively high costs as both systems are in operation at the same time for some time
- Faced with a choice employees may pick the old system.
- Doubling employees' workloads.
- Method cannot be used for systems which are not similar.

5.4.6.3 Pilot operations

The old and new systems operate at the same time but in a particular section of the organization. The rest part of the organization continues using the old system. The developed system is placed in actual site and tested before actual use to check if the system operates according to the set aims and objectives. System processes are checked to see if they perform according to the user requirements.

5.4.6.3 .1 Advantages of pilot operations

- Moderate costs as only a chosen site would be running two systems at once
- A moderate risk of failure as the new system is only installed at the pilot site.

5.4.6.3.2 Disadvantages of pilot operations

This method is also costly as compared to the direct change over.

5.4.6.4 Phased changeover

With this, the system is implemented in stages or modules across the organization. Phased changeover gives part of the system to the organization and cost is relatively moderate as the

system is implemented in stages rather than all at once. Risk is also very moderate because the risk associated is limited to the module being implemented.

5.4.6.5 Recommended changeover method

In this case pilot changeover is the recommended for the project. With a pilot changeover, the new system is tried out at a test site before launching the system company-wide. Since parallel changeovers tend to be expensive, using the pilot changeover technique allows companies to run the new system next to their old but on a much smaller scale. This makes the pilot changeover method much more cost-effective.

Maintenance

Following implementation of the system, there comes a time when there is need for its review and this is normally done on monthly basis. It is carried out on this phase. The system should be maintained to make sure that it still conforms to the specifications. Reviews should be done periodically and if the specifications or environment changes then the system should be upgraded. Maintenance of the system is an ongoing process. The system was implemented and examined to see if it is meeting the objectives set out in the original specifications. The enhancement of the system is important in satisfying the users and it is often the key in ensuring that the system changes as business requirements change. The maintenance process is triggered by changing requests from users, management. The system will need to be reviewed and this is done through system maintenance. There are four types of system maintenance and these are:

- Corrective maintenance.
- Perfective maintenance.
- Preventive maintenance.
- Adaptive maintenance.

5.5.1 Corrective maintenance

Scach (2011) defines corrective maintenance as the removal of residual faults while leaving the specifications unchanged. This type of maintenance focuses on the errors that are made during the design and implementation phases. It looks at the errors that were established by

the intended users and the steps that were taken to implement the changes. Coding errors are common during this phase.

5.5.2 Adaptive maintenance

According to Pressman (2001) adaptive maintenance results in modification to the software to accommodate changes to its external environment. This shall be undertaken to cater for changes that might arise due to the working environment of the user. This is done to upgrade the system or add enhancements so as to adapt it to changing requirements e.g. there might be a need to upgrade the size of the database, as more branches will be opened in due course.

5.5.3 Perfective maintenance

Perfective maintenance involves changing an operational system to make it more efficient, reliable, or maintainable, (Shelly, 2012). This is carried out to make sure that the application system is constantly satisfying user requirements, thus constant communication with user is established to open room for improvements and new add-ons. The system is refined so that it operates more efficiently and gives extra-value.

5.5.4 Preventive maintenance

The primary goal of preventive maintenance is to avoid or mitigate the consequences of failure of system equipment. This may be by preventing the failure before it actually occurs which include planned maintenance and condition based maintenance. It is designed to preserve and restore system reliability by replacing inefficient system components before they actually fail.

5.6 Conclusion

This marked the last items of the system. Many different kind of tests were carried out, this helped us to determine whether the project has met the stated objectives. No any other phase will come after this. Testing was done successfully. This entails the completion of the project.

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Appendices

Appendix A: E-Customer Servicing System user manual

Introduction

A user manual has been prepared to complement on user training and to provide help whenever users are interacting with the system.

General Requirements of the System

The system requires every user to undergo training on how to use the system and acquaint with the system before using the system. After training and familiarizing with the system the user has to be added into the system to enable him or her to use the system. A user should have the correct login details, that is, the username and password in order to gain entry into the system. Access level rights determine the levels in the system that can be accessed by a certain user.

Technology

The system is built on the following technology:

PHP programming language

Macromedia Dreamweaver 8

MySQL

Ozeking SMS Gateway

The system consists of the following modules:

- Administrator Module
- Sales Module
- Technician Module
- Customer Module

Accessing the site and login in to the system

In accessing the site of the system a url must be written to point out the main page of the system. Currently the url in use is: `http://localhost/customsteel`. After entering this url the main page will be displayed different system navigations

Main Home Page

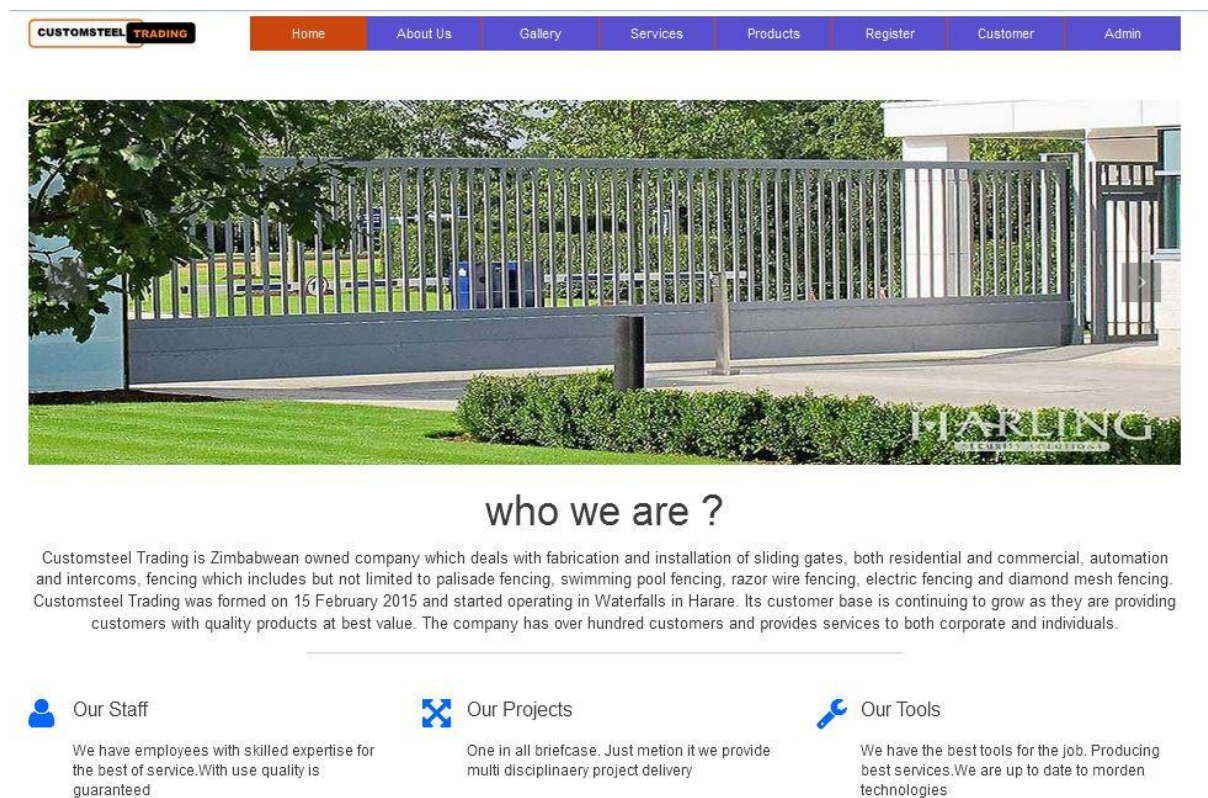



Fig A.1: Main Home Page

Customer Account Creation

The customer account creation is the most important form without that the whole process wont go any way because customers are the main targets of the system



Account #	AC29045
First Name	Mike
Last Name	Moyo
Gender	Male
Occupation	Teacher
National ID	03-130699-H
Physical Address	233 Westwood, Harare
Phone Number	0775122374
E-Mail Address	mm@gmail.com
Password	mnsnnnsnsnsnsnsn

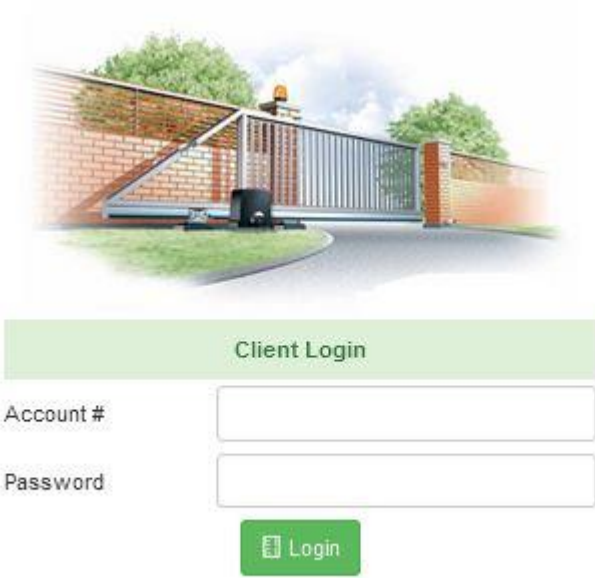
[+ Register](#)

Username already exists, Try again

Fig A.2: Customer account creation page

Customer Login

If the customer has created an account then this is the time to login to the system. The following login page is displayed.



The image shows a web form titled "Client Login" with a light green header. Below the header are two input fields: "Account #" and "Password". A green "Login" button with a document icon is positioned below the password field. The form is set against a background image of a brick wall and a gate.

Fig A.3: Client login

Client Home Page

If the client is successfully logged on he/she is directed to the dashboard as shown below

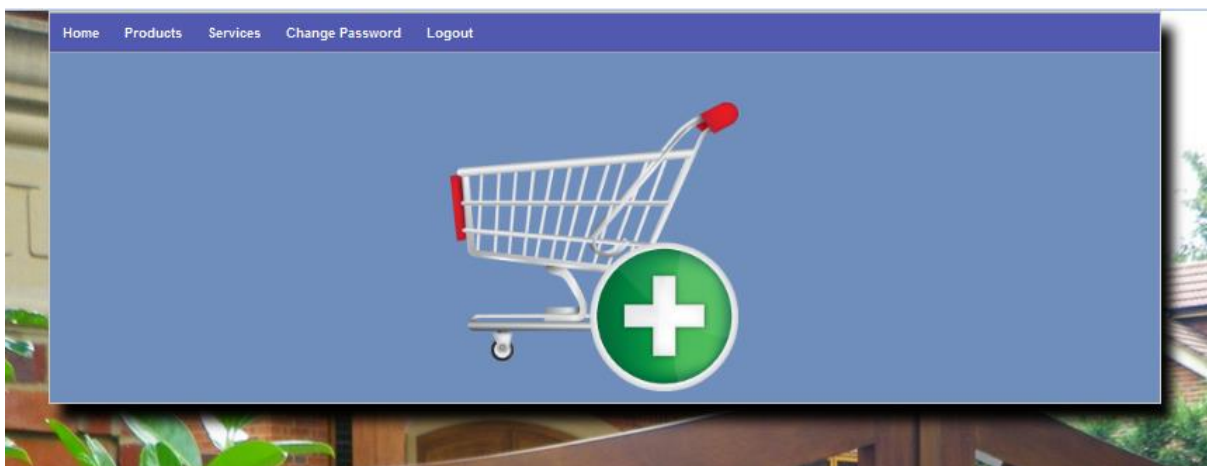


Fig A.4: Client Home

Buy Products

This form is displayed when the customer wants to do an online ordering.

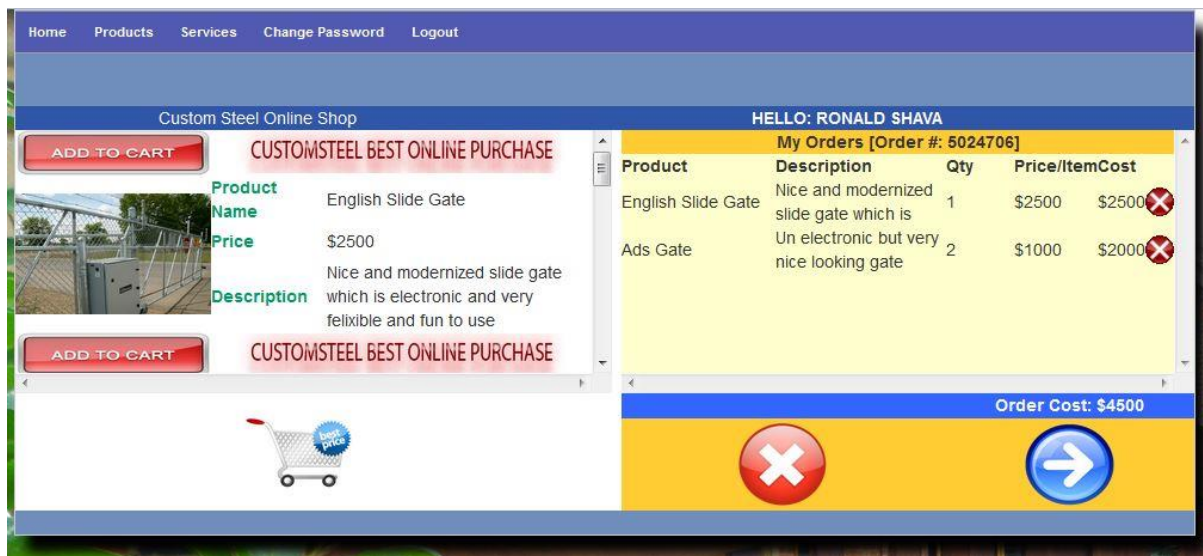


Fig A.5: Buy Products

Sales Home Page

The sales has a variety of navigation to see about products request and services as well

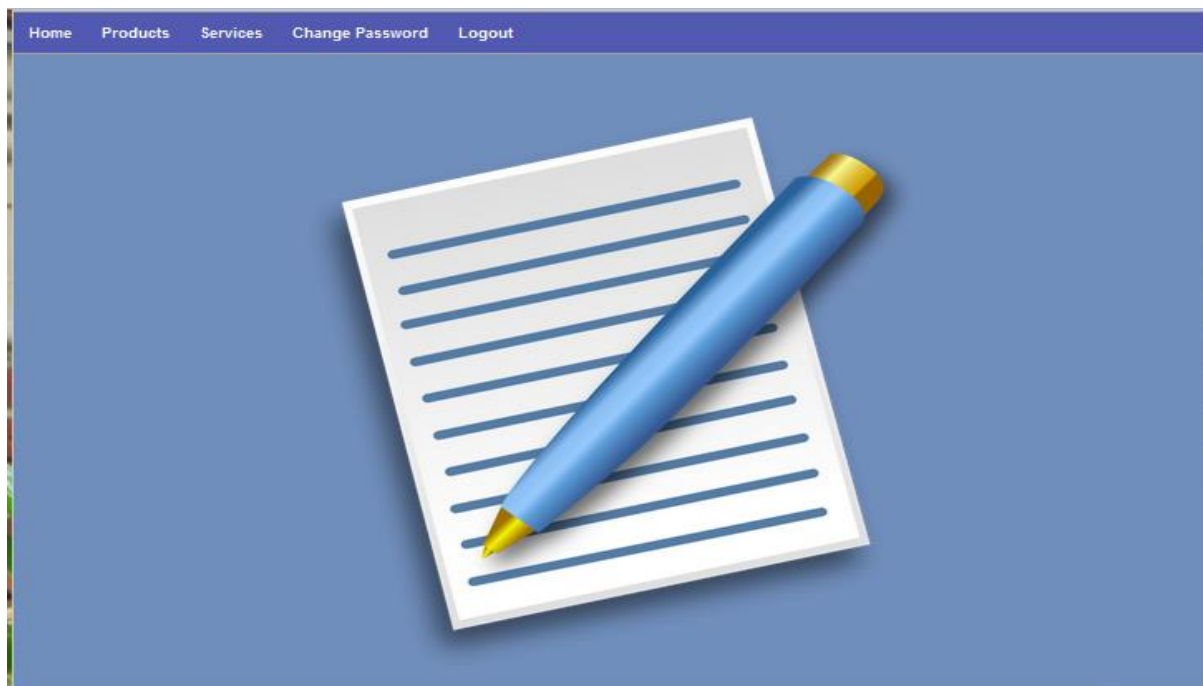


Fig A.6: Sales home page

Sales View Orders

Product	Description	Price
English Slide Gate	Nice and modernized slide gate which is	\$5000
Ads Gate	Un electronic but very nice looking gate	\$3000
Smooth glider	Flexible gate with a very smooth move an	\$2800

Total order cost: \$10800

Fig A.7: Sales view orders

Admin Home Page

This is the landing page for the administrator with various menus such as user account creation, adding products and so many more

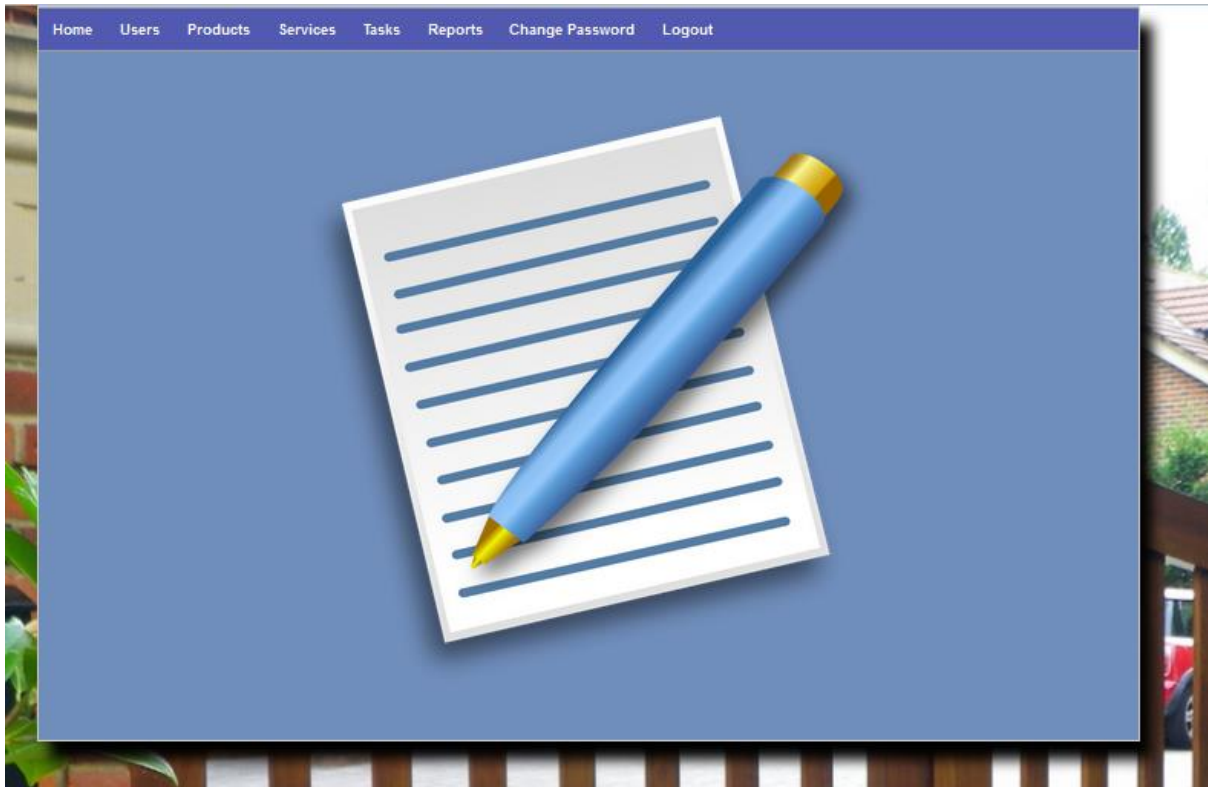


Fig A.8: Admin Home Page

Create User Account

User accounts for technician and sales are created in the admin portal



Account #	AC29045
First Name	Mike
Last Name	Moyo
Gender	Male
Occupation	Teacher
National ID	03-130699-H
Physical Address	233 Westwood, Harare
Phone Number	0775122374
E-Mail Address	mm@gmail.com
Password	mnsnnnsnsnsnsnsn

[+ Register](#)

Username already exists, Try again

Fig A.9: Create user account

View Users

Home Users Products Services Tasks Reports Change Password Logout				
All Current Users				
Name	Surname	Cell	Status	Action
Anold	Maphosa	0775122374	Active	Admin
Mike	Moyo	0778567123	Active	Deactivate
Jacob	Musasa	0772783901	Active	Deactivate

Fig A.10: Viewing All System Users

Add Products

ADD PRODUCT

Product Name

Description Please fill out this field.

Price

Upload Image No file selected.

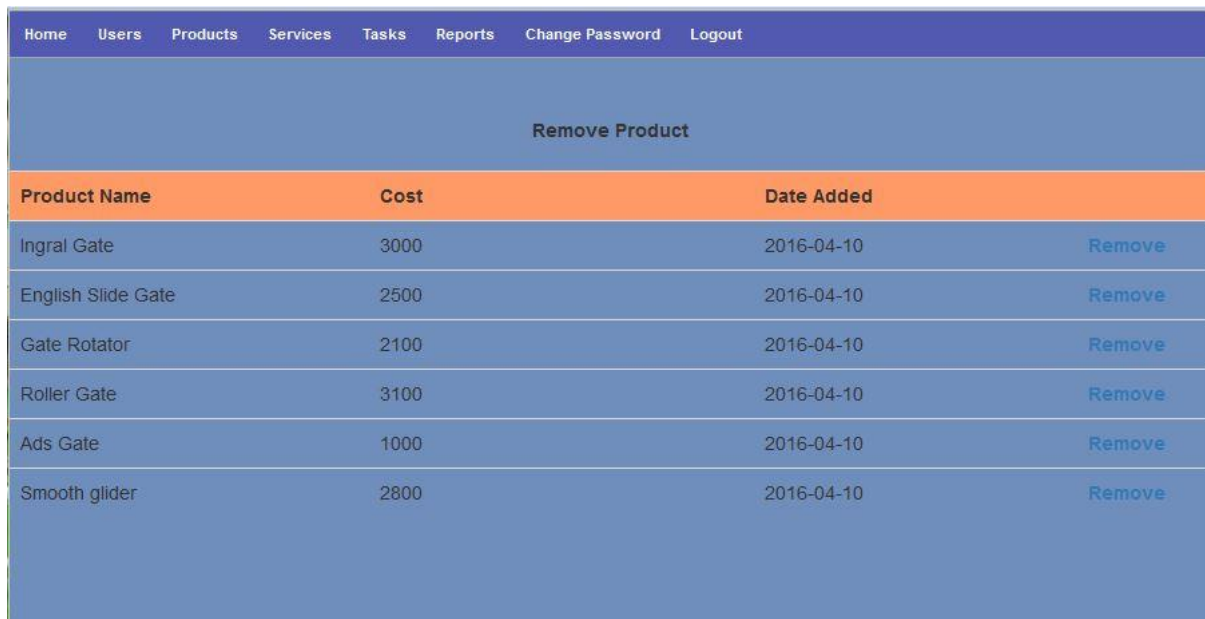
Fig A.11: Add new products

View Products

Products Lists		
Product Name	Cost	Date Added
Ingral Gate	\$3000	2016-04-10
English Slide Gate	\$2500	2016-04-10
Gate Rotator	\$2100	2016-04-10
Roller Gate	\$3100	2016-04-10
Ads Gate	\$1000	2016-04-10
Smooth glider	\$2800	2016-04-10

Fig A.12: View Products

Remove Products



Product Name	Cost	Date Added	
Ingral Gate	3000	2016-04-10	Remove
English Slide Gate	2500	2016-04-10	Remove
Gate Rotator	2100	2016-04-10	Remove
Roller Gate	3100	2016-04-10	Remove
Ads Gate	1000	2016-04-10	Remove
Smooth glider	2800	2016-04-10	Remove

Fig A.13: Remove Product

Technician Home



Fig A.14: Technician Home Page

Change Password

The screenshot shows a web form titled "Change Password" with a navigation bar at the top containing "Home", "Products", "Services", "Change Password", and "Logout". The form contains four input fields: "Account #", "Old Password", "New Password", and "Confirm Password". The "Account #" field contains the value "AC66908" and has a validation error message: "This field is required. ✖". The "Old Password" field is empty and has a validation error message: "The length must be at least 5 characters ✖". The "New Password" field is empty and has a validation error message: "This field is required. ✖". The "Confirm Password" field is empty. At the bottom of the form is a green button labeled "Change Password".

Field Label	Value	Validation Error
Account #	AC66908	This field is required. ✖
Old Password		The length must be at least 5 characters ✖
New Password		This field is required. ✖
Confirm Password		

Fig A.15: Change Password

Appendix B: Interview Customsteel Staff

Sample of an interview questions used for information gathering:

How do you rate the current order processing?

.....

Do you think make use of online ordering useful?

.....
.....
.....

What challenges do you face when analysing sales?

.....
.....
.....

Have you ever think of making an online platform for advertising products?

.....
.....
.....

What your future prediction on the technological improvement of ordering, sales and processing at your company?

.....
.....
.....
.....
.....

Date:/...../2016

Department:

Appendix C: Interview Checklist for Customers

Sample of an interview questions used for information gathering:

How do you rate customsteel performance comparing to other competitors?

.....
.....

Are you satisfied with the current ordering and service request at Customsteel? Give reason

.....
.....
.....

Have you ever encountered an issue of missing order information(Yes/No)?

.....
.....
.....

If yes what did you do?

.....
.....
.....

Do you think putting the ordering and services processes online will be helpful?

.....
.....
.....
.....

Date:/...../2016

Age:

Level of Education:

Appendix D: Questionnaire Checklist for Customsteel Staff

NB: On some of the questions below indicate your answer with a tick

Where do your sales most come from?

Online Advertising

Poster Advertising

What do you think can be lead to high sales for the selected method?

.....
.....
.....

Considering the high rate of internet use. Do you think putting your things online will draw more customerere?

Yes

No

If yes how and why?

.....
.....

What do you think about introducing an online customer servicing system?

.....
.....
.....

Date:/...../2016

Department

Appendix E: Questionnaire Checklist for Customers

NB: On some of the questions below indicate your answer with a tick

Do you like operating online?

Yes

No

Do you have internet access at home or a mobile internet access?

Yes

No

How do you rate the manual system of ordering products and services at Customsteel?

Satisfactory

Not satisfactory

For the selected option give reason why?

.....
.....
.....
.....
.....
.....
.....

Date:/...../2016

Age

Occupation

Appendix F: Observation

Observation Sheet Customer Servicing System

Observation guide schedule.

Date..... Observer.....

Time.....

Department.....

Observations

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

Conclusion

.....
.....
.....
.....

Stamp



Appendix G: Snippet of Code

Ordering snippet code module

```
<form id="form1" name="form1" method="post" action="">

<table width="100%" border="0" cellspacing="0">

<tr bgcolor="#3056A9" >

<td width="41%" ><div align="center"><?php echo "<font
color=#FFFFFF>".$_SESSION['sn']." Online Shop</font>"?></div></td>

<td width="59%" ><div align="center"><strong><?PHP echo "<font
color=#FFFFFF>HELLO: " .strtoupper($_SESSION['nam'] . " "
".$_SESSION['sur'])."</font>"; ?></strong></div></td>

</tr>

</table>

<table width="100%" height="260" border="0" cellspacing="0">

<tr>

<td width="52%" bgcolor="#FFFFFF">

<div id="mydiv2">

<?php

include("connection/db_con.php");

$query=mysql_query("select * from products where sn='".$_SESSION[sn]' order by id");

while($fetch=mysql_fetch_array($query)){

?>

<table width="100%" height="146" border="0" align="center">

<tr>
```

```

        <td height="37" align="center" bgcolor="#FFFFFF"><strong><a href=""
onclick="window.open('add_to.php?id=?php echo $fetch['id'];
?>', 'mywindow', 'width=350,height=200,left=550,top=50,screenX=10,screenY=10')"></a>
</strong></td>

```

```

        <td height="37" colspan="2" align="center" bgcolor="#FFFFFF"></td>

```

```

</tr>

```

```

<tr>

```

```

        <td width="34%" rowspan="3"></td>

```

```

        <td width="20%" height="31"><span class="style1">Product Name </span></td>

```

```

        <td width="46%"><?php echo $fetch['tittle']; ?></td>

```

```

</tr>

```

```

<tr>

```

```

        <td height="31"><span class="style1">Price</span></td>

```

```

        <td>$<?php echo $fetch['cost']; ?></td>

```

```

</tr>

```

```

<tr>

```

```

        <td><span class="style1">Description</span></td>

```

```

        <td><?php echo $fetch['infor']; ?></td>

```

```

</tr>

```

```

</table>

```

```

<?php

```

```

}

```

```
?> </div> </td>
```

```
<td height="112" colspan="2" bgcolor="#FFFFCC"><div id="mydiv"><body  
onLoad="JavaScript:AutoRefresh(9000);"><table width="100%" border="0"  
align="center">
```

```
<tr bgcolor="#FFCC33" >
```

```
<td colspan="6" ><div align="center"><strong>My Orders [Order #: <?php echo  
$_SESSION['onum']; ?>] </strong></div></td>
```

```
</tr>
```

```
<tr>
```

```
<td width="34%"><strong>Product</strong></td>
```

```
<td width="36%"><strong>Description</strong></td>
```

```
<td width="15%"><strong>Qty</strong></td>
```

```
<td width="24%"><strong>Price/Item</strong></td>
```

```
<td width="15%"><strong>Cost</strong></td>
```

```
<td width="6%">&nbsp;</td>
```

```
</tr>
```

```
<?php
```

```
$query2=mysql_query("select * from orders where sess='$_SESSION[onum]'  
order by id");
```

```
while($fetch2=mysql_fetch_array($query2)){
```

```
?>
```

```
<tr>
```

```

<td><?php echo $fetch2['tittle']; ?></td>

<td><?php echo $fetch2['pnam']; ?></td>

<td><?php echo $fetch2['qty']; ?></td>

<td>$/span><?php echo $fetch2['cost']; ?></td>

<td>$/<?php echo $fetch2['price']; ?></td>

<td><a href="del_p.php?id=<?php echo $fetch2['id']; ?>"></a></td>

</tr>

<?php
}
?>

</table></div></body>

</td>

</tr>

<tr>

<td width="52%" rowspan="2" bgcolor="#FFFFFF"><marquee direction="right"
scrollamount="3" behavior="alternate"></marquee></td>

<td height="21" bgcolor="#3366FF"></td>

<td height="21" bgcolor="#3366FF"><div align="center"><strong><font
color="#FFFFFF">Order Cost: </font><span class="style4"></span>

<?php $qry=mysql_query("select sum(price) from orders where
sess='$_SESSION[onum]"); $take=mysql_fetch_array($qry); $total=$take['sum(price)'];

```

```
$_SESSION['total']=$total; echo "<font color=#FFFFFF>".$_SESSION['total']."</font>";
?>
```

```
</strong></div></td>
```

```
</tr>
```

```
<tr>
```

```
<td width="27%" height="21" bgcolor="#FFCC33"><div align="center"><a
href="cancel_order.php?sess=<?php echo $_SESSION['onum']; ?>"></a> </div></td>
```

```
<td width="21%" bgcolor="#FFCC33"><div align="center"><a
href="process.php?order=<?php echo $_SESSION['onum']; ?>" target="_blank"></a></div></td>
```

```
</tr>
```

```
</table>
```

```
</table>
```

```
&nbsp;
```

```
</form>
```