

# Online enquiry and bill payments management system for a local authority



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# **Online enquiry and bill payments management system for a local authority**



**By**

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## **ABSTRACT**

Plumtree Town Council is an urban local authority located in Plumtree town in Matebeleland South district of Zimbabwe. It is situated 100 km away from the City of Bulawayo along Bulawayo Botswana road and railway line, 10 km from the border. It services local residents, outlying farmers in Bulilima and Mangwe rural districts as well as tourists as it is a border town. Like other local authorities it is under the jurisdiction of the Ministry of Public Construction Rural and Urban Planning having moved recently from the Ministry of Local Government. The purpose of the study was to develop an online bill enquiry and payment management system after seeing that customers had to visit, call the local authority or wait for the monthly statement to be delivered for them to access their bill. With the online enquiry system customers can get access to their bill anywhere, anytime as long as they have internet access. The feasibility of the projected was aided by the fact that most of the hardware, software and technical skills were already available at Plumtree Town council. The system was developed using instruments like Macromedia Dreamweaver, PHP programming language, MY SQL and WAMP applications. The project was completed on time and now Plumtree Town Council and all its stakeholders enjoys the benefits which include convenience for everyone concerned.

# DECLARATION

I, **Yangekile Dube**, hereby declare that I am the sole author of this dissertation. I authorize the **Midlands State University** to lend this dissertation to other institutions or individuals for the purpose of scholarly research.

Signature: .....

Date: .....

# APPROVAL

This dissertation, entitled “**Online enquiry and bill payments management system for a local authority** ” by **Yangekile Dube** meets the regulations governing the award of the degree of **BSc Honours Information Systems** of the **Midlands State University**, and is approved for its contribution to knowledge and literary presentation.

Supervisor’s Signature: .....

Date: .....

## **ACKNOWLEDGEMENTS**

Firstly, my acknowledgement goes to GOD my Creator, who makes all things possible and has seen me through all my trials and tribulations up to this time that I have completed this dissertation. My thanks also go to, my project supervisor who has guided me well in compiling this thesis. I would also like to thank my fellow colleagues at work and at college. Lastly but not least I would like to extend my thanks to my family for the support they have given me, without which I would not have reached this far.



## **DEDICATION**

This dissertation is a dedication to my mother, late father and immediate family who have seen me through my every aspect of life and gave me a valuable present in life which is seeing me through school and teaching me the values of life. They have been my pillar of strength and always wished me well, I would like to leave this legacy to my children and it is my hope that they will make something of themselves in life.

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# **LIST OF ACRONYMS**

*ICT : INFORMATION COMMUNICATION TECHNOLOGY*

*ERP : ENTERPRISE RESOURCE PLANNING*

*PTC: PLUMTREE TOWN COUNCIL*

## List of Appendices



# CHAPTER 1: INTRODUCTION

## 1.1 Introduction

This project seeks to address the need to make enquiries and payments into a ratepayer`s account of a Local Authority from anywhere anytime where there is internet access. The ratepayer does not need to visit the municipal offices to get a balance of their account but can do so at their convenience in the comfort of their home or office. Travel and time costs are drastically reduced using such a system. It has been observed that in Plumtree Town Council a large number of the investors and property owners are in the diaspora and are local nationals from the district who need to keep an eye on their investment wherever they are in the world without relying on relatives who may mal administer their funds. Some properties are owned by landlords who are working in other towns in the country and the accounts are administered by tenants where sometimes there are misunderstandings on who is responsible for payment of rates and fees other than water which is consumed by and is the responsibility of the occupant of the property. The misappropriation of funds which might arise from the current system where property owners rely on relatives or tenants to manage the affairs of their investment can be prevented by availing a platform to the property owners to directly control and supervise their accounts with local authority, thereby preventing revenue loss to both parties. The creation of such a system will reduce the number of queries by ratepayers that require them to visit or call the council offices as they will be able to do this online anytime even outside normal business hours thus improving efficiency greatly and freeing up workers` time for more innovative duties. Such a system will help alleviate the prevailing cash shortage problem through the promotion of online transactions and the early settlement of debts by ratepayers who otherwise without this administrative tool may not be aware of the debt, as well as improve revenue collection for the municipality

## 1.2 Background of study

The purpose of the study was to provide a solution to the problem of long queues for

enquiries by ratepayers wanting to know how much they owe. The customers had to either visit or call the council offices or wait for monthly statement to know their account balances, which was quite an inconvenience for diaspora and long distance customers.

### 1.2.1 **Background\_of\_the\_organization**

Plumtree Town Council is located at the CBD of a little border town which began as a railroad station known as Kutitji tja Getjenge along the Bulawayo Botswana rail route line.

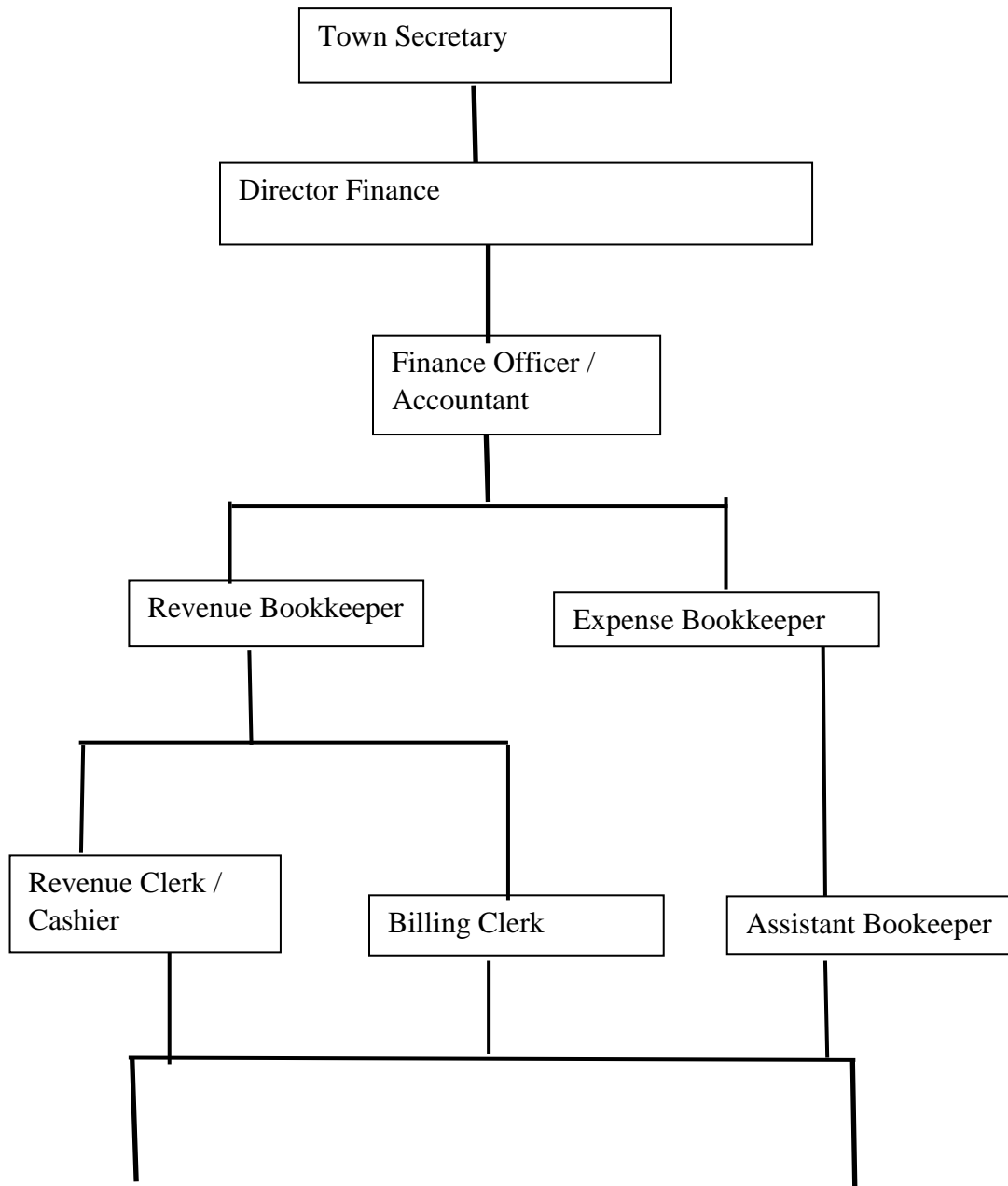
Like the other railroad stations along this course it was named Plumtree after a tree. It mushroomed as a semi-perpetual station for early white pioneers at that point forming into a rail course of provisions between South Africa, Botswana and Bulawayo

Expanded exchange and rail exercises in the long run changed what was primarily a travel port into a set up network that began growing in populace to a formal settlement with administration structures, neighbourhoods, schools, centres and in the end a local hospital, impose workplaces and farmers` clubs.

At first the nearby board was under the organization of Bulilimamangwe District Council until the point when it was allowed town status in 2002 and the legislature settled on a choice to subdivide the locale which was thought to be excessively extensive and awkward in wording of organization. It was part into three free administrative authorities, to be specific Bulilima Rural District Council, Mangwe Rural District Council and Plumtree Town Council.

### 1.2.2 Organisational Structure

This is the organisational structure of the Finance department only of the local authority headed by the Finance Director at par with directors from other departments not shown here like Engineering Director, Housing Director and Administration Director with the Town Secretary at the helm of the organogram.



Messenger

General Hand

Fig 1.1 : Organisational Structure

### 1.2.3 Corporate\_Vision

“To become an investor friendly border municipality by 2020”

The town is trying to end up a municipality sooner rather than later hence the entirety of our tasks is finished with the view that we will fit the bill to be conceded metropolitan status by the Ministry of Local Government previously or by 2020. An all-around controlled holding up list database that is anything but difficult to utilize will bring about amicable staff who comprehend what they are doing and work towards advancing the organization.

### 1.2.4 Mission Statement

“Committed to investment promotion and provision of quality services through optimum use of resources to the satisfaction of all stakeholders”

Through this venture the online enquiry and payment framework will guarantee ideal utilization of assets like time, cash and human cash-flow to the general advantage of the property proprietor and additionally the Local Authority and the entire nation everywhere observing this is a border town and subsequently the window of the country.

#### Corporate values

- Transparency
- Accountability
- Innovativeness
- Responsiveness
- Gender Sensitivity

Through this project innovative ways will be introduced in response to organizational and stakeholder needs to improve operations involving billing and the settlement of the raised bills thereafter regulations which requires transparency and accountability on the part of the local authority.

### **1.3 Problem definition of study**

There is an existing website for the local authority where ratepayers can get information about the organization but no platform to enquire about the state of their account which need constant supervision as failure to settle debts in time may result in the disconnection of water supplies by the local authority in a bid to improve revenue collection for supporting continuous, adequate delivery of all the essential services.

The ratepayer has to visit, call or communicate with the council offices in some way each time they need their balance of accounts. Alternatively, the ratepayer has to wait for a statement which is delivered once a month only after billing and statement delivery is costly and unreliable at times.

The existing Ecocash and bank transfer systems that enable the client to make payment for their rates take too long to update and require that ratepayers communicate and submit proof of payment before they are effected in the receipting system.

### **1.4 Aim of study**

The project aims to create a platform for ratepayers to make enquiries and payments into their accounts at Plumtree Town Council through the organization's website from anywhere, anytime at their convenience.

Through this system council should be able to provide a user-friendly self-service at low cost to the ratepayers as they would have cut down on travel, time and communication expenses.

## **1.5 Objectives of study**

- To create a simple interface for ratepayers to make enquiries and payments into their council accounts.
- To create a platform where municipal workers can update customer balances
- To create an online platform for ratepayers to sign in, enquire and pay their accounts
- To reduce the distance and provide direct control of ratepayer`s account to the property owner.
- To reduce costs for the local authority and the ratepayer to acquire their account statements.
- To update payments timeously.
- To help improve revenue collection at the convenience of ratepayers and improve efficiency in general service delivery

## **1.6 Instruments and methods**

- Software package: Macromedia Dreamweaver and HTML to be used to develop the website and compile programs for use in the day to day operations of the system.
- Language for development: PHP programming language to be used to create a simple GUI (Graphic User Interface) for users to access the system.
- Database: My SQL is an open source database relational management system that will be used to create the customer database and its tables

## **1.7 Justification and rationale of study**

Ratepayers for Plumtree Town Council have to call in or visit council offices to get their balances and make payments or wait for a hard copy statement to be delivered once a month to their postal addresses. This makes it difficult for customers to manage their accounts considering such factors as:-

Poor information dissemination to those property owners who do not live in Plumtree, and some have unfinished structures as statements are delivered to a postal address different from their residential addresses.

It is expensive and difficult for property owners who live in the diaspora to obtain their balances and make payments as they have to travel or call in at council, or even rely on relatives to manage their accounts.

It is difficult for council staff to manage the queues and calls that come through to the finance department as it is the only source of information on ratepayer account status and updates

Utilizing the new system, it would be easy for ratepayers to manage and transact on their accounts from anywhere and enjoy extended business hours and full control of their accounts.

## **1.8 Conclusion**

With an online enquiry and payment system ratepayers will micromanage their finances and accounts from anywhere, anytime at their convenience at lower costs thus save money which they can channel towards settling their bill. This will improve revenue collection for the local authority and in turn improve efficiency in service delivery to the satisfaction of all stakeholder needs.

## **CHAPTER 2:PLANNING PHASE**

### **2.1 Introduction**

The success of this project is sorely dependent on the dimensions of planning which has been done by the researcher, therefore in this chapter the researcher will project a plan she has designed for the success of this project. In this section of the project, the researcher shall list, explain and scrutinize all resources needed for this project to be a success, that is ‘system requirements’, both hardware and software. A feasibility study was carried out on the proposed Plumtree Town Council Online Enquiry and Bill Payment Management System to ascertain the possibilities of the success or failure of the project. After ascertaining project feasibility and examining all the risks, at this stage of the project the researcher is going to plan on what hardware and software to use to develop the system. We just have to list few findings of the feasibility study as proof that we surely conducted the feasibility study).

### **2.2 Business Value**

Sward (2006) says “business value are the benefits that can be accomplished by boarding on the proposed system and should increase the goodwill of the business in terms of effectiveness and efficiency”. These are the advantages to the organization and its stakeholders that the proposed system brings and in this case the major benefit was increased financial management by the customers leading to increased revenue collection and its management by the local authority, thus the achievement of a major goal of meeting service delivery targets as is outlined in the Client Service Charter (CSC).The Client Service Charter is a blueprint which guides the local authority in expected and acceptable timelines for essential service delivery especially in critical areas like water and sewer services delivery as well as refuse collection. Particularly the following groups of stakeholders should benefit from the proposed system: -

The customer: -There should be a cost-effective system that helps the customers micromanage their finances without time and distance hindrances or constraints enabling them to save enough



to settle their bills timeously. This should reduce their indebtedness to council who should in turn honour that by supplying better and improved services and public amenities.

Finance department: - The cost-effective online method of bill management and payment thereof by customers should enable the Finance department to structure the local authority budget and allocate resources proportionally for the various service departments like Administration, Housing and Engineering. The online service should be particularly convenient as a self-service for customers thereby reducing congestions and queries in the revenue halls as well as reducing the workload for Finance staff who sometimes have to work overtime.

Housing and Community Services department: -With enough revenue collected towards the Housing account, the department should be able to plan critical refuse collection schedules within the confines of time stipulated by the Client Service Charter without the worry of shortage of resources like fuel and funding to service and maintain the refuse collection fleet and other service vehicles which are always broken down. The fees collected towards sanitation and inspection fees should enable the department as it is responsible for providing suitable facilities for the whole community to do future plans about schools, clinics, community halls and shops as well as churches for Plumtree Town.

Administration department: -With improved revenue collection especially towards asset and infrastructure accounts the department can strategically plan for the future with ease. Special critical areas of concern are staff welfare, transport and fire and ambulance service provision.

Engineering Services department: -This is the department that is responsible for the core and essential services of any local authority which includes the provision of water and sewer services as well as servicing of stands and roads, these services are highly dependent on availability of funding to maintain the robust infrastructure it houses. As the largest consumer of financial and other resources its funding should be closely monitored and a joint effort from both the consumer and supplier to micromanage it should be afforded by the proposed system.

### **2.3 Feasibility Study**

Feasibility study evaluates the applicability and practicality of the project. It analyses whether it is worthwhile for all stakeholders to continue with the project or to abandon it. This enlightens the researcher giving alerts on present variables, pros and cons which have a direct and an

indirect bearing on the success of the project. In turn it keeps the researcher informed such that planning may override the findings of the feasibility research, therefore contributing greatly to the success of the project. Feasibility study is a very broad subject divided into several sections which are technical, economic, social and operational feasibility, all of which are probed in this section

### 2.3.1 Technical Feasibility

Technical feasibility refers to the ability of the project to continue as far as technology is concerned. It consists of an analysis of existing and proposed hardware, software and personnel to determine its affordability and whether it is usable. The presence of other project requirements (hardware, software and labour) puts the project at an advantage since the budget will be reduced, however the absence of such sabotages the whole project since more funds to recruit and employ skilled labour as well as purchasing equipment will be incurred. Personnel involves the availability of skilled labour to setup and configure the IT equipment as well as an IT affluent project manager.

#### 2.3.1.1 Hardware Requirements

*Table 2. 1 Hardware requirements*

Hardware	Specifications	Available	Quantity	Price (\$)	Affordable
LAPTOP	Ram >=8gb CPU>=corei5 HDD>=1TB	NO	1	\$1250	Yes
Printer	HP LaserJet Printer	NO	1	\$795	Yes
Router	12 port Cisco switches	Yes	1		
Ethernet Cable	150 meters	Yes	1		

Desktops	4Gb RAM, 500HDD, 3.0 GHz Dual Core	Yes	5		
Server	8G ram, 2TB HDD, ML310e Gen 8	Yes	1		

### 2.3.1.2 Software Requirements

The following are software packages that are needed at Plumtree Town Council for the development of the Online enquiry and payment system.

*Table 2. 2 Software Requirements*

Items	Recommended	Available	Quantity	Price	Affordable
Software	Windows 10, & 7 professional	Yes	1 Each		
Software	MySQL Server	Yes	1		
Application	Macromedia Dreamweaver WAMP Server	Yes	1		

Technically it is feasible to carry on with the project as all softwares are available and technical skills too. The hardware that is required is affordable and income generated from all forms of payments including online should be able to fund this project

### 2.3.1.3 Overview of the Technical Feasibility

The proposed system can be developed in a timely manner as most of the technical requirements are available at Plumtree Town Council and there is technical staff skilled enough to handle the development of the system. There are good relations existing between the service provider who hosts the council website and the company who supports the council's ERP system such that it would be easy to develop the interface to enable account balances to be extracted from the system as well as updates to be made to the account balances as payments are done online.

### 2.3.2 Economic Feasibility

“Economic feasibility is a study to find out whether the benefits estimated from the new system overshadows the costs of carrying out the project”, Castro et al (2002). In this case, the proposed system must not use more than what it will give back to the company. The returns of the project must be higher than the actual investment. This then makes the project economically feasible and profitable.

#### 2.3.2.1 Development Costs

According to Thompson (2009) Development costs are referred to as the total of all costs and expenses incurred from project initiation to implementation in monetary value. Plumtree Town council will incur minimum development costs as the system database will be built by internal IT staff teaming up with developers from Silver technology (Pvt) Ltd (the company that hosts the council website) and Axis Solutions (who support our ERP system for billing) from whom the council already have contract agreements and enjoy lower hourly rates of extra development work.

Table 2. 3 Developmental costs table

Development Costs	Value (USD) Year	Value (USD) Year	Value (USD) Year
	1	2	3
Development of payment platforms, interfaces and technical support	2500	1500	1000
Training teas and refreshments	1500	700	-
Occasional overtime	1000	700	200
Total	<b><u>5000</u></b>	<b><u>2900</u></b>	<b><u>1200</u></b>

#### 2.3.2.2 Operational Costs

According to Thompson (2009) “operational costs are defined as the price tag of resources used by a body just to uphold its existence.” Presently Plumtree Town Council operational costs pertaining to printing and delivery of statements are;

*Table 2. 4 Operational costs*

Operational Costs for 1 year	Value (USD) Year 1	Value (USD) Year 2	Value (USD) Year 3
Printing and stationery	12500	9000	3000
Occasional overtime	1500	900	500
Computer maintenance	2000	1500	1500
Total	16000	11400	5000

### **2.3.2.3 Benefits of the system**

#### **NPV**

Khan (1995) is the difference between the present value of cash inflows and the present values of cash outflows over a period of time. It is used to in capital budgeting and as an aid investment planning in the analysis the profitability of projected investment profit. The formulae for calculating present value is shown below:

$$\text{Present value} = \text{initial investment}/(1+r)^y$$

Where: r is the rate of return, y is the year of cash flow

*Table 2.5: Net Present Value*

YEARS	Estimate Present Value	CASHFLOW	CASHFLOW

	(10%)	Online billing system		Traditional billing system	
		Cash flow	Present value	Cash Flow	Present value
0	1	(10000)	(10000)	(10000)	(10000)
1		3000		1000	
2		2000		1500	
3		5000		4500	
4		2000		1000	
5		3500		2000	

### Payback period

Table 2.6: Payback Period

Online Billing system			Traditional billing system	
Years	Cash inflows\$	Total\$	Cash inflows\$	Total\$
Year 0	(10000)	(10000)	(10000)	(10000)
Year 1	3000	(7000)	1000	(9000)
Year 2	2000	(5000)	1500	(7500)
Year 3	5000	0	4500	(3000)
Year 4	2000	2000	1000	(2000)
Year 5	3500	5500	2000	0

Payback period is the length of time required to recover the initial investment. The investment project with less payback period is seen as the investment. In the above table the Online Billing System has a less payback period than the traditional billing system as all the investment is recovered in the third year rather than the traditional billing system which recovers its investment in the fifth year. The advantage of using this method is that it is easier to calculate and it takes into account the risks involved in the investment.

### 2.3.2.3.1 Tangible Benefits

These are positive returns that come after the implementation of the system project. For example, the hardware computer equipment bought remains an asset to the organization and adds value to asset inventory. Savings in terms of reduced printing and stationery as well as overtime costs are also material benefits of the system. This is a benefit also to the ratepayer as they have access to a more current statement everyday than the usual monthly statement anywhere at any time.

*Table 2. 7 :Tangible benefits*

<b>Benefits</b>	<b>Value Estimated (USD) Year 1</b>	<b>Value Estimated (USD) Year 2</b>	<b>Value Estimated (USD) Year 3</b>
Improved efficiency	1500	2000	2500
Savings in overtime	500	200	500
<b>Total</b>	<b>2000</b>	<b>2200</b>	<b>3000</b>

### 2.3.2.3.2 Intangible benefits

According to Whitten (2008) immaterial benefits are “benefits that are related to the qualitative aspect which the system is expected to produce”. Plumtree Town Council will enjoy the benefits of an efficient database system that is portable which can be accessed anytime even outside business hours. The electronic files are also more durable and up to date than physical hard copy monthly statements. Moreover, rate payers will also enjoy fast, convenient and reliable account enquiries as well as payment of bills at any given point in time. This will reduce the arrears owed to council by the ratepayers at the same time increasing revenue collection for the council without extra costs to both the supplier and the consumer. A number of investors may be lured into investing in the local authority with such a system which has a global outreach for economic development of the society at large.

<b>Benefits</b>	<b>Value Estimated (USD) Year 1</b>	<b>Value Estimated (USD) Year 2</b>	<b>Value Estimated (USD) Year 3</b>
Goodwill	500	800	1000
Increased worker morale	700	900	1200
Improved customer satisfaction	300	500	800
<b>Total</b>	<b>1500</b>	<b>2200</b>	<b>3000</b>

*Table 2. 8: Intangible benefits*

#### **2.3.2.4 Cost Benefit Analysis**

According to Hughes (1999), “Cost-benefit analysis is a detailed financial evaluation where development costs are compared against the benefits that come as a result of using the system”. Comparing the cost of acquiring the new hardware that is not available which is \$2045.00 and the amount saved by the local authority for year two and three in the way of tangible benefits and overtime salaries which is \$2200.00 and \$3000.00 respectively, the latter of which is more, it is economically feasible to carry out the project to completion.



### **2.3.3 Social Feasibility**

Dennis (2010) expounded “social feasibility as a detailed study on how stakeholders, such as end users interact with each other within the use of the proposed system in the organisation. At Plumtree Town Council customers traditionally interact with finance staff as they request or query monthly bill balances and carry out any other financial transactions when they either visit or call the council offices. At times proof of payment in the form of receipts is required from the customer to settle disputes, this proof may not be readily available and that always requires physical presence of customer at the council offices which always poses a challenge to long distance callers.

With the introduction of the online enquiry and payment system with easy to follow steps and procedures, all the customer has to do is to access the Plumtree Town Council website and conduct business conveniently from anywhere in the world, at any time, with minimal interactions like a phone call or email, solving the problem of distance and time constraints. This should cut out the need to visit council offices all the time and receipts and other finance records can be filed electronically by the customer, these have advantages like portability, durability, ease of access and cannot be lost.

Using the internet based proposed system other cheaper and user-friendly options like online chats, video chats and WhatsApp can be utilized to enhance interactions with the customer. This way interactions with customers need not be restricted to once a month when they visit council offices to settle their bills but can be a daily routine with instantaneous feedback and thank you notes.

Other users from other departments can be trained as multi-skilled agents or a help desk can be set up to improve efficiency as customers can be quickly assisted without the need to always refer queries and enquiries to finance staff. Management should be able to log into the system and using audit trails and customer feedback, appraise and supervise their staff effectively as well as make swift decisions.

With the world in the digital era and the wide spread usage of the world wide web it should not be too difficult for the customers and the modern community to utilize and interact with the proposed system. The local authority should implement measures to educate the community through fliers, literacy training workshops and tips and guidelines posted on the Plumtree Town Council interactive website to improve system technology infusion and diffusion.

### **2.3.4 Operational Feasibility**

Matson et al (2010) asserts that Operational feasibility is the study of how well the solution of problems or a specific solution will work in a business or organization and also how people feel about the solution. Operational feasibility studies how user friendly the proposed system is.

Time of processing data- this measure how much time is taken to query the council database for an account balance or to conclude an online payment transaction.

Admission Regulator Apparatus – the system is secured by user authentication methods of logging in with a username and password.

The system is secured and users log in for access authentication in order to input data or retrieve data from the system. Staff at Plumtree Town Council will receive hands on practical training on how to use the simple system which should have a graphic user interface that is easy to follow.

### **2.4 Risk analysis**

Plumtree Town Council runs the risk of failing to provide essential services on time, like provision of water and sanitation services if enough revenue is not collected to meet the operational costs. This would lead to dilapidated health services infrastructure and may cause disease outbreaks that would be difficult to control. Presently Plumtree Town Council is collecting about 44% of the total budget which is not sustainable.

Data security risks of loss due to theft, fire or any other natural disaster as well general theft of information by employees will be minimized by doing regular backups of the database and storing it offsite in a secure environment. There is already a security firewall in place and Escan antivirus software to prevent data loss due to hacking and viruses. (*for the website*).

There may be challenges with operations in **times** of network failure and power outages which can be prevented by maintaining computer and network infrastructure in good working condition

to minimize downtime and there is a standby inline generator for alternative power whenever electricity goes off.

## **2.5. Stakeholder Analysis.**

According to Schwalbe (2006), stakeholder analysis is the evaluation of the benefits that are derived from the system by all its users. Plumtree Town council and its external stakeholders should benefit from the introduction of the Online enquiry and payment system.

Finance Department: - since this department is responsible for the collection and use of funds, this will make it easy for them to collect revenue from service users consequently raising the percentage of revenue collected in yearly budget. This will even ease the pressure of compiling monthly financial statements for every rate payer, therefore giving a chance for the department to use the saved time on other business of high priority.

Management: - Detailed reports extracted from the system and customer feedback from the website will aid the management in all departments to make informed decisions, budget for and make strategic plans for effective service delivery, future improvement and development of the town.

External stakeholders: - Customers are going to benefit because there will be a convenient platform for them to inquire into their account so as to budget for payments, settle their arrears as well as remain consistently informed of their account's balances. In this case external stakeholders will also have an expedient platform that do not require them to visit council offices always. This will therefore reduce their arrears as well as help them better manage their services provided. This will also make it easy for governmental, political and traditional leaders to probe the used of council funds and resources, that is the revenue collected against the money used in the provision of goods and services.

## **2.6 Work Plan.**

Schwalbe (2006) asserts that "a work plan is a detailed account of how one or a group of people intends to finish a certain objective". It is the guideline that regulates speed of doing the project against time given. Matson et al (2010) said "the work plan involves dividing the whole project into a series of individual sequential phases which must be followed in the development of the

system.” Efficient allocation of scarce resources such as time was realized. Furthermore, a work plan stipulates diverse responsibilities and resources to a specific group or individuals in line with the required skills and labour present in the organization as well as that needed for the success of the project. This means the best hands are allocated an objective that fits the ability present. This in turn results to the smooth and successful implementation of the project as well as attainment of project objectives. In order to work within the set time frame, a work schedule had to be put in place.

### 2.6.1 Project Schedule

According to Lucey (1997) Project schedule is the allocation of time against the current phase of project. Each phase had a start date and termination date which means each phase had a specific period of completion to ensure we met deadlines. Table 2.9 shows project schedule of Plumtree Town Council Online Enquiry and Payment System.

*Table 2. 9: Project Schedule.*

<b>Undertaking</b>	<b>Beginning</b>	<b>End</b>	<b>Period(weeks)</b>
Project Introduction	05/03/2018	23/03/2017	3
Project Planning	02/04/2018	27/04/2018	4
Project Analysis	02/05/2018	19/05/2018	3
Project Design	21/05/2018	15/06/2018	3
Implementation	18/06/2018	25/07/2018	5
Testing	26/07/2018	05/08/2018	2
Documentation	05/03/2018	05/09/2018	24

### 2.6.2 Gantt Chart of the system development

This is a chart that represents the progression and duration of activities involved in the development of the system.

<b>Tasks / Weeks</b>	<b>1-3</b>	<b>4-5</b>	<b>6-7</b>	<b>8-9</b>	<b>10-11</b>	<b>12-14</b>	<b>15</b>	<b>16-18</b>	<b>19-20</b>	<b>21-24</b>
<b>Project Introduction</b>										
<b>Planning</b>										
<b>Analysis</b>										
<b>Design</b>										
<b>Implementation</b>										
<b>Maintenance</b>										
<b>Documentation</b>										

Fig 2.1: Gantt Chart

## **2.7 Conclusion**

Having planned in detail for the proposed project of the Plumtree Town Council Online Enquiry and Payment System and carried out an extensive feasibility study which proved it possible and sustainable to carry out, we were ready to work on the analysis phase of the project with the IT Systems Administrator as project manager.

# **CHAPTER 3: ANALYSIS PHASE**

## **3.1 Introduction**

As the chapter indicates, this section will focus on all aspects of data collection and analysis of the current system, its weaknesses, alternative solutions as well as the evaluation thereof. Lewis (2006) explains analysis as the segment where the researcher focuses on the system's status, weaknesses with the intention of bringing about a better solution from diverse dimensions of alternatives. The researcher will therefore utilise the data collection and analysis instruments used in this chapter pointing out its strengths and weaknesses as well as the general reasons as to why those specific mechanisms were used. This whole chapter is therefore dedicated to the current system exposing its weaknesses as well as selecting the best alternative for the system with the intention to improve service delivery as well as interaction between the service provider and the rate payers as explained in previous chapters.

## **3.2 Information gathering methodologies**

In this research the researcher adopted the qualitative methods of collecting and analysing data. Dickson and Russel (1997) postulate that, unlike quantitative methods of collecting and analysing data, qualitative methods are more concerned with the expressions of feelings, opinions, perceptions and personal opinions on a specific subject under survey. Therefore, this chapter shall unpack instruments to be used in this research and these are observations, interviews and questionnaires for their strengths so that the researcher will gather objective as well as subjective data around the present system. This research shall also identify and stratify groups from which data can be interpreted and used throughout this project. The collection of such data will help the researcher decide on what alternatives to undertake.

### **3.2.1 Observations**

According to Marshall and Rossman (1989) defined observations as "the systematic description of events, behaviours, and artefacts in the social setting chosen for study". To Schensul et al (1999) an observation is "the process of learning through exposure to or involvement in the day-to-day or routine activities of participants in the researcher setting". Moreover, observations involve active looking, informal interviews, improving memory, writing detailed field notes and mostly importantly patience. Above all when conducting observations there is need for sampling guidelines as well as interview guides so that only actions, words and expressions related to the study may be captured and used in the project. The researcher therefore intends to do the observations online where comments on the organization's Facebook page will be considered as well as on the organization's complaints register. This therefore makes observations an exercise with a clear target as the researcher goes to the field knowing exactly what he/she is looking for.

### **Merits**

Like other data collection tools, observations have numerous advantages which contributes greatly to the attainment of required information. Below are some advantages of using observations;

- Help check non-verbal expressions (gestures) and feelings which sometimes possess great meaning than words,
- It helps the researcher know how much time is spent on specific or various activities,

- It works as a verifying tool for the data collected using questionnaires and focus group discussions or other more interactive methods of data collection.

### **Demerits**

- It's a tiresome activity which requires high concentration and patience, therefore making it difficult for researcher to undertake,
- It's also difficult to choose your major participants and interpret the captured data and gestures observed,

### **Data Findings**

The researcher discovered that fifty two percent of enquiries on account balances as well availability of stands for investments come through the website platforms showing how busy the website is.

### **3.2.2 Interviews**

An interview is regarded as the most interactive data collection tool, since it gives space and time for the discussion of relevant issues around the subject. According to Maxwell (1998) of the research seeks to integrate the quality of the present system so as to justify the need to carry out the proposed system, there is need also to use such an interactive tool such that emotions may be identified, personal feelings and views be taken into consideration so as to factor them in the justification of the 'need' for a new system as well as the selection of alternatives. Maxwell (1998) went further to explain that, for the collection of objective information there is need for the researcher to identify a number of trusted individuals such that the outcomes of the process are not disrupted. The analyst being the researcher drafts and asks planned questions and depending on the answers s(he) gets may ask unplanned questions which are derived from the answers they would have gathered so far. Researcher may end up asking questions which were planned peradventure the respondent identifies an issue of great significance to the research.

### **Advantages of Interviews.**

- Interviews allowed direct communication with knowledgeable population on the subject matter such as finance staff who know the current system in and out as they had first-



hand information of how it works, its weaknesses and strengths (to be upheld in the new system),

- Interviews help the researcher understand the needs of the population under study as well as acquire some new ideas during such sessions since respondents are free to say out their views on a subject matter under question,
- This data collection tool helps in acquisition of information from direct users since they know their needs in the operations within the system and could elaborate them clearly which could be deduced from their answers to open ended derived questions that the researcher had for them,
- Interviews allowed full communication incorporating also non-verbal communication which is a vital part of the communication process

### **Disadvantages of Interviews**

- Interviews needed face to face hence involved travelling to meet up with the interviewee and necessitated travelling often which is a cost in terms of time and money thus this form of information gathering technique proved cheaper with members of staff where no travelling was involved and it was done during working hours running it concurrently with other duties at the office,
- It is normally difficult to disclose sensitive information in a formal interview unlike a questionnaire where someone can remain anonymous hence interviews with members of staff safeguarded sensitive information to remain within the organization with both parties the researcher and the interviewee being bound by the confidentiality clause in their respective code of conduct for Plumtree Town Council,
- Fear to be quoted was one issue which hindered the researcher from collecting the amount of data needed, though the researcher explained ethical issues related to data collection and the disclosure of respondent's details when it comes to publication and sharing of information and data collected,

### **Findings**

From the interviews held it was gathered that;

- there was need to improve on the following areas:

- Printing monthly statements is tiresome, adamant as well as inconvenient exercise since customers will have to wait for the end of the months just to know their usage of water and other services, which makes it difficult to plan for and manage the usage of their services,
- The present platforms of transactions are inadequate since there are frequent network challenges experienced with eco-cash as well as swipes, a challenge which also affects council in the revenue collection,
- Customer services where by people stand in the ques for enquiries whilst they can do it online instead on their individual accounts at their convenience and use simple devices like their mobile phones,
- There was risk of loss of data due to wear and tear of manual hard copy statements and receipts with no means of back up.

### **3.2.3 Questionnaires**

MacGrill (2009) says a questionnaire is an arrangement of printed enquiries, more often than not with a selection of answers tailor made for a study or measurable review. For questionnaires the interviewee is guided by the answers provided on the pamphlet, therefore being unable to add further information. In some instances, the interviewee is given some space under questions to briefly justify their responses, this also works as a means of letting the respondent express responses in their own words, from which the researcher can decipher emotions and further information. The questionnaires will be structured in a way that will accommodate internal stakeholders (councillors and HODs and staffs in general) and external stakeholders (the business community, residents, and property owners in the diaspora).

### **Advantages of questionnaires**

- Planned questions targeting all the details about the present system were administered to respondents with respect to their groups and categories,
- Data collected from questionnaires is easy to analyse and present since these can be structured according to responses provided in the answer pamphlet as well as classes used in the administration of these questionnaires,
- Questionnaires also save time by limiting the respondents mostly to answers provided on the pamphlet,
- If structured according to diverse groups of rate payers, more information is acquired since rate payers from different groups experience different inconveniences besides common inconveniences universally experienced,
- The researcher is not necessarily supposed to be around when interviewees respond to questions on the pamphlet, so the researcher can as well focus on other duties whilst this is being undertaken,
- Unclear questions which customers could leave left blank can be clarified by the workers carrying out the survey.

### **Disadvantages**

- It was difficult, tedious and expensive to carry out a survey of this magnitude as we had to hire casual workers.
- The questionnaires did not allow the customers to give their views about the system as only closed ended questions were asked.

### **Findings**

From the questionnaires the researcher gathered that most customers did not know which department was concerned with the allocation of stands and the application for registering with the Plumtree Town Council housing waiting list.

### **3.3 Analysis of existing system**

Prior to developing a new system, the researcher identified the state of the present system, bringing out its strengths and weaknesses such that the strengths of the current may be adopted and carried over to the new system whilst its weaknesses are waived.

#### **3.3.1 Description of the current system**

In the current system, the local authority has centralised offices where the payment for stands, sanitation and water services are done. This then forces all ratepayers to visit the offices for the payments. The council currently has an operational Biller Code which is used by people in the payment of their bills. The challenge faced is that of frequent Eco-cash Network challenges which leaves people with no choice but to visit the council offices. The other challenge faced is that, printed financial statements are released once at the end of every month which also take time to be compiled and printed. This stands as an inconvenience for property owners who are out of the country, since they cannot access their financial information. This even makes it difficult for them to plan on how they will pay for their rates at council since they have no way whatsoever of accessing their financial statements. Moreover, whenever a rate payer needs financial information for their account, they will have to visit council offices where they spend time standing in queues also awaiting these statements to be printed out. This system tends to be expensive to the local authority, tiresome to both council and the stakeholders as well as inconvenient, hence the need for a new system.

#### **3.3.2 Advantages of current system**

At the present moment the current system helps stakeholders acquire their account statements in an easy way since they are computerized. This makes the information clear and safe from distortion since each individual is allocated some space where their personal details are kept pertaining to the location of their property even to financial details. The system is also flexible though to a lesser extent since customers can pay at their convenience from their phones using the Council Biller Code.

#### **3.3.3 Inputs of current system**

This is what is input to be processed in the system.

- The payment of bills is done at council offices through Biller Code, swipes as well as through cash. Receipts are given just after payments have been made and a copy is left in their system showing that a payment was made for that specific account.
- Data on water usage is acquired from one's water metre for those who do not have prepared water metres and is presented. Fixed charges are also presented in the same receipt which is printed and distributed once in a month. This receipt breaks down the financial provision printed in the receipt in line with their specific account, for example public lighting, roads levy, water, sewer and so on.

The inputs to the system are critical to the development of the proposed system as they define the type of interface to be designed.

### **3.3.4 Process**

The current system captures all the customer input details manually. It involves:

- Capturing customer details and presentation of financial bills for the current month using two variables, (fixed charges and user charges),
- Individual financial information is kept in the system for reference and monitoring. The information is updated every month on payments made that month as well as standing balances on that account.

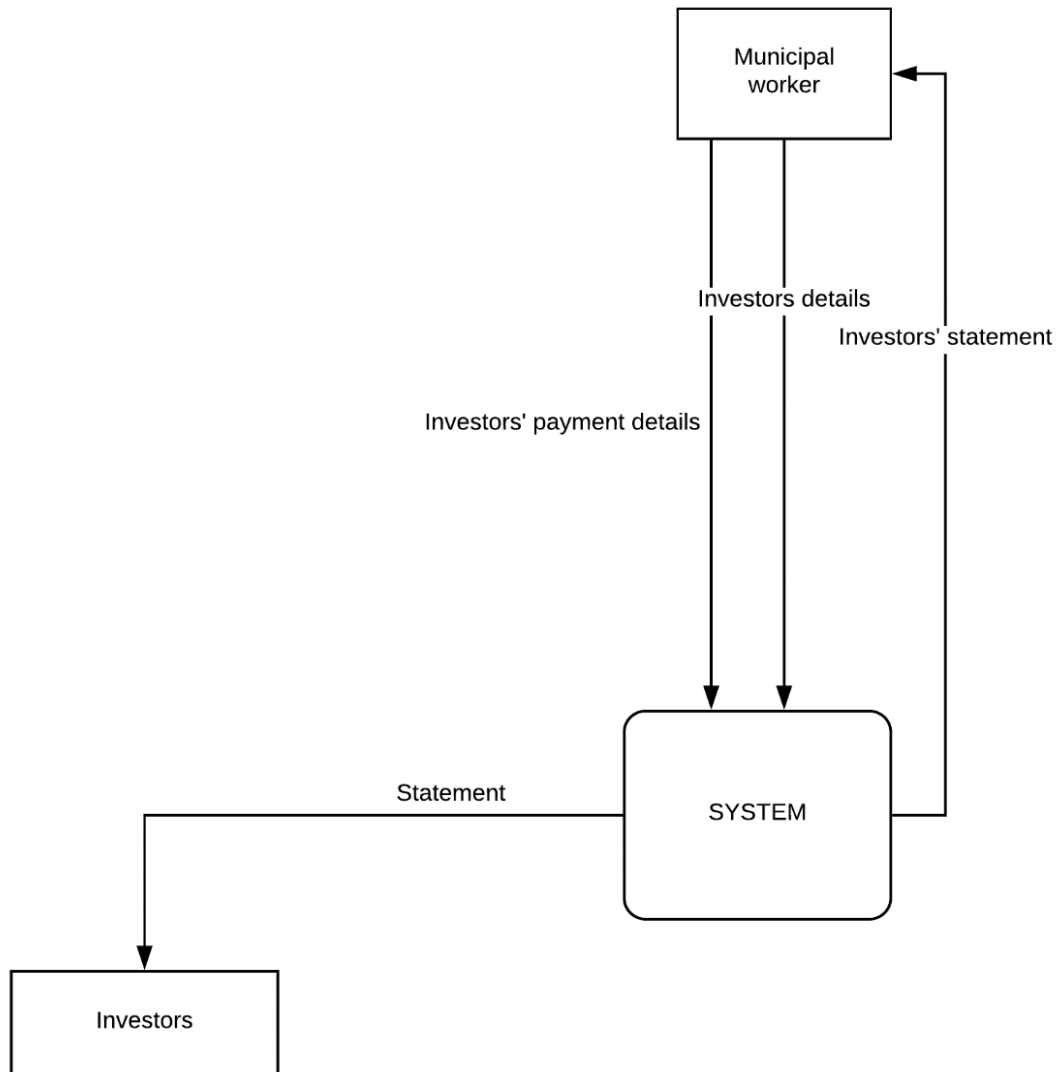
### **3.3.5 Output**

This is the result of the process and in the Plumtree Town Council Financial Account System these are: -

- Just after a stakeholder pays for any service to council, a stamped receipt is given to the customer as their record.
- The information is also kept on their system where deductions are made which record the payment made, highlighting the remaining balance owed by that client.
- In the case of enquiry, the stakeholder is given a signed financial statement after inquiry which gives a detailed account of the financial standing of the stakeholder (balance owed to council),
- The computer reports extracted from the manual files.



### 3.4 Process analysis



**Fig 3.1:** Context Diagram of current system

Key to figure 3.1



### 3.5 Data Analysis

Judd et al (1989) says “This is the process of inspecting, transforming and modelling data with the goal of discovering useful information and supporting decision making”. It involves the process of data requirement specification, data collection, data processing, data cleaning and data analysis. A technique of analysing data is by producing a data flow diagram which show how the data will be moving with the system as shown in the figure below:

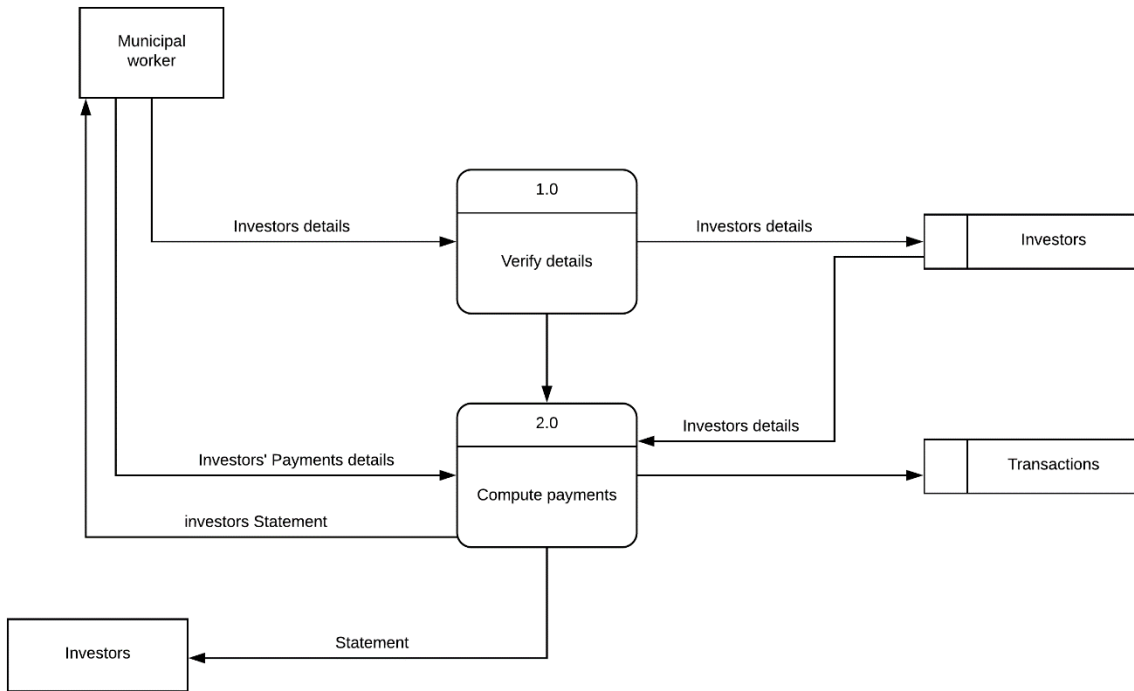
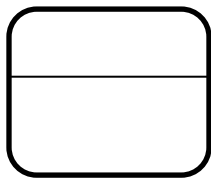


Figure 3.2: DFD of Current System

#### Key to figure 3.2



PROCESS



Entity



Data Store



Data Flow



### **3.6 Weaknesses of current system**

- It is labour and time intensive to process financial accounts list manually and to search the manual files,
- It requires clients to always visit the council offices for the payment of their bills,
- Stakeholders have to visit the council whenever they have quarries concerning their accounts or need a financial statement for their property,
- Its tiresome for the finance departments since they will have to focus on paying individuals and those with quarries, which is also time consuming.

### **3.7 Evaluate Alternatives (Refer to Feasibility Analysis)**

The alternatives for the system are either to improve the existing system or to outsource for the implementation of an already developed software program for creating a management system for the housing waiting list. We have to consider economic and operational feasibility for these alternatives.

There is pool of options from which the researcher can make choices so as to improve services expected from the current system as well as those presently provided for by this platform. The researcher can either outsource for such a system, improve the present system by introducing new properties to the systems which will override the weaknesses of the current system or develop a new system which will suit the needs of the council's internal and external stakeholders.

#### **3.7.1 Outsource**

In this respect the researcher would have to recommend for the purchase of an already developed system tailor made to costume the description and the need of the proposed system. For this alternative to be carried out the organization needs to purchase a package which costs \$3600 excluding training and implementation which is not economically feasible. Furthermore, we would incur costs of annual licences and support fees. This will force the organization to compromise other equally demanding priorities to be disturbed consequently resulting in great inconveniences.

## **Advantages**

- To outsource would have been less time consuming than to develop our own system.
- Technical staff would have had more time to concentrate on core duties especially the Systems Administrator,

## **Disadvantages**

- Outsourcing an external person would have been expensive and whenever the system needed upkeep the external worker had to be consulted.
- Changes are difficult to make as they involve the external consultant.

### **3.7.2 Improvement**

The current system could be improved by placing sub-offices in different parts of the town so that stakeholders could easily visit the nearest council sub-offices at their convenience which may actually reduce the distance to be travelled by the ratepayers. this would be expensive since there will need to either build or rent an office (s) for the accommodation o such a facility. There would be need to employ a number of people to main such offices which will incur more costs to the council. A customer service desk may be placed to accommodate complaints calls and attend to all their quarries such that daily departmental duties are not disturbed. This option may not be fully utilised by the rate payers since it would require them to have airtime om their cell phone accounts. This alternative might only work locally based stakeholders alienating a bunch of remotely located property owners. This will still bring about huge financial burdens on the local authority, therefore making it less preferable.

## **Advantages**

- It would convenient for local property owners to visit the nearest offices which might as well reduced the time they will spend on ques,
- It would have taken less time to improve on the existing system than to develop a new system altogether.

## **Disadvantages**

- It would be expensive for the local authority to rent or construct new sub-offices for the purpose of improving services since it would require them to buy new computers, printers, install Wi-Fi as well as employ skilled labour to manage this office,
- It would take more time to construct these sub-offices, as well as hire people to manage these facilities therefore consuming council funds,

### **3.7.3 Development**

An application for an online client enquiry platform can be developed by skilled council staff for Plumtree town council using programming languages such as PHP and Visual Basic. This system will be tailor made to match the description and needs of the proposed system which are present in the current system. Internal skilled personnel will work in the development of this system without incurring extra costs on the council. Since the council already has a server in place and good laptops and desktops required for this system to be a success, this becomes the most feasible alternative to stick to. The council already owns a functional website which in which new properties can be introduced to accommodate the needs of this system.

## **Advantages**

- All user needs would be likely met.
- Development costs would be reduced with the use of in-house technical skill at the normal pay rate,
- Expenses will be reduced since a number of resources needed are already available in the organization,
- Maintenance and future improvements would be easy to implement with ownership of source code.

## **Disadvantages**

- A lot of time would be spent in the development and implementation of the project.

- There might be a skills gap that would require the organization to consult experts who are expensive.

### **3.8 Requirements Analysis**

After analysing the current system, its weaknesses and a feasibility study of the proposed system we proceeded to examine the requirements of the Plumtree Town Council Online Enquiry and payment system in terms of the services it was supposed to provide to the users, that is its functional requirements. We needed to also examine the non-functional requirements of the proposed system.

#### **3.8.1 Functional Requirements**

These are properties required for the ease of access of the system and for the smooth functioning of the system as they will determine the effectiveness of the system. For the smooth running of this system, the following properties will be required:

- There would be need for logon security which will ensure that personal users log into their personal accounts only. This will make sure that the information is in no way mixed up such that when the client logs into his/her personal account they only view details on their account only.
- Power and Data backup system: there will be need for a powerup. This will ensure that when there are power cuts the systems remain on such that end user can continually access their accounts and pay their bills at conveniences. Data backups will be in place to make sure that data is not lost and updates are made timeously on into individual accounts. This will ensure that whenever a transaction is done by the rate payer an instant update is made directly into that user account. This will ensure that, arrears paid are constantly recorded into the system.
- Internet Access for end users: the system will be designed in such a way that the end users would need internet access to connect into their accounts for whatever purpose.

#### **3.8.2 Non-functional requirements**

- For security users should log on to the system with unique passwords for authentication.
- System backups must be done every day

- The network infrastructure should be fast up to 100mbps for efficiency and there should be backup WIFI connection in case anything goes wrong with the cabling system to minimize network downtime.
- There should be a standby alternative power source like a generator to avoid reverting back to the manual system in times of power outages.

### **3.9 Conclusion**

After an in-depth analysis of the current system and its shortcomings as well as the proposed system feasibility study and the turnover it could bring to the organization and its stakeholders, it was then possible to continue with the project. This then paved a way to the planning phase of the project.

# CHAPTER 4: DESIGN PHASE

## 4.1 Introduction

Bruegge and Dutoit (2002) says, the design stage gives a total review of how the new system will be created utilizing the prerequisites that are outlined in the examination phase. In order for users to familiarize themselves with the new system, interfaces were defined in detail as well as physical outline, database plan and program configuration

## 4.2 System design

According to Donald (2004), System design is the method of outlining the architecture, interface, elements and data for a system to fulfil stated needs. It can also be described as the use of systems philosophy to software development. The design of the system should meet what is required by the users. The system should meet certain characteristics for it to be accepted by users. The three characteristics of a good software product are operational, transition and revision. Some of the characteristics that the design should meet are:

- **Security** – since nowadays there is an increase in the threats that affects computer information, the design should provide enough security to protect organizational data and customer information from unauthorized attackers.
- **Correctness** – the design should meet all stakeholder specifications thus the organizational needs and customer needs.
- **Reliability** – the design should be perfect and it should be relied on by the organization thus the operation uptime should be favourable than its downtime.
- **Usability** – the design should provide ease of use to all system users.
- **Portability** – the design should be compatible to all operating systems Transferring the system from one computer to the other should be easy.
- **Maintainability** – a good product design should be easy to maintain.
- **Flexibility** – flexibility implies that the design should be easy to make and should be easy to change when there is need to do so.

### 4.2.1 Description of the proposed system

### 4.2.2 Context diagram

A context diagram demarcates the system from the environment it operates. The context diagram shows all the entities that interacts with the system. According to Kenneth and Kendall (2011) a context diagram is a diagram that shows the interaction between the system and its external entities. The context diagram of the system is shown on the diagram overleaf.

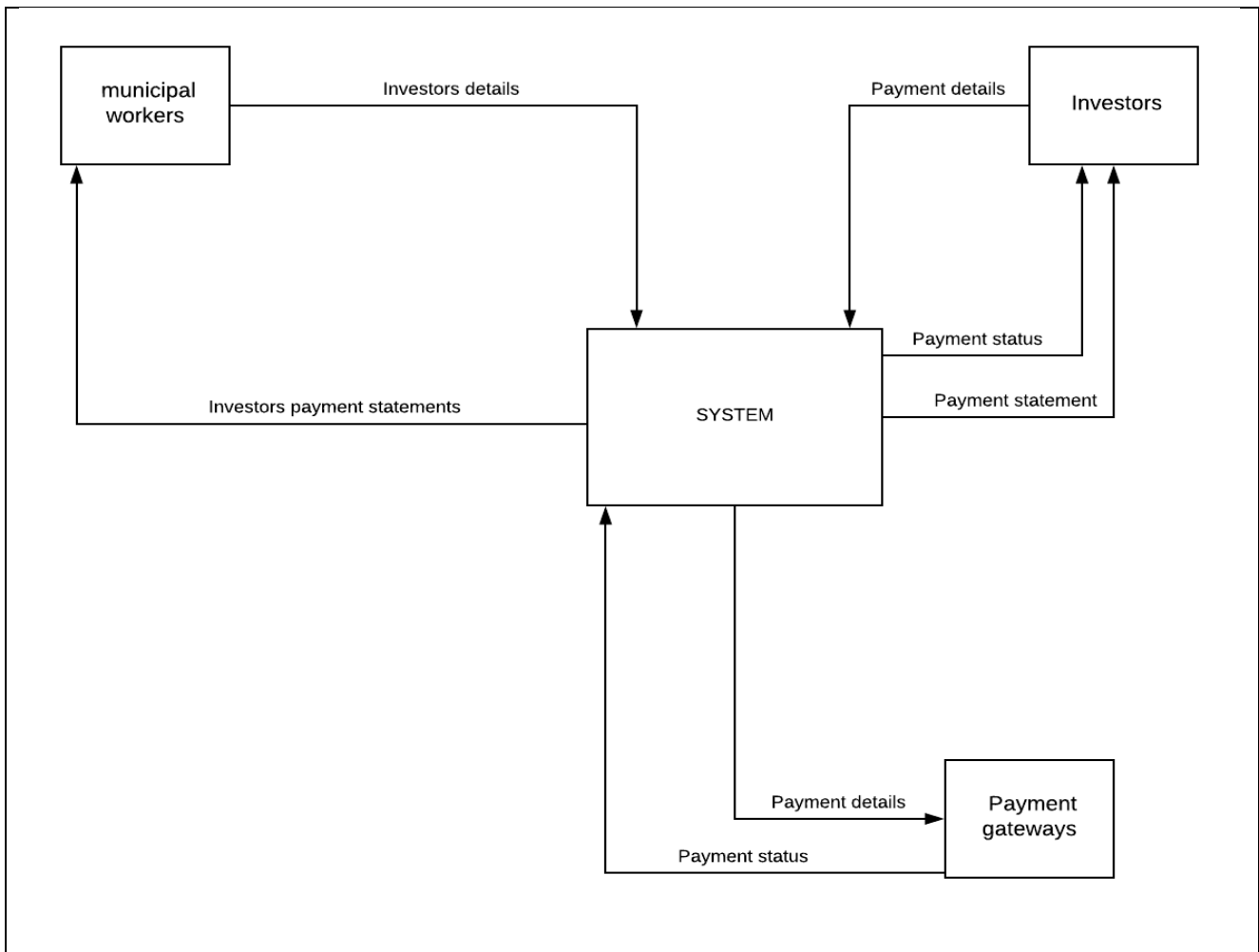
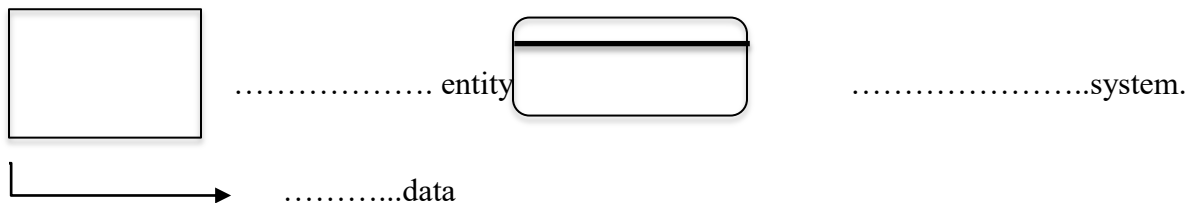


Figure 4. 1 *context diagram*

#### Key



### 4.2.3 Dataflow diagram

Dataflow diagram is a diagrammatical representation of the whole system showing all the processes that are available in the system. It is a more advanced diagram from the context diagram. A DFD was constructed so as to clearly show how the data flows in the system. The DFD of the proposed system is shown overleaf.

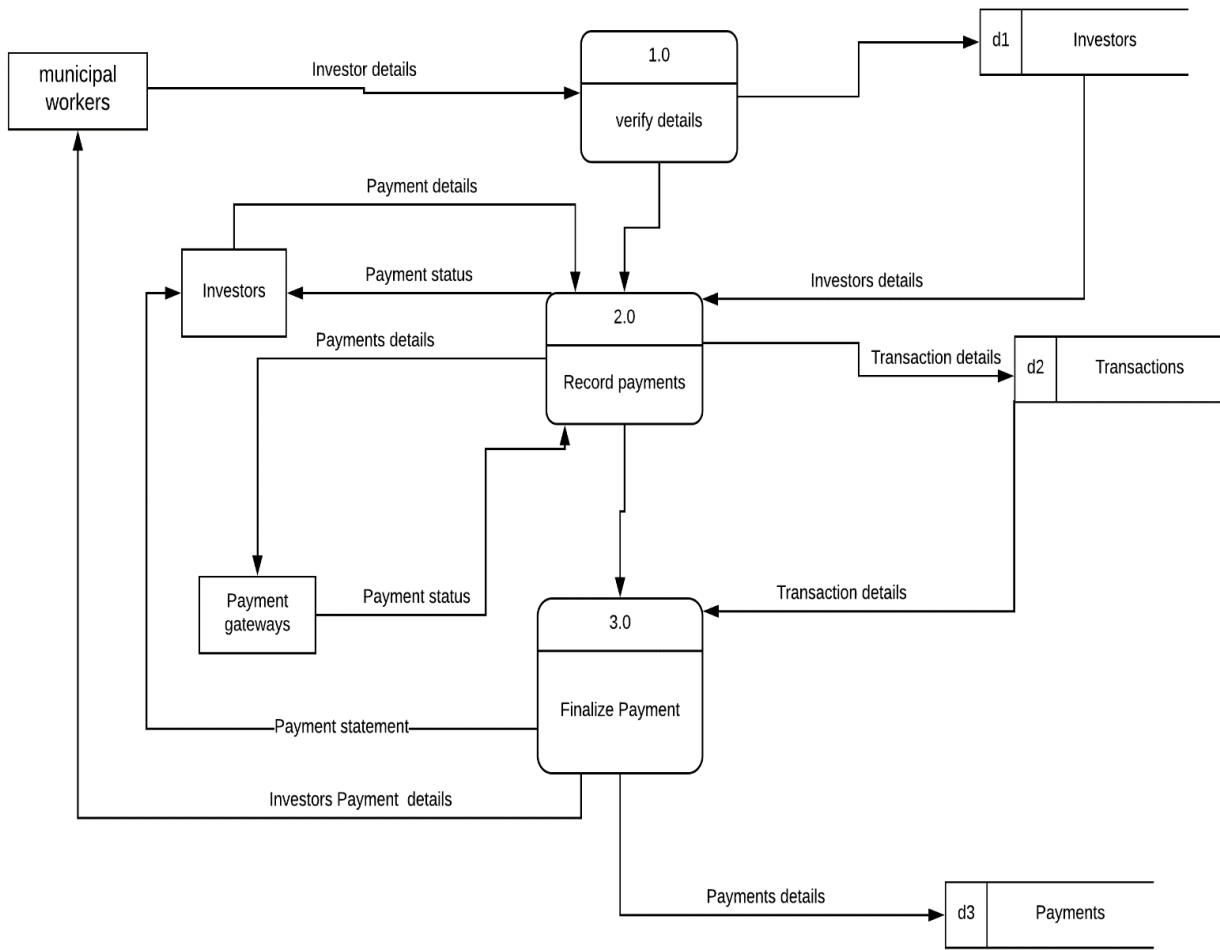


Figure 4. 3 Data Flow

#### Key



..... entity



.....process



.....data store

.....data flow



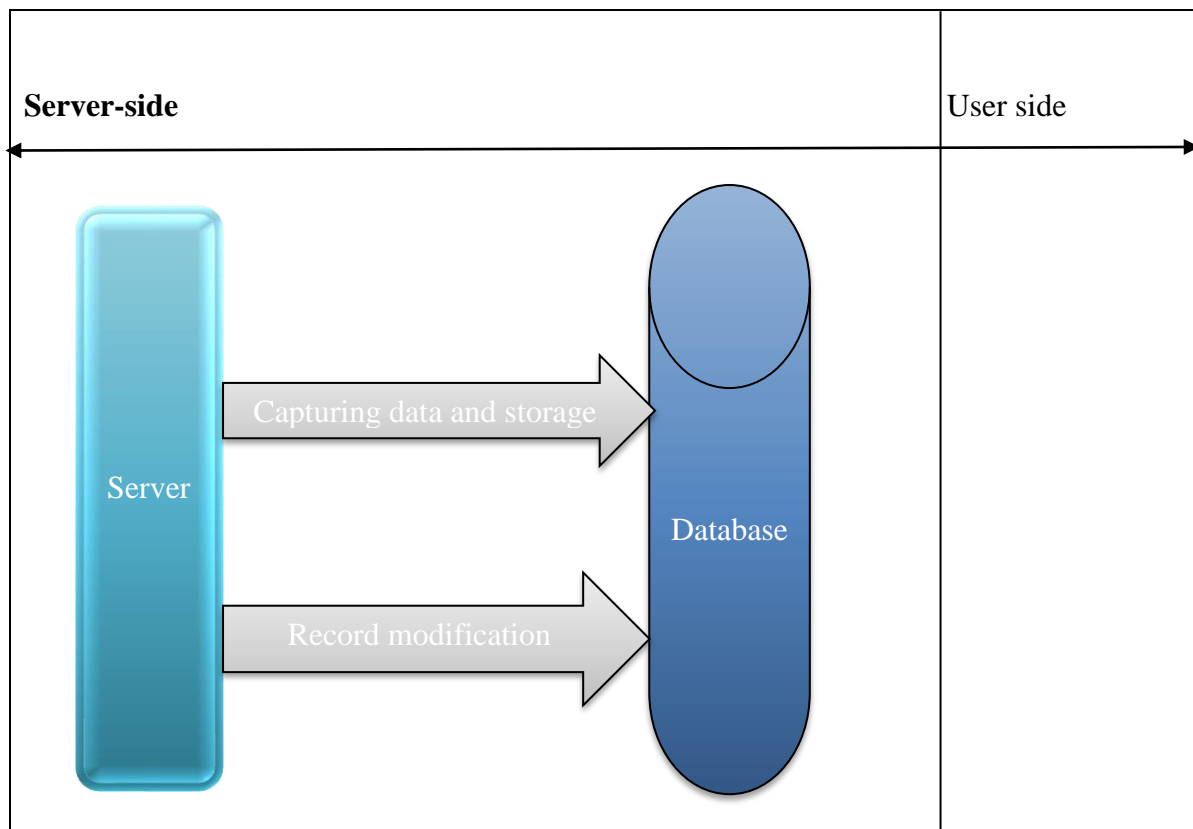
### 4.3 Architectural design

According to Kenneth and Kendell, (2011) the architectural design shows the interconnection between the hardware and the software to be used in the development process of the proposed system. It shows the grouping of features of the proposed system. The researcher designed the architecture of the system clearly showing how the components are connected to each other. The main objective of the architectural design was to reduce systems blockages which might be caused by the hardware and software.

#### 4.3.1 Client server approach

The developer used the server approach in developing the system. The server provides the platform for the interconnection between the organization and the customer in transferring the information. The client server is shown on the diagram overleaf.

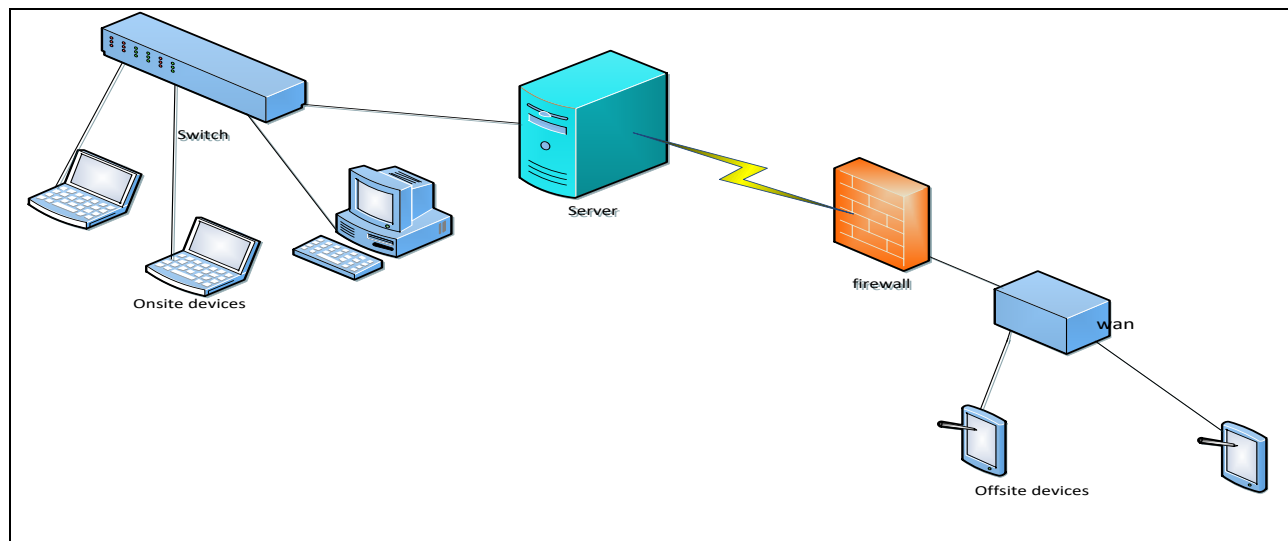
*Figure 4. 4 client server architecture*



#### 4.4 Physical design

According to Cornell and Crockett (2008) the physical design is a technique that is used to transform the analytical model into real model showing how components are arranged and how they communicate to each other. The researcher used the design to show the relationship between the hardware and the software of the system to be developed. The physical design of the proposed system is shown on the diagram overleaf.

Figure 4. 5 physical design



#### 4.5 Database design

According to Powell (2006) database base design is a method of creating a detailed data model that is understandable. A full implemented data model contains all the attributes and the entities of the system. The model contains all the required logical and physical design decisions and physical storage parameters expected to produce a plan in a data definition language which will be utilized to model the database. The outline of the database should be made in such a way that it should minimize data redundancy and the design should also support reliability and data integrity.

#### **4.5.1 Database architectural design**

According to Dennis and Roberta (2012) database design architecture refers to how information is to be maintained and stored in the database, Information in the database might be arranged in form of a database schema. The database schema will help the organization in interpretation of data that is stored in the database. The architectural database design describes how the users of the system are to access information in the database. The design will show who have the access to the database to avoid unauthorized access of organizational database. The developer of the system has used the ANSI SPARC model in designing the database architecture of the proposed system.

#### **4.5.2 ANSI SPARC Three Level Architecture**

According to Coronel, (2004) three level architecture by ANSI SPRAC is a database design architecture model consisting of three layers that are internal level, the external level and the conceptual level. The main objective of the model was to differentiate user views to the system. The internal level of the design should not be affected by any change that could have been made in the storage of the data. Changes made at any level on the model should not affect other levels. As illustrated on the structure, the gap between the external level and the external level showed that the users do not have to know how the data was to be stored in the database.

##### **The external level**

The external level of the three-level architecture shows the user views of the database. Each user will only have access to information that affects them.

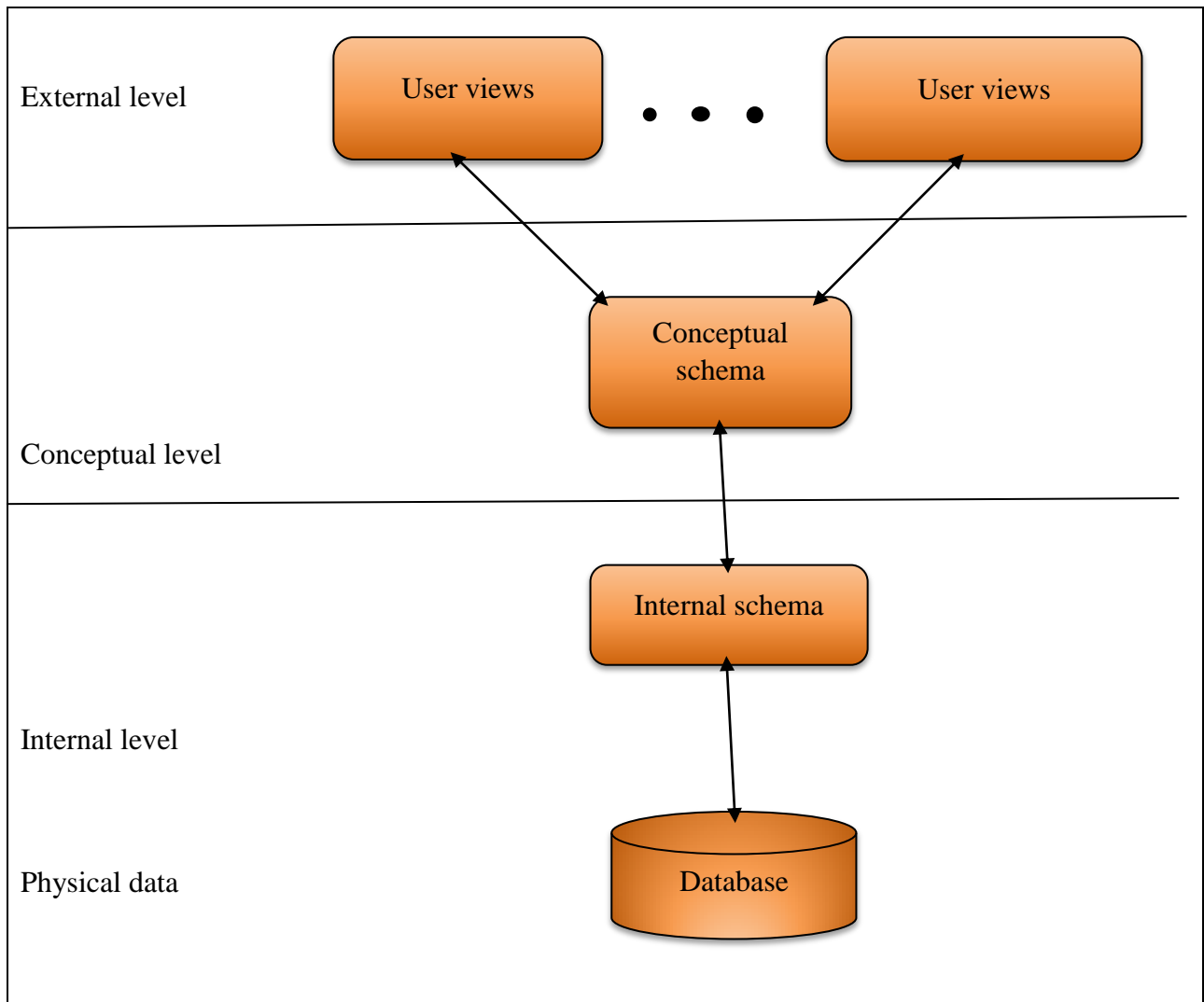
##### **The conceptual level**

The conceptual level shows the type of data that is to be stored in the database and the interrelationship of the data in the database. The level doesn't determine how the data is to be represented in the database.

##### **Internal level**

This is the level which shows how the data is stored in the database. The three-level architectural design is shown on the diagram overleaf.

Figure 4. 6 three level architecture



### 4.5.3 Data modelling

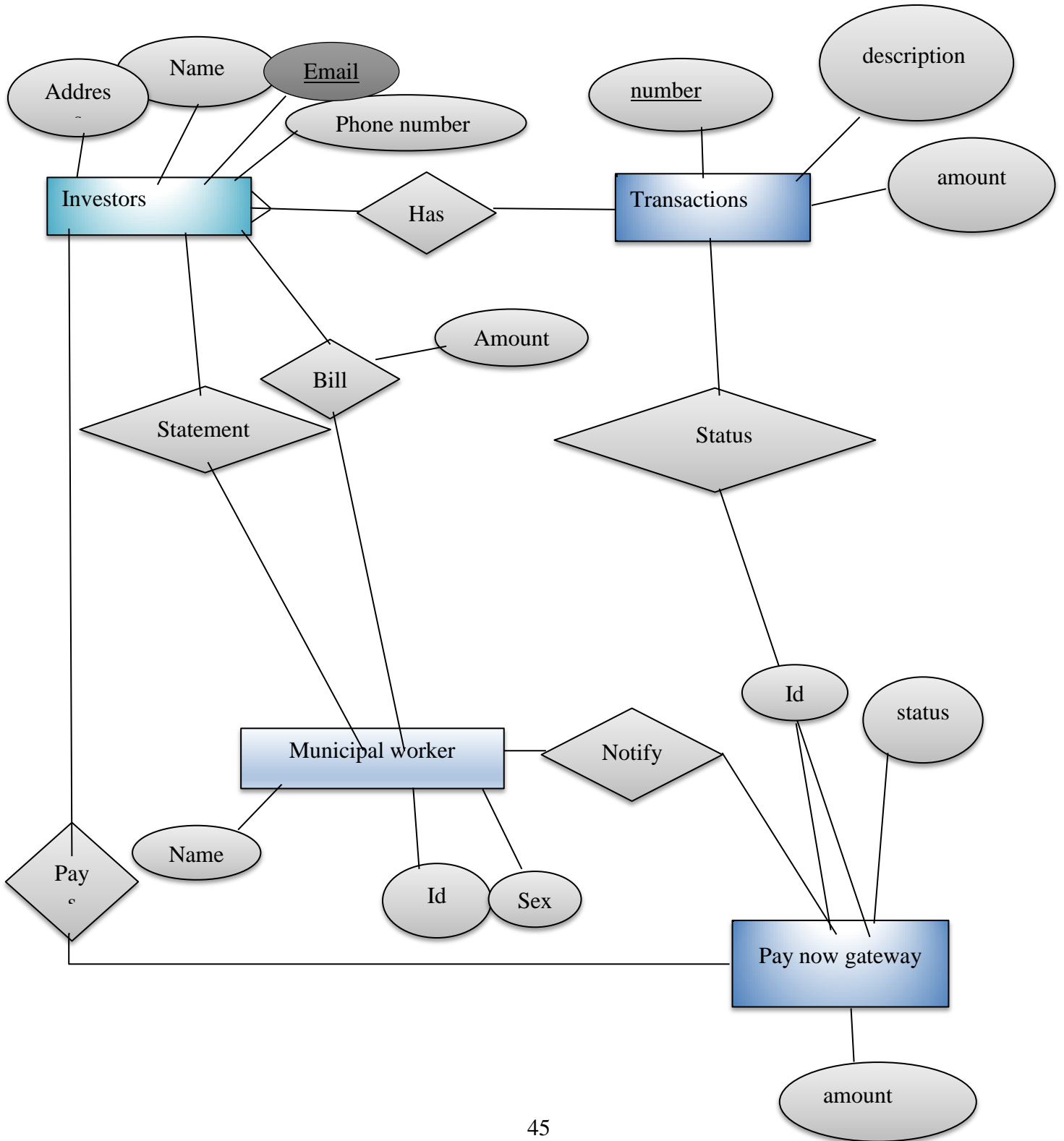
According to Powell (2006) data model is the initial phase in database plan. Data modelling includes a development from the theoretical model to logic model to the physical schema. The developer showed the data model using entity relationship diagram (ERD), and enhanced entity relationship diagram (EERD).

### 4.5.4 Entity relationship diagram

(Sommerville, 2004) an ERD is a diagrammatic presentation which shows how the entities are related to each other in the system. The developer constructed the ERD showing the relationship

of the entities and how they are related through cardinality mapping. The entity relationship diagram of the system is shown on the diagram overleaf.

Figure 4. 7 ER Diagram.



## Key



## Database tables

The database tables show how the data will be represented in the database.

*Table 4. 1* investors

Attributes	Data type	Value
full name	Varchar	Not Null
Phone	Varchar	Not Null
Email	Varchar	Not Null
Address	Varchar	Not Null
Phone number	varchar	not null

Table 4. 2 transactions

Attributes	Data type	Value
Id	int	Not null
Reference number	varchar	Not null
Amount	decimal	Not null
Transaction status	varchar	Not null

Table 4. 3 notifications

Attributes	Data type	Value
Id	Varchar	Not null
Notification code	Varchar	Not null
Directed_to_phonenumber	Varchar	Not null
status	Varchar	Not null
Description	Varchar	Not null

Table 4. 4 users

Attributes	Data type	Value
Id	Varchar	Not null

Name	Varchar	Not null
Email address	Varchar	Not null
Password	Varchar	Not null

#### **4.6 Program design**

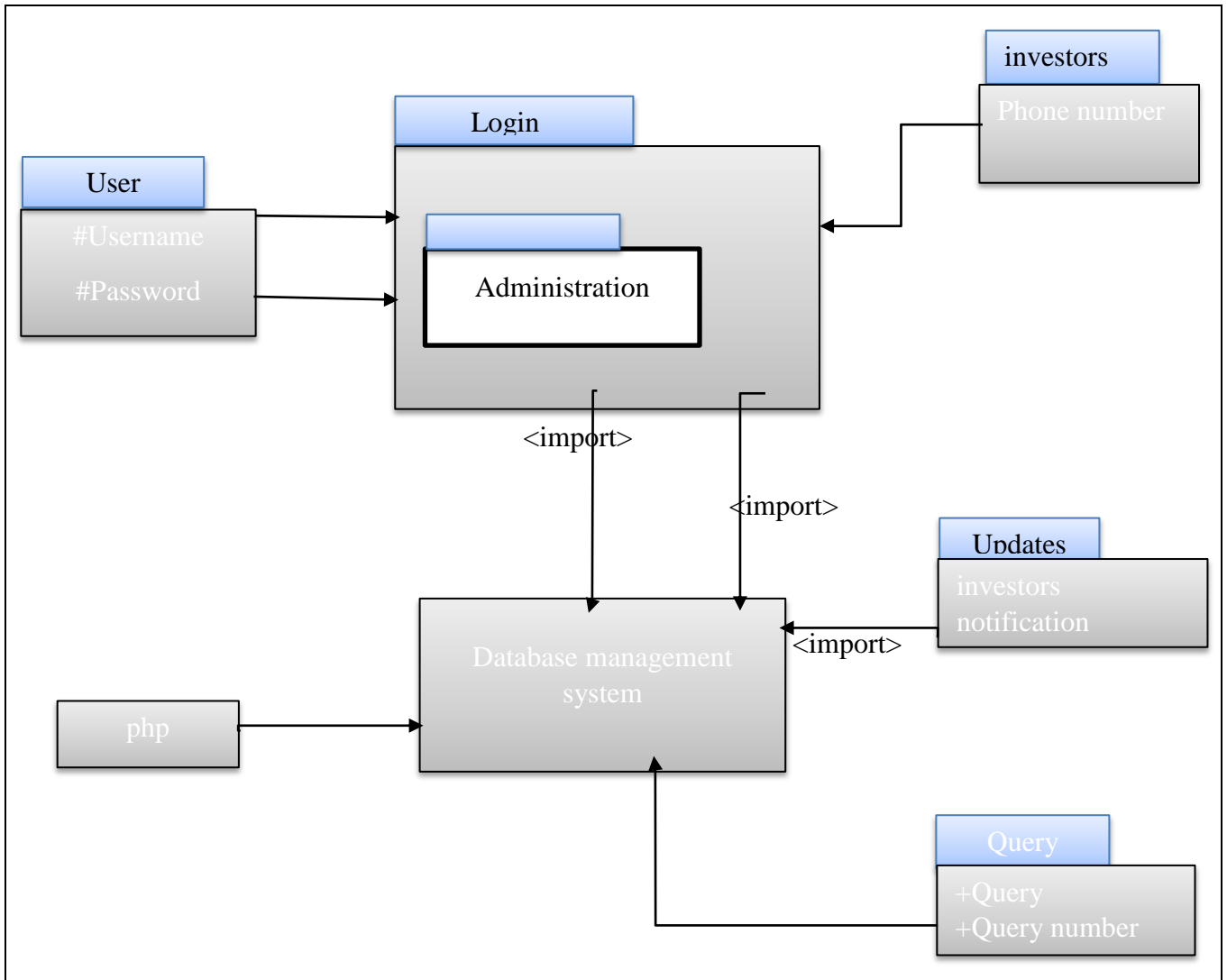
According to McConnell (2004) program design is a structural model that coordinate all the entities that are involved in the system so as to make sure that the system designed is working in accordance with their needs when configuration of the system is done. The program design of the system was illustrated by the package diagram.

##### **4.6.1 Package diagram**

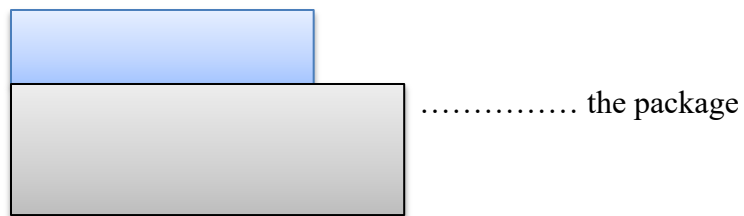
In the Unified Modelling Language (UML) a package diagram is a diagrammatic illustration which explains the conditions of the packages making a model, according to Rouse (2005). Package diagram demonstrates how the elements are organized and arranged in the large-scale project. The package diagram was used to show the high-level view of the system and also on tracking dependency. The package diagram is shown on the diagram overleaf.

*Figure 4. 8 Package diagram*





**Key**



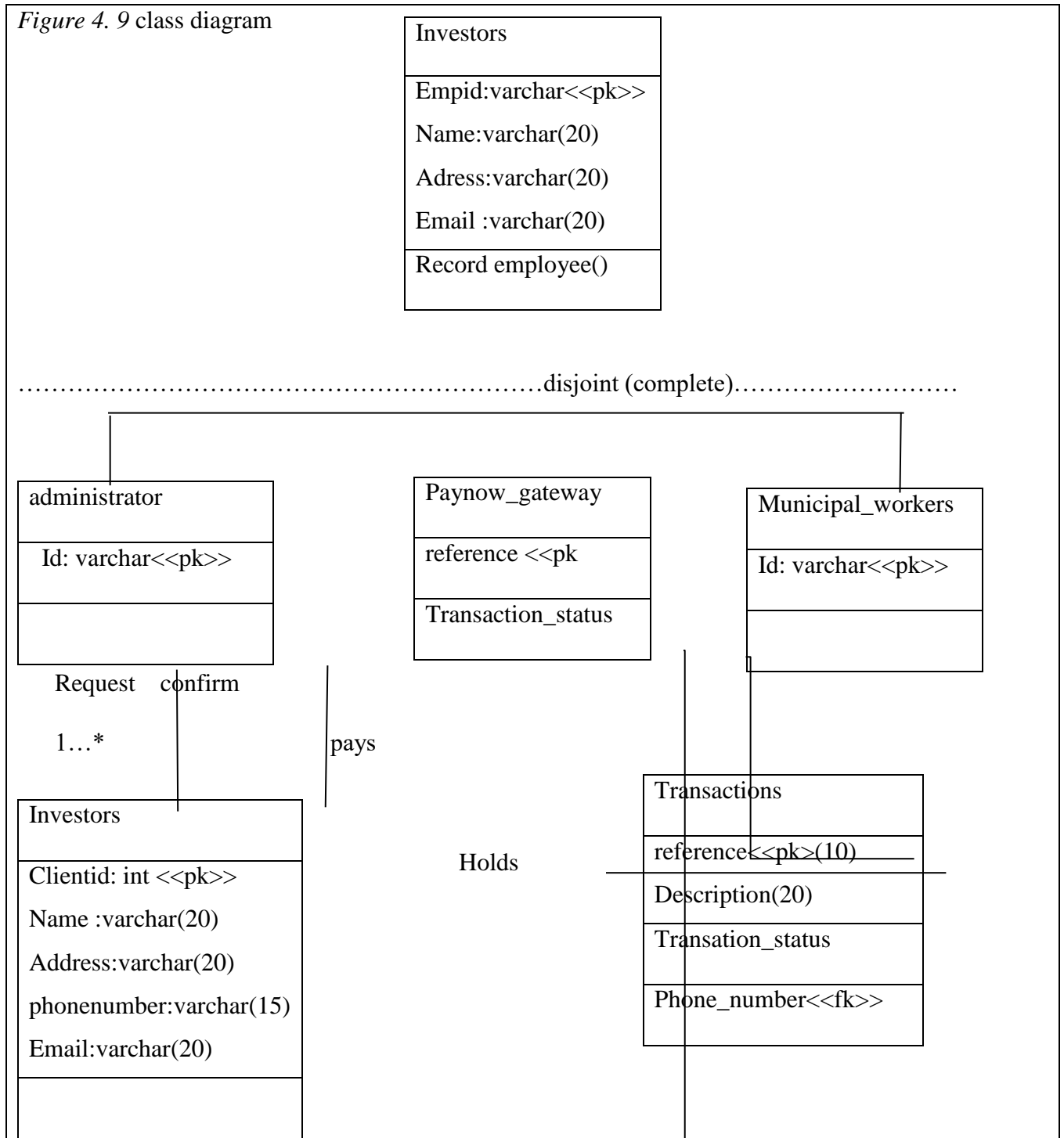
<Import> .....dependency

**4.6.3 Class diagram**

According to Bently and Whitten (2007) a class diagram is one of the models found in the unified modelling language. Class diagrams are defined as static structure graphs that portrays

the structure of a system by demonstrating the system classes, traits, techniques and the connections amongst the objects. The class diagram is shown on the diagram overleaf.

Figure 4. 9 class diagram



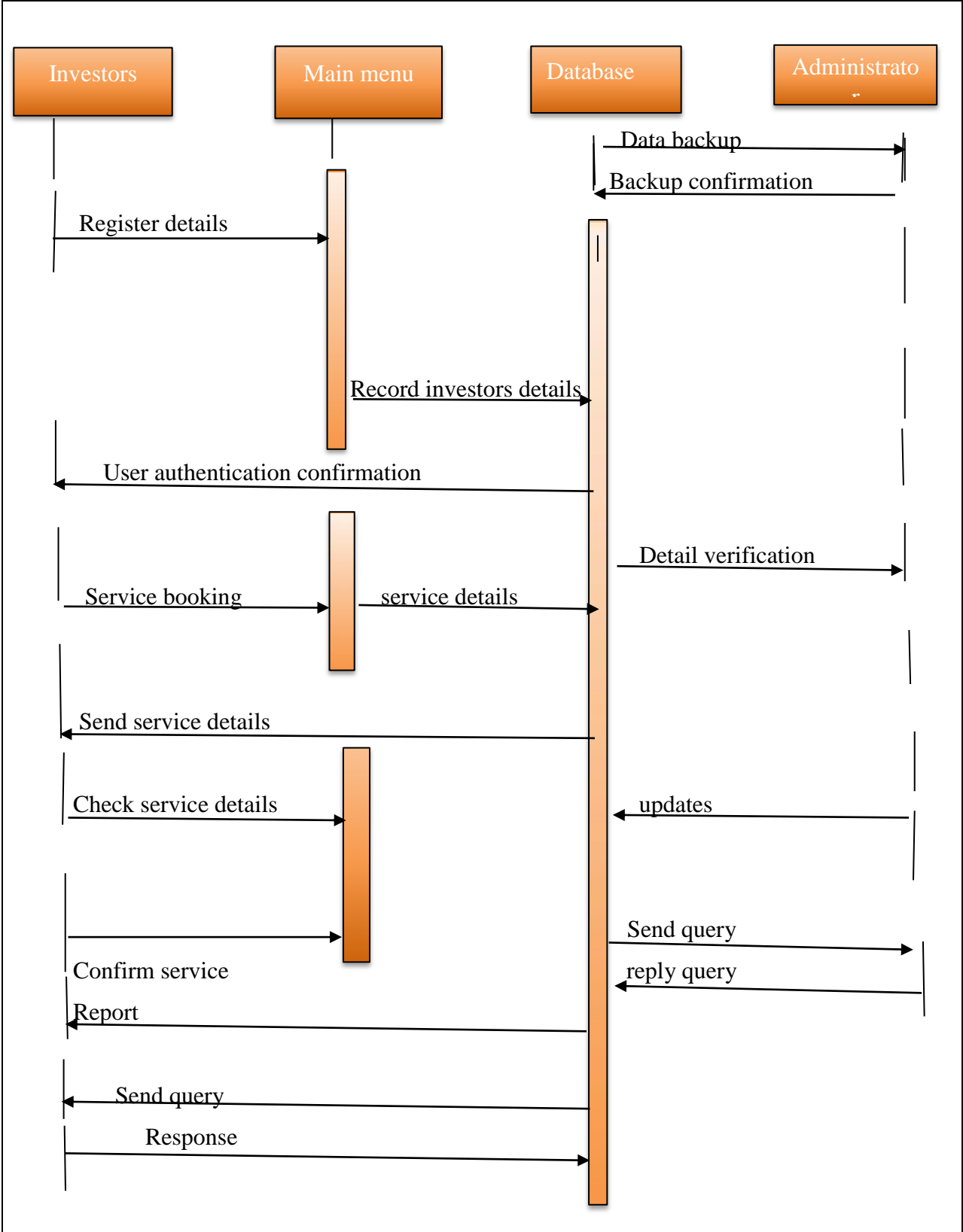
## Key

Class
Attributes
Operation

### 4.6.4 Sequence diagram

According to Thompson (2003) sequence diagram is a graphical representation that shows how objects work with each other and it also shows the order of operations of the objects. It is a build of a message sequence. The diagram shows the interactions between the objects in their time sequence arrangement. The sequence diagram of the system is shown on the diagram overleaf.

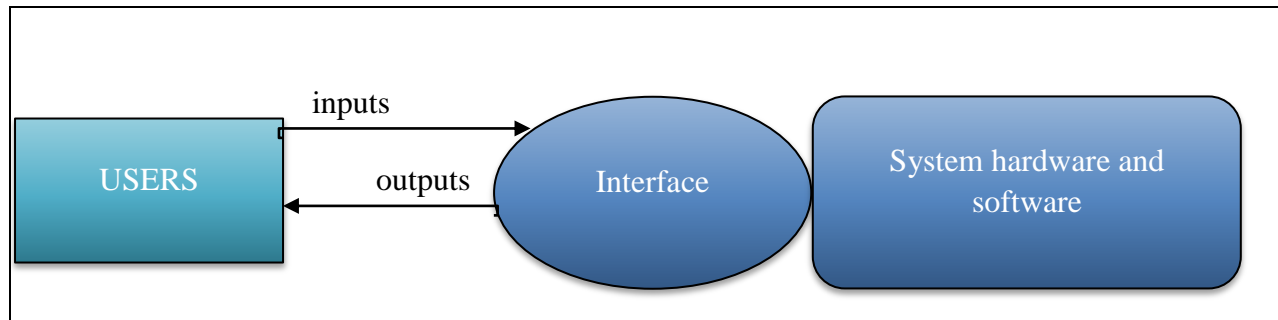
*Figure 4. 10* Sequence Diagram



## 4.7 Interface design

The interface design provides the platform that will be used by users when using the system, Pressmen (2001). The design of the system was done such that it will be easy for every user of the system to use the system. The design of the system should be attractive to the customers and should be friendly.

*Figure 4. 11 interface design*



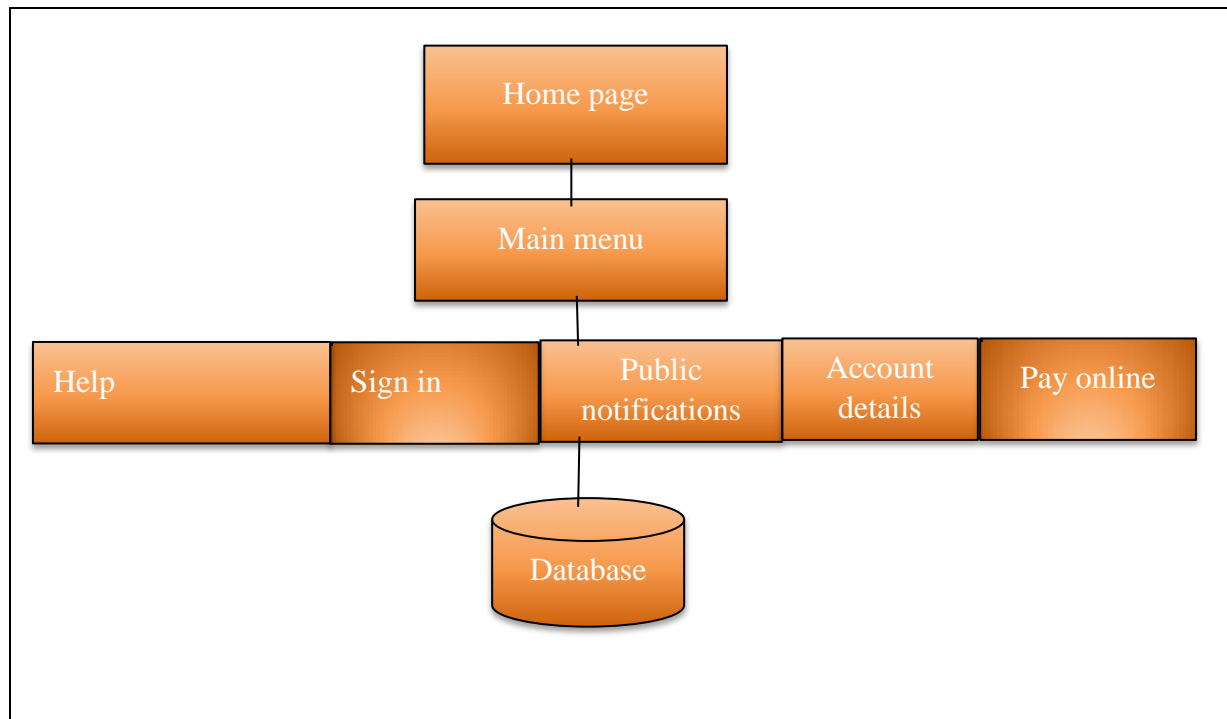
### 4.7.1 Menu design

Menu design is defined as set of options that will be available on the system that will be used by deferent users. The design helped the system users to navigate into the system in retrieving the information that they are authorized to use by the system.

#### 4.7.1.1 Main Menu

A menu design can be defined as the full home page of the system as a whole. A well-designed menu is the one which communicates easily with the users and provide assistance to users when need arises. The menu design of the application allowed the clients to log in to the system on their mobile phones and request for service of their vehicles. The menu design will allow users of the system to log into the system using their email address and passwords.

Figure 4. 12 Sub menus

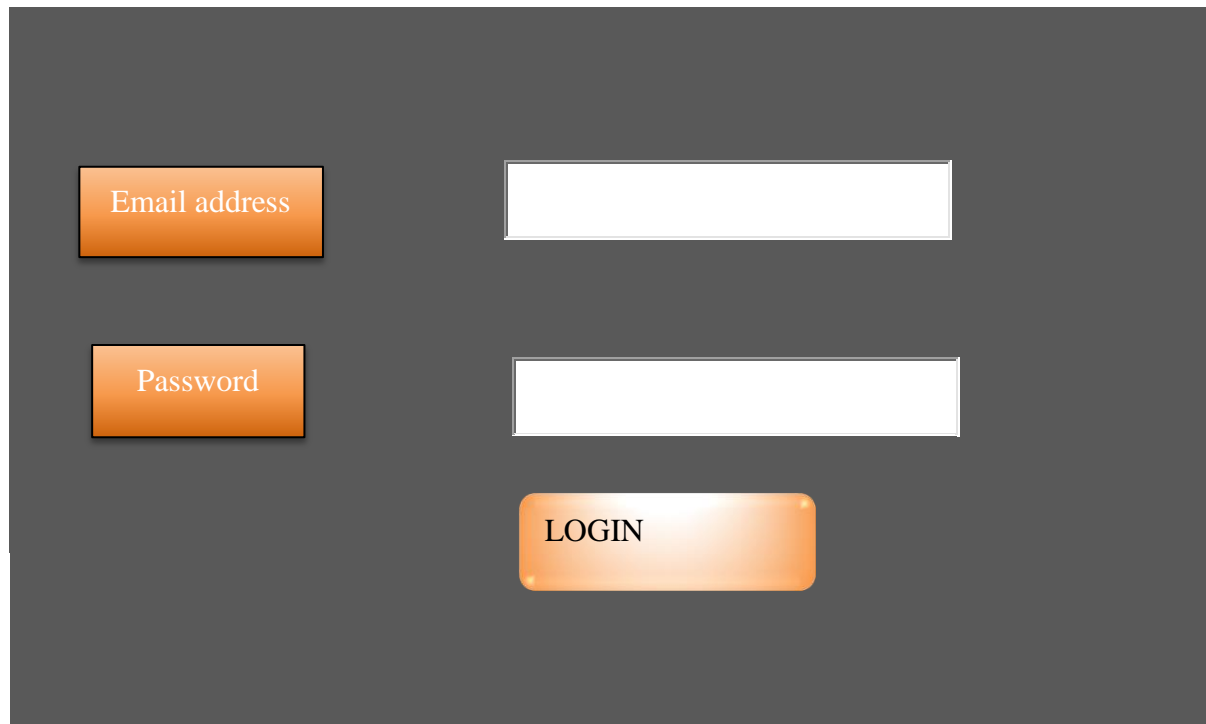


These are menus that are found within the main menu. The submenus of the system include the log in menu for the new user and the administration work portal.

#### 4.7.2 Input design

According to Brown (2008) input design is the platform whereby users of the system will input their login details that is user name and password to access the system. To log in to the system, the client first creates account and login to the system using their email address and passwords.

Figure 4. 13 Log



The image shows a login form on a dark gray background. It consists of two rows of input fields. The first row has an orange button labeled 'Email address' on the left and a white rectangular input field on the right. The second row has an orange button labeled 'Password' on the left and another white rectangular input field on the right. Below these two rows is a single orange button with rounded corners labeled 'LOGIN'.

Users will login to the system using their email addresses and passwords.

#### **4.7.2.1 User registration form**

This is the first form that the user fills in so as to register to the system. Registration details of the clients are kept in the database. Upon registering to the system, the user will be allowed access to the system only if he/she inputted the correct details in the input design explained above. Clients will register to the system by inputting the form overleaf.



Figure 4. 14 register

A registration form with a dark grey background. It contains five input fields with white borders and labels to their left: 'Customer full name', 'Email address', 'Phone number', 'Home address', and 'password'. Below the fields is an orange 'Submit' button with white text.

When a customer fills in all the above details, the details will be capture in the database and the customer will be able to login to the system using the email address and password created. The customer is supposed to fill in all the fields otherwise registration will be unsuccessful.

#### 4.7.3 Output design

The output design shows all the stored information from the registration details and the login details. The results will be stored in the system as reports and will be referred to by the organization when need arises.

Table 4. 5 Output for investors records

No#	Name	Email address	Phone
1	Themba Moyo	Themba.moyo@gmail.com	0772613909
2	Godknows shumba	godknowsshumba@yahoo.com	0782631555
3	Tatenda Chinyanga	tatenda@gmail.com	0782631556

## **4.8 Pseudo code**

According to Rouse and Smith (2005), a pseudo code is an English like code which is used so as to understand the logic of how the system should be used. The pseudo code was used so as to make it easy for the developer when programming the system. A pseudo code is a true representation of the system logic.

### **Creating account**

**If** all details are inserted in the fields

Accept details

Else if some fields are blank

Notify the customer to fill in all details

### **Login**

Enter username and password

If username and password are correct

Accept details and allow access

Else if username and password are incorrect

Notify user and deny access

Else if any text area is blank

Notify user to fill in all details

Deny access

### **Form validation**

If username or password = false

Alert user and deny access

Else if fields are blank

Notify user to fill in blank spaces

## **4.9 Security design**

According to Godfrey (1999) data security is very important aspect to take into consideration in an organization to keep the information safe and secure from third parties that would want unauthorized access of organizational information. Security design will be used to secure organizational information.

### **4.9.1 Physical security**

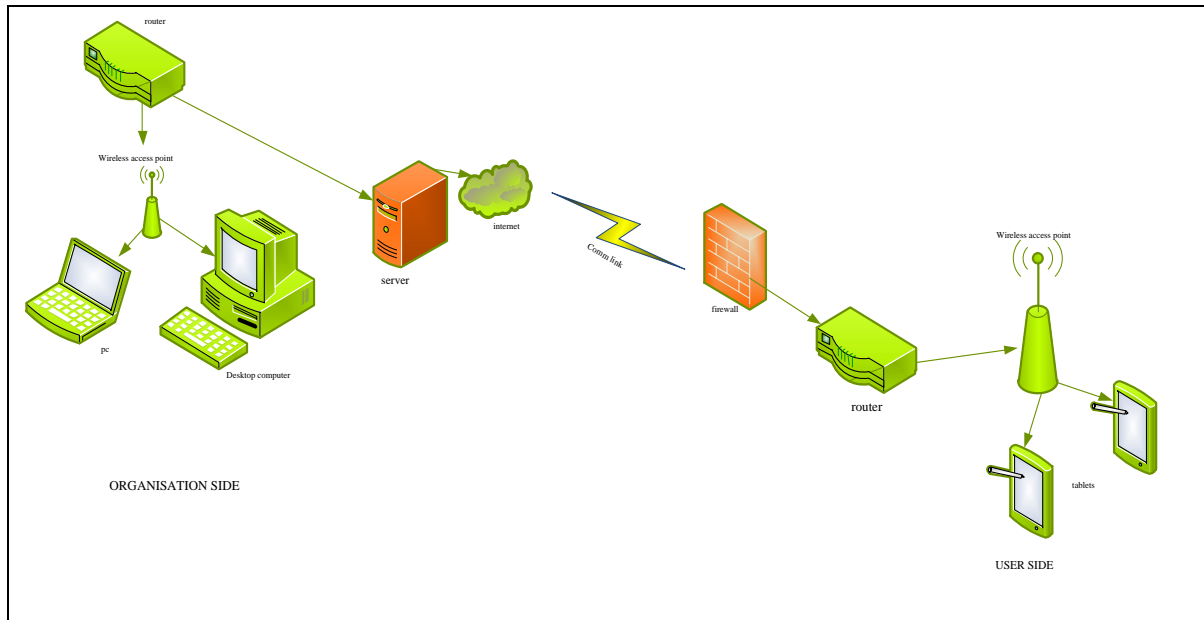
Physical security protects hardware, software and networks information from physical activities and occasions that could lead to data lose. Physical security aimed to protect the organization from unforeseen events or natural disasters. This includes flooding, theft, fire, natural disasters, property damage and fire.

To protect data from being lost due to natural disasters, the organization made use of disaster recovery plans. The organization used the disaster recovery plans to protect the server room from being attacked by fire.

### **4.9.2 Network security**

This is the security measure which is inserted to protect data integrity and usability of the information and network in the organization. Network Security is the method of taking physical and preventive measures of the software to have protection to the infrastructure of the network from being accessed by unauthorized users. The framework of network security is set to protect information from information misuse, abuse, alteration, destruction. The network security diagram is shown on the diagram overleaf.

*Figure 4. 15 network security*

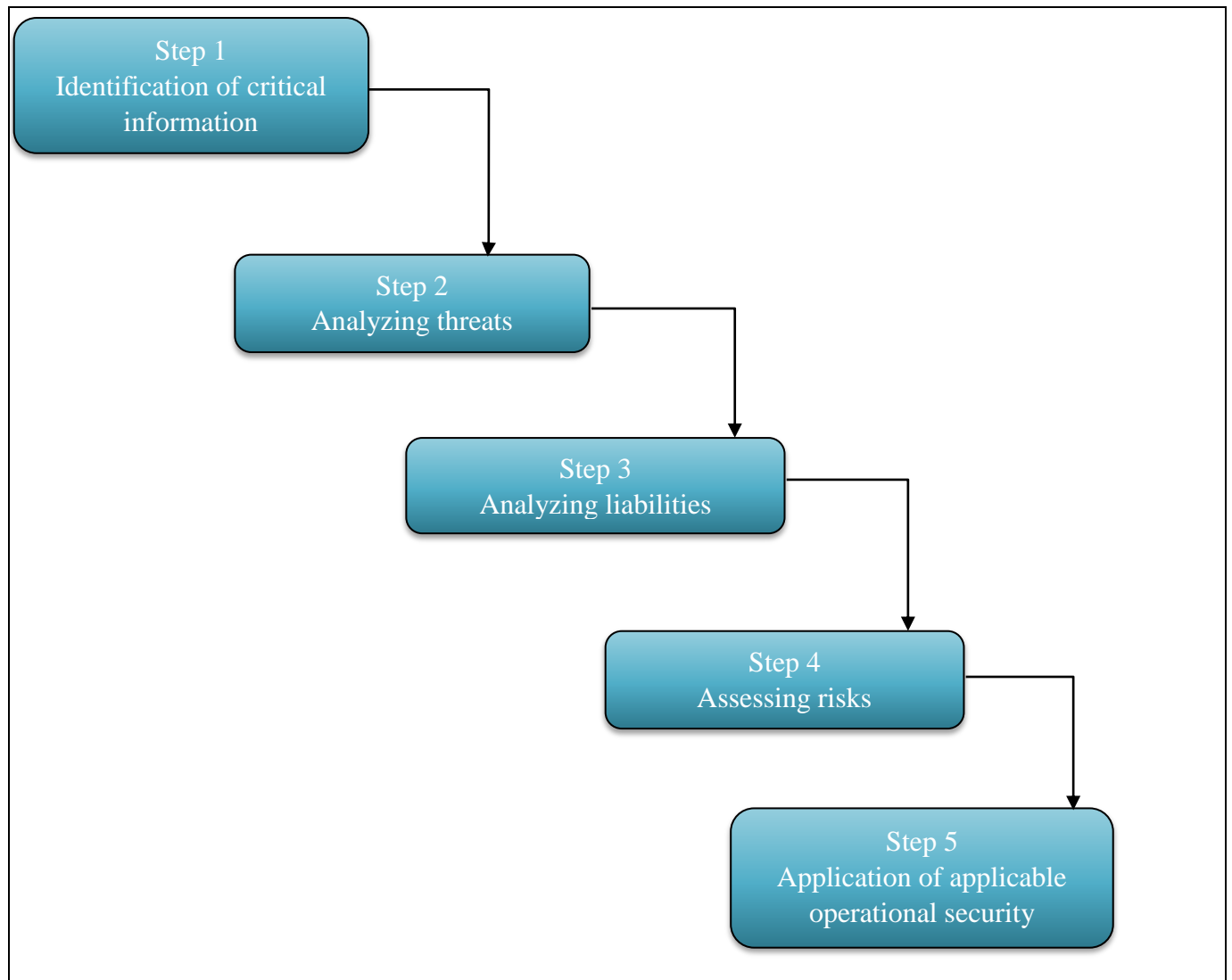


### 4.9.3 Operational security

Operational security is the security measure which is used in identifying and protecting organizational data from the competitors and unauthorized information seekers.

Operational security secures the system from being attacked by different types of viruses and malwares. To prevent the system to be affected the organization used ESSET nod32 antivirus software. Also, the system will be using encryption method on passwords to avoid the system from being hacked. The organization made use of policies for example disaster recovery policy, password policy, acceptable use policy. Operational security was shown on the diagram overleaf.

Figure 4. 16 operational security



#### 4.10 Conclusion

Having designed the system to meet user requirements we can now move on to the next phase which is implementation.

# CHAPTER 5: IMPLEMENTATION PHASE

## 5.1 Introduction

This chapter explains how the system was designed and how the plan was executed. In this case coding is presented. The whole system was coded and pretested to ensure there are no loop holes and weaknesses in the system. The properties of the whole system are presented in this chapter.

## 5.2 Coding

### 5.2.1 Pseudo Code

Goel (2010) describe pseudo code as a formal and structured way of writing and explaining algorithms that will be used in the system in a much simpler way that makes it easy for none technical people to understand. The pseudo code will be simplified and it usually does not contain declarations and initialization of variables. Below is a pseudo code for user registration.

#### **User registration**

Connect to the database

After successful connection then

Check if the user exists

If it exists then give a notification to the user

If it does not exist then create it

Then login the user and redirect to the home page

#### **System login**

Connect to the database

If connection is established

Then

Check if the username and password entered by the user are correct

If they are correct

Then

Redirect to home page

If they are wrong

Then

Give user an error message and remain at the login page

### **Online payment**

Connect to the database

If connection is successful

Then

Prompt the user to enter the amount being paid

Check if the amount is a valid positive number greater than 1

If amount is correct

Then

Redirect the user to Pay now website to process payment

Check for the HTTP response from Pay now

If response is paid

Then

Credit the user account with the amount paid

Send notification to the user on the notification tab

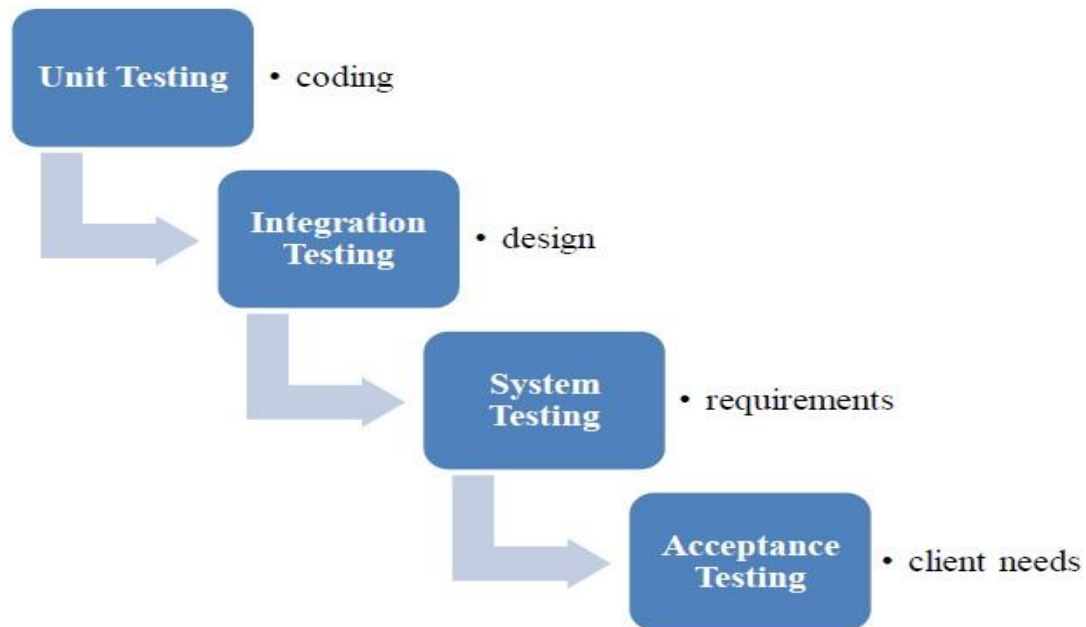
Else if response is cancelled

Send notification to the user on the notification tab

## 5.3 TESTING

### System testing stages

Figure 5. 1 Stages in System Testing (from Rani, 2004)



#### KEY



Flow of data or information

### 5.3.1 Unit Testing

Williams (2006) referred to it as a process whereby system units will be tried to evaluate their capabilities to execute various processes that they are supposed to carryout. The units that will be tested in this section are supposed to be as small as possible and they are supposed to have a single input and output. The researcher is going to carryout system testing in two phases namely white box and black box testing.

#### 5.3.1.1 Black Box Testing



Williams (2006) describes black box testing as a type of tests that is carried out by external entity or entities who does not possess any knowledge or idea of the design and or implementation details of the proposed system. This test is also referred to as functionality testing. For the proposed system the external service provider was given details and allowed to apply for a service. Below is a diagram that shows the test;

*Figure 5. 2 Black Box Test*



#### **5.3.1.1.1 Advantages of Using Black Box Testing**

- It suits for large projects with several lines of code
- There is no need for having access to the code
- It gives the developers room to understand the user's views towards the system
- The system can be tested by people without knowledge of programming

#### **5.3.1.1.2 Disadvantages of Using Black Box Testing**

- There is generalization since there is no testing of specific codes
- The test will be limited since the user won't be having any software knowledge.

### **5.3.1.2 White Box Testing**

Williams (2006) describes white box testing as a process of examining the system basing on its interior logic as well as the structure of the code. The tests will be carried out basing on the structure of the available code. The researcher carried out these tests so as to identify errors and correct them before deployment. These tests were done by developers as this type of test requires people who understand code better.

#### **5.3.1.2.1 Advantages of Using White Box Testing**

- It assists in code enhancing processes.
- It assists in discovery and removal of lines that brings defects
- Since it is carried out by examiners with a better understanding of code most errors will be noted and corrected.

#### **5.3.1.2.2 Disadvantages of White Box Testing**

- It increases costs since there is need for a skilled programmer to test the system
- It is too demanding since there a lot of tools needed

### **5.3.2 Module Testing**

Myers (2004) describes module testing as this is a testing process that involve examination of systems' individual modules and also its procedures and subroutines. This process also involves several modules being examined at the same time. In the process the login was tested and also the service providers rating was also tested as an independent module of the system, and the results showed that all were working finely. The researcher also moved on to test the reporting module before the system was combined and tested as a whole.

### **5.3.3 Acceptance Testing**

Powers (2012) referred to acceptance testing as a process of finding out if the system satisfy the users and meet their requirements and expectations as they are highlighted in the data gathering section of this research. To examine if the system meets the users' requirements the researcher logged into the system and check for functionality as highlighted in the data gathering section. The researcher also made the system available

to some of the users like the IT representative and some selected external service providers and they tested. Acceptance testing was also carried out to check the reliability and security aspects of the system as well as its ease of use. Acceptance testing comprise of beta and alpha testing.

#### **5.3.4.1 Alpha Testing**

Powers (2012) describes alpha testing as a type of testing that involves users' tests of the system. The system will be given to various stakeholders so that they can test and report any bug if found such that the developers can correct it. The proposed system was presented to management and other selected internal and external users for examination and problems that were noted where corrected.

#### **5.3.4.2 Beta Testing**

Powers (2012) describes to beta testing as a type of test that is made by the administrators and developers of the system. The system was examined using data that was given by external service providers who were selected to test the system and the process was continuously repeated and errors that were noted where corrected.

#### **5.3.4.2 Tests Strategies**

Various strategies were implemented in verification and validation of the system. In the process the researcher managed to identify some errors and they were successfully corrected. Some of the techniques that were used in the process are shown below.

#### **5.3.4.3 Validation**

Grady (1997) referred to validation as a process of proving if the correct system had been built. For the proposed system the author had to examine if the built system was the correct system. In the process the author checked various components of the system to see if they were designed according to the users' requirements and specifications. Some of the tests that were made involve entering texts in fields that are meant for numbers only and the system is supposed to show error messages.

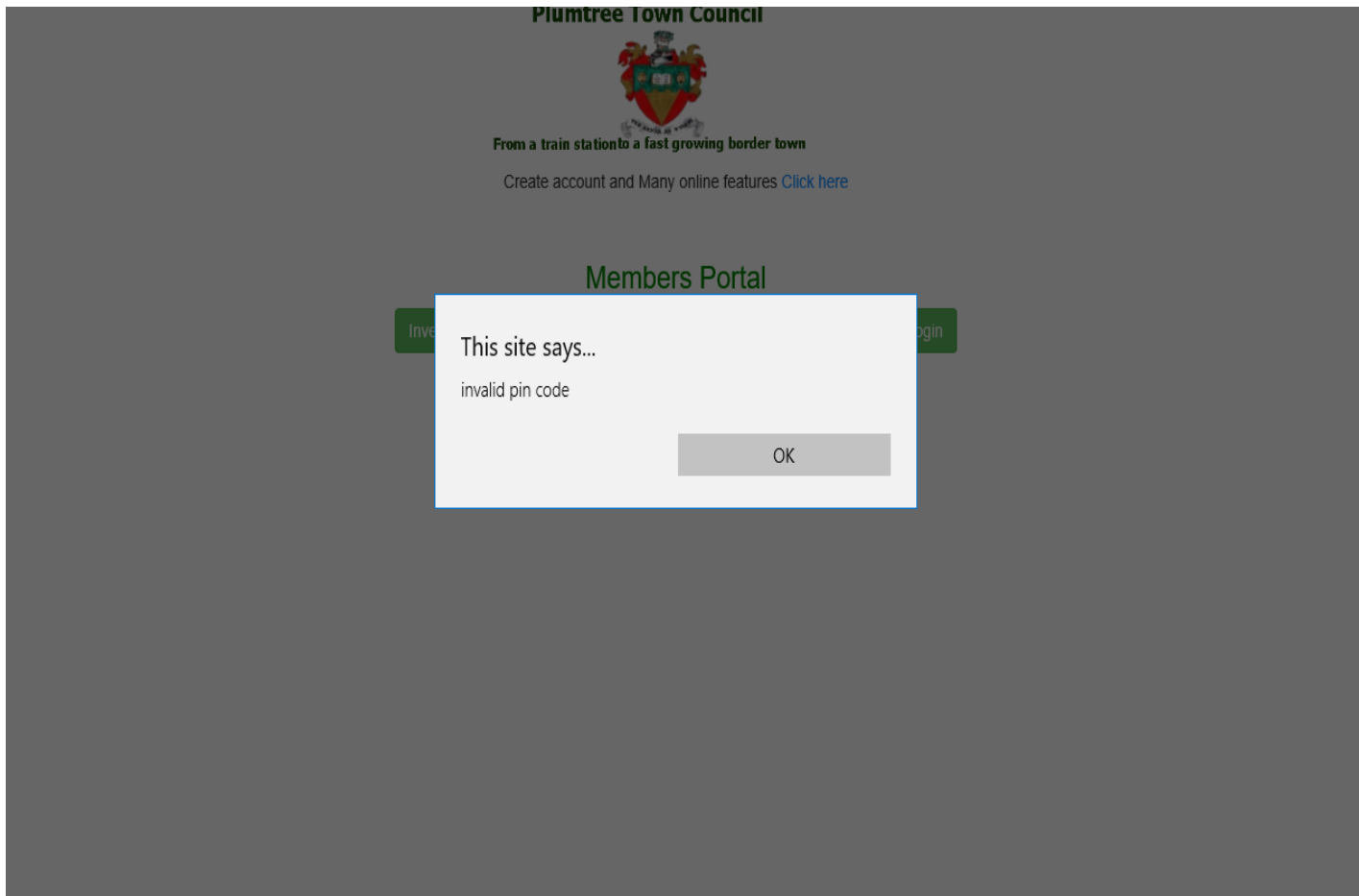
#### **5.3.5.1.1 Login Validation**

In order to access the system, the users are required to enter correct usernames and passwords, otherwise an error message will be displayed. If the credentials entered by

the users are correct then the user will be redirected to his or her view basing on his or her access level.

### **Login failed error display**

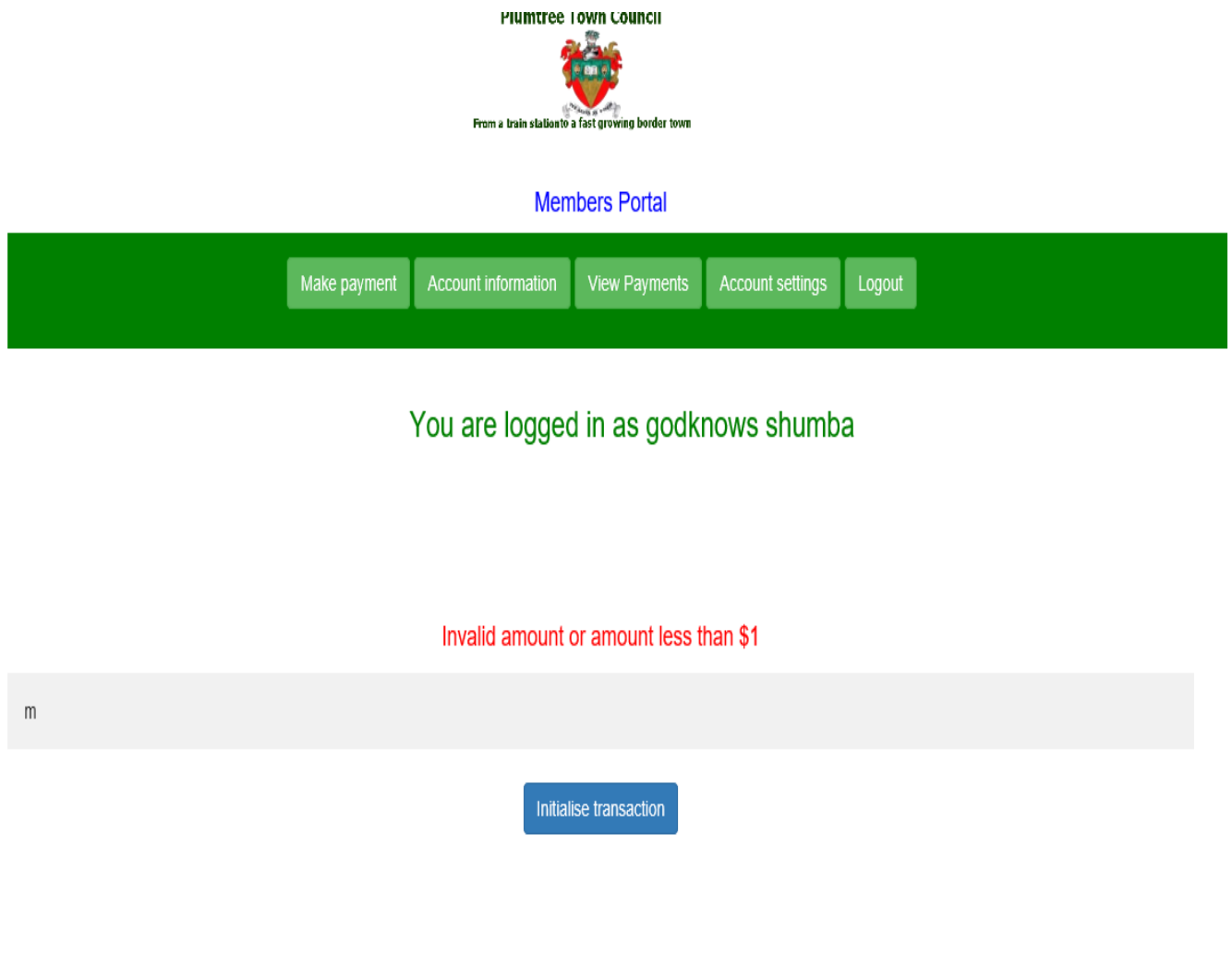
*Figure 5. 3 Failed Login Message*



#### **5.3.5.1.2 User Input Validation**

This refers to validation which is carried on when the user enters inputs. An error message will be shown if a wrong input is entered. This is used for client-side validation to reduce server load on validation. If the user enters an invalid input for example a letter instead of a number then the page an error will be displayed.

Figure 5. 4 User Entering Invalid Characters



### 5.3.5.2 Test Cases

Copeland (2004) describes a test case as a type of test that is used to examine components of the system which includes, procedures as well as that are required to come up with certain results. The researcher will look at some of the important cases.

**Case 1: logging in**

*Table 5. 1* Test Case1

Preconditions	Steps	Expected Results
The user must have only his or her correct credentials	<ol style="list-style-type: none"><li>1. Enter a valid user-name.</li><li>2. Enter a correct password.</li><li>3. Click login.</li></ol>	After a successful login no popup message but the user will be redirected to home page and the login name will be displayed on the middle of the welcome page

*Figure 5. 5* Test Case 1

Make payment   Account information   View Payments   Account settings   Logout



You are logged in as godknows shumba

Enter amount

Initialise transaction

**Test Case 2: User registration**

*Table 5. 2 Test Case 2*

Preconditions	Steps	Expected Results
The user visits the system home page	<ol style="list-style-type: none"> <li>1. Enter details</li> <li>2. Click submit</li> </ol>	If the user fills in the fields provided correct details then the system will automatically login the user and then redirect him or her to the login page

Figure 5. 6 Taste Case 2

**TASTE**

**From a train station to a fast growing border town**

Already Registered login [Click here](#)

Investment opportunities
Online help
Create account
Members login

Tinashe Jonas

0782631555

03-2345V56

Gweru Mkobha 10

Enter Email address

Enter password

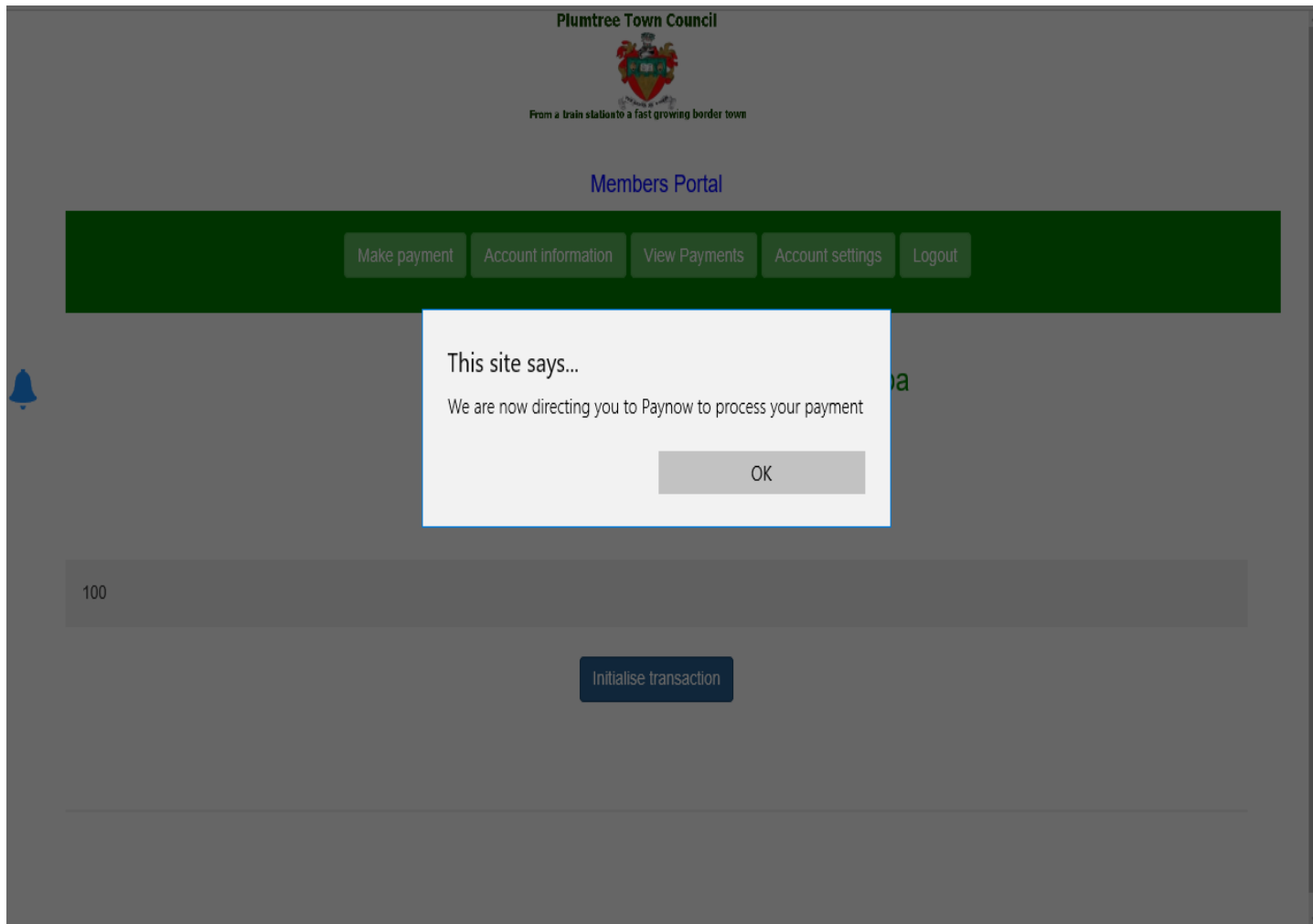
**Test case3: making online payment**

Table 5. 3 Test Case2 Our side

Preconditions	Steps	Expected Results
User has to login to the system	<ol style="list-style-type: none"> <li>1. click on the Make payment tab</li> <li>2. enter amount to be paid</li> </ol>	After successful transaction initialization the user will be directed to Pay now payment gateway website to complete payment



Figure 5. 7 Test Case 3



**Test case 4 Fetch payment statement**

Table 5. 4 Test Case 4

Preconditions	Steps	Expected Results
The user has to login to the system	1. Filter data according to preset criteria such as transactions created, sent, paid for, and period	After submission all the records that matches the search criteria are displayed as shown in fig 5.9 below

## Test case 4

Figure 5. 8 Test Case 4

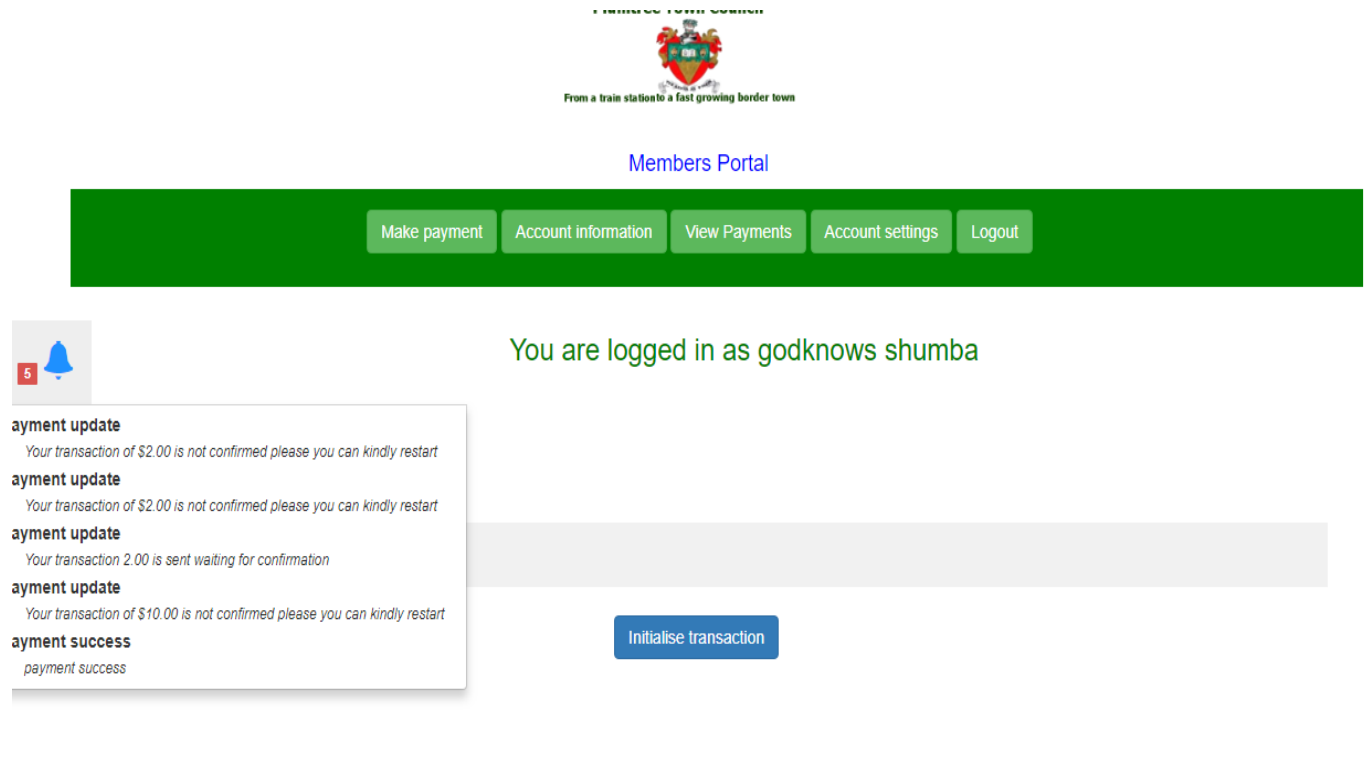
The screenshot displays the 'Members Portal' interface. At the top, there is a logo with the tagline 'From a train station to a fast growing border town'. Below the logo, the text 'Members Portal' is centered. A green navigation bar contains five buttons: 'Make payment', 'Account information', 'View Payments', 'Account settings', and 'Logout'. Below this bar, a notification bell icon is on the left, and the text 'You are logged in as godknows shumba' is centered. Underneath, the 'Payments statement' section features two date input fields (both containing 'mm/dd/yyyy'), a dropdown menu set to 'All', and a blue 'Fetch' button. The main content is a table with the following data:

Transaction->date	Reference->number	Transaction->Description	Amount->involved	Transaction->status
2018-10-12	Ref.-1525693	Cash in transaction	\$2.0000	Cancelled
2018-10-12	Ref.-268294	Cash in transaction	\$2.0000	Cancelled
2018-10-12	Ref.-1118076	Cash in transaction	\$10.0000	Cancelled
2018-10-13	Ref.-2672449	Cash in transaction	\$2.0000	Sent
2018-10-17	Ref.-694866	Cash in transaction	\$1000.0000	<a href="#">Finish transaction</a> (Created)
2018-10-17	Ref.-998427	Cash in transaction	\$1000.0000	<a href="#">Finish transaction</a> (Created)
2018-10-17	Ref.-277704	Cash in transaction	\$100.0000	<a href="#">Finish transaction</a> (Created)

### 5.3.5.3 Verification

Grady (1997) referred to verification as a process whereby a system will be evaluated against the initial primary objectives so as to make sure that the system meets the required objectives. This process will also involve checking of the processed data is correct and is the same as the captured data. This process will be done so as to make sure that the output of the system tally with the inputs because it might be possible for a system to accept inputs and process wrong data and presents wrong output. The researcher tested the system and checked the data processed and the system passed the verification test.

Figure 5. 9 Verification



After every transaction a notification message is sent from Pay now to the user on the updates concerning the transaction whether it is completed, cancelled or sent to the user phone number for confirmation in case of Telecash, Econet and Netone.

## 5.4 Installation

Grady (1997) define installation as procedures and processes that are involved during the deployment of a system. On a certain platform. Some of the issues that will be looked at during the installation segment are, user training, methods to be adopted on the deployment of the system and also the location of the system server.

#### **5.4.1 The Software Installation Procedures**

- A CD containing the system will be used to install the system on the server.
- The next step will be to follow the installation wizard
- The folder in which the application will be residing will be selected
- Database connection and configuration
- Test database connectivity

#### **5.4.2 User Training**

The researcher had come up with a training program for users of the system. The training program was mainly aiming at ensuring familiarization of the system to its users. The training program covers even the management as they will also be involved in using the system as they will be the ones who will be viewing and printing reports from the system. The training program also covered existing service providers so as to make sure that they are able to use the system without any complications. After the training users were given room to ask on all areas that required clarification, this was done so as to make sure that everyone who attended the training understood how the system operates and is to be used. At the end of the training some of internal and external users of the system were asked to log into the system and demonstrate to others.

## User Training Schedule

Table 5. 5 Training Schedule

<b>TRAINING DAYS</b>	<b>TARGET GROUP</b>	<b>COMMENTS</b>
Day 1	Administrators	Training was mainly focusing on the administrative functionality of the system which include adding new user, Deactivation of user account. And the general system navigation.
Day 2	Investors	Those who managed to attend the meeting where taught how to process online payments and how to apply for account creation and activation. The rest of the instructions is on the website under the help tab.
Day 3	ICT manager	The ICT managers training was mainly on the system maintenance, backups and recovery ways.
Day 4	Management	Managers were trained on how to access and print reports such as investors statements

### 5.4.3 Operation Environment

This refers to the platform on which the new system is to be installed and will be residing. The operating environment is very crucial as it determines the performance of the system, so it has to be tested before any change is made. Some of the components of the system environment are:

- Network equipment
- Operating system
- Hardware
- Software configuration

All these components were tested for compatibility and passed.

#### **5.4.4 Conversion**

After successful completion of the system testing then files of the old system had to be transferred to the database of the new system. Since the old system is manual, it means that the new system won't affect the old system in any way. All the stakeholders of the old system were involved in the conversion process so as to make sure that no modifications will occur on the data and also that no valuable data will be left out.

#### **5.4.5 System Changeover**

Culley et al (2001) describes system changeover as a process of shifting from an old system to the newly proposed system. A number of changeover strategies exists and some of them are explained below.

##### **5.4.5.1 Direct Changeover**

Culley et al (2001) referred to direct changeover as an instant process of moving from the old system to the new system and immediately putting the new system into operation and full control. In this process the old system is quickly abandoned for the new system. This is the simplest and least expensive changeover strategy.

##### **5.4.5.1.1 Merits of Direct Changeover**

- Implementation is cheap
- No keeping of duplication records

##### **5.4.5.1.2 Demerits of Direct Changeover**

- It is risky, if anything goes wrong there is no alternative system to cover up.
- May take a lot of time for users to familiarize the system while it will be already functional.
- There might be system unavailability during installation

### **5.4.5.2 Parallel Changeover**

Culley et al (2001) referred to parallel changeover as a process of using the two systems together for a certain finite period of time. The inputs and outputs from the system will be compared until it is certain that the new system is producing correct results. When it is concluded that the new system is free from bugs then the old system can be eliminated.

#### **5.4.5.2 Merits of Parallel Changeover**

- It is less risk since if anything goes wrong an old system will be used
- No stress on the stakeholder's side since they will be having the old system for cover up
- It gives enough time for users to learn the new system

#### **5.4.5.2.2 Demerits of Parallel Changeover**

- Costly since two system has to be used at the same time.
- Requires confirmation of similarities of the data entered into both systems.

### **5.4.5.3 Pilot Changeover**

Culley et al (2001) this is a method of shifting from old system to the new that involve implementation of the system to a certain part of the organization or branch and check if the results are satisfactory. The part of users that are selected to use the system for a certain period of time during evaluation stage is called the pilot group.

#### **5.4.5.3.1 Merits of Pilot Changeover**

- Reduction in risk of failure
- Cheaper in comparison with other changeover strategies
- Less time consuming

#### **5.4.5.3.2 Demerits of Pilot Changeover**

- It is costly when compared to direct changeover

## **Changeover Decision**

After a thorough analysis and evaluation of all possible changeover strategies the researcher recommended parallel changeover to the management. The researcher reaches this decision after discovering that though this changeover strategy is costly but it is less risk and safe and it also gives the users of the system time to learn and get familiar to the system. This will reduce stress on the users and also gives them room to learn the system without pressure. Furthermore, parallel changeover also gives developers and other concerned stakeholders time to compare the results from the two systems and see if the new system is giving correct results.

## **5.5 Maintenance**

Edward and Bramante (2009) said that system maintenance is a process of managing and improving the components and modules of the system so as to make sure that they are operating in the best possible way. The maintenance process ensures that the system is free from errors and is functioning in a satisfactory way. Maintenance is not a once for all process but it is an ongoing process as the system need to be constantly checked, corrected and improved to ensure that it will remain reliable. It is the duty of the administrators and developers of the system to always make sure that the system is up-to date and is operating in a proper way with the current technologies.

Various types of maintenance exist and some of them are explained below;

### **5.5.4 Perfective Maintenance**

This can be defined as a process of improving and refining the existing system, Edwards and Bramante (2009). This process is necessary as it ensure that the system will be able to carter for the changes in users' requirements and also change in technology as well as operating environment. All the changes that will be made to the system will be documented for error recovery and also for future maintenance.

### **5.5.5 Preventive Maintenance**

Edwards and Bramante (2009) referred to preventive maintenance as a process of maintaining the system so as to make sure that it won't lose value but will keep on being necessary and that it will also not lose its functionality through use. This can be achieved having constant maintenance on the system.



### **5.4.1 Disaster Recovery**

Mechanisms has to be put in place to enable data to be recovered if things go wrong. To do this the developers had incorporated an option for database backup such that everything will be safe.

### **5.5.6.1 Security**

Dorian et al (2003) describes system security as the access control mechanisms that are put in place to protect the system from unauthorized access and also prevent data lose to intruders and other threats. These mechanisms are put in place such that only authenticated users can access the system. To make sure that the system is secure various security policies has been incorporated by the developers and some of them are listed below:

User authentication – It is one of the generic objectives of the system that is meant to make sure that only approved users should be given access to the system.

System security – In order for a system to be considered acceptable it should have access levels that is to say that it should filter the type of data, functionality and processes accessed by each and every user depending on his or her profile

Data backup – in order to make sure that data is recovered if anything goes wrong, a backup of the database is to be made, this will enable data recovery and prevent information loss.

#### **5.5.6.1.1 Security Measures**

In the implementation of the policies the researcher added some policies which are mentioned below.

- Password characters should be at least six characters to make sure that accounts are secure. □ All users should have usernames and passwords.
- Access levels are in place so as to filter the type of information accessed by users basing on their access levels
- There is backup in place which ensures that the data in the database is safe.

### **5.5.6.2 System Backup**

To ensure maximum security of the data in the database a backup strategy should be in place. To make sure that this is achieved a continuous backup has been put in place which will enable database backup to be carried out any time and any day. All the tapes on which data is to be stored after backups are to be labelled so as to simplify the recovery process and avoid guess work. All the backup tapes are kept in a secure locked room so as to ensure maximum security.

#### **5.5.6.3.1 Full Backup**

Dorian et al referred to full back-up as a backup process that involve backing up all the selected files. In this process the whole file will be backed up whenever a backup is made. This type of backup has the advantage of a quick recovery whenever recovery is to be made. However, this process is time consuming and requires a lot of backup space that's being expensive.

#### **5.5.6.3.2 Incremental Backup**

Dorian et al (2003) states that incremental backup is a type of backup which involve the changes of data to the last backup. It means that only new data will be added to the backup data. In this type of backup only the first backup will be full backup and all other backups will be partial. The problem with this type of backup only comes when recovery is needed as the process will be slower as compared to that of full backup.

#### **5.5.6.3.3 Differential Backup**

Dorian et al (2003) describes incremental backup as that type of backup that only stores changes that were made since the last backup. In this type of backup full back-up is made only at the first backup process and thereafter only changes will be backed up. The advantage of this backup is that recovery will be slow though it possesses the advantage of a fast backup execution process.

#### **5.5.6.3.4 Mirror Backup**

From Dorian et al this is a type of backup in which a mirror of the source data is backed up. In this type of backup when the source file is deleted then the backed-up file will also be deleted. It is a replica of the source file. In this type of backup when a source file

is modified then the backup file will also be modified. Its advantage is that it will be containing the most current state of the database.

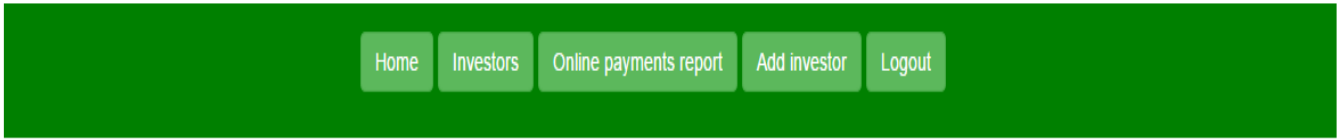
The researcher recommends that the organization adopts full backup though it might be expensive and time consuming to carryout but it is certain that data will be recovered after running restore and it also has the advantage of a quick recovery process and it also allows data from different backup processes to be stored on different labelled tapes for ease of recovery.

#### **5.5.7.1 System Vs. Objectives**

Here all the developed system will be evaluated against objectives that were mentioned in chapter

- 1) To create a platform where municipal workers can create customer invoices online . This objective was met as the developed system allows municipal workers to create invoices for the clients as shown in the diagram below.

*Figure 5. 10 Create Invoice Section*



Clients Full details

**Owner:**tatenda

**National-id:**wertyuio

**Email address:**rollergees@gmail.com

**Business type:**Public limited

0782631556

Enter amount

Invoice description

Generate invoice

- 2) To create an online platform for ratepayers to sign in, enquire and pay their accounts using Ecocash, Zim-switch and One Wallet with the help of Pay now payment gateway  
This objective was achieved as the system allows users to pay online using the above-mentioned payment gateways as shown below using Pay now online payment gateway.

Figure 5. 11 Now Gateway Section

The screenshot displays a payment interface with the following elements:

- EcoCash**: USD 806.30 (Status: Success, indicated by a green checkmark)
- OneMoney**: Exceeds Limit (Status: Failed)
- ZIM SWITCH**: Vpayments USD 804.27 (Status: Pending, indicated by an empty circle)

*This merchant is splitting Paynow fees 50/50.  
Fees have been added to the transaction value and the total is shown.*

\* ZW & International Visa / Mastercard accepted.  
\* Is my bank supported?


---

### Transaction Details

<b>Transaction ID</b>	1738845
-----------------------	---------


- 3) To develop a system which allows Ratepayers to view their statements and payment history online as a way of reducing the distance and provide direct control of ratepayer`s account to the property owner. The following system screenshots shows how the objective was achieved.

Figure 5. 12 Client Statement

  
 From a train station to a fast growing border town

Members Portal

Make payment
Account information
View Payments
Account settings
Logout


You are logged in as godknows shumba

Payments statement

Transaction->date	Reference->number	Transaction->Description	Amount->involved	Transaction->status
2018-10-12	Ref.--1525693	Cash in transcation	\$2.0000	Cancelled
2018-10-12	Ref.--268294	Cash in transcation	\$2.0000	Cancelled
2018-10-12	Ref.--1118076	Cash in transcation	\$10.0000	Cancelled
2018-10-13	Ref.--2672449	Cash in transcation	\$2.0000	Sent
2018-10-17	Ref.--694866	Cash in transcation	\$1000.0000	<a href="#">Finish transaction</a> (Created)
2018-10-17	Ref.--998427	Cash in transcation	\$1000.0000	<a href="#">Finish transaction</a> (Created)
2018-10-17	Ref.--277704	Cash in transcation	\$100.0000	<a href="#">Finish transaction</a> (Created)

Figure 5. 13 Client Statement (2)

From a train station to a fast growing border town

Members Portal

Make payment Account information View Payments Account settings View statement Logout

You are logged in as tavonga zhou

Owner: Tavonga zhou  
 National-id: m234567890V  
 Email address: go@gmail.com  
 Business type:  
 Print to pdf

Amount owed >>842

Transaction->date	Reference->number	Transaction->Description	Debit	Credit
2018-10-19	Ref:--818427520	ddddyyyy		\$12.00
2018-10-19	Ref:--1578750612	tax, wate, every		\$50.00
2018-10-20	Ref:--1371499491	rates		\$780.00

- 4) To reduce costs for the local authority and the ratepayer to acquire their account statements. This objective is met since the municipal workers can also view client’s statements and view payments made by the clients online.

## **5.6 Recommendations**

**The results from all the system tests that were made reflected that the system had passed all the requirements and expectations therefore the researcher made the following recommendations:**

- The database has to be backed up each and every day. This is very crucial as it will prevent data loss if anything goes wrong as the data will be recovered from the backed-up files.
- A training has to be made for all users of the system especially internal users so that it will be easy for them to use the system.
- The system needs to be constantly maintained so as to make sure that it is up to date and functions properly.
- All users of the system should not disclose their passwords to others as this will make their accounts prone to attacks or abuse.
- If any problem is encountered during the use of the system, only developers are supposed to make changes to the source code as if this is left to people without programming skills it may result in data loss or worsening of the situation

## **5.7 Conclusion**

The project has been completed in the time frame estimated and was a success as it meets all user requirements. The system can now be used at Plumtree Town Council and any other local authority which may choose to adopt it as all local authority operations are standard.



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## APPENDIX A

### User Manual

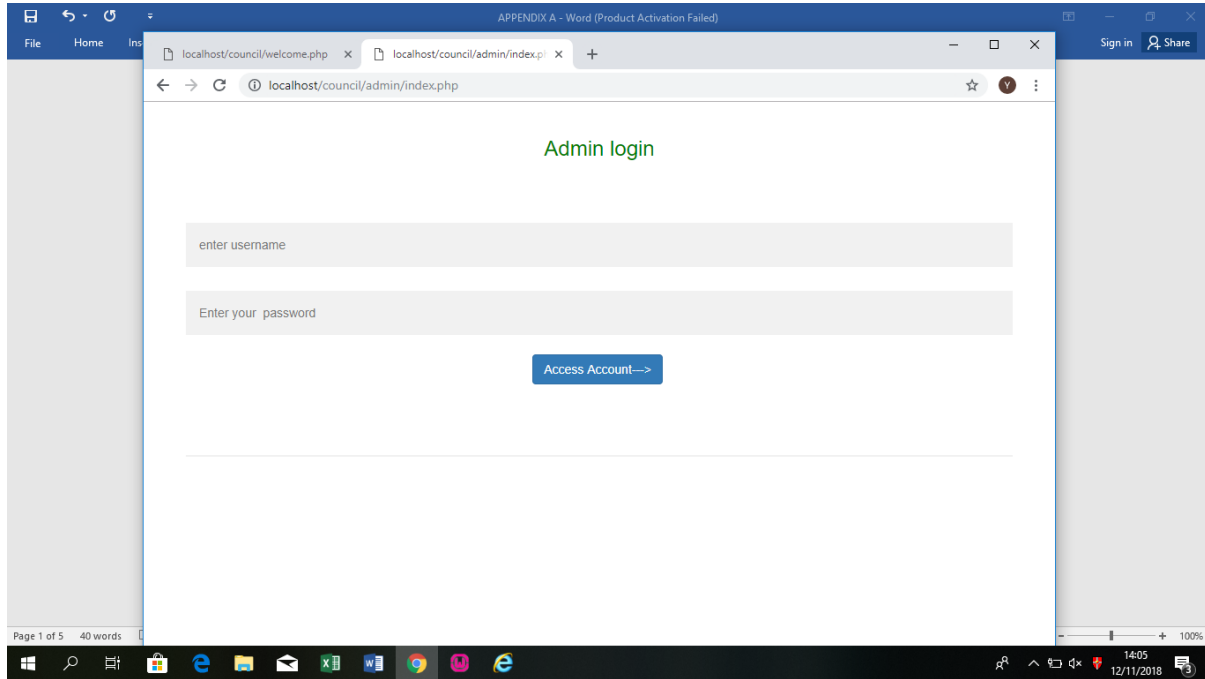


Fig 6.1

#### HOW TO LOGIN TO MUNICIPAL PORTAL

1. Open and start Wamp Server on your computer
2. Open a browser Chrome or Firefox
3. Type `http://localhost/council/admin` in your url
4. A page like Fig. 6.1 will appear
5. Logon using administrator credentials

A screen like Fig 6.2 will appear

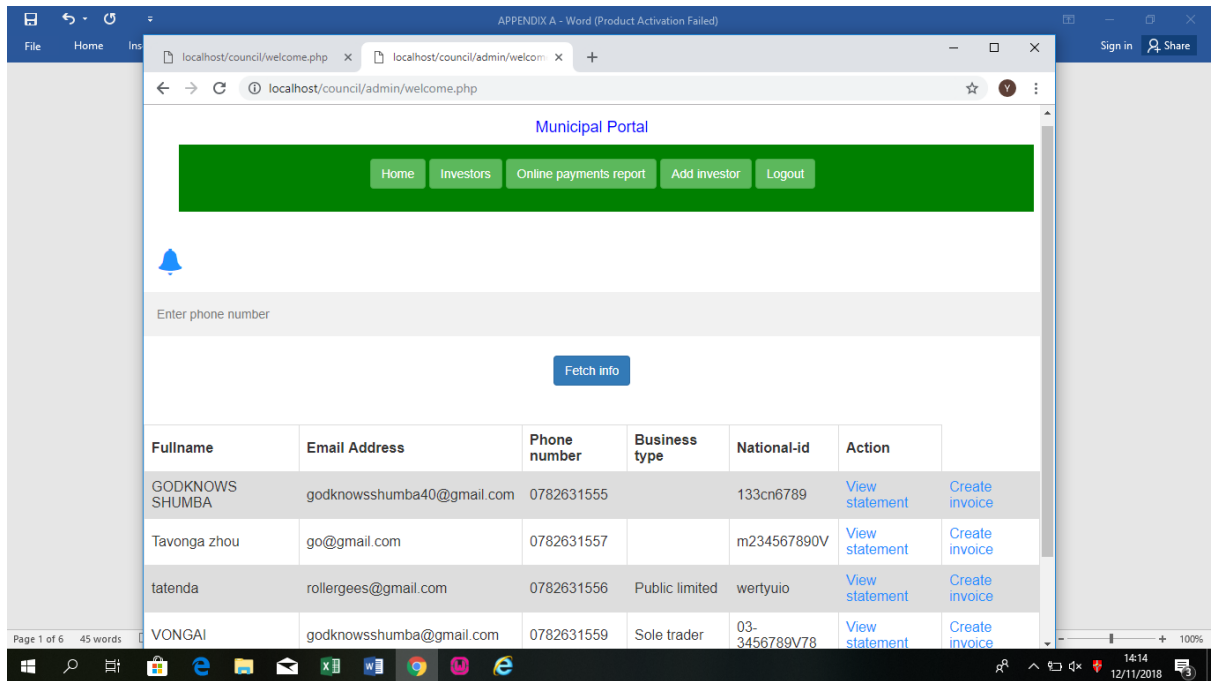


Fig 6.2

## HOW TO ADD AN INVESTOR OR RATEPAYER

1. Click on Add Investor in fig 6.2
2. A page like Fig 6.3 will appear
3. Enter investor details in the relevant fields
4. Click on Create profile as shown in Fig 6.4
5. Fig 6.5 will appear and you click on ok to complete the process.

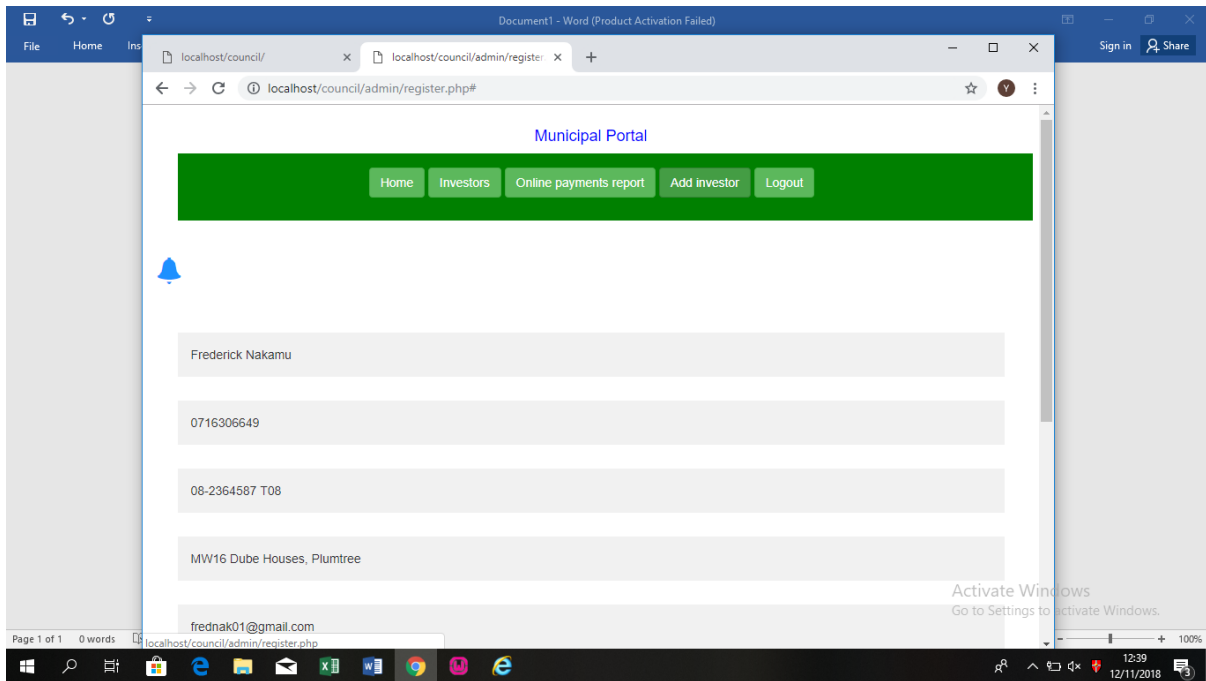


Fig 6.3

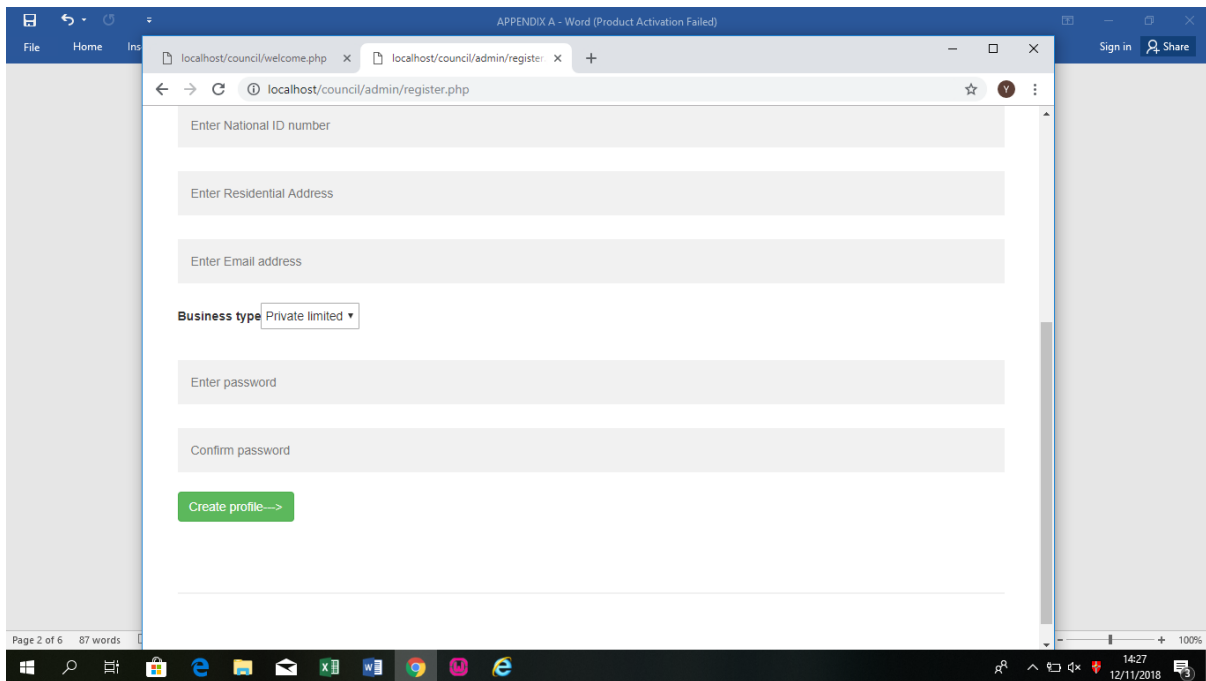


Fig 6.4

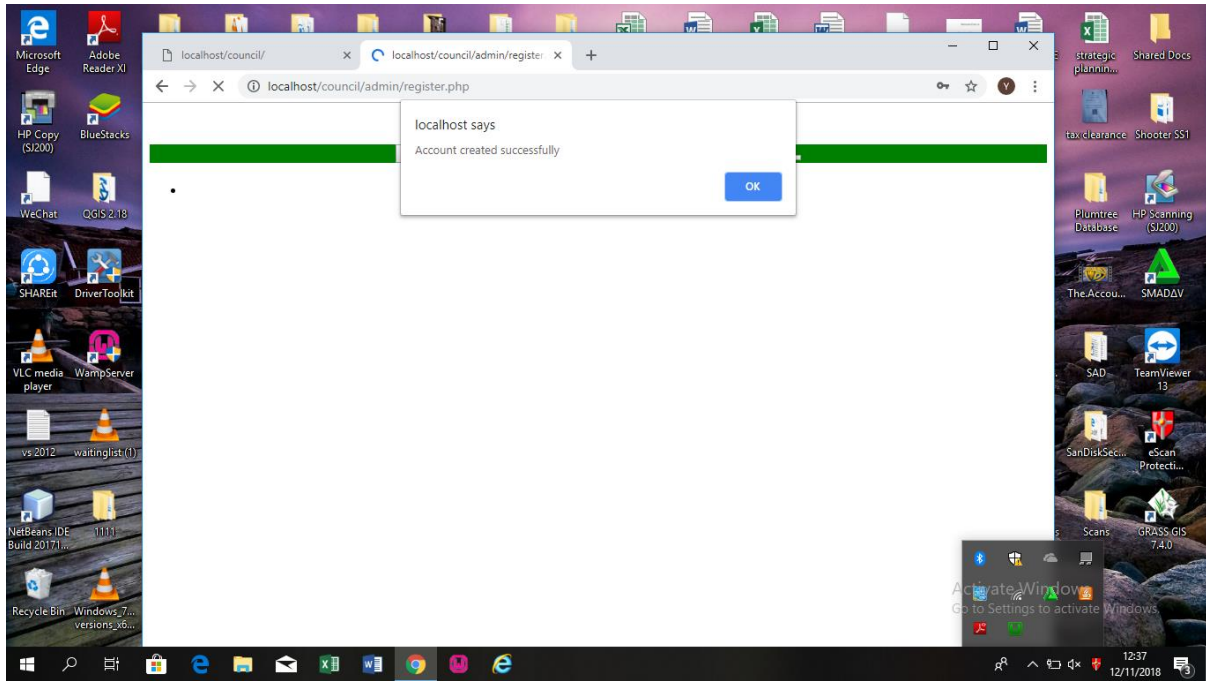


Fig 6.5

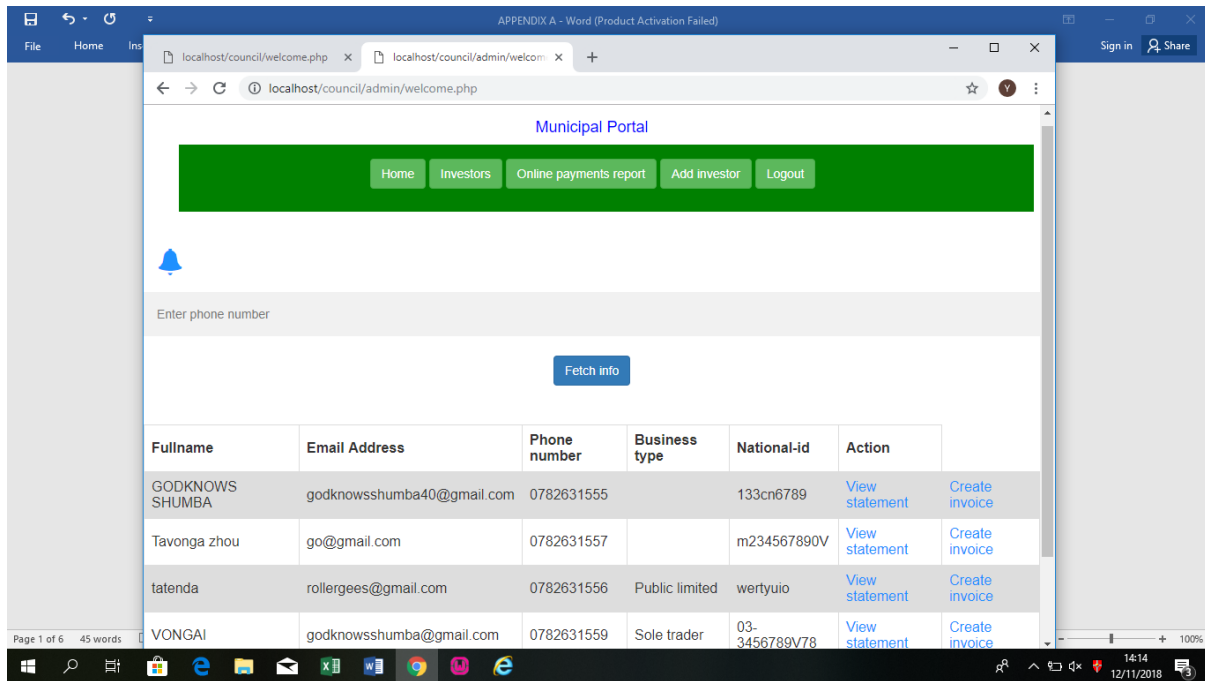


Fig 6.6

## HOW TO GENERATE AN INVOICE OR STATEMENT

1. Log onto Municipal portal
2. Fig 6.6 will appear with a list of all customers or investors that have been added
3. Enter a phone number to search the customer and click Fetch into
4. Click on Create invoice against the customer you fetched and Fig 6.7 will appear
5. Enter invoice amount and description of what invoice comprises as shown in Fig 6.8
6. Click on Generate Invoice



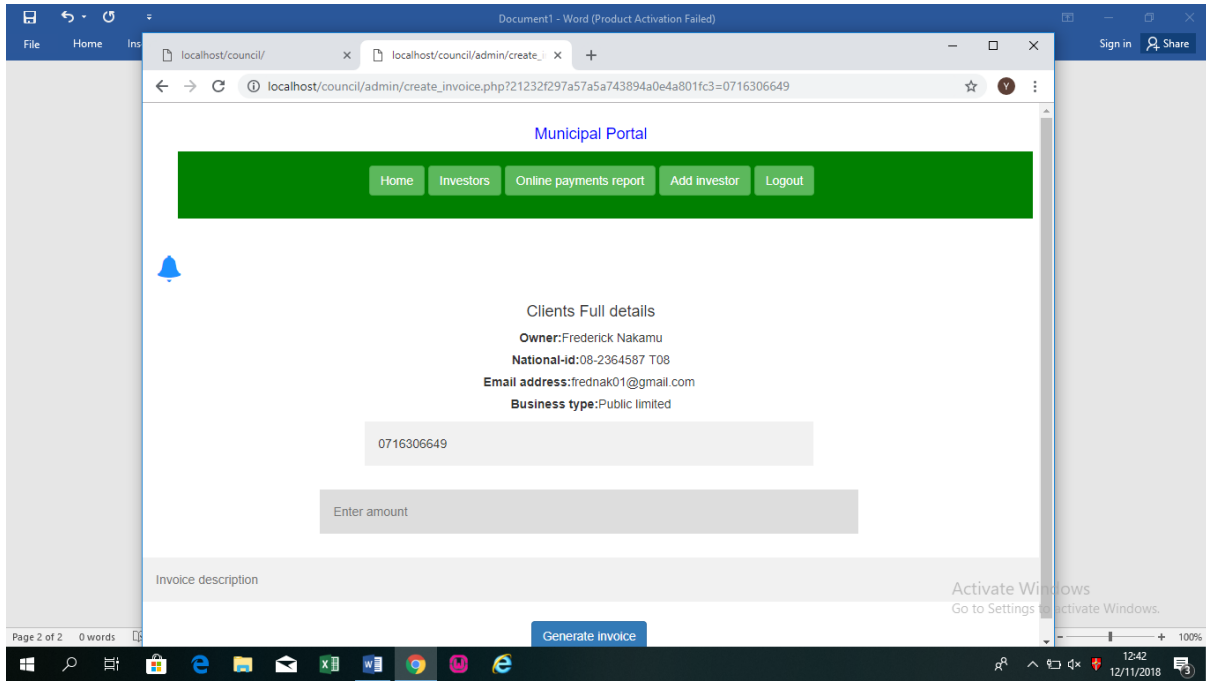


Fig 6.7

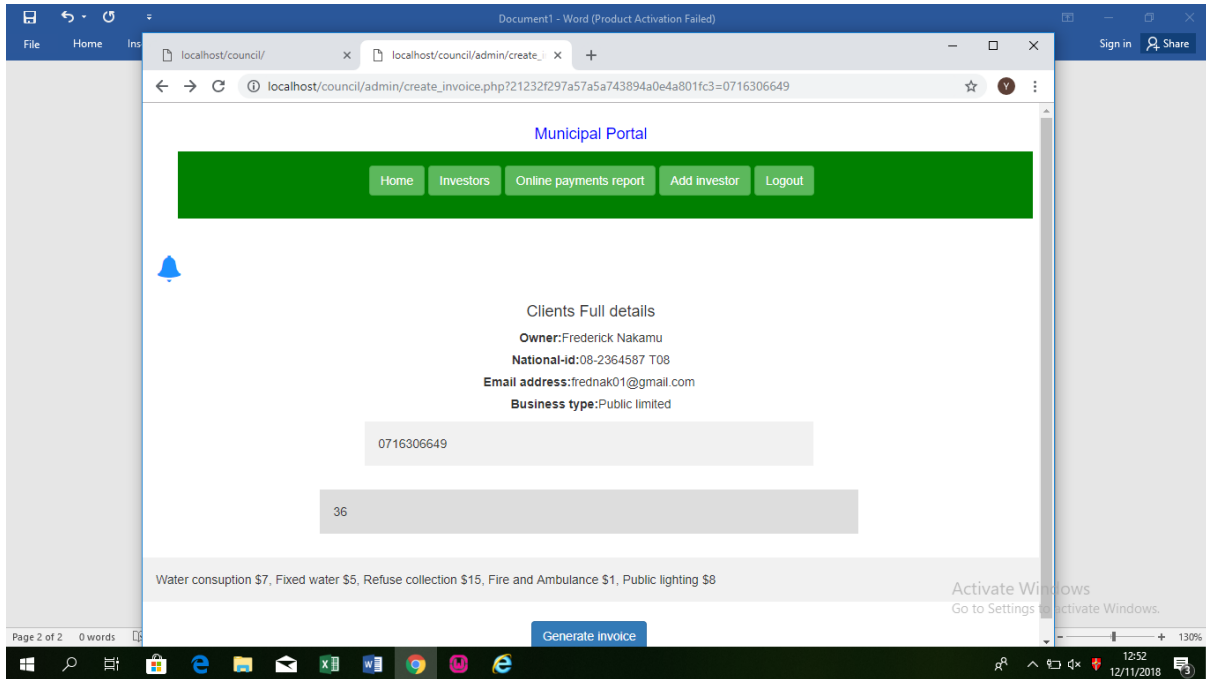


Fig 6.8

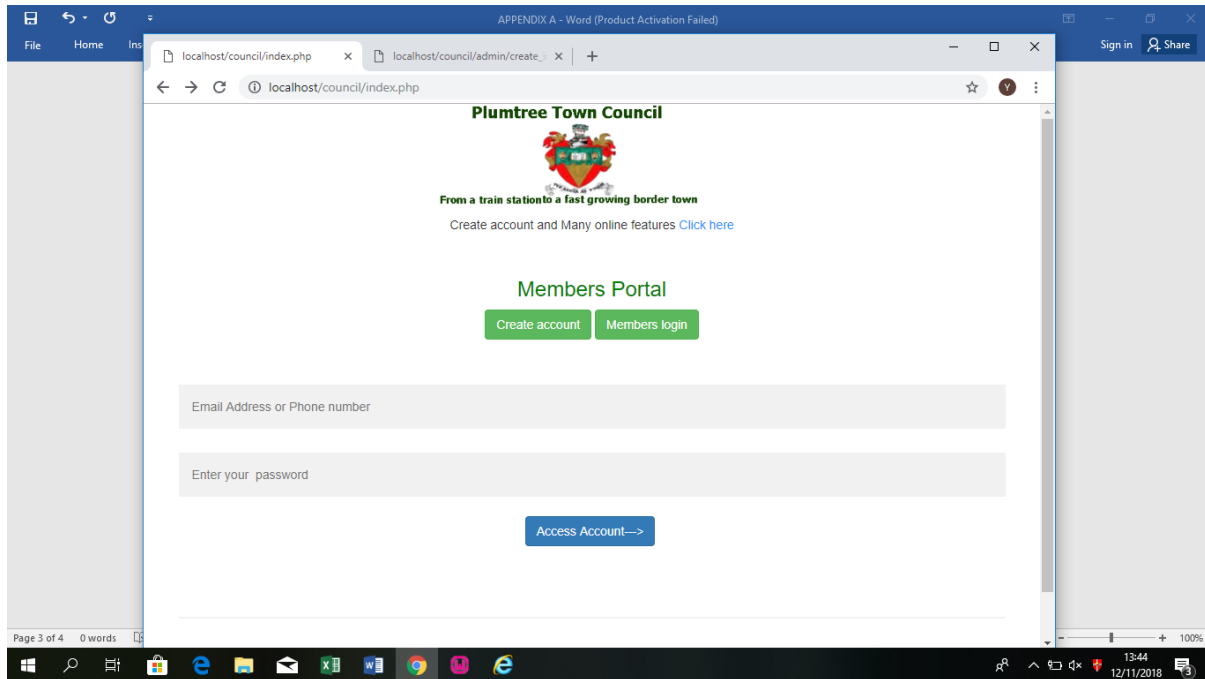


Fig 6.9

## HOW TO LOGON TO CUSTOMER OR MEMBERS PORTAL

1. With Wamp Server started and running type `http://localhost/council` in your browser url
2. A screen like Fig 6.9 will appear
3. Enter your phone number and password pin code and click Access Account
4. You will be directed to your account and a screen like Fig 6.10 will appear

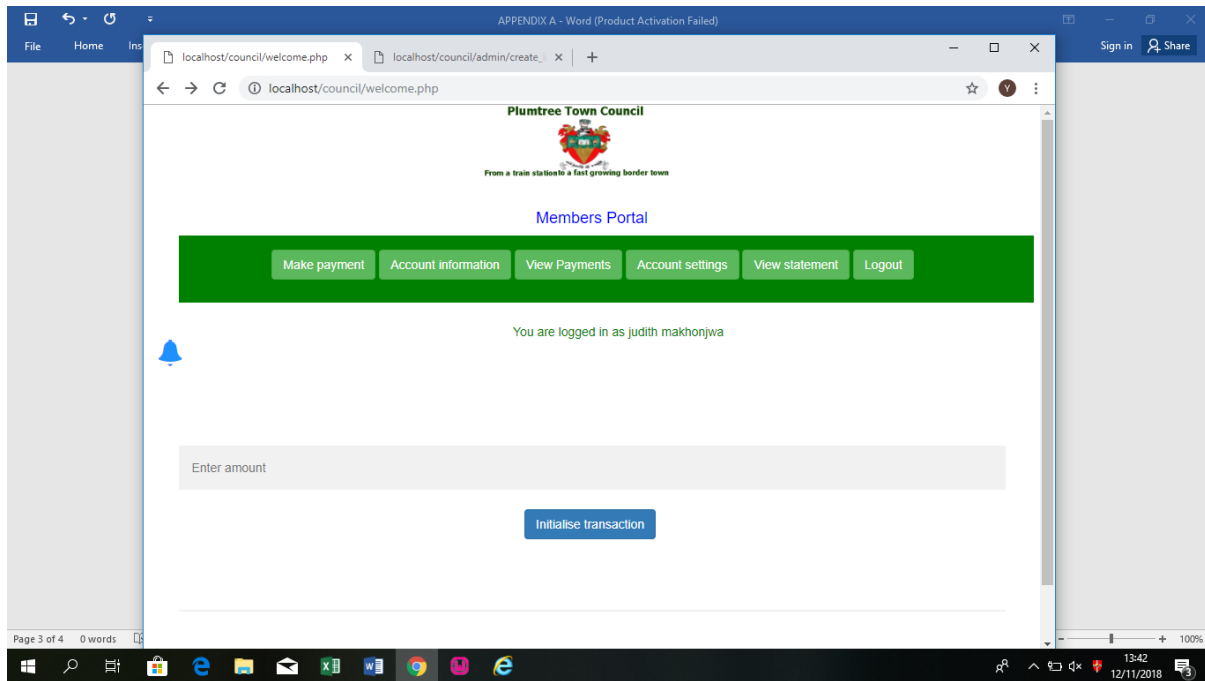


Fig 6.10

## HOW TO VIEW YOUR STATEMENT

1. Login to your account as customer or investor into members portal
2. Click view statement
3. A screen like Fig 6.11 will show.

APPENDIX A - Word (Product Activation Failed)

localhost/council/viewpayments.php

**Plumtree Town Council**  
 From a train station to a fast growing border town

**Members Portal**

Make payment Account information View Payments Account settings View statement Logout

You are logged in as judith makhojwa

Owner: Judith Makhojwa  
 National-id: 56-123456J 78  
 Email address: ndlovujudith@gmail.com  
 Business type: Private limited

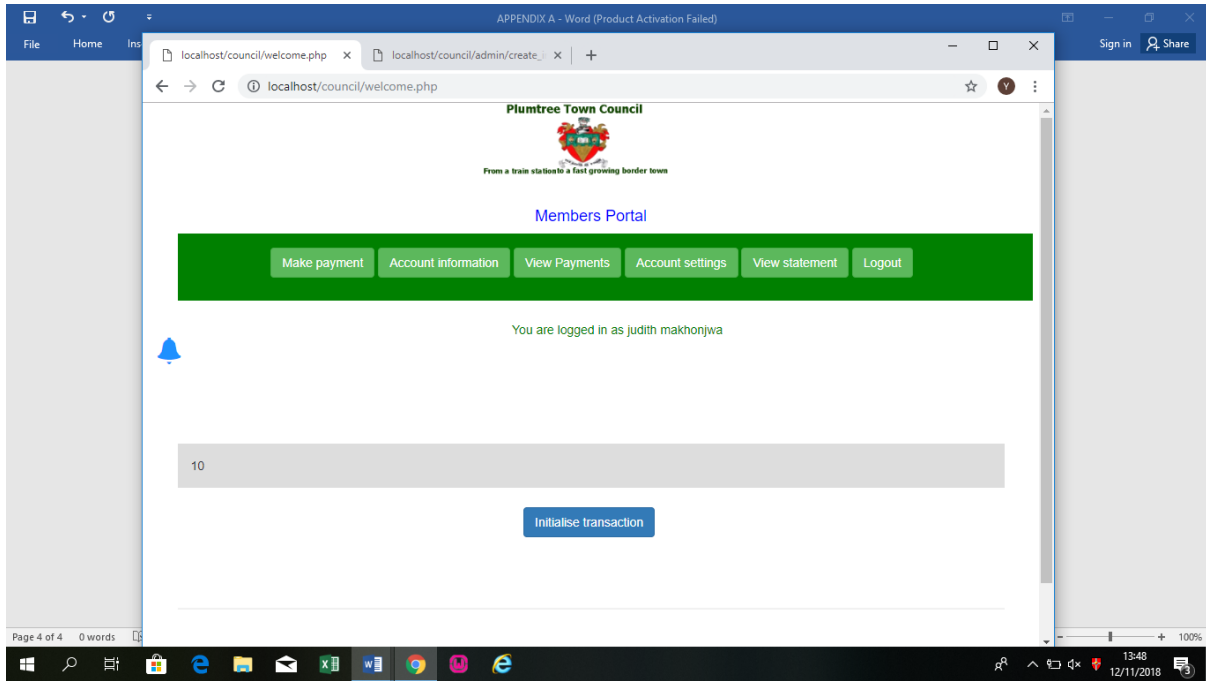
Print to pdf

Amount owed >> 17

Transaction->date	Reference->number	Transaction->Description	Debit	Credit
2018-11-12	Ref.--883124967	Water Consumption \$4, Refuse collection \$7, Fixed water \$5, Fire and Ambulance \$1		\$17.00

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13:40 12/11/2018



## APPENDIX B

Create.php

```
<?php
include('header.php');
error_reporting(0);
//include('session.php');
?>

<style>
#loader {
    position: absolute;
    left: 50%;
    top: 50%;
    z-index: 1;
    width: 150px;
    height: 150px;
    margin: -75px 0 0 -75px;
    border: 5px solid #f3f3f3;
    border-radius: 50%;
    border-top: 5px solid #3498db;
    width: 90px;
    height: 90px;
    -webkit-animation: spin 5s linear infinite;
    animation: spin 2s linear infinite;
}

@-webkit-keyframes spin {
```

```

0% { -webkit-transform: rotate(0deg); }

100% { -webkit-transform: rotate(360deg); }

}

@keyframes spin {

0% { transform: rotate(0deg); }

100% { transform: rotate(360deg); }

}

/* Add animation to "page content" */

.animate-bottom {

position: relative;

-webkit-animation-name: animatebottom;

-webkit-animation-duration: 1s;

animation-name: animatebottom;

animation-duration: 1s

}

@-webkit-keyframes animatebottom {

from { bottom:-100px; opacity:0 }

to { bottom:0px; opacity:1 }

}

@keyframes animatebottom {

from{ bottom:-100px; opacity:0 }

to{ bottom:0; opacity:1 }

}

```

```

#myDiv {
    display: none;
    text-align: center;
}
</style>
</head>
<body onload="myFunction()" style="margin:0;">
<div id="loader"></div>
<div style="display:none;" id="myDiv" class="animate-bottom">
<style>
body {
    font-family: Arial, Helvetica, sans-serif;
    background-color: white;
}
* {
    box-sizing: border-box;
}
/* Add padding to containers */
.container {
    padding: 16px;
    background-color: white;
}
/* Full-width input fields */

```



```
input[type=text], input[type=password],input[type=Email] {  
    width: 100%;  
    padding: 15px;  
    margin: 5px 0 22px 0;  
    display: inline-block;  
    border: none;  
    background: #f1f1f1;  
}  
  
input[type=text]:focus, input[type=password]:focus {  
    background-color: #ddd;  
    outline: none;  
}  
  
/* Overwrite default styles of hr */  
hr {  
    border: 1px solid #f1f1f1;  
    margin-bottom: 25px;  
}  
  
/* Set a style for the submit button */  
.registerbtn {  
    background-color: #4CAF50;  
    color: white;  
    padding: 16px 20px;  
    margin: 8px 0;
```

```
border: none;

cursor: pointer;

width: 25%;

opacity: 0.9;

}

.registerbtn:hover {

    opacity: 1;

}

/* Add a blue text color to links */

a {

    color: dodgerblue;

}

/* Set a grey background color and center the text of the "sign in" section */

.signin {

    background-color: #f1f1f1;

    text-align: center;

}

</style>

</head>

<body bgcolor = 'white'>

<?php

$conn = mysqli_connect("localhost", "root", "godamanex", "ecocash");

$phone = mysqli_real_escape_string($conn,$_POST['phone']);
```

```

$password = mysqli_real_escape_string($conn,$_POST['password']);
$password1= mysqli_real_escape_string($conn,$_POST['password2']);
$fullname = mysqli_real_escape_string($conn,$_POST['name']);
$address = mysqli_real_escape_string($conn,$_POST['address']);
$nat_id = mysqli_real_escape_string($conn,$_POST['nat_id']);
$email= mysqli_real_escape_string($conn,$_POST['email']);
if(isset($_POST['btn']))
{
//VALIDATION OF USER INPUT
//phone number
if($password != $password1)
{
echo"<script>alert('Password mismatch')</script>";
}
elseif($phone<710000000)
{
echo"<script>alert('Invalid phone number')</script>";
}
elseif($phone>790000000)
{
echo"<script>alert('Invalid phone number')</script>";
}
elseif(strlen($phone)>10)

```

```

{
    echo"<script>alert('Invalid phone number')</script>";
}
else
{
    $com = mysqli_query($conn,"insert into
clients(phone,fullname,address,national_id,password,email) VALUES
('$phone','$fullname','$address','$nat_id','$password','$email')") or die(mysqli_error);
if($com)
{
    echo"<script>alert('Account created successfully');location.href='index.php';</script>";
//header("location:index.php");
}
}
}
?>

<form action="" method = "post">
    <div class="container">

        <br>

        <input type="text" placeholder="Enter Fullname" name="name" value = "<?php echo
$fullname; ?>" required>

```

<br>

<input type="text" placeholder="Enter Phone number" name="phone" value="<?php echo \$phone; ?>" required>

<br>

<input type="text" placeholder="Enter National ID number" name="nat\_id" value = "<?php echo \$nat\_id; ?>" required>

<br>

<input type="text" placeholder="Enter Residential Address" name="address" value = "<?php echo \$address; ?>" required>

<br>

<input type="Email" placeholder="Enter Email address" name="email" value = "<?php echo \$email; ?>" required>

<br>

<input type="text" placeholder="Enter password" name="password" required>

<br>

<input type="text" placeholder="Confirm password" name="password2" required>

<br>

<button type="submit" name = "btn" class="btn btn-success" >Create Account---></button>

<br>

<br>

<br>

<br>

```
<hr>
```

```
<br>
```

```
<br>
```

```
</div>
```

```
</form>
```

```
</body>
```

```
</html>
```

```
</div>
```

```
<script>
```

```
var myVar;
```

```
function myFunction() {
```

```
    myVar = setTimeout(showPage, 300);
```

```
}
```

```
function showPage() {
```

```
    document.getElementById("loader").style.display = "none";
```

```
    document.getElementById("myDiv").style.display = "block";
```

```
}
```

```
</script>
```

</body>

</html>

</div>