

**CHIPINGE TOWN COUNCIL BUILDING INSPECTION SYSTEM**



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# CHIPINGE TOWN COUNCIL BUILDING INSPECTION SYSTEM

BY

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## **ABSTRACT**

Chipinge Town Council Building Inspection system is an online software that manages, queries and inspection of stands to the Chipinge residents. The system allow clients to book, request for inspection, receiving the response online whilst the housing director is able to assign Inspectors tasks and there is generally improvement on the interaction between the clients and the Town Council through online communication that is facilitated by sending and receiving queries. The system was developed as a result of problems that were associated with the old system which were, the problem of lost clients' information due to mismanagement of files, lack of transparency and manipulation of clients' information by unscrupulous employees, long queues of clients who want to book for inspection and also bribery was rampant among the building inspectors. After evaluation of several alternatives in solving these problems, In-house development was agreed by the developing team in delivering the new system. Feasibility study in form of technical, economic and social was done which proved economically viable to develop this system. The research instruments to gather information which were used included interviews, questionnaires and observation and they were used on Housing Director, Inspectors and clients respectively. The system was developed using PHP, XAMPP, JavaScript and MySQL. Testing was done through validation and verification which was successful. The implementation process was done using the direct changeover because of its minimum costs. Adaptive maintenance was chosen because the system is always evolving and it needs to meet the technological changes. An aftermath implementation review was done it was noted that there was great improvement on service delivery at Chipinge Town Council as the feedback that was obtained revealed that the users were being satisfied by the system and liked the system. Though the system has received much applaud there are some future work which have been put forward regarding the system which are as follows; In future, the system will introduce the stand application system to work hand in hand with this system. The system will cater for all mobile banking facilities that are Ecocash, One-wallet or Telecash, as well as internet banking to make it easier for the clients to pay for inspection booking.

## DECLARATION

I **Nomatter Tambudzayi** hereby declare that I am the true and sore owner of this dissertation. I authorise **Midlands State University** to lend this dissertation to any other institution or any individual whom they may find it necessary to use it for scholarly purposes.

Signature.....Date.....

**APPROVAL**

This dissertation entitled **Chipinge Town Council Building Inspection System** by **Nomatter Tambudzayi** meets the regulations governing the award of the degree of **Information Systems** of the Midlands State University, and is approved for its contribution to knowledge and literary presentation.

Supervisor.....

Date.....

## ACKNOWLEDGEMENTS

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Fellow class mates

Hlahla and Tambudzayi families

All those people made it possible to develop the **Chipinge Town Council Building Inspection System**. Thank you.

## **DEDICATION**

This dissertation is dedicated to Hlahla (Tambudzayi) family their support is highly appreciated.

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## LIST OF ACRONYMS

API	Application programming interface
CTC	Chipinge Town Council
CPU	Central Processing Unit
DFD	Data flow diagram
DBMS	Database management system
EER	Enhanced Entity Relationship Diagram
ER	Entity relations
ET-water	Engineer or Technician in Water
ET-roads	Engineer or Technician in roads
GH	General Hand
GSM	Global System Mobile
HDD	Hard drive
H Officer	Health Officer
HRO	Human Resource Manager
HTML	Hyper Text Mark-up Language
I Auditor	Internal Auditor
IT	Information Technology
LAN	Local Area Network
MNC	Multi-national Company
n.d.	no date
PHP	PHP: Hypertext Pre-processor
P.S	Post scriptum (additional information)
RAD	Rapid Application Development
RAM	Random Access Memory
ROI	Return on investment
Rd	Road Assistant supervisor
SMS	SHORT MESSAGE SERVICE
SQL	Standard Query Language
USB	Universal Serial Bus

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# **Chapter 1: Introduction**

## **1.1 Introduction**

The Chipinge Town Council Building Inspection is a web based system which serves the management of Chipinge Town Council's building inspectors and residents as it will enable clients to upload the pictures of their houses plans when booking for inspection. It also provides a platform where the details of the stages of houses being built from the ground level up to roofing being captured with their details of approval. The system has an audit trail which tracks the building inspectors of their activities in the system. There is a platform of instant messaging and alerting of clients through notifications and query management. It will also capture all the clients' receipts and the clients' transactions history by uploading the scanned documents of the clients concerning their transaction with the council to reduce fraud. By just clicking the house number it will be viable to track the status of client's booking and users are also able to view the stage that had been lastly approved.

## **1.2 Background of the study**

The research seek to improve the information system at Chipinge Town Council over the current status quo of file based system which has triggered the researcher to be motivated to come up with a more sophisticated system to manage the operation at the Town Council. The proposed system is intended to transform old model of managing the housing and building inspection into a more reliable system and globalised system that seek to cease the traditional way of operation. Currently the offices are drenched with files and filled up to the brim which are sometimes eyesore and there is a really huge problem concerning clients who want to apply for inspection who have to come in person, which is costly and information concerning application of building inspection is obtained through grapevine. All these issues have slowly retarded the operations at Chipinge Town Council. Currently management of files has become expensive and time consuming that to some extend they have to hire labour to organise files in the offices. At one point sometimes ago the files were subjected to manipulation which led some residents to fake the stages they were lastly inspected. Files are currently missing and some people are skipping the protocols done on inspection citing the problems of their files which will be missing. Also building inspectors are currently facing problems as to when the last date and at what stage did they lastly inspect. Thus the proposed system will heal all the woes as it will capture all details in

the system. The last date they lastly inspect. The client's transaction history will be also captured hence it is not subjected to transformation or manipulation by unscrupulous employees. The system on its own will safeguard all the information. Communication is a barrier since the several departments at Chipinge Town Council rely on one information. If the single department fails to release information the others remaining will suffer because the current system is not online. Therefore the proposed system will enhance communication through instant messaging and since it is an online system there is mutual sharing of information con-currently.

### **1.2.1 Background of Organisation**

The Chipinge town council was formed just after independence in 1980 where the black population used to live in rural areas and were headed by the chief's councils. Small scale farmers were governed of their operations by the associations which they formed whilst the large scale farmers were governed by the authority of Rural Councils. Chipinge Town Board was detached from the Chipinge Rural District Council (CRDC) to come up with the Chipinge Town Council (CTC). Therefore presently, there are two local authorities the Chipinge Town Council governing the urban area and the Chipinge Rural District Council governing the rest of the District. The CTC is situated in the Chipinge town approximately 188 km from Mutare and nearly 48 km from the boader post of Mt Selinda. There is a sub-office at Gaza Community hall responsible for serving the Gaza Community. Chipinge District is mainly occupied by the Ndau people and fewer Shangani people occupying the southern tip. The Town's population was approximately 35 000 by the end of 2006 according to the Central Statistics department.

### **1.2.2 Organisational Structure**

It is an organogram which shows the approach in which the chain of command works with the organisation, in terms of allocation of duties and responsibilities. Each department is responsible for specific activities. The way in which CTC is organized is shown below on a diagram overleaf.



Fig 1.1 Organogram

**Key**

ET-water Engineer or Technician in Water

ET-roads Engineer or Technician in roads

GH General Hand

H Officer     Health Officer

HRO            Human Resource Manager

I Auditor      Internal Auditor

Rd              Road Assistant supervisor

### **1.2.3 Vision**

To be the best Governed Local Authority in Zimbabwe by 2025.

### **1.2.4 Mission Statement**

To provide first class service delivery and promote economic growth to enhance the quality of life of residents of Chipinge Town Council.

### **1.3 Problem Definition**

After carrying an extensive research at Chipinge Town Council the researcher came across with several problems which are used as tools to support for the proposed system. It was however depicted that the current system has got several problems which are below.

- Problem of time wasting when assigning building inspectors jobs by the director as sometimes the director will be not available.
- Problem of communication barrier as sometimes residents could not access information they want unless they are to visit the Town Council.
- Overcrowding of clients in offices who want to book for building inspections.
- Mismanagement of files containing information for inspection by building inspectors.
- Poor query management if the clients or residents who had lost their receipts, there is no proof of payment even if they had already finished paying since they rely on files.
- There are problems of spontaneous scenarios where building inspectors accepting bribes due to the insecure of the current system.

## **1.4 Aim**

To develop Chipinge Town Council Building Inspector and Housing management system.

## **1.5 Objectives**

- To book building inspectors online.
- To facilitate online communication in form of query messaging.
- To assign tasks to the building inspectors online.
- To provide an audit trail that tracks the activities done by inspectors.
- To facilitate clients track for their inspection response online.

## **1.6 Instruments and Methods**

The following were the instruments and methods that the researcher used in developing the application and their rational.

### **Micro Dreamweaver**

This is a web design and development compiler that has a visual WYSIWYG editor (also known as the Design view). It also provides a code editor that has standard features like syntax highlighting, code completion, code collapsing and more sophisticated features like real-time syntax checking and code introspection specifically for generating code hints that will assist the user in code writing (Scott 2008). Dreamweaver 8 was chosen from other compilers because it is an open source that is freely downloaded and can be supported by other script languages like bootstrap, extensible mark-up language (XML), PHP (PHP Hypertext Pre-processor), Cascading Style Sheet (CSS) and JavaScript.

### **PHP**

It is a scripting language that predominantly suits web development which can be embedded into an HTML. PHP was preferred to other scripting languages due to its embedded code samples which assist in the development and construction of the web application (Capron 1995).

### **Xamppserver**

XAMPP is a form of mini-server that run on almost any Windows Operating System. XAMPP includes Apache 2, PHP 5 and MySQL (phpMyAdmin and SQL managers that are installed to

manage databases) Xamppserver was chosen because it works with the PHP language hence as an open source software it is cheaper to obtain.

## **MySQL**

This is a SQL relational database management system which was developed, distributed and supported by the Oracle Corporation. MySQL was chosen in this project for its ability of producing relational database for storing captured data for applicants. It is fast, robust and efficient whilst holding large amount of data.

### **1.7 Justification and rationale**

The implementation of the task management system brings a number of advantages to the organization and also to those who will use the system. Listed below are a number of points that justified the implementation of the system.

- The system allows easy access of information, users can easily track their inspection booking for example by punching in account number.
- It reduces time consuming spend on searching and arranging files.
- Security and integrity will be enhanced to deter building inspectors from accepting bribes.
- The system will encourage bond between clients and employees through notification and instant messaging.
- Online task management by the housing director will reduce bureaucracy in the case where the director is away from the office as he can assign the tasks through online.
- There will be convenience and fewer confusion to the building inspectors in the case that there records have been lost which shows the history of the house they inspected.

Clients will benefit from reduction in shoe leather-costing that is the cost they will have to pay when visiting the offices in case they have queries since this system will provide the query management platform.



## **1.8 Conclusion**

Conclusively, the introduction phase gives an overview of the system which includes the background study that drives the developer to develop this system. The organisational background for which this system is developed for has been depicted and there was also further exploration on its organisational structure. The objectives that are supposed to be met has also been clarified. Furthermore the organisation's aims, vision and its mission statement was also depicted. The problem statement is also noted and the objectives of the system were explained while the instruments and methods which will be used to develop the system are fully described. The justification as well as the rationale of the system were put forward. Following is the planning phase which explore on business feasibility study and work plan.

## **Chapter 2: Planning Phase**

### **2.1 Introduction**

The researcher had to weigh the business value in this phase which helped in the analysis of the organisation's success through its available information to achieve its strategic goals. The feasibility study was also carried out which was a vivid assessment of whether the project is worthy to invest or a mere resource wasting one. This phase explored much on the risks that may be associated with the new system and several solutions were forwarded to compact them. All the stakeholders of the proposed system were identified and their expected deliverables of the new system were enlisted. Timing and a work plan was drafted also, that was the schedule under which the project will be carried out until its implementation.

### **2.2 Business value**

Cohan, (2005) argued business value as the situation where the organisation could sustain itself over a long period in future in good health. This put much emphasis on the fulfilment of the customer needs by improvising the lowest costs as a result of using this system. Following are the business core value that are obtained as a result of using this system.

- Reduction of travelling costs especially to customers through mutual communication between the organisation and customers through instant messaging.
- Hiring costs will be reduced especially part time employees who are being hired for arranging and packing files that contains customers' information.
- Reduction in costs associated with rectifying dual allocation of stands like re-allocating of stand to the affected people since the system provide clients management platform with their respective details.
- Time saving as the system will allow customers to book and replied online.
- Reduction in bureaucracy as the system will allow the housing director to assign building inspector tasks online even he or she is out of office thus increase efficiency.

- Reduction in costs of purchasing files which the clients are entitled to buy in order to store their information.
- Bond with clients through online communication and instant messaging thus increase the goodwill of CTC.

## **2.3 Feasibility Study**

Matson (2000), argued it as a management-oriented tool that has a purpose of assessing whether it is viable in pursuing developing the system or aborting it is more conserving, through proper analysis and justifications after clear propositions of the necessary alternatives. The significance of carrying out this study enabled analysts to determine which part of the system was productive or not. The study was carried out by assessing the system's impact on technical feasibility, technical expertise, technical resources, economic and societal environments. A feasible system that is chosen is the one that is beneficial than the one which produces losses.

### **2.3.1 Technical Feasibility**

This type of feasibility study considered the aspect of technical requirements of the system on whether the organisation is capable of acquiring them (Matson, 2000). This consider assessment on resources like, technical expertise and technical resources on site. The analyst analysed the resources whether, were they able to match with requirements and all the logistics needed so as to make this system a success. However most of the technical resources that were required were locally available which made it deem necessary to develop the system.

### **2.3.2 Technical Expertise**

This explore on how easier do the Chipinge Town Council staffs are capable to use and acquaint themselves with the system on daily bases. The staff are all literate and it was easier to learn the systems since the system had to come up with a user manual and induction had to be carried out during implementation. This system just needs basic computer understanding. The town council has also highly qualified IT personnel who has deep understanding of MySQL and PHP programming language thus it will be cheaper to patch up the system during maintenance of the system. The developer had to work with IT personnel of the organisation which enabled a

smooth environment of developing the system as some of the data needed by the developer was provided by her. She even assisted the developer with coding and testing of the system.

### 2.3.3 Technical Resources

This specifies the availability of resources and their measure of practicality for a specific technical solutions (Bentley and Whitten, 2007). The resources that were needed were hardware which were tangible elements or digital electronic devices and software which was the intangible resource that control the digital electronic devices. The following diagrams show the hardware and software resources that were required for Chipinge Town Council. Fortunately most of the technical resources that were required were available at the town council.

**Table 2.1: Hardware Necessities**

<b>Items</b>	<b>quantity</b>	<b>descriptions</b>	<b>status</b>	<b>comment</b>
computers	6	Core I3 Intel	5 are available	The organization is willing to buy the remaining one
UPS	6	Power backup 220V	4 available	CTC agreed to buy 2 more
Modem	6	Econet GSM Modem	All 6 available	There is no need to buy more
Main server	1	4GHz Quad 4 16 Gig RAM 3 Terabyte HDD	available	The server is already there
Connecting cables	10	25m long RJ45 Connectors	6 available	CTC can buy 4 more
printers	3	HP 2035 PRO	Available	All are available

**Table 2.2: Software Necessities**

<b>software</b>	<b>Version</b>	<b>status</b>	<b>comment</b>
Dreamweaver	Cs6	available	Already there
Operating system	Windows 8	available	Already installed
Antivirus	Avast 2016	available	Already installed
Xampp	1.8.3.3	available	Already installed

### **2.3.4 Economic Feasibility**

According to Baker and Powell (2005), economic feasibility is the rationale of the cost effectiveness that the project is going to produce. Economic feasibility is calculated by obtaining all costs that are to be encountered in the development of the project and deducing the net returns of the project by deducting all costs from the possible returns that are to be realised after the use of the project. A project is feasible when the possible returns are more than the costs. Instruments that were used to assess economic feasibility were Cost Benefit Analysis, Return on Investment and Payback Period. All cost which were experienced are described below.

### **2.3.5 Costs**

These are determination and sacrifice on organisation's resources in order to acquire anything it need, quantified in monetary value (Jaffe, 1967). The costs which were acknowledged were developmental costs, set up costs and operational costs.

### **2.3.6 Developmental costs**

These costs were incurred in the preliminary development of the system that were the costs incurred during research and those equipment needed in the development of the system.

**Table 2.3 Developmental costs**

<b>Developmental costs</b>		
<b>Item</b>	<b>quantity</b>	<b>Estimated cost( USD) 2016</b>
Barcode scanner	5	500
9 port switch	4	100
Personal computer	1	4 00
cabinet	2	200
labour	5 people	900
Training costs	5 people	600
Connecting cables	4	100
Router	1	200
<b>Total</b>		<b>3 000</b>

### **2.3.7 System Set-up costs**

These costs were incurred when the new system was about to be deployed and implemented for example renovation, setting up cabinets, and arrangement of hardware. Overleaf is table which shows the set-up costs which were suspiciously to be incurred.

**Table 2.4 Set-up costs**

<b>Set-up costs</b>	
<b>Description</b>	<b>Estimated costs (USD) 2016</b>
Renovations like painting, fixing of cabinets set up of computers, connecting cables and creating conducive environment.	2500
Induction whereby the end users are taught to familiarize with the system.	1000
Food allowance during training and people doing minor renovations	500
<b>Total</b>	<b>4000</b>

### **2.3.8 Operational costs**

These are costs which were probably to be incurred during the operation of the system and cannot be avoided for example internet service provider, maintenance of the system and stationery. Below is a table which depicts the operational costs.

**Table 2.5 Operational costs**

<b>Operational costs</b>		
<b>Description</b>	<b>Estimated cost for 2016 (USD)</b>	<b>Estimated cost for 2017 (USD)</b>
Stationary	350	250
Operational labour	960	750
Hardware maintenance	340	200
Software maintenance	250	100
Other costs	400	200
<b>Total</b>	<b>2300</b>	<b>1500</b>

### 2.3.9 Benefits

According to Randall (1996) benefits are the inflows or value of good reputation that an organisation realise from its operation. Benefits are grouped into tangible and intangible and they are explained further below

### 2.3.10 Tangible benefits

These are the benefits that are easily quantified into monetary value as a result of reduction in expenses and costs for example reduction of money spending on purchasing stationery.

**Table 2.6 New System Tangible Benefits**

<b>Tangible Benefits</b>		
<b>Description</b>	<b>2016 Estimated benefits (USD)</b>	<b>2017 Estimated benefits (USD)</b>
Stationary cost reduction	900	1500
Operational costs reduction	400	2000
Enquiry time reduced	200	250
Clerical labor costs reduction	100	150
Business increase	500	2000
<b>Total</b>	<b>2100</b>	<b>5900</b>

### 2.3.11 New System Intangible benefits

These are important benefits the organisation will be enjoying as a result of the use of the project but cannot be easily quantified into monetary value like tangible benefits for example improvement on customers' satisfaction and employees' morals. The following table overleaf is for the intangible benefits.



**Table 2.7: Intangible benefits**

<b>Intangible Benefits</b>		
<b>Description</b>	<b>2016 Estimated benefits (USD)</b>	<b>2017 Estimated benefits (USD)</b>
Improvement on customer satisfaction	1650	2750
Improved employee morals	650	750
Time saving	60	120
Improved job satisfaction	40	80
<b>Total</b>	<b>2400</b>	<b>3700</b>

### **2.3.12 Cost benefits analysis**

The above information can be further shown below on a cost benefit analysis table which is the method to assess investment viability (Chen, 1996). Cost benefit analysis is calculated by deducting the cost from the returns that are forecasted and if there is more benefits than costs then the project is proved viable while if the reverse is true, it will not be viable to invest.

**Table 2.8 Cost Benefit Analysis**

<b>BENEFITS</b>		
<b>Description</b>	<b>2016 (USD)</b>	<b>2017(USD)</b>
Tangible benefits	2100	5900
Intangible benefits	2400	3700
<b>Total benefits</b>	<b>4500</b>	<b>9600</b>
<b>COSTS</b>		
<b>Description</b>	<b>2016 (USD)</b>	<b>2017(USD)</b>
Developmental costs	3000	n/a
Set-up costs	4000	n/a
Operational costs	2300	1500
<b>Total costs</b>	<b>9300</b>	<b>1500</b>
<b>Benefits or losses</b>	<b>(4800)</b>	<b>8100</b>

From the above tables which shows the information regarding the cost benefits analysis, it is visible that after implementing the new system will bring more benefits although there will be reasonable losses by the year end of 2016 because of the developmental and set-up costs, but more profits by the coming year will be realised because these costs will no longer exist. The total benefits rose by the year end of 2016 to the year end of 2017 with an initial figure of \$4500 to \$9600 which was a very superb progress. Basing on the cost benefits analysis, it was economic viable to proceed to carry out this project since the benefits are more than the costs. The return on investment was also used to further determine the economic feasibility of this project which is described next.

### **2.3.13 Return on investment**

Mathers (2000), explains this method as the calculation of the percentage value of benefits that are realised from investing. The following formulae was used to calculate the return on investment.

$$R.O.I = \frac{\text{the average Annual profit}}{\text{investment}} * 100/1$$

Total investments

$$\text{R.O.I} = \frac{(8100 - 4800)}{2} * 100/1$$

10800

= 16%

From the results basing on Return on investment, the 16% portrays a good percentage since most analysts regarded a project with 15% or more percentage in return on investment as good projects to invest on them.

### **2.3.14 Payback Period**

This is a capital appraisal method which takes into consideration as to when the project could cover up the initial investment costs. Payback period was obtained as follows.

Assuming that

P = Remaining amount to reach the payback period (\$1500).

Q = the total amount received in the year received in the year of payback (\$

R = Number of years before final payback year (1 year).

Payback period =  $R + (P/Q) * 12$  months

=  $1 + (1500/9600) * 12$

= 1 year 1 month 21 days

Since the payback period is shorter it means it takes shorter time to recover the costs which were incurred during the investment so this proves it viable to invest into the project.

Conclusively from the economic feasibility study the benefits are more than the costs and with return on investment pegged on 16% which is a good percentage while also a shorter payback

period, therefore it was viable to continue and developing this system. However it was also important to analyse on whether the following feasibilities studies like social and operational would they allow the developer to continue with the project or not since they also had great impact to the system.

#### **2.3.14 Social Feasibility**

This study analyse the social impact of the system that were suspiciously going to affect the people who live in Chipinge and their reactions. The system was said to be feasible as it provided more benefit to the residents than costs.

- Improvement on quality of life for the residents by adoption of new technology and online operation.
- The ability of residents and employees to work remotely increase their social time with their families.
- Self-esteem to the younger age group as they want to be pioneers when it comes to the use the technology and computers.
- Employment creation to local graduates who have IT related degrees or diploma who have maintain the system and carrying out inductions.
- Collaboration and coordination is facilitated through instant messaging and query management.

#### **2.3.15 Operational Feasibility**

According to (Skidemore 1994) operational feasibility involves the projecting and predicting the viability of the system to use when it is fully developed and implemented, depending on the human resource available. For it to be feasible the management should support the system. The system proved to be feasible as it addresses several issues which follows.

- Security measures that minimize fraud by allowing the administrator only to manipulate the status of the system like adding users and deleting them.

- Audit trail leverage the system security as it will track all the activities that were done by the building inspectors.
- Provision of user manual makes it easier for use and also induction and training is provided.
- Users and clients benefit from a user friendly interface that is be provided by the system.
- The already in-built infrastructure makes it possible for the Chipinge Town Council to implement the system as major hardware are already installed and no more complex hardware or materials like mainframe computers or installation of cupboards needed.
- The system allows multitasking where several users can access the system without fail.
- The system can operate on windows operating system which is being used by the Chipinge Town Council.

Considering operational feasibility it was viable to develop the system as the necessary requirements for the operation under this system are available. Comes next is the risks analysis.

#### **2.4 Risk analysis**

Brown (2008), expressed it as the technique that the analysts carry out to critical scrutinise the vulnerabilities that are allied with the new system. The table overleaf shows the risks that might be encountered associated with the new system and the possible solutions to curb them.

**Table 2.10 Risk analysis log**

<b>Risks</b>	<b>Probability of occurrence</b>	<b>Impact of risk</b>	<b>Preventative measures</b>
Resource constraints	average	Delay the finish time of the project	start the project when enough materials are available and creating a budget
Shortage of expert and expertise and Lack of knowledge	Minimal	System will fail to perform its function	Hiring experts and expertise from reputable providers
Miss time schedule of implementation	Average	It will increase organizational costs since they would have to rely on manual labour they are running from	Implement proper time scheduling and good planning.
Lack of team spirits and poor motivation	average	retards coordination result in failure to implement the system and resistance to accept the change	Creating work groups which encourage team spirit and give incentives.

**2.4.1 Other risks**

These were other risks which were not major and were not directly affecting the system but they also had their impact to the project.

- Political issues: government policies like internet access privacy will hinder the usage of the system as sometimes it will order ISPN companies to switch of their internet thus users will be affected. The risk can be solved through adherence to the government policies and pre-warn the users in case of internet shutdown.

- The introduction of new system prioritised that is more prioritised: There might be a situation where the CTC organisation will have to carry out another new system different from this one therefore they will have to set aside this system and concentrate on that one however this risk is avoided by keeping the system administrator to be always in touch with the CTC top management to always source the information about any strategic plan of introducing another new system with immediate effect so that other solutions will be improvised before the new system is commenced.

After risks analysis next is the stakeholder analysis.

## **2.5 Stakeholder Analysis**

This analysis was the study that real focus on all stakeholders that were suspiciously going to be affected by the system probably considering their expectations and interest on the system in an effort of addressing these issues. Next are different types of stakeholders who were possibly going to be affected.

- Housing Director wanted a user friendly interface to use since she had a lot of duty to perform, she did not want an overloaded interface which is difficult to configure.
- Building Inspectors wanted the system to have a quality website so that they can clearly see the information like uploaded stand plan pictures to be approved.
- Auditors wanted a system with an audit trail which captures the details of the people who had logged in and logged out at different time so that they can see who manipulates the data.
- Town Treasure wanted a system which is less costly to maintain.
- Clients expected a system which is not complex to use and has traditional colours that represents the town of Chipinge.
- Others internal stakeholders expected a system which has integrity not prone to manipulation.

After the study on the technical, economic, social feasibilities, risk analysis and stakeholder analysis proved it to be viable to continue with the system the next step was to do the work plan.

## **2.6 Work plan**

According to (Sommerville, 2001) work plan is a tool which explains the plans of the project by depicting the available phases which are to be undertaken during the system development. The work plan of this project is described below.

### **2.6.1 Project Activities**

These are the key phases that were to be undertaken at CTC until implementation of the system.

- **Planning:** The commencing phase which sheds light on exploration of the resources like labour, time, financial that the project needs for development and also how to manage them.
- **Analysis:** Considers basically evaluating the CTC daily activities and the current system's capabilities to meet the user specifications and requirements. This information was needed when designing the CTC system that was perturbed to meet specific requirements of users also known as the high level design.
- **Design:** This phase considered the usage of information that was obtained from analysis phase to design the new system. The information had to show the look and feel of the new system.
- **Coding:** This phase is where the adding of functionality to the design from the previous phase that are in the new system.
- **Implementation:** This comes after the tests are completed by the developer, users and the project manager, if the system passed the tests then the system is to be implemented.
- **Maintenance:** It is an ongoing process which is done to keep the system to be always aligning with the user requirements.



**Table 2.11 New system work Plan**

<b>PHASE</b>	<b>START DATE</b>	<b>END DATE</b>	<b>WEEKS</b>
<b>Proposal</b>	12-09-2016	26-09-2016	2
<b>Planning</b>	26-09-2016	04-10-2016	1
<b>Analysis</b>	04-10-2016	11-10-2016	1
<b>Design</b>	11-10-2016	24-10-2016	2
<b>coding</b>	24-10-2016	24-11-2016	4
<b>implementation</b>	24-11-2016	24-12-206	4
<b>Maintenance</b>	24-11-2016S	Ongoing	

### **2.6.2 Gantt chart**

Gupta, (2008) explains a Gantt Chart as a chart that displays how the system development phases are assigned to time, commencing from system planning until implementation phase. The Gantt Chart for the new system is shown overleaf.

**Table 2.12 New System Gantt Chart**

PHASES				W	E	E	K	S						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Proposal</b>	■	■												
<b>Planning</b>			■											
<b>Analysis</b>				■										
<b>Design</b>					■	■								
<b>coding</b>						■	■	■	■	■				
<b>implementation</b>											■	■	■	■
<b>maintenance</b>														
<b>Whole document</b>	■	■	■	■	■	■	■	■	■	■	■	■	■	■

**2.6 Conclusion**

Conclusively the planning phase explained on the feasibility study which were economic, technical, social and operational and the results from these study deemed it necessary to continue with the project. The risks analysis which was carried out led to the discovery of several risks and their solutions were put forward. Furthermore the stakeholder analysis was carried out depicting their expectations on the new system while the work plan was also drafted, supported by a Gantt Chart in depicting the duration of the project. Following is the analysis phase which studies how the current system works so as to identify its weaknesses for the purpose of developing a new flawless system.

## **Chapter 3: Analysis Phase**

### **3.1 Introduction**

The analysis phase was dedicated to explore on the information gathering methodologies that were used. The current system's analysis was carried out and the entire processes including some of the system's loopholes being indicated. The study of the current system had to be depicted through the activity diagram, context diagram, data flow diagram and use case diagram. Moreover the researcher conducted the assessment of the alternatives that Chipinge Town Council might employ in sourcing the software. Requirements analysis for the new system were part and parcel of this analysis phase.

### **3.2 Information gathering methodologies**

These were techniques that were employed in order to gather enough information about this project, the system analyst had to employ some methodologies and tools which were interviews, observation and questionnaires. Information gathering was very important activity as it helped the system analyst with the required information for analysing the current system so as to map for an improved system.

#### **3.2.1 Interviews**

This form of communication allows directly asking questions and getting response between two or more people being involved (Gillham, 2008). The interview was carried out with the IT controller, Housing director as well as the Building inspectors. The interview conducted was helpful as it exposed the following features which were to be included in the system.

- A system that allows the administrator to track all the activities done by each building inspector.
- A system that allows the residents to book for inspectors online.
- A system that allows the Housing Director to assign building inspectors tasks online.
- A well designed interface that has traditional colours for Chipinge.
- Quick record searching and data retrieval.
- A system that allows management of queries online that is sending and replying.

### **Advantages of Interviews**

- It revealed some of other features that were supposed to be included in the system which the analyst was unaware of, that were needed by the housing directors and inspectors.
- Interviews created a common community of practise as the interviewed groups felt to be part and parcel of the system development thus stimulate easiness in developing the system due to collaboration.

### **Disadvantages**

- Fearing to lose their job especially building inspectors resulted in obtaining misleading information as they tended to protect the organization rather exposing the truth.

### **3.2.2 Observation**

This methodology involves the analyst basically seeing people's daily activities at work, current environment conditions and the process being undertaken in their natural settings (Brown, 2000). This methodology was utmost to the expert as it enabled fact finding of the necessary information without affecting the work flow whilst obtaining true information free from bias as workers did not see that they are being trolled of their daily activities. The analyst successfully carried out this methodology by pretending to be a resident who want to book for inspection and also wanted to process his queries. The observer managed to conclude the following.

- Overcrowding of residents who were booking for inspections and those who were seeking for assistance for their queries.
- Inspectors were not finding some files containing information about the stages they lastly inspected.
- Inspectors were idle when the Housing director was not around since no one could assign them tasks.
- There was misplacement of files.

### **Advantages of Observation**

The analyst gathered information easily since he could see by himself.

- The analyst had a better understanding of the current system without consulting anyone.

- Observation reduced the costs required for conducting research.
- It enabled a quick data and information gathering.

### **Disadvantages**

- The conclusion that the analyst find was not reflecting the day to day scenario at Chipinge Town Council since people are dynamic hence the analyst ended up dealing with wrong conclusion.
- Some employees ended up adjusting after detecting that they were being observed by the analyst hence the conclusion ended up being biased.

### **3.2.3 Questionnaires**

These are paper scripts that contain questions, answers and filling spaces where large coverage is indebted to be met (Kendall, 2002). Questionnaires were important because they showed a collective culture of Chipinge residents because they were broadcasted in large quantities, therefore by considering the responses that were obtained they resembled the true picture of the particular group's views, if it produced similar or near similar responses, thus it was easier to disseminate the organisational culture and the Chipinge resident's culture. This methodology was carried out by broadcasting the questionnaires which had yes or no answers and gaps for other suggestions. Some of them were distributed to the general public so as to deduce their feelings about the new system and also putting their own suggestions if there were possible improvements being needed. Following are the results that were obtained from this methodology.

- Users wanted an easy navigation system which is not complex to use.
- Users wanted improvement on response time to their queries.
- Residents complained much about long queues when booking for inspections.
- There was appreciation for an improved new system from the current system.

### **Advantages of Questionnaires**

- The maintenance of user confidentiality made it possible to obtain relevant information.
- Users were able to express their opinions on the blank spaces that were provided within the questionnaire.
- It was relatively cheaper than conducting interviews.

## **Disadvantages**

- There was lack of contribution from users as some questionnaires were not returned by some of the staff members.
- It was discovered later that the questionnaires by themselves had no proper clarifications like interviews hence ensued in wrongful interpretations of questions which resulted in the gathering of inaccurate information.

## **3.3 Current System Analysis**

Data gathering tools that were used to collect the necessary data which included interviews, observation and questionnaires helped in the description of the current system of Chipinge Town Council. The analyst had a clear understanding of the current system after conducting an extensive interview with the Housing Director and the building Inspectors. When one is booking for inspection at Chipinge Town Council, the client has to come in person and collect his or her file in housing office which contain all the information pertaining to the last stages and transaction histories then pay inspection fee at the counter. The client will seek the Chief debtor's office who will issue a form containing the stages which are to be inspected after producing a receipt for inspection fee. The inspection form will then be authorised by the Housing Director who will then assign the building inspectors to visit the client. The client had to approach the offices for the inspection requisition until the completion of the structure. The construction will continue if the previous stage has been inspected and meets the expected standards. Clients have to approach the Billing Office for clarifications of their queries. The problem which arise with the current system are, overcrowding of people in offices, loss of files, slow processing of queries and retards operation of work.

### **3.3.1 Inputs**

- Client payments.
- Client inspection requests.
- Client's registration details.

### **3.3.2 Processes**

- Inspection fee receipting.
- Verifying building plans.
- Stage inspection.
- Ruling.

### **3.3.3 Outputs**

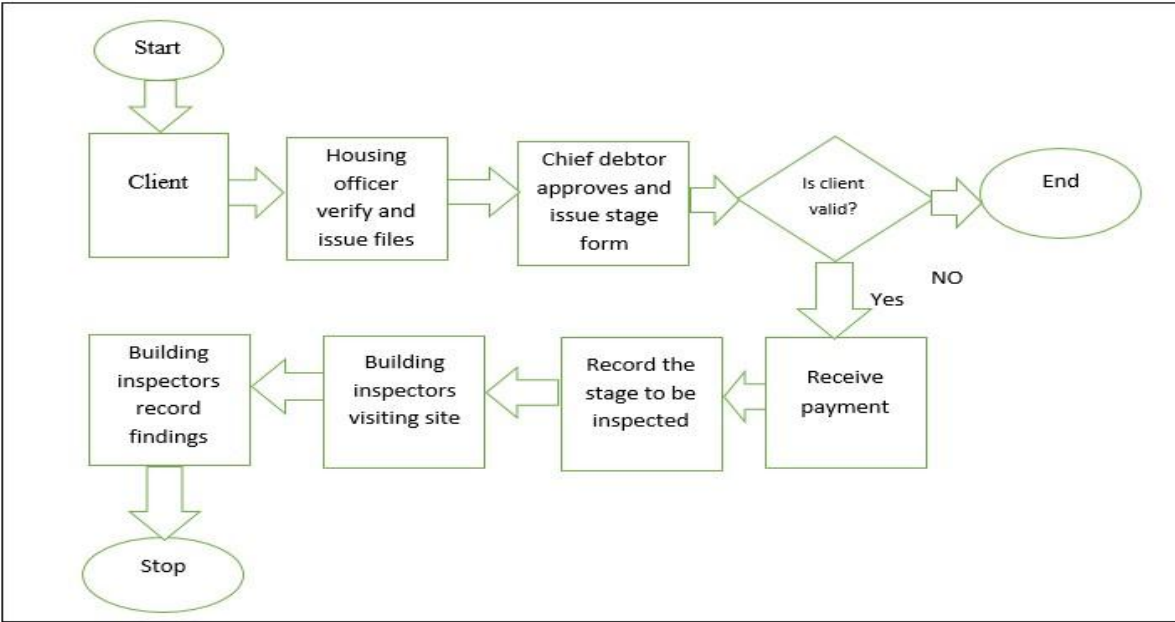
- Ruling reports.
- Occupation certificate.

## **3.4 Analysis of Processes**

This activity is done to scrutinise the general chronological sequence of activities that are done in developing a system noting the key inputs, processes and outputs (Sommerville, 2011). The major aim of process of analysis was to map for the activity diagram which assisted the developer to understand the existing system.

### **3.4.1 Activity Diagram**

It describes the flow of activities that are executed in the system from the preliminary stage up to ruling point (Donald, 2004). The next diagram is the current activity diagram for Chipinge Town Council.



**Fig 3.1 Current System Activity Diagram**

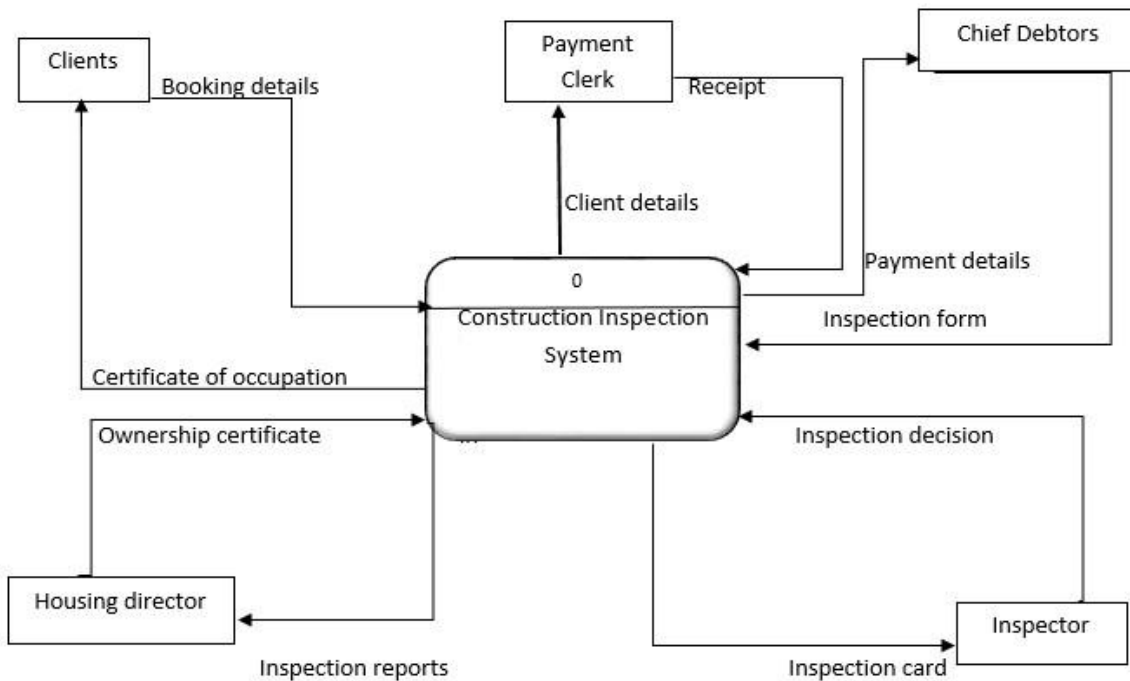
### 3.5 Data Analysis

It is the assessment of data using logical and diagnostic tools to explore each element of the data provided (Roos and Levine 2007). Data analysis helped in the formulation of a data model to facilitate a simple, normalized, flexible and adaptable database. This was achieved through evaluating the necessity and value of the gathered information to facilitate a deeper understanding of the current system so as to map a flawless new system. The data analysis involves context and data flow diagrams.

#### 3.5.1 Context Diagram

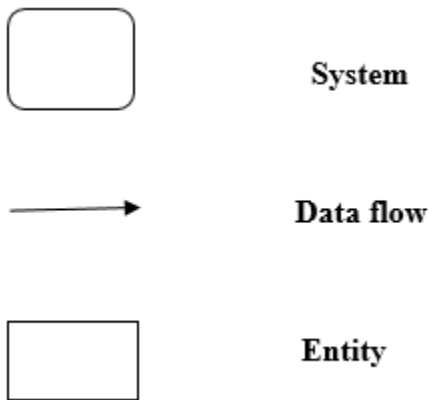
Kendal (2011), explained it as a diagram that facilitates easy defining of the highest level design of the current system, hence it should vividly depicts all the inputs, entities, flow of data and outputs involved. Overleaf is a context diagram which shows all the entities of the current system as well as the symbiotic relationship of data and information sharing within the system.





**Fig 3.2 Existing System Context Diagram**

**Key For the Context Diagram**



**3.5.2 Data flow diagram**

According to Marakas (2001) depicted as a tool that represents the system processes, functions and the movement of data that are within a specified system periphery. Whitten et al (2004) defines a data flow diagram as a low level design of process model that shows the in depth of

movement of data within a system and all the processes done by the system. The data flow diagram for the existing system is below.

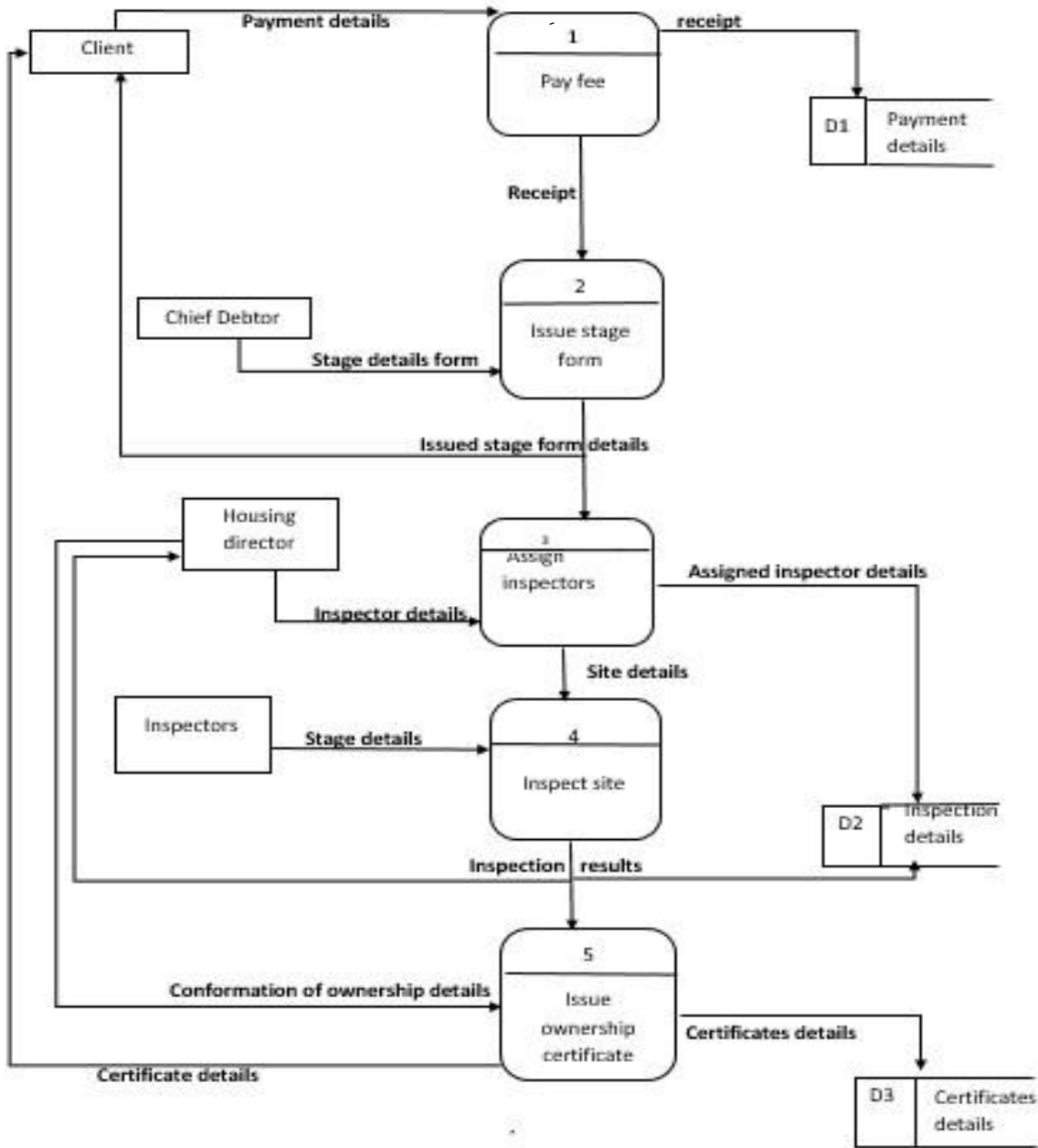
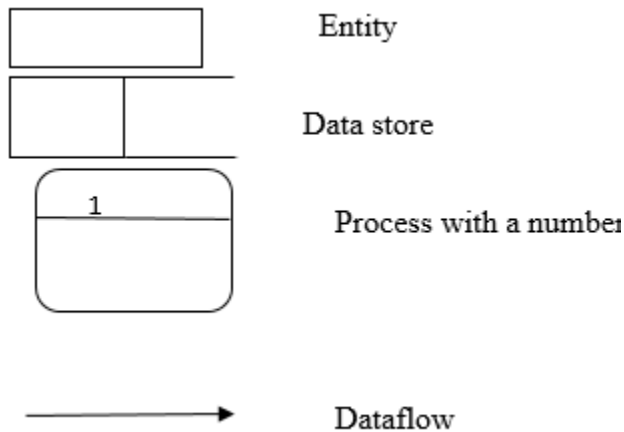


Figure 3.3: Current system data flow diagram

## Key for dataflow diagram



### 3.6 Weakness of the current system

- Shoe-leather costing to clients who had to visit the town Council for inspection booking on each and every stage which is very costly and time consuming.
- Overloading employees with workload due to high usage of paper work.
- Overcrowding of clients who come for booking and querying.
- Very costly on purchasing stationary.
- Misplacement of files triggered data loss and thus the system lacks data security.
- There is data redundancy and duplication of information.
- Arrangement and sorting of files was tedious and boring to employees
- Generally the operation of the current system is too slow due to lack of collaboration among departments.

### 3.7 Evaluation of Alternatives

There were different alternatives of sourcing when considering developing a new system depending on the costs and time span of the system needed. These alternatives included outsourcing, improvement and in-house development. The developer consulted the Chipinge Town Council management on the evaluation of these alternatives in sourcing the software that will solve the current problems. These alternatives were evaluated using the feasibility study to deduce the one which was most appropriate, cost effective and shorter life cycle.

### **3.7.1 Outsourcing**

Outsourcing is the resolution to allocate Information Technology resources, premises and workforce tasks for providing of Information Technology services from internal Information Technology functions to outside vendors which embodies at least eighty percent of the Information Technology budget (Hoffer, George and Valacich 2002). This alternative was going to be an appropriate alternative if it ascertained to be economic and cheaper than other alternatives, however the following reasons which were put forward by the developing team made it impossible to outsource.

- There were hidden costs which made it expensive like maintenance cost and patching of the system.
- Incompatibility of the system with the requirements since it will be developed somewhere without user involvement, thus resistance will be common.
- If the developer liquidate the company or moves out the country, the town council will face challenges as to who would maintain the system.
- It does not guarantee the security of Chipinge Town Council information because the information might be hacked by the developer.
- It might suffer from scheduling priority issue for example the developer might be overwhelmed by other tasks thus postpone this system.

### **3.7.2 Improvement**

According to Hoffer *et al* (2002), explained it as a situation where the existing system is continuously upgraded by adding new features or innovative components to it. Improvement is done in order to meet the stakeholder's needs which are always dynamic. Improvement was going to be applicable if Chipinge Town council had enough resources to meet the changing needs and wants of stakeholders however due to the following reasons which were unanimously agreed upon by the developing team it was not viable to do improvement

- In long run, these problems will come again.
- Continually upgrading the system raises more processes, activities and needs more workers resulting in expanding the organisation expenses.

- The organisation will end deviate from its core strategic objectives if continually improving the existing system, hence will be expensive to reverse it.

### **3.7.3 In-house Development**

According to Setende (2012), this involves management puts a decision to retain at least eighty percent of the IT budget internally after evaluating the IT services markets. This is a clinically and direct problem-solving solution as it opts to facilitate the curbing of all the problems being encountered, using the data and information gathered in the planning phase which is close to accurate. Development provides a cheaper solution than opting for outsourcing or off-the-shelf system which might increase the cost levels. The reasons why it was agreed upon by the team to employ in-house development as the best alternatives were.

- Maintenance costs are reduced because everyone in the company has a deep understanding on how the system was developed and works.
- It minimize expenses since the infrastructure needed for development is already there.
- System failure was very slim since it was developed after an intensive research and analysis, thus each and every problem specified is catered for.
- Fully ownership of the system that gives them the right to change and upgrade it easily.
- In-house development is usually carried out in accordance with the organization's budget.
- It enabled users to feel the control of the system because it is centered on user stipulations and requirements.
- Reduces consultation fees.

### **3.7.4 Alternative selection**

With the different alternatives available, in-house development was chosen to be the most appropriate alternative after it was unanimously agreed upon by the management and the analyst as it overcame all the current system problems much better than others. Due to its capability to meet various user requirements with minimum costs, In-house development was selected as the most appropriate. In-house development provided the following features, thus makes it phenomenal important to be selected.

- Easy in upgrading and maintaining the system within the organization if the need arise.
- Very easy to integrate the system with user necessities and specifications from other departments.
- Customization of the system reduces costs like consultation that are accumulated when outsourcing.

**Table 3.1: alternative selection table**

Alternative	Cost
Outsourcing	7500
Improvement	5500
<b>In-house development</b>	<b>4800</b>

The above table illustrates that it was less expensive to adopt the in-house alternative, due to the minimum costs that will be forwarded to development and maintenance as the IT can easily maintain the system, also with the user involvement in every stage of the system development made it less expensive during training and induction. The process of in-house development incorporates staff from all different departments, which fuels the development of a system that solves almost all problems at hand and meets achievable user requirements and specifications.

### **3.8 New System Requirements Analysis**

Whitten *et al.* (2004), refers it as the scrutiny of the new system’s capabilities to provide good results to the users. This study basically focused what should be delivered by the new system in terms of its goals specifically to the users which are categorised in functional and non-functional facilities and also indicating the information that should be captured, stored and made available. At this stage performance levels were expected and the priorities of different requirements were to be endorsed. The major aim of requirements analysis was to address the challenges of the current system which had been specified earlier.

#### **3.8.1 Functional Requirements**

Somerville (2007), argued that the functional requirements are merely the primary or basic activities, capabilities and abilities that the new system is entitled to meet. Commonly denoted as

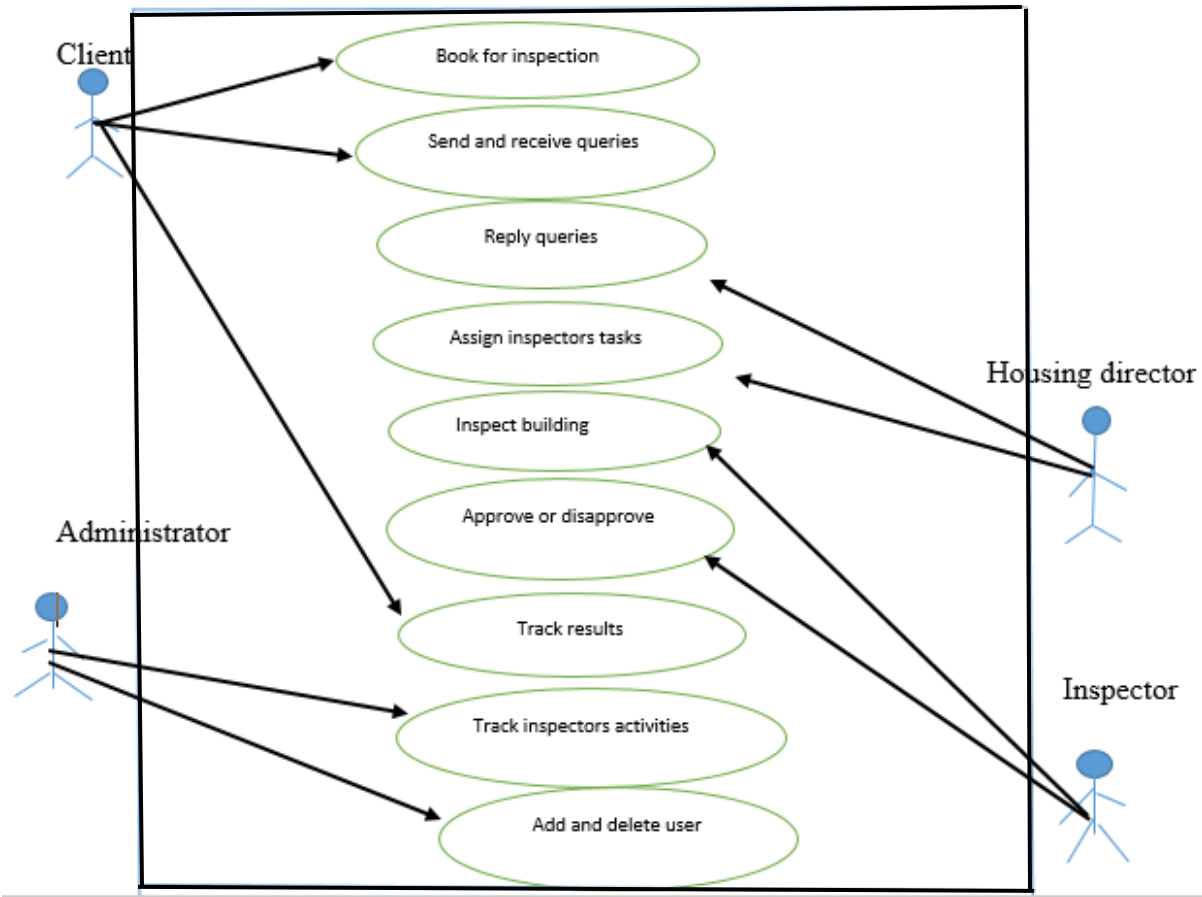
the primary utilities the new system should provide. Functional requirements concentrate on the activities the system should do and convey minus failures to the users. Generally it cogitates on what were the forecasts from the new system that were, inputs, processes and outputs. The expected functional requirements of the new system were.

- The system had to allow clients to book and send their requests online.
- Allowing the housing director to provide feedback to clients as well as allowing them to view the feedback.
- Allow the building inspectors to view all the details send to them without fail.
- The system should provide the reports to the management which are true.
- It should provide an audit trail which tracks every building inspector's activities in the system.
- Allowing the housing director to assign building inspectors tasks.
- Concurrency and consistence, where the system should be accessed by different clients anywhere, anytime without fail as long as they are linked to the internet.

These functional requirements were further represented with the use case diagram presented below.

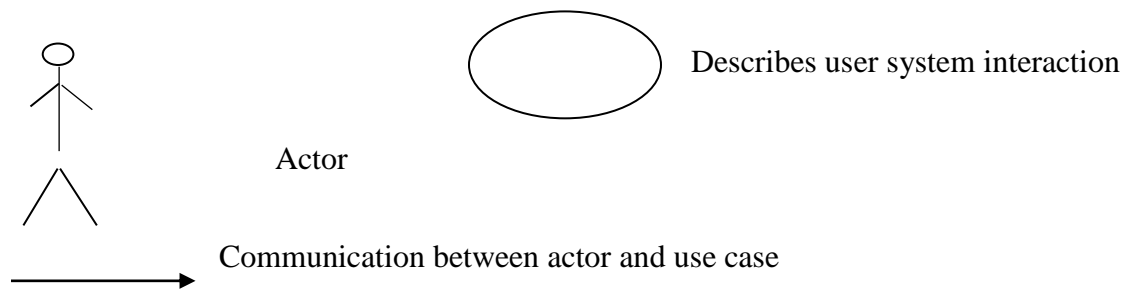
### **3.8.2 Use Case Diagram**

It simply depicts the users' interaction with the system showing all the relationship involved (Sommerville, 2011). The use case diagram identified the different types of users in the system, corresponded to their specific activities whilst depicting the symbiotic relationship between them. Overleaf is a use case diagram for the new system.



**Fig 3.4 Use Case for the new system**

**Key to diagram**



**3.8.2 Non-functional requirements**

Non-functional requirements shade light on the assumptions or how the system is thought and supposed to behave which is basically referred to as the quality of the system. These requirements expresses on how well the system is regarding its standard other than requirements and specifications that is the system is being assessed and evaluated on its performance rather



than its behaviour. They are also known as secondary utilities that the system is entitled to meet. The non-functional requirements that the new system should possess are.

- User-friendly interface that is easy, simple to learn and use while having a vibrant and comprehensible user interface.
- The system should have authentication, authorisation and access level facilities to allow integrity checks.
- Fault handling like, authorising and authenticating user credential particulars transferring of information and error recovery allowance.
- Flexibility in modification that is easiness in updating and deleting.
- Portability, where the system should be transferrable to different location.
- Being compatible with any windows applications, can open up to any web browser and to any operating system.
- System efficiency and output where it should enable quick information retrieval, minimize the time taken to log in and response time.

### **3.8.3 Constraints**

- The system should not be multi-tasked together with other activities.
- Technician are needed to help in the development and maintenance of the new system.
- The system needs to updated periodically and always check for updates.

### **3.9 Conclusion**

This phase depicted a fundamental part in preparation of the new system. The project team studied the existing system by the superlative chosen data gathering methodologies. The existing system was analysed through the use of context, activity, and dataflow diagrams which were helpful in the groundwork for the new system. The project team unanimously agreed on in-house sourcing as the best alternative to develop the new system. This phase created a real understanding of what the new system should do and behave by analyzing its functional requirements which included its use case diagram and non-functional requirements with the constraints that are accompanied with it. The next phase is the designing of the new system.

## **CHAPTER 4: DESIGN PHASE**

### **4.1 Introduction**

This is the phase which centers mainly with the crafting of the new system using several designing approaches. The developers commenced on the system design in form of context diagram, dataflow diagram, architecture design and database design. The program design and interface design was carried out while security design was also undertaken. In general this phase provides a summary on how the new system is supposed to operate.

### **4.2 System Design**

It is the portrayal of all the system mechanisms, its manner, interfaces, components, and the specified data to encounter the acknowledged requirements (O'Brian 2006). In essence, system design explained the construction of the entire system architectural scheme which consisted of the numerous mechanisms that commenced from the dispensation components until the complete body is realized. This system was proved to be well-designed because it has the following paramount features.

- The clients' ability to book and send query online without fail.
- Auditors and administrators are able to track the activities of the inspectors.
- The housing director's ability to assign inspectors online.
- Efficiency, the system will run all its operations and process jobs with minimum response time.
- Security, the system has tight security to guard the system from the outside and local hackers and it maintains user confidentiality and controlled access level.
- Trustworthiness, the ability of the system to get rid of system problems like failure after system crash is of paramount importance.
- User friendliness, the system provides a very good interface which provides easy navigation and ease of use for users.

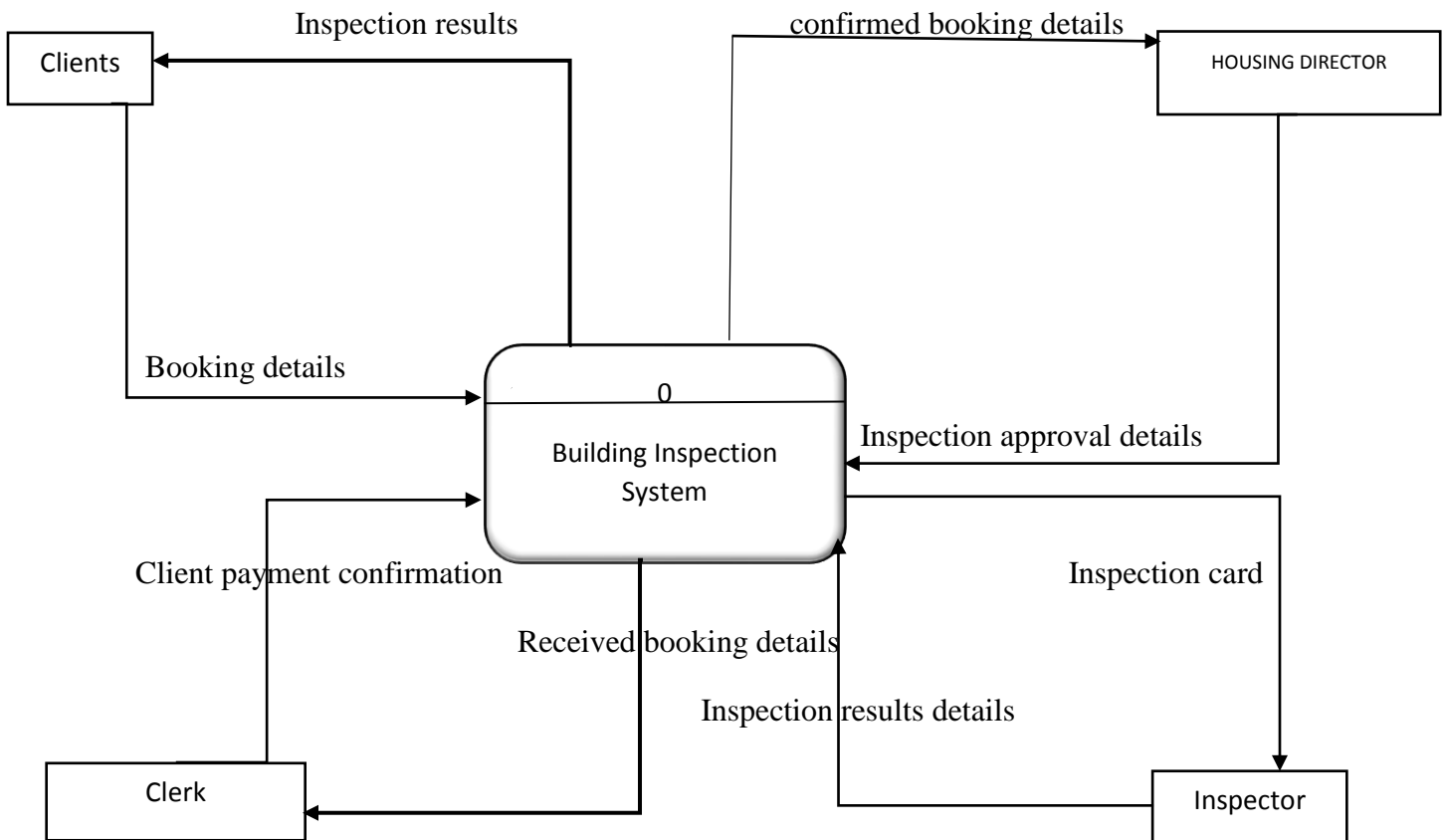
#### **4.2.1 How the new system works**

The Chipinge Building Inspection System enables customers to book for the inspection, sending queries, track their response and receive their queries reply online. The housing director has the privilege of assigning building inspectors tasks online. The system has an audit trail that keep

tracks of the activities done in the system by the inspectors. The inspectors are able to reply the clients online and even the housing director is able to view the house plans of the clients who had booked for inspection before assigning the inspectors. All the transaction history will be stored in the system. Clients will be able to view their stage status online.

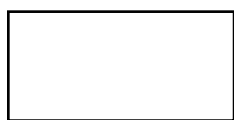
#### **4.2.2 New System Context Diagram**

Kendall (2002), expressed it as a framework of the specified system defining its precincts, reflecting the magnitude under which the system is relating with the outside situation. It is also known as level 0 data flow diagram which comprises one process node called the "Process 0" with the units which provides data. The main purpose of the process node is to generalise the function of the system relative to entities. The new system context diagram is indicated on next page.

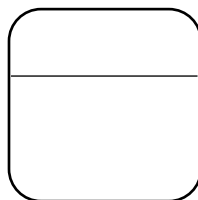


**Fig 4.1 New System Context Diagram**

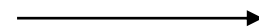
**Key**



**Entity**



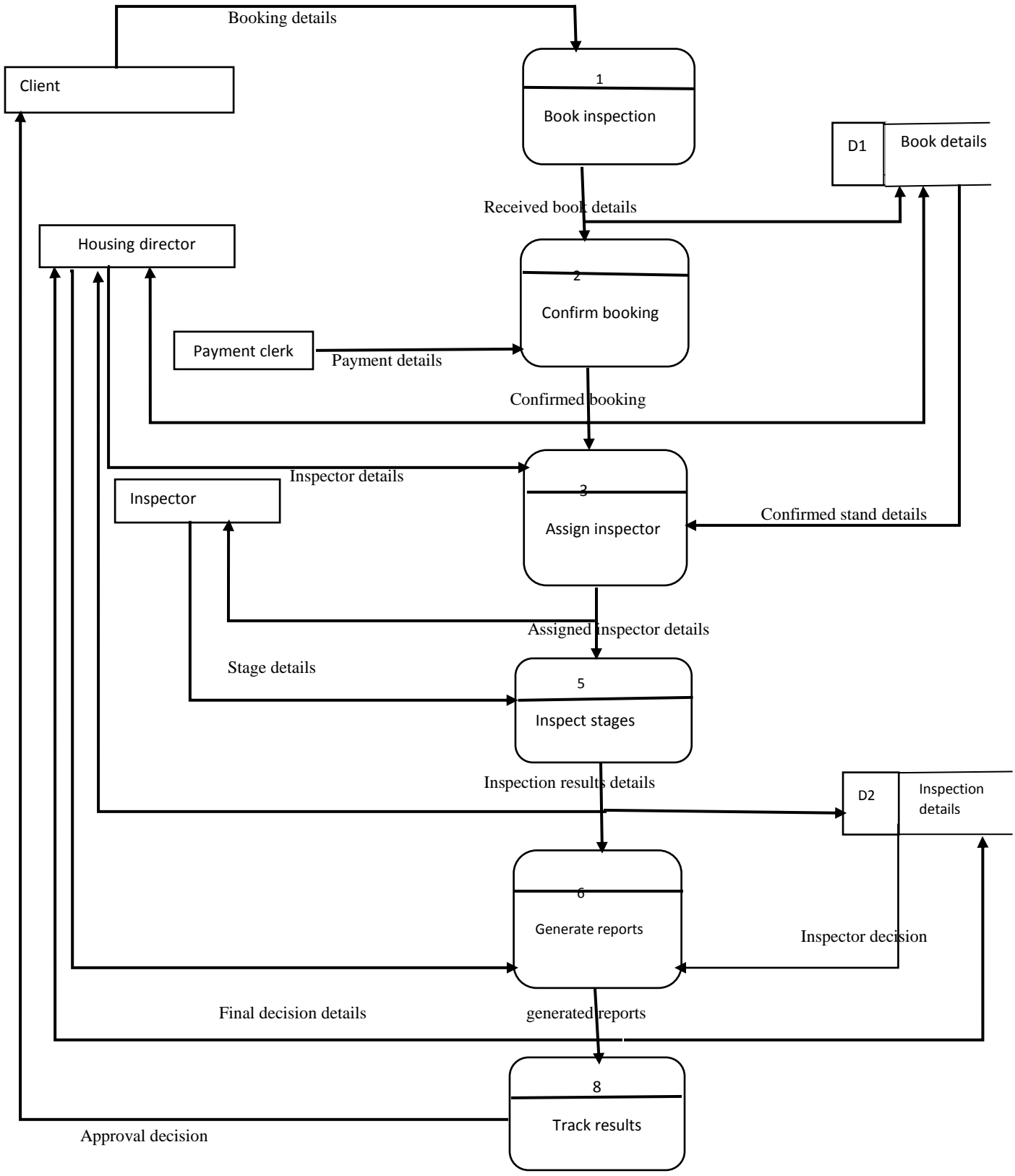
**System**



**Dataflow**

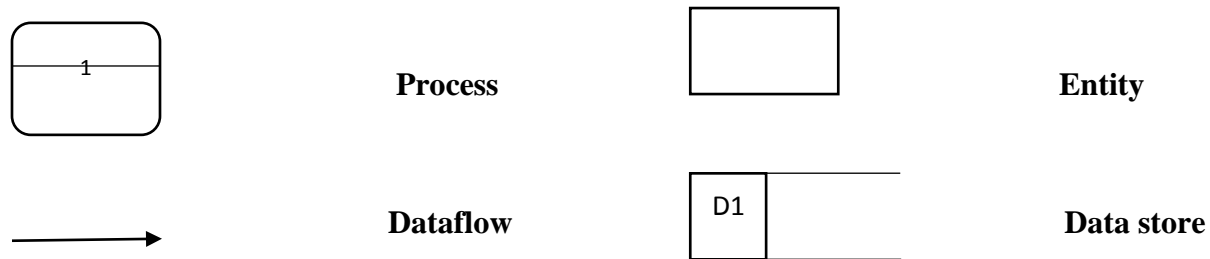
**4.2.3 Data Flow Diagram for New System**

Kendall (2002), put forward that it is a process model which represents data in motion inside the system and the relationship between the processes accomplished and the entities that have responsibility of providing inputs and receiving outputs also. In nut shell, data flow diagram is low level design also known as level 1.0 that helps in unfolding the system peripheries and depicting the reasoning behind the flowing of data within the system. Overleaf is a new system data flow diagram.



**Fig 4.2 New System Data Flow Diagram**

**Key**



**4.3 Architectural design**

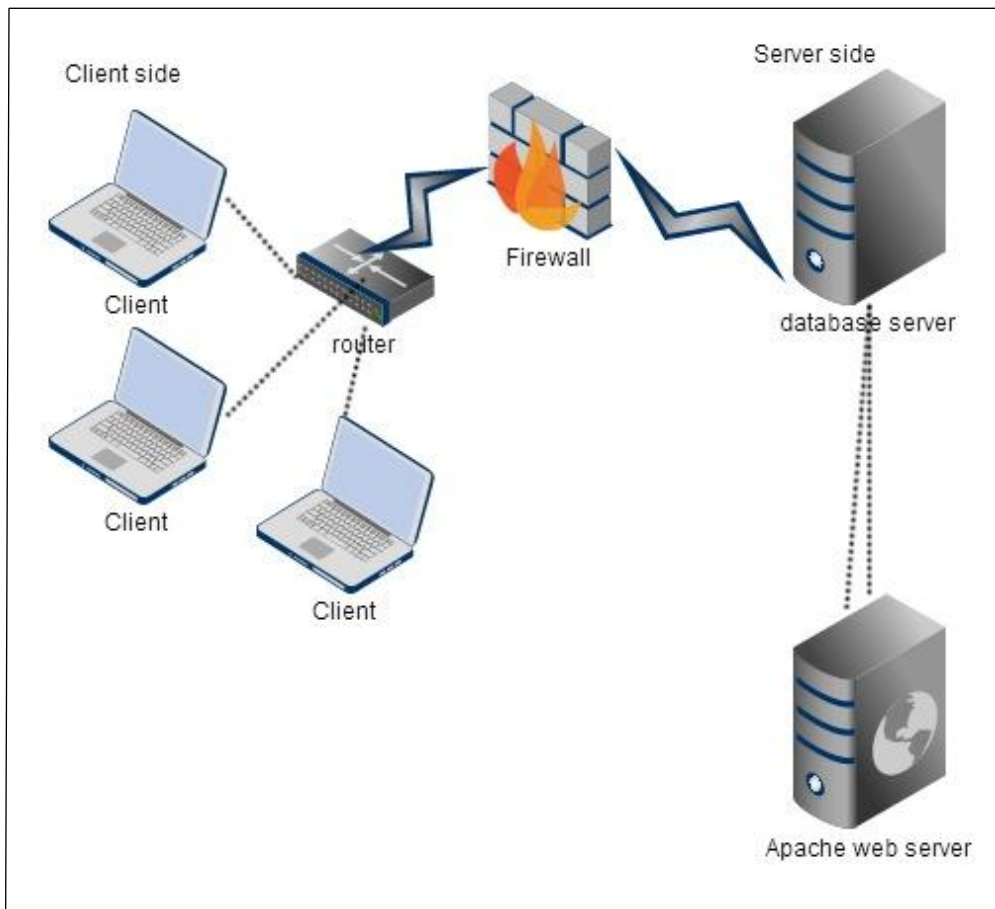
Bass (2012), argued that systems architectural design refers to a generic discipline that is undertaken to handle objects that are existing or to be created known as “systems”, so that they support reasoning and the structural properties of the named objects. Forouzan (2007) portrays architectural design as the breaking down of highest-level system into its fundamental parts. Therefore systems architecture is of great paramount as it unifies system structures that are defined in terms of system elements, processes, interfaces, behaviors and constraints of the system. Furthermore architectural design is a solution to the conceptual and practical difficulties when describing and designing very complex systems. The project team agreed to use static architectural design model because it has the ability to show all the system components with their relationship communicating to each other in the new system. The client-server approach was adopted to develop the system.

**4.3.1 The Client-Server Method**

This method incorporated a dedicated influential server with the purpose for management of disk network servers and drives print servers. The server is surrounded by the clients consist of personal computer or workstations which request for resources from the servers. The client-server architectural design for the system has got following elements:

- Database Server, where all organization’s information needs are stored.
- Web Server where the graphical user interface (GUI) and web pages are found and also they are retrieved on the browser.
- The client machines communicate collectively whilst asking for information from the server.

- Local area network cables, used to connect customers and the hub in a network.

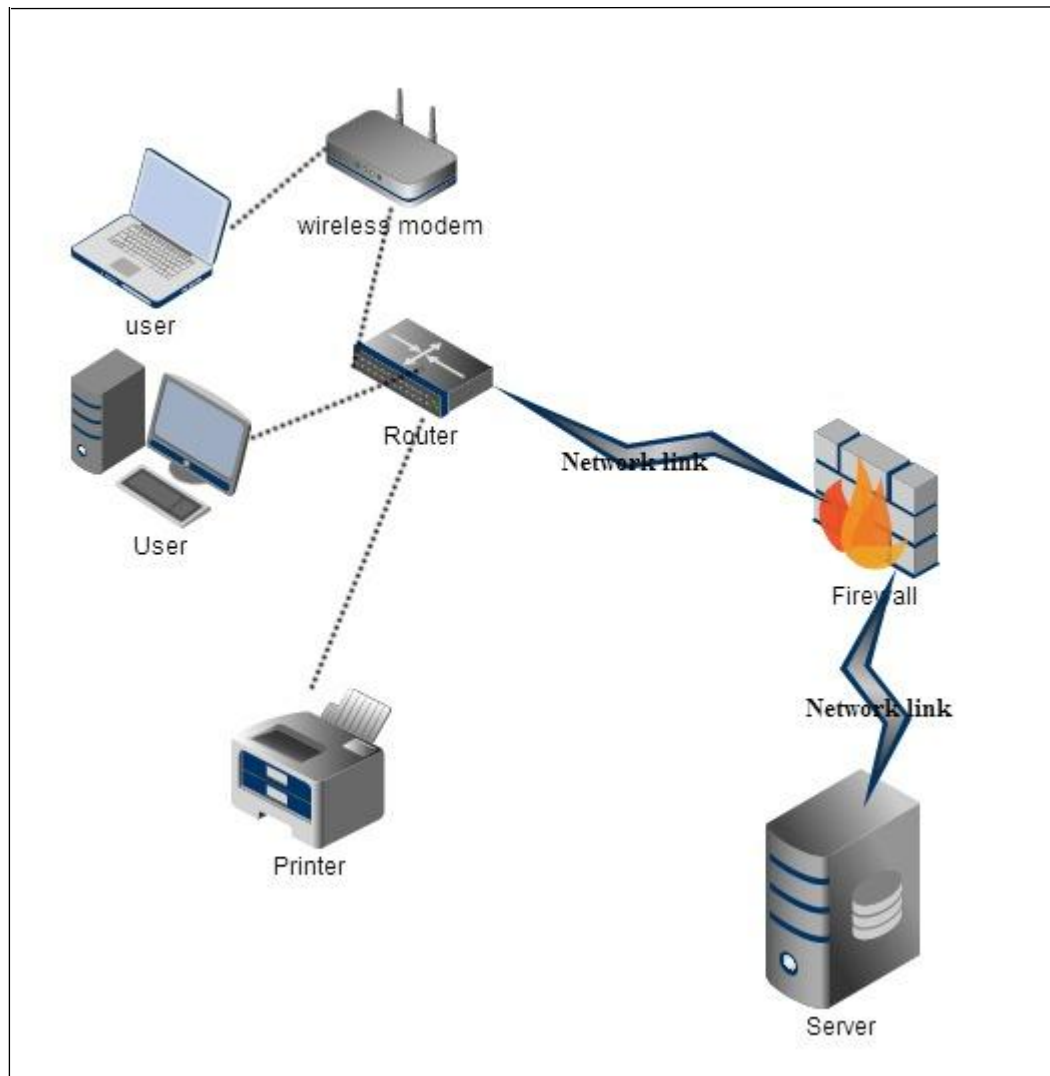


**Fig 4.3 Architectural Design** (*adapted from Somerville, 2004*)

#### 4.4 Physical design

This design shows the physical set up of hardware and software components of the new system, showing their symbiotic relationships and how they are linked to the database server. Basically hardware and application elements of the new system are focussed on how they are linked and communicate to each other. This policy vividly shows the hardware platform needed by the new system whilst clearly and entirely defining the technical surroundings of it. The new system's physical design consists of several clients with desktops where the updating of the system is done by the administrator, inspectors and housing director. These computers are connected to a router that translates data to the database server which has the responsibility of manipulating the whole operations that are done for example deleting, updating and retrieval of information in the database. The firewall that is between the system server and the router assist in protecting the

transitory of virus and malware from the internet. There is a printer which is linked for reports printing. Below is the new system physical design.



**Fig 4.4 New System Physical Design** (adapted from O'Brian, 2006)

#### **4.5 New System Database design**

Gehrke (2003) stresses it as a mechanism that enable the capturing of data in a way that expedite easy read and write of the stored data by end-users. A well designed database is perfect, secured and provide current data to the users. The designing process of a database generally involves two level procedures and the first level is user requirements identification before database design, also known as information level design and the next level is physical level which facilitates all



the transformation of information to a particular Database Management System design that is employed in the solicitation of the system. Data administration is vital in the database for the purpose of:

- Securing of data independence
- Facilitation of data integrity

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

According to Meyers (2007), explains it as a procedure that manages collections of rules and protocols concerning on how well data is stored in the database whilst implementing some constrictions on the right to entry on data by unauthorised users. The project team agreed to use ANSI-SPARC model which has three discrete schemas namely the outside layer, conceptual layer and the physical layer.

#### **4.5.2 External level**

This level is the uppermost of the model and it comprises of a personalised view for the end users (Meyers, 2004). This level is paramount as it leathers the way data is kept in the database to the final users but allowing those several different users to view the same data in unique ways for example the interface shown to the employees is different from the one of customers however the same data is being accessed.

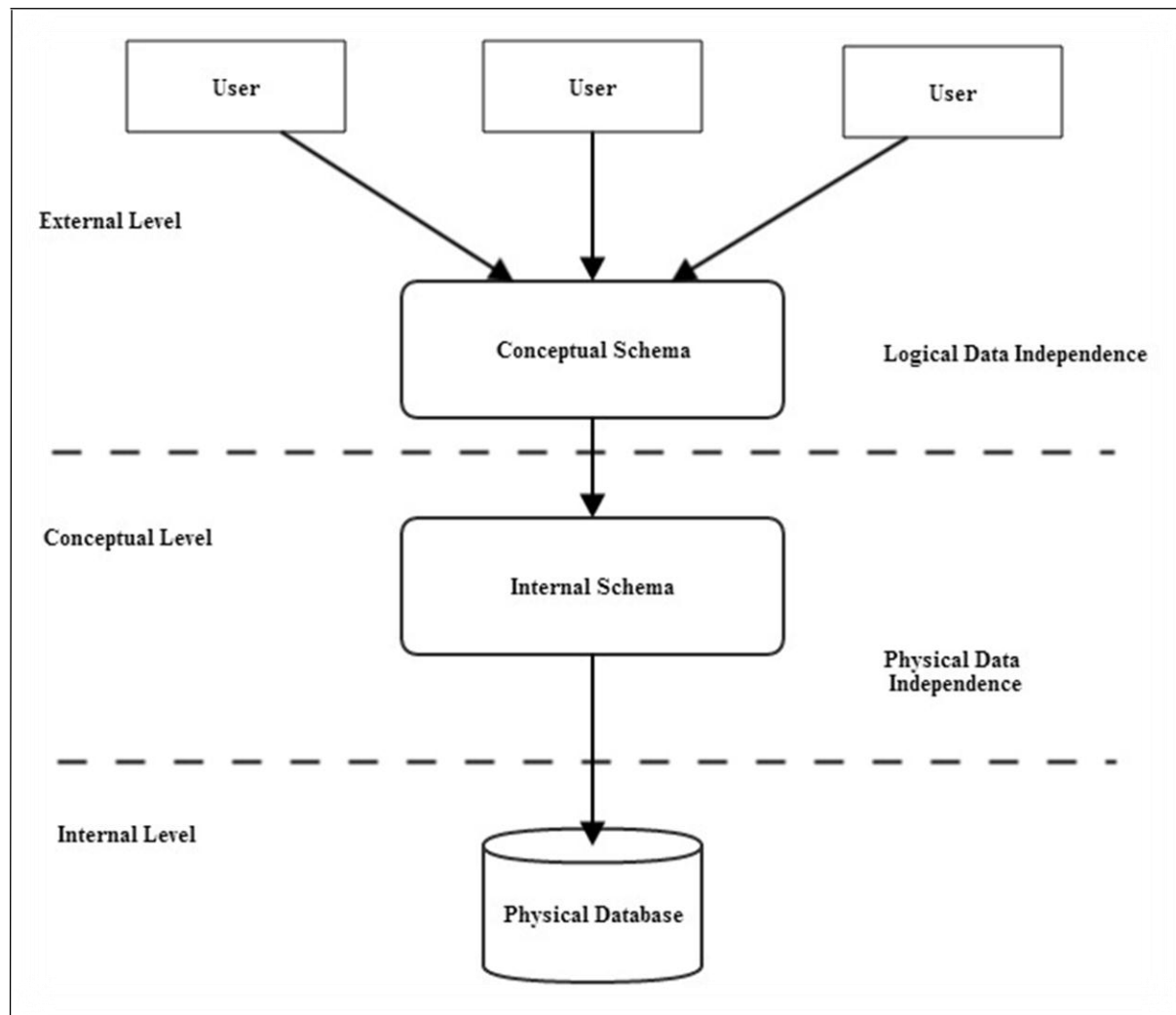
#### **4.5.3 Conceptual level**

The conceptual level shows the type of data and their relationship with all the constraints and enforcements in it with the aim of facilitating all data to be viewed in the external level. This level has the following protocols that it represents, the entities' relationships with their attributes, the constraints of data, security and integrity of information. The new system contains tables in the database which is the repository for diverse data like, the table name called users, the user is an entity with the following attributes, user identity, username and password.

#### **4.5.4 Internal level**

It explains the physical view of the database and the description of the data that it possesses. In nutshell, the internal schema defines the types of stored records, indexes existing and how stored files will be retrieved. This lowest level also specifies the encryption techniques that were used

which were MD5 functions that were used on user passwords. Also this level interfaces with the operating system when inserting and retrieving data on the storage devices. The diagram below depicts the model of ANSI-SPARC.



**Fig 4.5 Database Architectural Design**

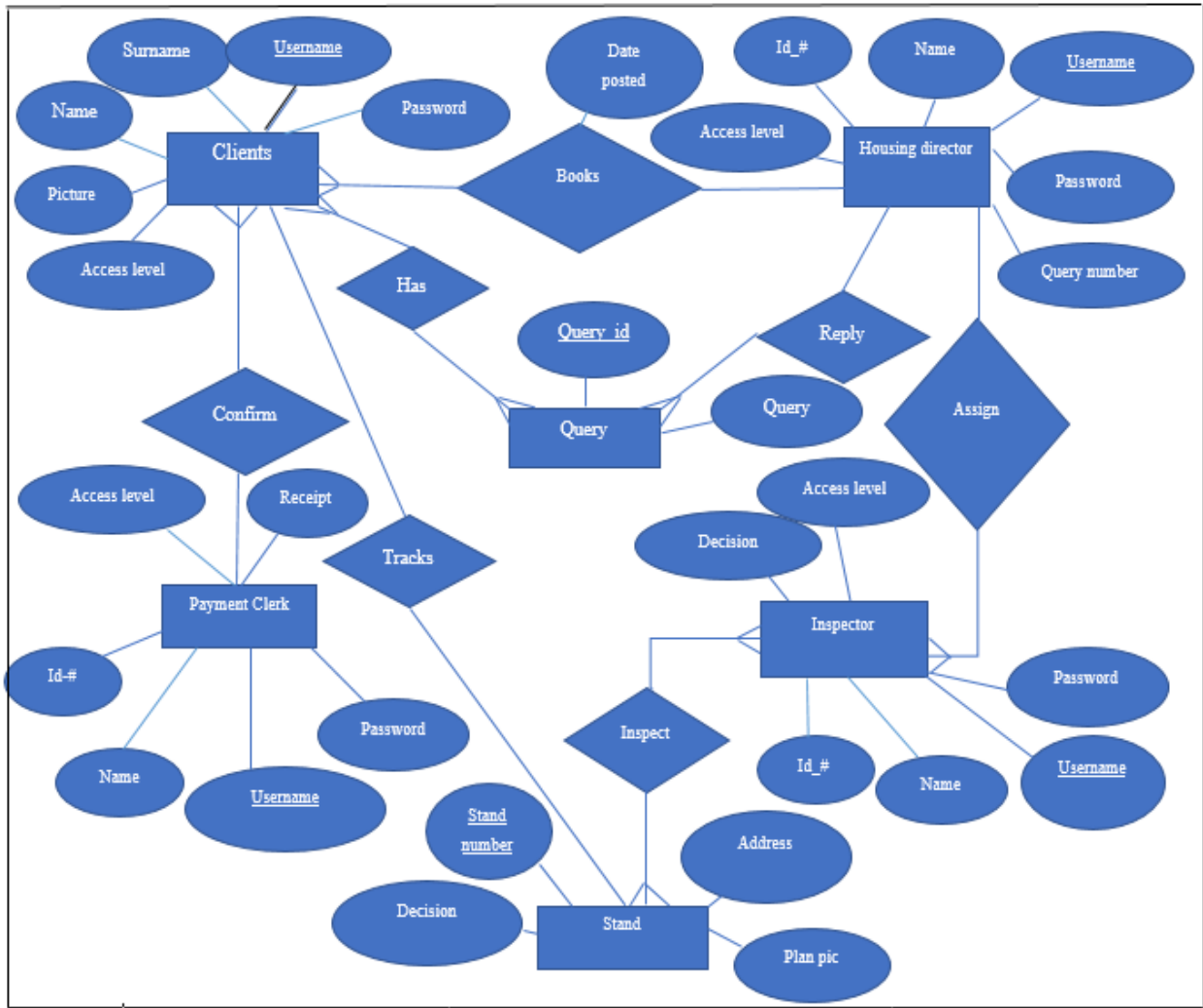
#### **4.5.4 Reasons for adopting relational databases**

- Facilitation of data matching it uses of common features that are provided by the data set.
- They are very efficient, robust and good for data handling.

- They are secure because they provide the application measures that controls and limits external handling.
- Ability to facilitate the database management procedures for example; retrieving, deleting and updating.
- Relational databases facilitates simultaneous access of same data in difference ways by users due to its improved sophisticated concurrence access.
- Providing data independence.

#### **4.5.5 Entity Relationship Diagram (ERD)**

According to Joey and Jeffrey (2012) portrays an entity relationship diagram as a data modelling technique that diagrammatically depicts the information of the system's entities and the relationship that are associated with it. Hazra (2013) put forward that the Entity Relationship as entities or objects that possess the data kept concerning them and the cardinality which explains the association between entities in terms of numbers. Overleaf is an entity relationship diagram for the new system.



**Fig 4.6: New System Entity Relationship Diagram**

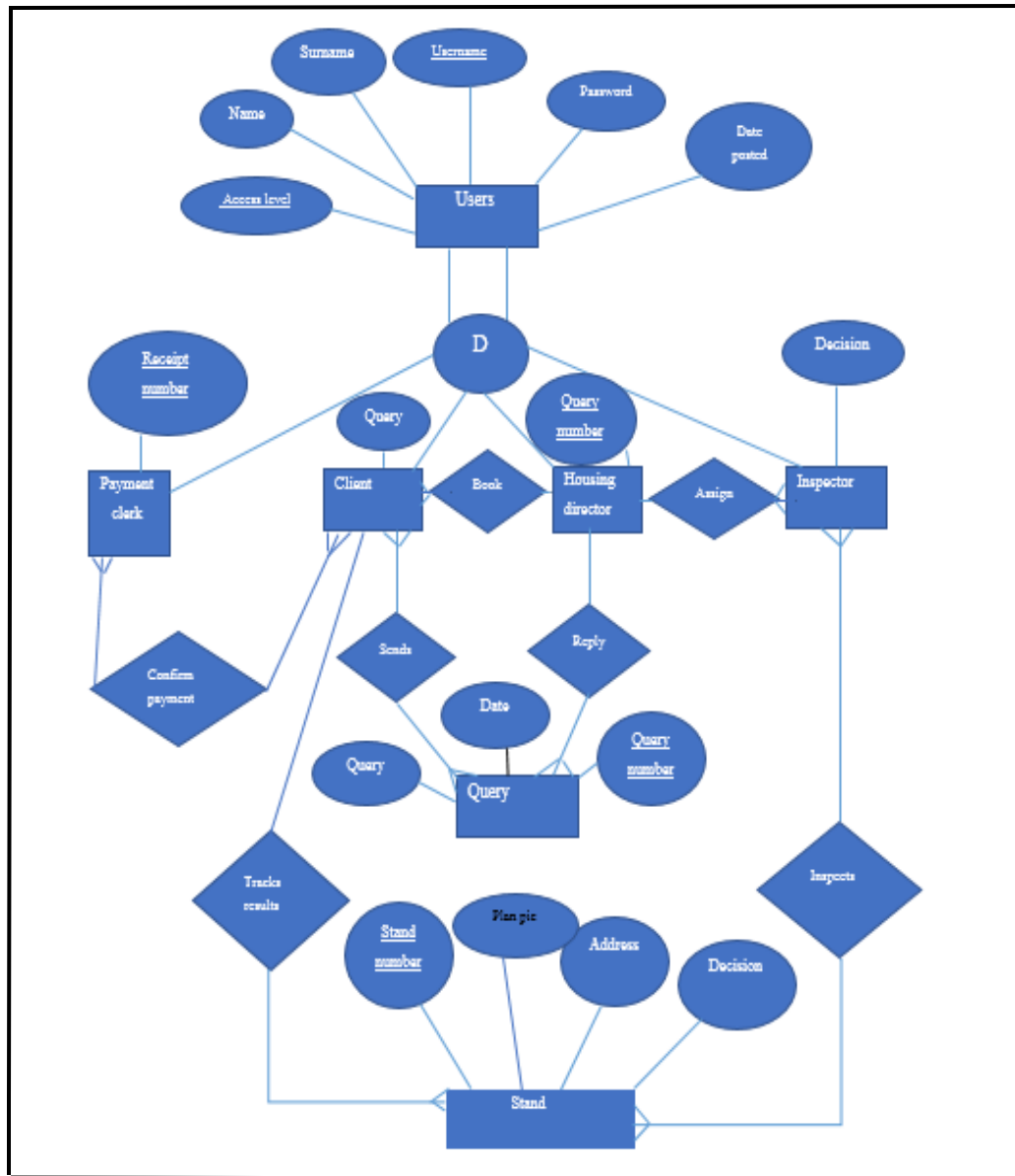
**Key for New System Entity Relationship Diagram**



**4.5.6 New System Enhanced entity relationship**

EER is specialized model that uses the concepts largely related to object-oriented design with inheritance as a major emphasis, (Vermaat 2012). The EER includes the following properties and elements namely subclass and superclass, concepts of a union type, used to signify collection of

several objects which are the combination of objects from several entity types. The EER is designed to simplify the complex relationships that exists between objects in a relational database. It is an extension of the Entity Relationship Diagram. The diagram below shows the EER of the new system.



**Fig 4.7 New System Enhanced Entity Relationship diagram.**

## Key

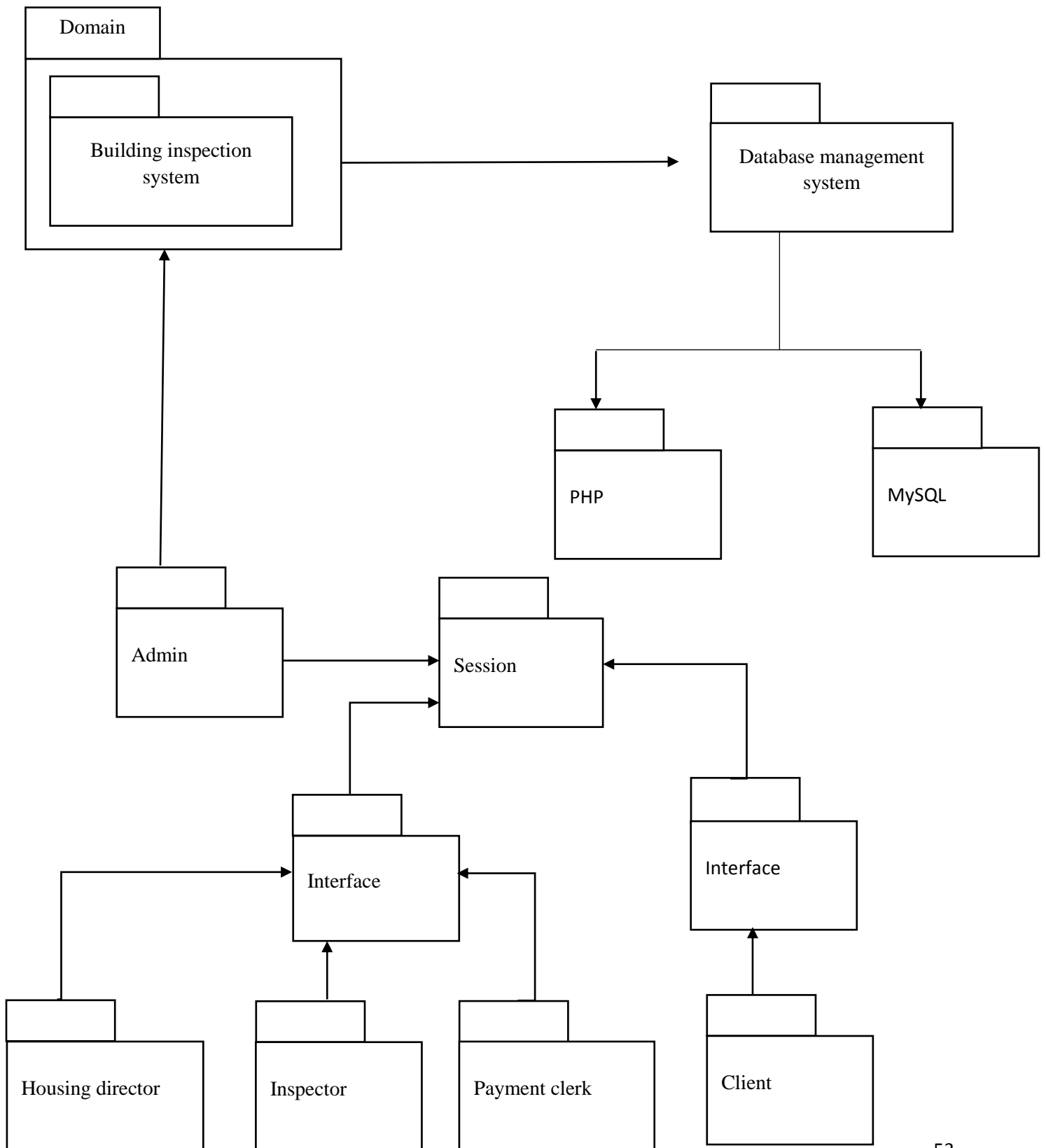


### 4.6 Program Design

Lester (2014) describe it as the programs that are written and the way they are supposed to be written, enforcing on how several fragments of code are to be merged to form complete programs or modules. The process involves the designing of the system implementing the flow of processes which include the class diagram as well as the sequence diagram which assist the system developer to produce a correct system sequence (Stephens, 2015). The system developer and the management team agreed to use the package design, class diagram and sequence diagram on program designing.

#### 4.6.1 Package diagram

Rouse (2005), reiterated that the package diagram shows system components classified into packages that interacts together to fulfil the system specifications clearly showing the dependences of these components that exists. The project team had to use the Unified Modelling Language (UML) to model the package diagram for the new system. These components are produced by breaking down the whole system unit into several smaller system components. Duffy (2011) stresses the point that the package design is a group of logically connected software components that interacts together. The package diagram for the new system is on the next page.



**Fig 4.8 Package Diagram for the New System**

## Key



**System module**

### 4.6.2 Class diagram

According to Pratt and Last (2014) explains it as a form of exemplification which signposts the liaison occurring between entities and the attributes found. This helps precisely to express the inheritance that occurs in object oriented model with the associations participated in the internal structure. The class diagram comprise of the following components class name, attribute name and operation.

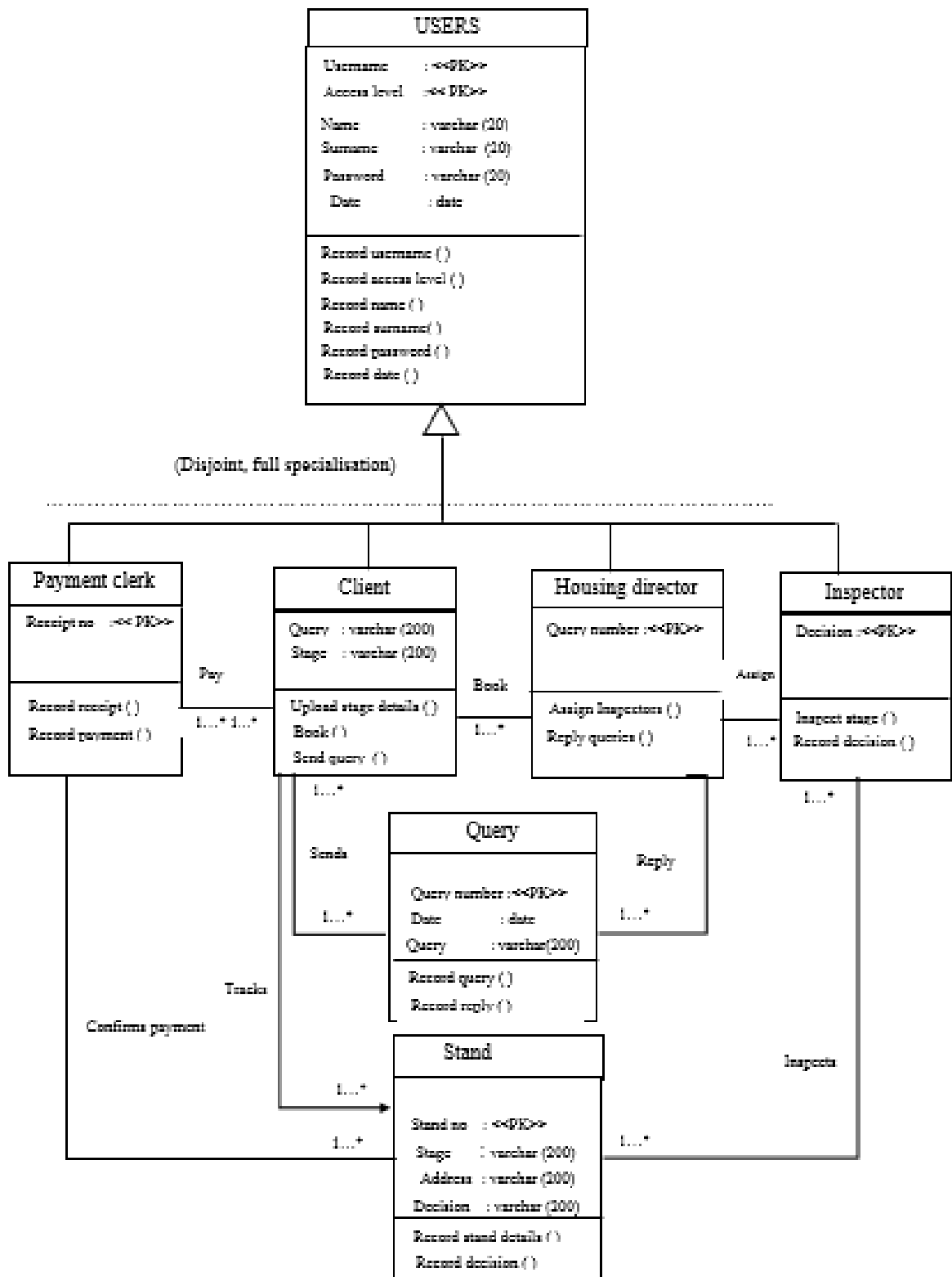
**Class name** – is shown on topmost of the diagram which represents the entity of the system that captured or store information like places, people and events.

**Attribute name**- refers to the belongings of the class where the information was captured and it is depicted on the middle of the class diagram.

**Operation**- these are the functions and methods that a class is supposed to do. Also are shown on the lowest level of the class diagram.

The package diagram for the new system is shown on the next page.





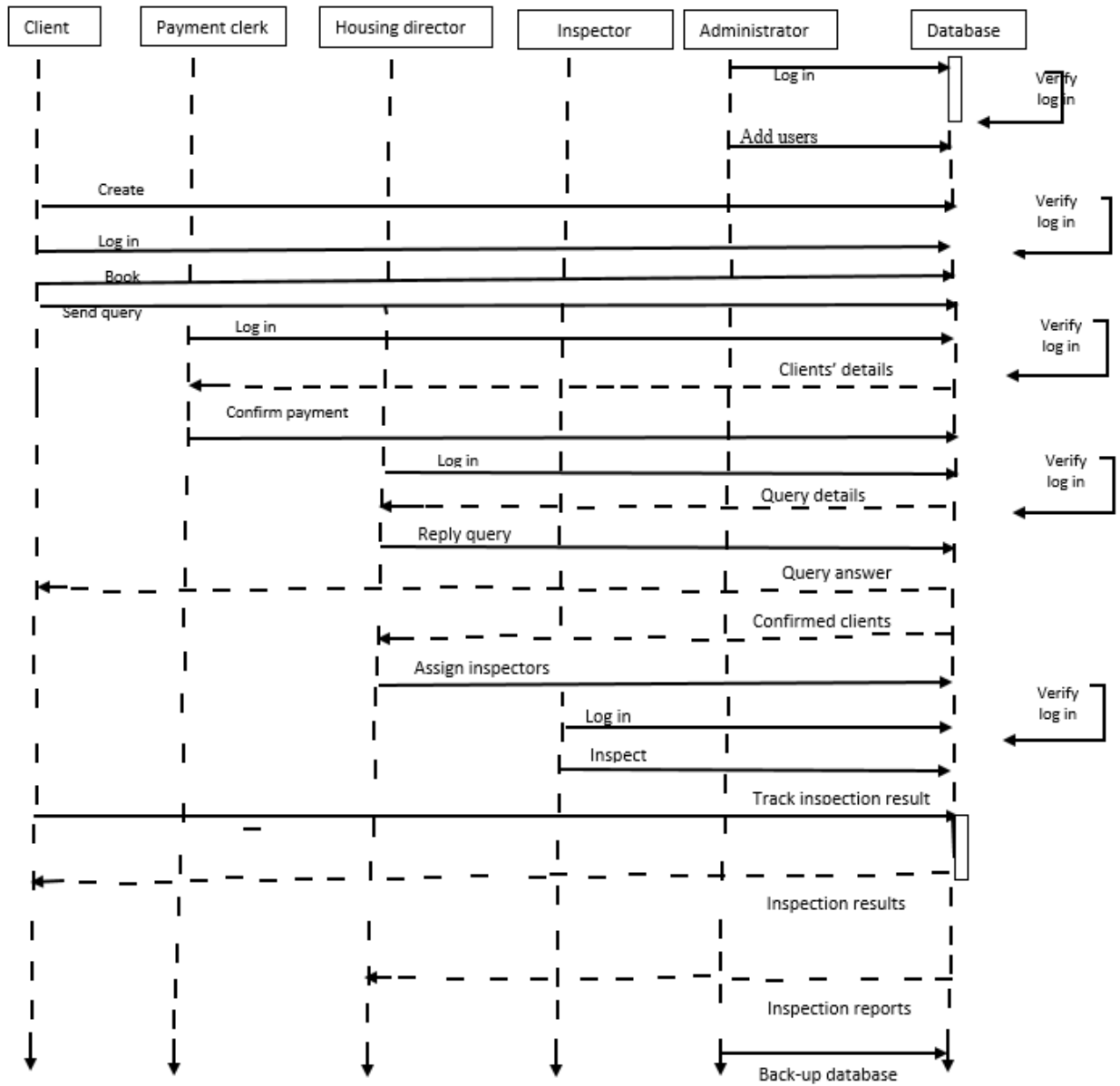
**Fig 4.9 Class Diagram for the new system**

**Key**

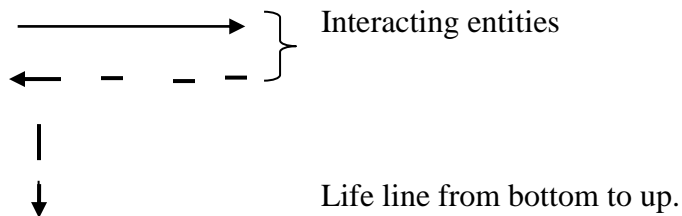
Class Name
Attribute name
Operation

**4.6.3 Sequence Diagram**

According to Matson, (2000), it is an illustration that shows the relationships of system entities in their sequential order. It describes the activities of the entities in the system and also describe the messages they share. These messages normally pass through several objects until it stretches to the final object that is intended to receive the message. Overleaf is a sequence diagram for the new system.



**Fig 4.10 Sequence Diagram**



## **4.7 New System Interface design**

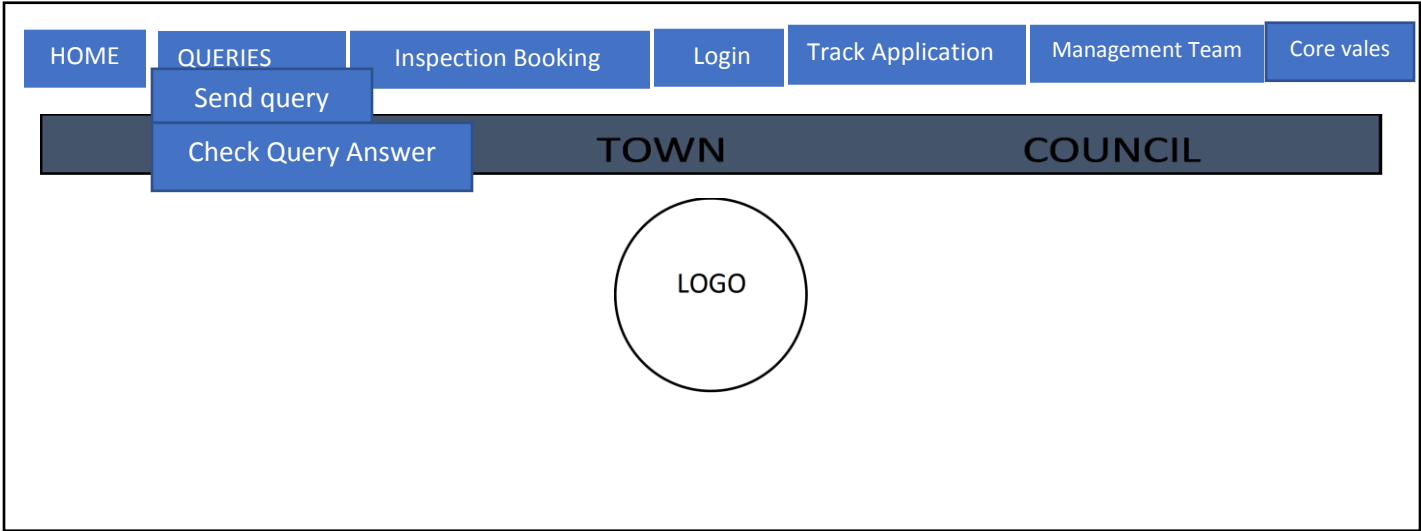
Capron, (1995) puts forwards that this design mainly focusses on designing the graphical control that facilitates the final users to input and retrieve the data and information from the system. The interface facilitates symbiotic communiqué between the authorised users and the system. The developers agreed to develop a virtuous interface which provide a splendid background colour that is friendly to the end-users whilst providing menus, buttons and textboxes which facilitates the users to input data and output the desired from the system. Furthermore the interface will provide messages that prompts and helping users after each and every entry made. The menus labels expose button names in standard manner following the international general standards used by international software like Microsoft, this will aid users not to be disturbed. The interface was designed for the users and administrator. The same menu will be used for all users however after authorised to enter into the system, they are linked to their respective homepages.

### **4.7.1 Menu design**

This is the interface that depicts all the system functions controlled by the commands that the users will use to navigate system menus in an easy and understandable way. Skidmore, (1994) argued that menu design consists of designing the graphical user interfaces that enforces the user to input and retrieve data to and fro the system. The developer has to design a menu that is easier to navigate for the new users since it is self-explanatory and all buttons are exposed whilst describing what is supposed to be done on them. The menu design also include input and output designs.

### **4.7.2 Main menu**

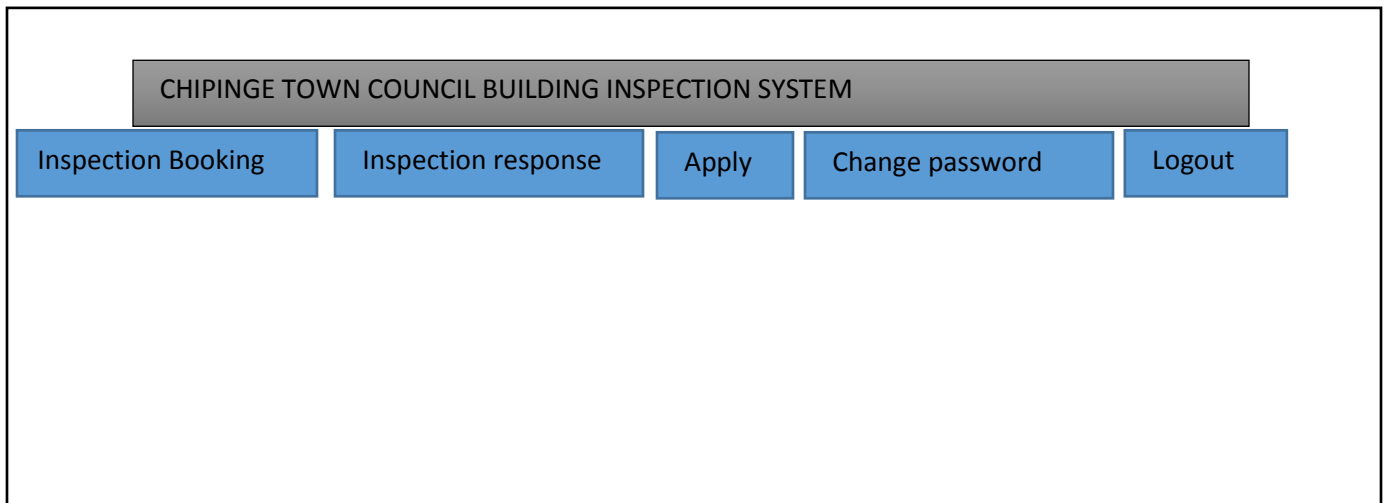
This is a home page that has the major menu of the system which consist all the navigation to the system mainly login page, other buttons and the organisation company information. It is on this platform that provides a one stop centre for inspection booking, system login, viewing of the results, sending and viewing of queries and the tracking of applications. Overleaf is the main menu.



**Fig 4. 11 Home page**

**4.7.3 Sub-menu**

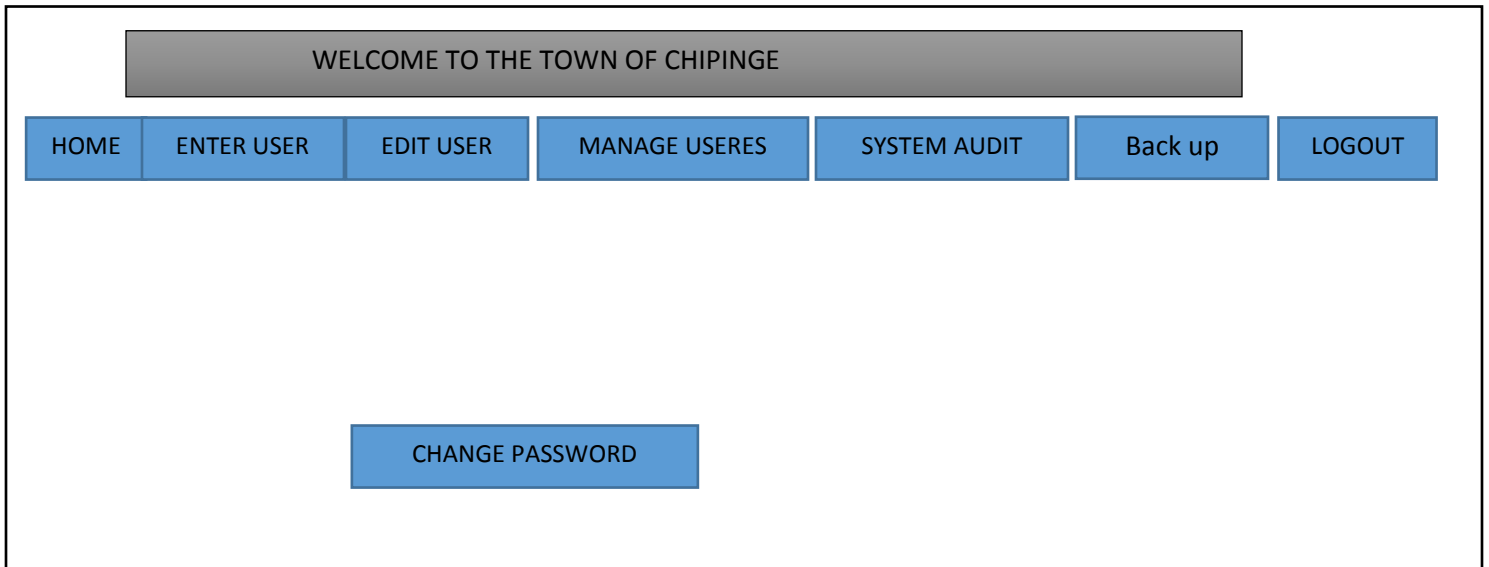
The sub-menu contains particular functionalities for a specific user who has been authorised to login depending on the user’s reserved rights. The next diagram is the sub-menu for the client which allows them to book for inspection, view the results and sending whilst receiving answers for their queries.



**Fig 4.12 Client home page**

**Administrator homepage**

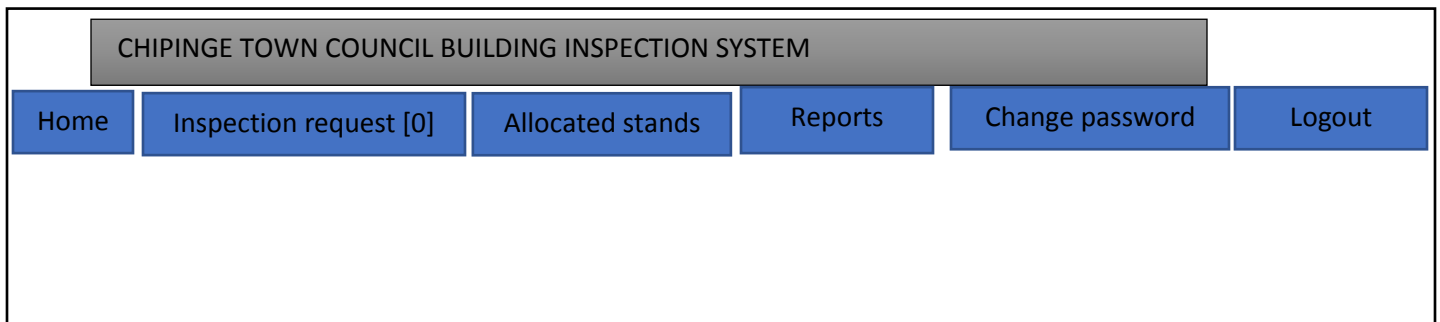
This page allows the administrator to add the inspectors into the system since they are not allowed to create their own account for security reasons. The audit trail allows the administrator to track the activities that were done in the system in case of unclear circumstances. The administrator can delete the users also. The following homepage is for the Administrator homepage



**Fig 4.13 Administrator page**

**Inspector homepage**

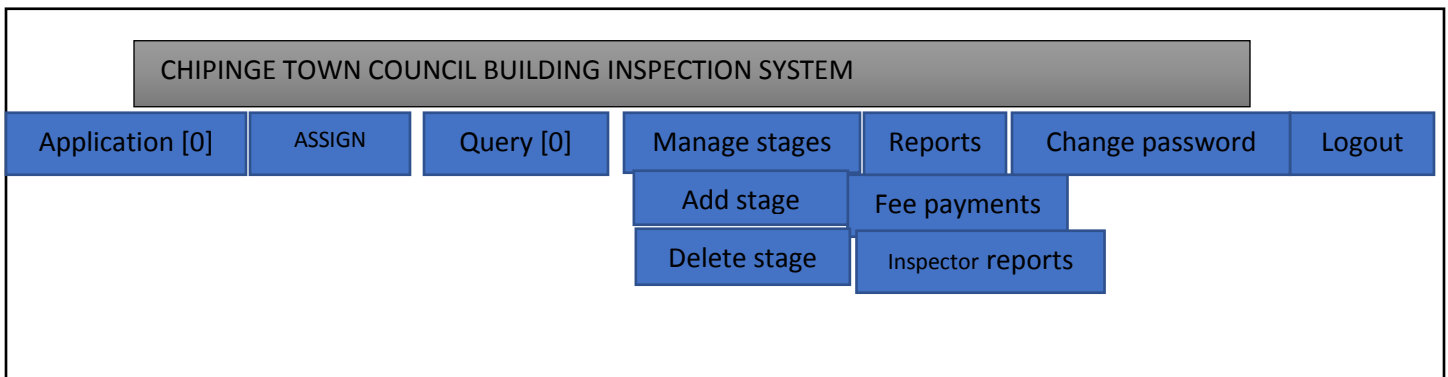
The inspector homepage consists of inspection requests, stand allocated and inspection reports as shown on the next diagram.



**Fig 4.14 Inspector’s homepage**

**Housing director homepage**

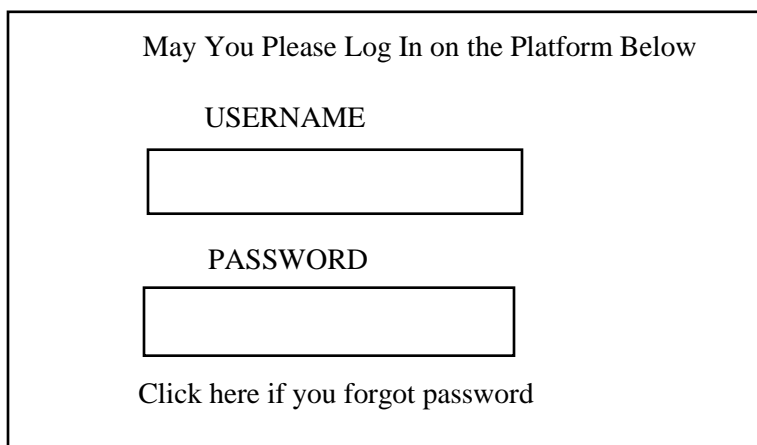
The housing director’s homepage has the following buttons message so as to communicate with building inspectors. A button query is for receiving and replying the queries from the clients. The housing has to assign the inspectors and also able to view reports and all the applications made. The director must be able to check those who have paid. The housing director homepage comes next.



**Fig 4.15 Housing director’s homepage**

**4.7.4 Input Design**

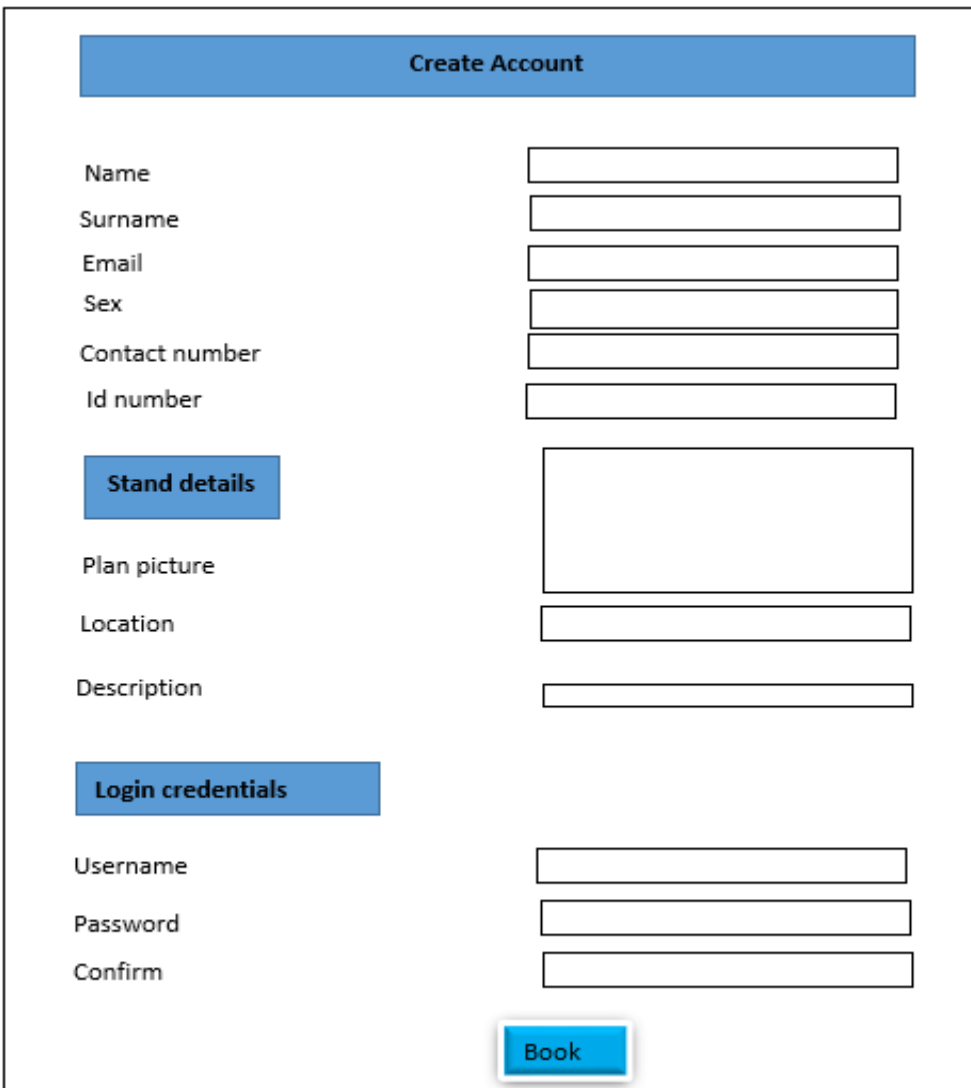
This is the designing of the input forms for the users to insert data into the system. Validation is prioritised to avoid database inconsistency. Below is a diagram that display different types of input forms that allow users to access to the system.



**Fig 4.17 Log in Form**

**User application form**

This input form allows the applicant to apply for inspection. All the applicant details should be inserted including their addresses and the picture of the house plan to be inspected. Below is the application form for the client.



The form is contained within a rectangular border and is organized into several sections:

- Create Account:** A blue header bar at the top.
- Personal Information:** A list of labels on the left with corresponding text input fields on the right: Name, Surname, Email, Sex, Contact number, and Id number.
- Stand details:** A blue header bar.
- Plan picture:** A label on the left with a large rectangular image upload area on the right.
- Location and Description:** Labels on the left with text input fields on the right: Location and Description.
- Login credentials:** A blue header bar.
- Authentication:** Labels on the left with text input fields on the right: Username, Password, and Confirm.
- Book:** A blue button at the bottom center.



**Fig 4.18 Client Application form**

**Administrator add users form**

The administrator is the one who has the responsibility of adding the inspectors into the system for privacy reasons and the input form for the administrator is shown below.

Please Enter User details below!!!	
<i>Note: All fields should be filled.</i>	
Name	<input type="text"/>
Surname	<input type="text"/>
E mail	<input type="text"/>
Sex	male <input type="button" value="v"/>
National ID Number	<input type="text"/> - <input type="text"/> - A <input type="button" value="v"/> - <input type="text"/>
<b><u>Login Details</u></b>	
User Name	<input type="text"/>
Password	<input type="text"/> <small>A value is required.Password too short atleast 8.</small>
Confirm	<input type="text"/>
Access level	Chief Inspector <input type="button" value="v"/>
	<input type="button" value="Save"/>

**Fig 4.19 Administrator add inspector form**

**Messaging input form**

The administrator and others will send the messages to each other and the form will be looking like the one below.

Query	Name	Surname	Email
<input type="text"/>			



**A Fig 4.20 Messaging form**

<i>Edit User Details</i>	
Name	<input type="text" value="zandij"/>
Surname	<input type="text" value="ntuli"/>
E mail	<input type="text"/>
Contact Phone Number	<input type="text"/>
	<input type="button" value="Update"/>

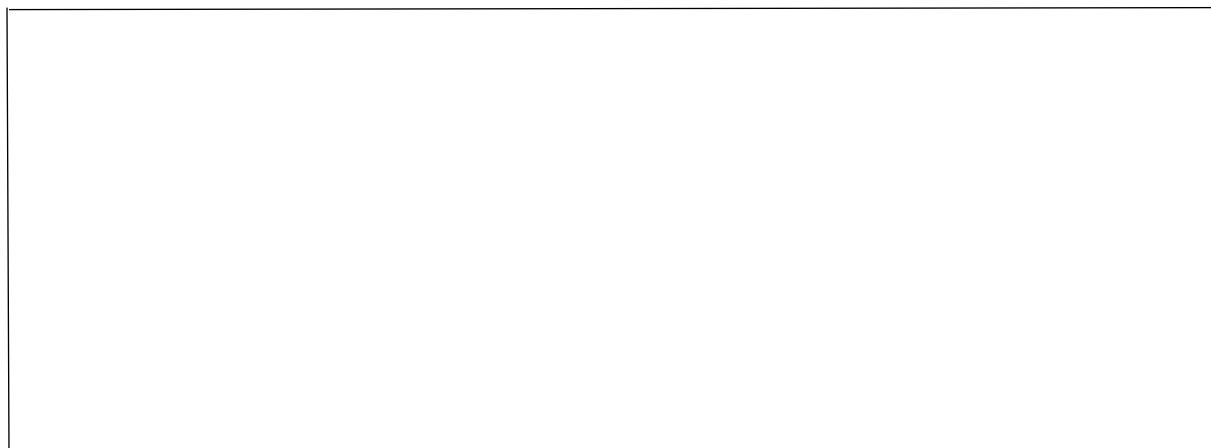
**Fig 4.21 administrator editing user form**

#### **4.7.5 Output Design Form**

This design focussed on the results that are displayed to the end users with aim of viewing the data processed data. The forms that are viewed might be the reports and the decision of the inspectors. The inspectors need to view the stands assigned to them while the housing directors need to view the applications done and the queries. The administrator need the output design for audit trail. The following forms displays the output design that the system has to produce.

#### **Inspector assigned stands form**

This form allows the inspector to view the stand that have been assigned to them by the housing director.



Assigned stands					
Name	Surname	ID number	Stand number	Stand location	Date of assignment
Tatenda	Hlahla	24-102068E24	1234	Gaza O	12/11/2016
Marvelous	Basera	12-203672G36	152	Gaza E	14/12/2016
Taku	Guzete	28-435366D56	2331	Uasnga	15/01/2017
Tendai	Sibanda	56-123456G36	765	St kelvin	28/01/2017

**Fig 4.22 Inspector Assigned Form**

**Audit Trail Output Form**

This form will allow the Administrator to track the inspectors who had logged in with the dates being recorded so as to find out if there are unscrupulous activities done by the inspectors with the aim of reducing corruption. The audit trail form is depicted below.

Specific System Operations Report  
Date format is mm/dd/yyyy e.g 01/21/1991

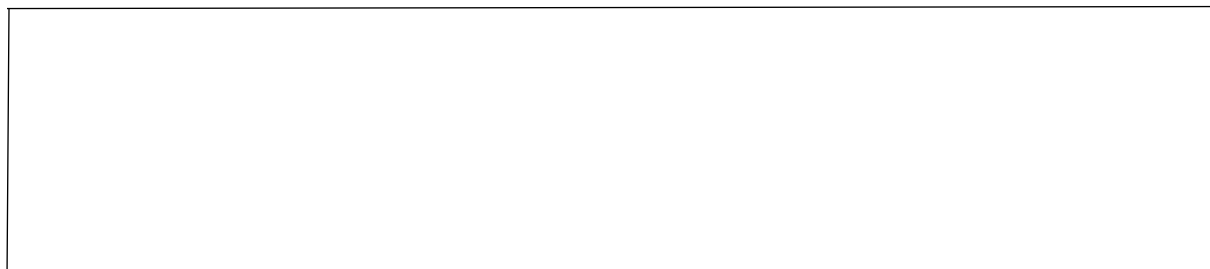
Start Date	<input type="text"/>	End Date	<input type="text"/>	User	All <input type="text"/>	Search
------------	----------------------	----------	----------------------	------	--------------------------	--------

Name	Surname	Operation	Time
Benedict	Benedict	Logged In	01/22/2017 - 09:21:12
roz	lio	Logged Out	01/22/2017 - 09:20:52
roz	lio	Logged In	01/22/2017 - 09:15:24

**Fig 4.23 System Audit Trail**

**Client response Output Form**

This output form will display the response that the inspector has decided pertaining the inspection to the clients whether is it approved or not and the following diagram shows the response form that the clients will view.



Inspection ruling by the inspector					
Stand location	Stand number	Request	Inspection ruling	Comment	Date of inspection
Gaza E	1123	Setting out	Passed	Excellently done	12/02/2017

**Fig 4.24 Inspector Response output form**

**Housing director view of Applications Output Form.**

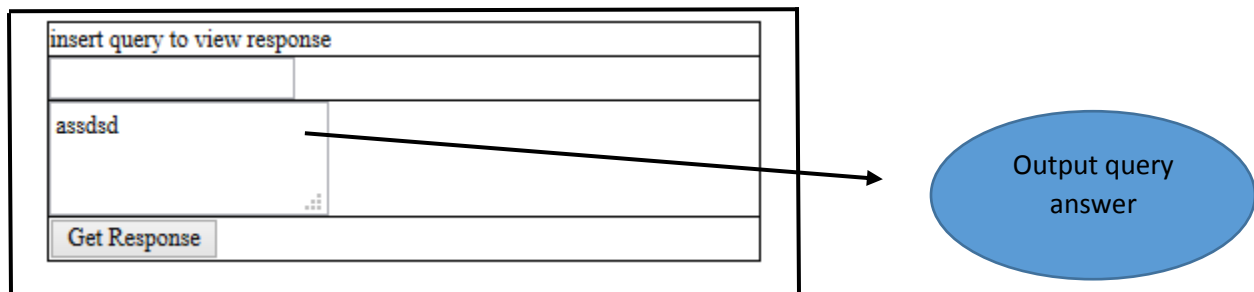
This output form shows the view of the applications done by the clients. The housing director must view all the applications so as to select the one which are to be assigned to the inspectors. The diagram overleaf shows how the housing director’s view of the applications done.

Stand Inspection Applications From Clients										
Click the links to download,confirm and reject										
Name	Surname	ID Number	Contact Number	Stand Location	Stand Number	Description	Date Applied	Download Plan	Accept	Reject
nomatter	hlahla	13-190905-P-13	0771498100	gaza	ground level	7301801100	12/14/2016	[DOWNLOAD]	[ACCEPT]	[REJECT]

**Fig 4.25 Housing Director’s view of Applications**

**Client query response output form**

The following output form is the one displayed when clients’ want to view the reply of their queries.



**Fig 4.26 Client Query Output Form**

## **4.8 Pseudo Code**

According to Rouse (2005), this is an algorithm in procedures which may be scripted in a readable format that look like the actual codes so that the persons can comprehend without too much difficulties. Below is a pseudo code for the system.

### **The Pseudo Code for Login**

Start

Write down the Universal Resource Locator on the browser

Insert the Usernames and Passwords

Pass in

If both Username and Password are correct

Login successful

Otherwise

Log in unsuccessful

Return the exact details

Close if

### **Adding Inspector**

If the user is administrator

Then insert the inspector details

Else

Only the Administrator is allowed to enter users

End if

## **Inspector decision**

If the inspector is dispensed

Then assess clients' requests and put resolution

Otherwise

You are not allocated that stand

End if

## **4.9 Security Design**

These are the features that the designer comes up with that makes the system to be fully safe (Flynn, 2011). Security design is paramount as it prevent the system from falling under vulnerability of either theft, unauthorised access and other malicious damages. Security was designed in the following ways which were network security, physical security and operational security. These features are discussed below.

### **4.9.1 Physical security**

This security design prevents unauthorized persons to have access to the resources and equipment which includes the hardware where the software reside with the aim of protecting property from physical damage, harm and theft (Forouzan, 2007). The developing team agreed to put lockers and install intrusion detection systems that assist in safeguarding all computer hardware and other equipment. The database administrator is one who is authorised to alter the physical attributes of the database.

### **4.9.2 Network security**

This security offers message confidentiality, endorsement of entities and system integrity (O'Hanley and Tiller, 2013). The developers agreed to use cisco technology to enhance network security which provides firewalls to curb intrusions and unauthorized interference with the

system. Furthermore the entity authentication is administered by the use of usernames and passwords to all personal computers. In order to protect internet security from malware and Trojan horse the developers agreed to use antivirus. Centralization of the information is part and parcel of the system.

#### **4.9.3 Operational security**

This security feature is majorly concerned on user privacy. The developing team enforces operation security by the use of access levels and passwords. The administrator of the system holds the highest privilege like viewing the reports, adding and deleting the inspectors and generating the audit trail of the system.

#### **4.10 Conclusion**

Design phase equipped the analyst to come up with a flawless system in terms of its abilities, appearance and user-friendliness through system design. The definition on how the system works in the real environment which include the specifications of the components of the software, users' ease of use and easiness to maintain was alluded in this system. A comprehensive representation of hardware and software specifications with the supplement of data flows, Enhanced Entity Relationship Diagram, database architecture and the Entity Relationship diagram were used to depict the physical operation of the system. The design phase exposed the exact appearance of the new system which include package diagram, class diagram and sequence diagram. All the menus which include input and output forms of the system have been depicted. The pseudo code and security design complete the design phase. The next phase is the implementation which comprises of system coding, testing and maintenance.

## **Chapter 5: Implementation Phase**

### **5.1 Introduction**

This phase was concerned about the system coding, changing strategies, testing, installation and its maintenance with much emphasis on the determination on whether this system's objectives were accomplished without fail in order to fuel an operable environment for the organisation. Testing was thoroughly done using several strategies like unit, module, subsystem and system testing. Several techniques were employed to enhance the system's validity and reliability through verification and faults testing. System versus objectives was also analysed. The system installation strategies were part and parcel of this phase and the chosen strategy was highlighted whilst further recommendations were included in this phase.

### **5.2 Coding**

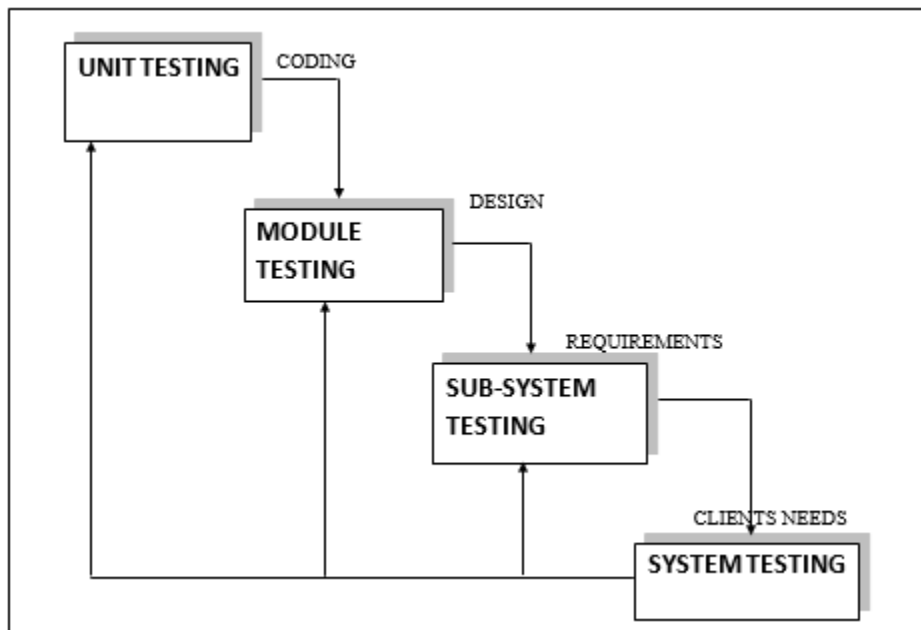
It suggests the scripting of programming statements that use programming language which the computer can understand and result in having the source code for the programme (Rouse, 2005). The system is a web based which coerced the developers to select the most helpful programming language for this system which were PHP and JavaScript. The coding session involved the



following persons, administrator, developers from Chipinge Town Council and the end-users. All the codes for this system are in the Appendix E.

### 5.3 Testing

This was the process of evaluating software products on numerous defects and correct it as soon as they were detected (Mathers, 2000). Testing was done so as to verify whether the system was operating properly and if it was satisfying specified requirements so that the system was fit for its purpose. The system testing was done using the special techniques like unit testing which included, black box testing and white box testing, module testing, subsystem testing and system testing which were designed for software testing. Intensive testing was done by the developers because they wanted to make sure that all components of the database were functional and running properly. The diagram overleaf shows the processes on how this software was tested before implementation.



**Fig 5.1 Testing Processes**

#### 5.3.1 Unit testing

This was the situation where individually code of the system was tested to prove if it was performing all the utilities and functions which were specified in the specifications and requirements. Unit testing was achieved in the development process testing in which all the

smallest testable parts of the system, namely units, were independently analyzed for proper operation and performance (Yeates and Wakefield 2004). This process can be automated but can be manually done. The developing team was able to detect the errors through several testing approaches of unit testing. The major two approaches to unit testing which the developers used were black box and white box testing. In this case each item in the program specification being a test, and several test cases were developed for it. An example of unit testing that was done was booking which was tested for its success as shown overleaf.

Note: All fields should be filled.

Name Samson  
Surname Mushayi  
E mail nomahla8x@gmail.com  
Sex male  
Contact Phone Number 1223456789  
National ID Number 12 34566667 A 12

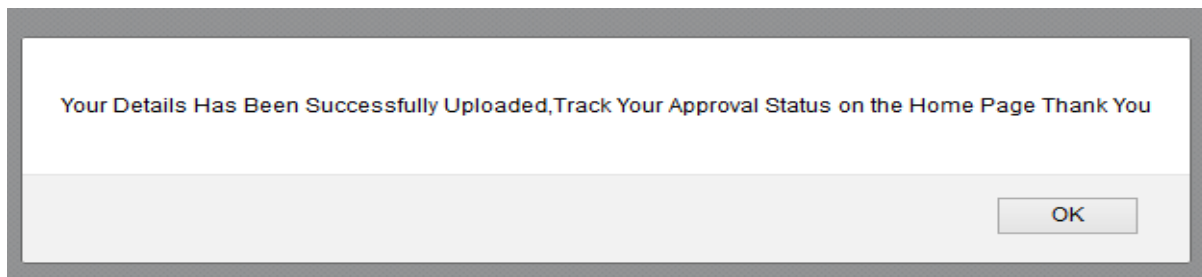
**Stand Details**

Stand Plan Picture Browse... image  
Location USANGA  
Stand N# 1231  
Description ground level

**Login Credentials**

User Name Sam  
Password .....  
*A value is required: Password too short atleast 8.*  
Confirm .....|

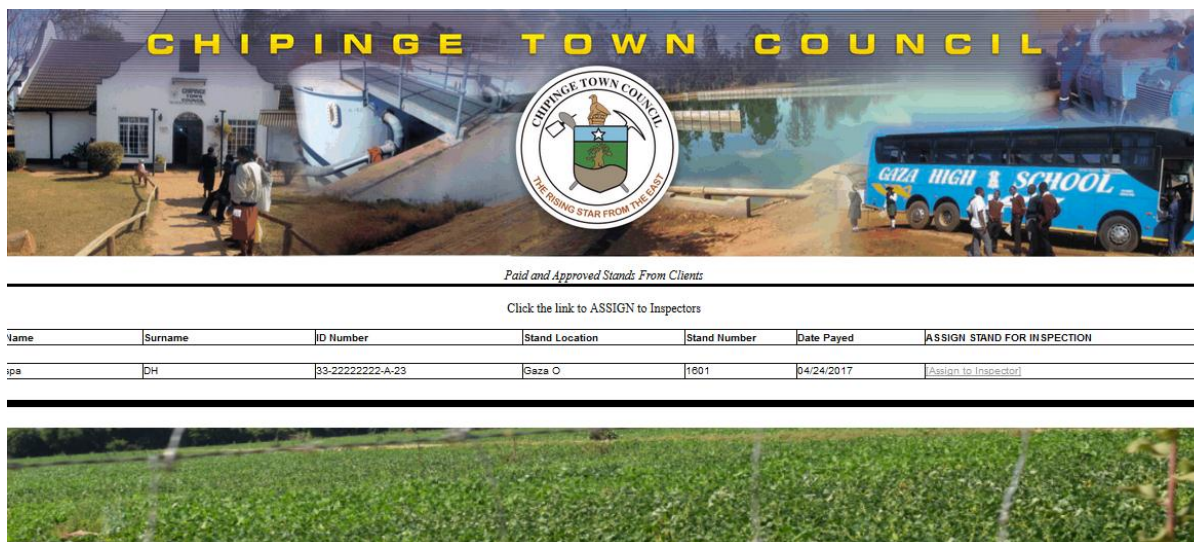
BOOK



**Fig 5.2 Unit Testing Booking**

### **5.3.2 Black box testing**

This method of software testing was done to examine mainly the functionality of an application without considering much on its internal structures or workings. The developers applied this method virtually to every level of software testing of a unit that consist of integration, system and acceptance. The project team were concerned with only the inputs and outputs however in this context the developer tested the application functionality of querying the database by selecting records (mainly the clients who are accepted of their booking for inspection) that the developer wanted to view by selecting the row with paid such that only records of paid clients will be retrieved. The following screen shot only show clients who had their payment had been confirmed are the ones who will be assigned inspectors.



**Fig 5.3 Confirmed Clients Assignment**

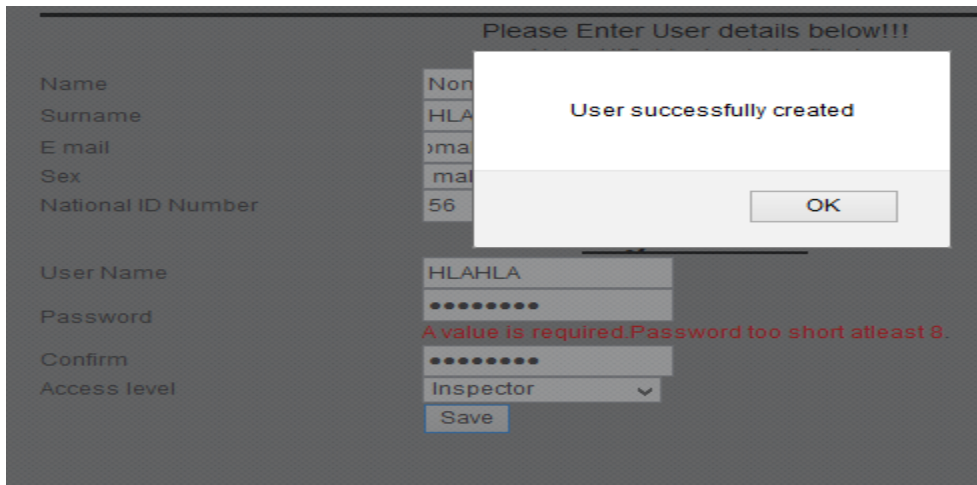
### 5.3.3 White Box Testing

This method was mainly concerned with testing the inner facets of the application which visibly defines the organisations of the back-end structures, scrutinising the algorithms of the source codes and also the system functions (Brown, 2008). White box testing was done on this system by the developers when they did step by step running of system. The reports and outputs at each and every step of the execution was documented. The developing team went on validating and verifying on each significant code segment.

### 5.3.4 Module Testing

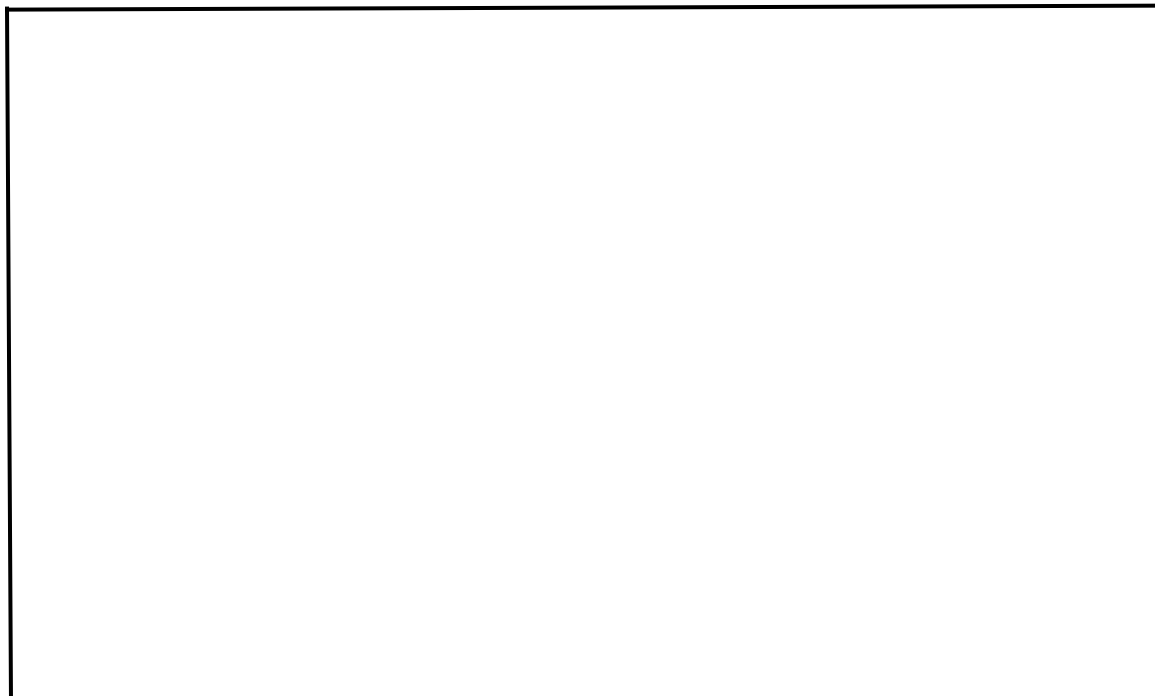
This testing method was more focused on testing the combined units and these units were logically integrated. Module testing was done by the testing team when they broke down the

application into several modules like adding the inspectors, login, clients' application and logout which were tested independently for errors and functionality. The major aim of module testing was to verify if the collection of these modules meant to work together are functioning as required without problems. The errors which were detected were fixed and the test was carried out repetitively until all modules were effectively combined. The example of module testing that was done was the Administrator adding an inspector and afterwards the inspector has to successfully log in as indicated by the following screenshots.



**Fig 5.4 Administrator Add Inspector**

After login use the above credentials the Inspectors should be redirected to their homepage as shown below.





INSPECTOR Logged in as : Nomatter HLAHLA

## Chipinge Town Council Building Inspection

### Fig 5.5 Inspector successfully Log in

#### 5.3.5 Subsystem Testing

Saleh (2013) defines it as the incorporation testing, which was a transitional between testing each program individually and the complete system with the major concern of ensuring that all job streams were correct and perfect. Subsystem testing was carried out by the testing team by matching and detecting the interface mismatches between programs and all the modules, which were linked together, whilst all collections of modules which were integrated into subsystems were tested for functionality and the result reviewed some errors that had been ignored before however they were corrected. Let's take for example the menu and interface for the housing director should always match and similar as shown on the screenshots below.

Home Applications [2] Assign queries [2] Manage Stages Reports Change Password Logout

**CHIPINGE TOWN COUNCIL**

Stand Inspection Applications From Clients

Click the links to download,confirm and reject

Surname	ID Number	Contact Number	Stand Location	Stand Number	Description	Date Applied	Download Plan	Accept	Reject
ghavondoka	3-2245-A-12	122243563636	Gaza	2	ground level	04/23/2017	[DOWNLOAD]	[ACCEPT]	[REJECT]
Mushayi	12-34566667-A-12	1223456789	USANGA	1231	ground level	04/27/2017	[DOWNLOAD]	[ACCEPT]	[REJECT]

**Fig 5.6 Sub System Testing (interface matching)**

Noting that the same interface is matching for the housing director when assigning the building inspectors between these two modules which works hand in hand as shown between these two interfaces, the one above and the other overleaf.

Home Applications [2] Assign queries [2] Manage Stages Reports Change Password Logout

**CHIPINGE TOWN COUNCIL**

Comment On Approval of the Request

Please put your comments below:

Approve

**Fig 5.7 Sub System Testing (interface matching)**

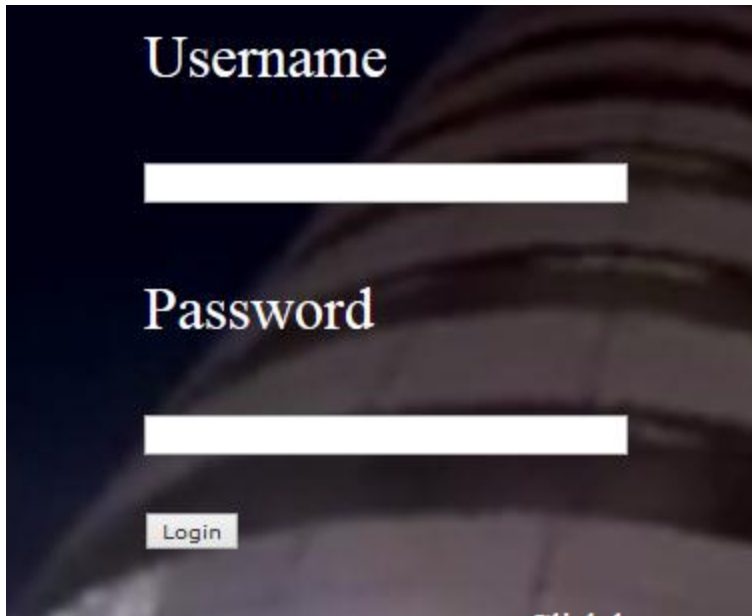
**5.3.6 System Testing**

The agenda of carrying out the system testing was to examine the complete system which involved integrating the subsystems that included those ones that were already tested and assembling them into a single integrated system (Graham et al, 2012). The testing team achieved this by testing the entire information system and processes with the aim of finding out if there were any defects that might trigger the malfunctioning of the application. They also tested how correct and easier does the system meets the requirements, usability, security, and performance under constrained environment and heavy load. System testing team also verified that all system components were integrated correctly so that the system was able to handle all input data nicely. Let's take for example, for the clients to log in, they are supposed to click the login on the menu then redirected to the login page and after successfully insert the required credentials they will be referred to their respective homepage as shown overleaf. After the clients successfully login to their homepage and do their operations without fail, this means system testing was successful.



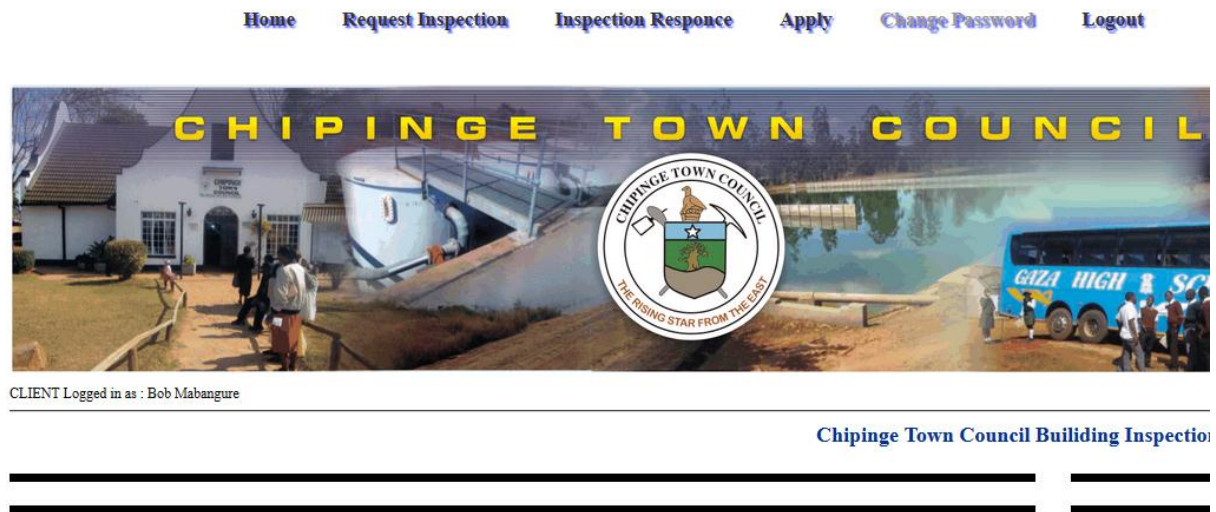
Figure 2 5.8 Fig 5.8 Homepage Menu

After clicking the client goes to the following page



**Fig 5.9 Log in Page**

Inserting the correct credentials, the client will be directed to the following homepage. This shows that system testing was successful as all independent modules were linked to form one whole system.



**Fig 5.10 Client Homepage**

### 5.3.5 Acceptance testing

According to Graham et al (20120, this is a final testing phase done to the system before it is deemed necessary for use. This testing technique was performed to determine the degree to



which the system has met the requirements specifications. Acceptance testing was carried out by presenting the system to the selected group of users and the testing team then evaluated the system's compliance with the business requirements and users' specifications whilst noting if it has met the necessary criteria needed for delivery by the end users. The two acceptance testing techniques which were employed by the testing team were alpha testing and beta testing which are further explained below and how the testing team carried out it.

- **Alpha testing**

The testing team used alpha testing method by presenting the system to the Chipinge Town Council's internal users, prior releasing it to the external users. Notably this testing method was carried out without involving the development teams, but the developers proactively observed these users and note down the areas with predicaments that needed attention. All the errors were vehemently tackled until the system met the desired functional requirements.

- **Beta testing**

As opposed to alpha testing, beta testing also known as user acceptance testing is cautiously carried out with the real end users to validate the reliability, functionality, usability and compatibility of the system. Beta testing supplements value to the software because it gives an ultimatum to the real clients to provide inputs into the design, functionality, and usability of the application. The developing team selected few residents to just have a taste of the system by giving them opportunity to apply and send their queries and the testing team noted the difficulties which were faced by the clients. They also took into consideration of all recommendations which were put forward by them then further evaluated it until the system was flawless correct.

### **5.3.6 Testing strategies**

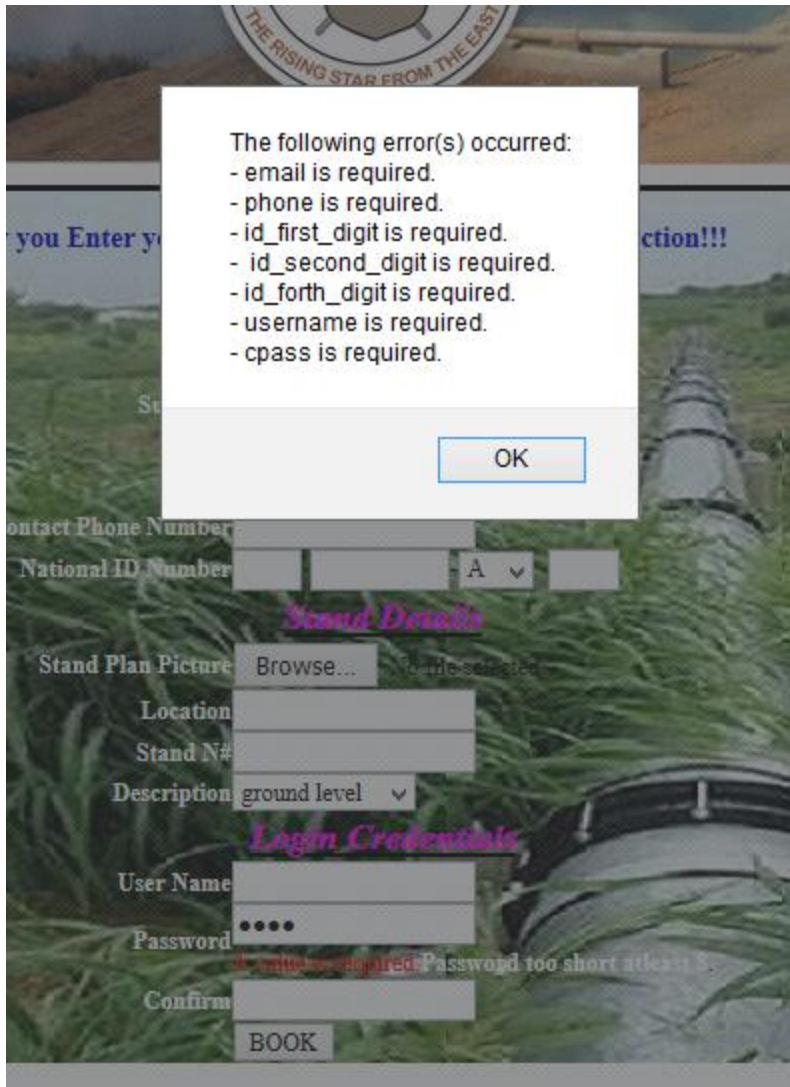
These were strategies for software testing which integrates software test case design methodologies into a well-organized serial steps that eventually results in the successful development of a splendid software. Several testing strategies were employed by the developers in their effort of ensuring the correct functionality of the whole system which resulted in detection of syntax and logic errors which were later corrected through code review process.

### **5.3.7 Validation**

Engel (2010) expresses validation as a testing procedure that checks if a product design satisfies and fits the intended use. It is also known as high-level checking which checks whether the software meets the user requirements by addressing the following scenario like, are the developing team building the right product? The major aim is basically ensuring that the system is sustainable and reduce clients' travelling costs and time spending through online application. The following diagrams shows validation of the system.

### **5.3.8 Validation Test Cases**

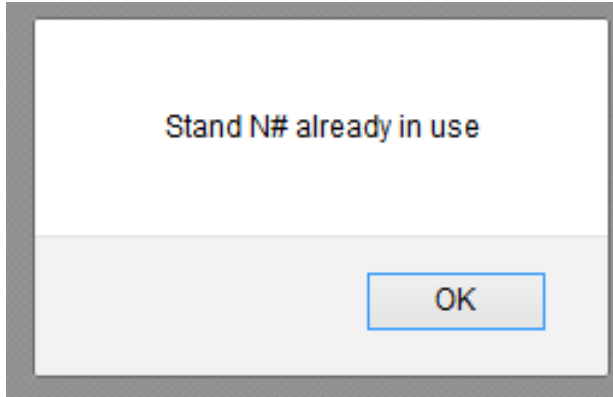
Test cases will depict the validation that were included in the system. A prompt message should pop up if the client insert wrong data or failed to insert data in the textbox. The following screen short shows the validation on the booking form if the client fails to insert data.



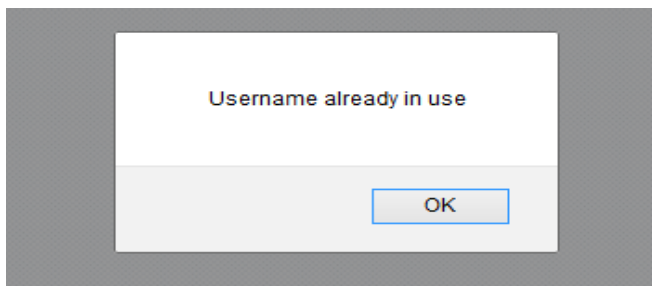
**Fig 5.11 Create Account Validation**

### **Test 2: Creating Same Account Twice**

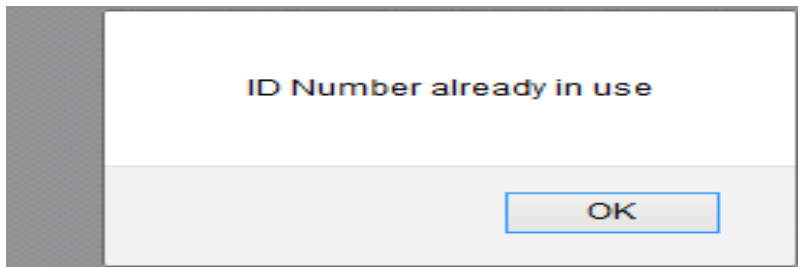
The system must not allow the creation of the same stand number in the same location twice and it should prompt the client that the username or stand number already exist as shown overleaf.



**Fig 5.11 Adding Stand Twice validation**



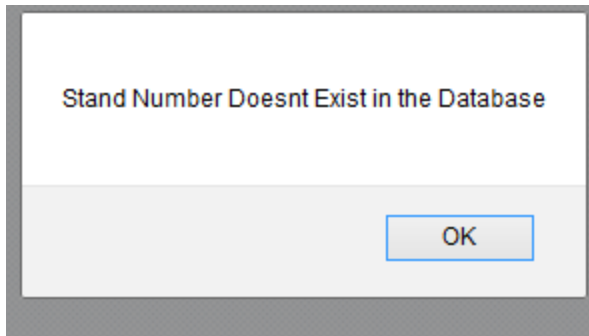
**Fig 5.12 Adding same Username Twice Validation**



**Fig 5.13 Adding same ID Twice Validation**

### **Tests 3: Client Tracking Validation**

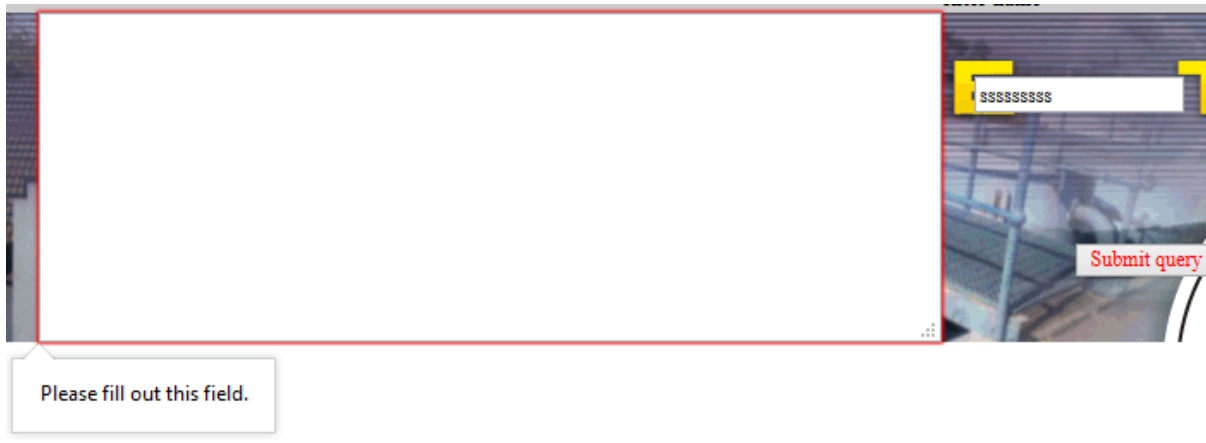
The client cannot track for the application using a stand number that does not exist the system should prompt the user that the stand number does not exist as shown overleaf.



**Fig 5.14 Client Tracking Validation**

#### **Test 4: Query Validation Form**

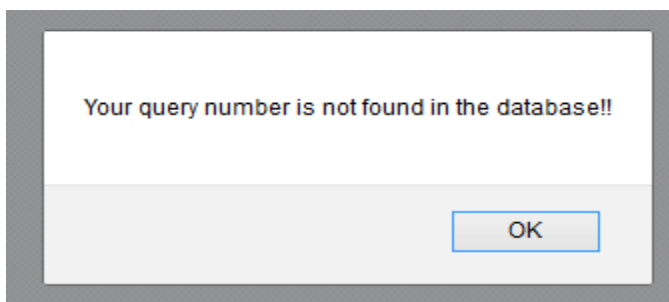
The clients are not supposed to send empty query without name and surname. The system should prompt the client to fill the textboxes.



**Fig 5.15 Query Validation Form**

#### **Retrieving Query**

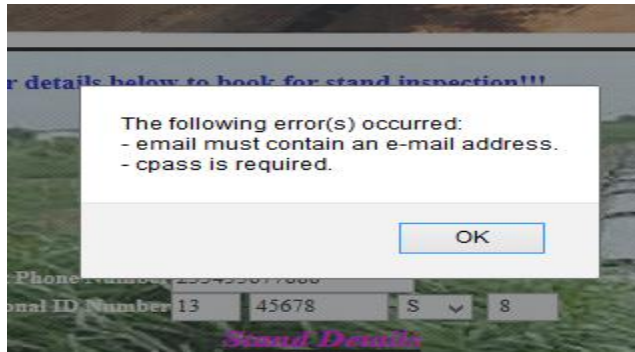
When the client insert the query number that does not exist, the system should prompt the user of the invalid query number as shown overleaf.



### **Fig 5.16 Unfound Query Number**

#### **Testing 5: Email Validation**

Users are not supposed to insert invalid emails the system should indicate that the user should put the right email.



### **Fig 5.17 Email Validation**

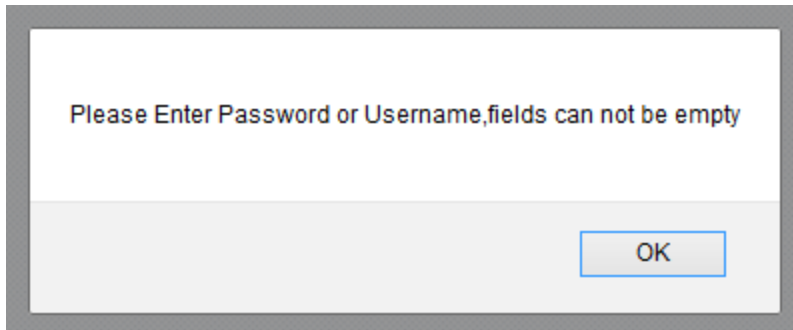
#### **5.3.8 Security**

Solomon (2010) argued that system security as measures done on the system so that all system protection tools and mechanism are able to protect unauthorized penetration and data alteration. The system security was achieved by make use of passwords and user access level to ensure integrity. The administrator had to put security measures which are shown below.

- **Password and Usernames**

Password and usernames were used to control the unauthorised users from accessing the system. If the users fail to insert the username and password the system should prompt the users about the failure to insert the details as shown below.

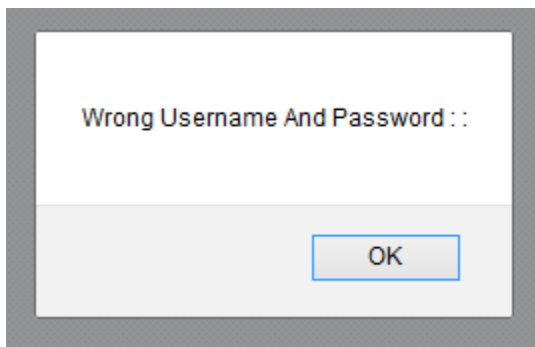
#### **Testing 6: Log In Validation**



**Fig 5.19 Login Validation**

### **Wrong Username or Password**

The users should not have access to the system if they use wrong username and password, the system should authenticate and authorise the right users to have access.



**Fig 5.20 Wrong Username and Password**

- **Views**

Views were instrumental in isolating other users from accessing and viewing a menu that is restricted to them. The administrator is the only who add and delete the inspectors and this part of the menu is not found on others users.

### **Testing 7: Add Users**

Only the administrator has the capability adding users only which makes a good security from disallowing unauthorised users from accessing. Therefore the administrator is the one with the menu for adding and deleting users as shown overleaf.

IN Logged in as : Nomatter Tambudzayi

Please Enter User details below!!!  
*Note: All fields should be filled.*

Name

Surname

E mail

Sex

National ID Number  -  - A

**Login Details**

User Name

Password   
A value is required.Password too short atleast 8.

Confirm

Access level

**Fig 5.21 Administrator Add Users**

**Administrator Delete Users**

Only the Administrator has the menu which permits the person to delete the users so that the systems are no deleted with unauthorised people as shown below.

**List of system users**

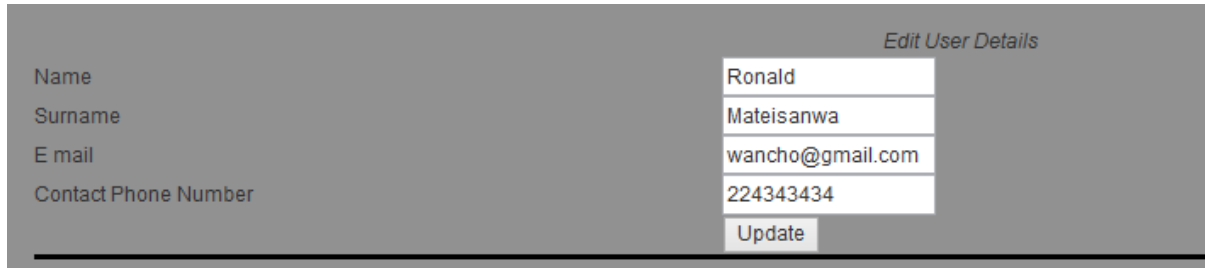
Name	Surname	ID Number	Username	User Type	Delete
Bob	Mabangure	12-12334444-A-12	BOB	Client	<a href="#">[click to delete]</a>
Carlynie	Mupando	13-23455566-A-13	Cero	Client	<a href="#">[click to delete]</a>
marve	baso	12-19090554-A-12	baso	Client	<a href="#">[click to delete]</a>
Marve	Baso	15-1233444-A-15	Basera	Inspector	<a href="#">[click to delete]</a>
nomatter	hlahla	13-19090554-A-14	nomta	Client	<a href="#">[click to delete]</a>
Nomatter	Hlahla	12-190906-A-12	Hlax	Client	<a href="#">[click to delete]</a>
Nomatter	Hlahla	13-1909055-A-13	Noman	Clerk	<a href="#">[click to delete]</a>
Nomatter	Hlahla	13-190905-L-13	basobaso	Clerk	<a href="#">[click to delete]</a>
Nomatter	Hlahla	33-11234455-A-12	NOX	Client	<a href="#">[click to delete]</a>
Nomatter	Tambudzay	13-190905-P-13	Nomtank	Chief Inspector	<a href="#">[click to delete]</a>
Nomatter	Tambudzayi	14-190905-P-14	nomanoma	Inspector	<a href="#">[click to delete]</a>
Ronald	Mabangure	33-23456-A-12	Rony	Client	<a href="#">[click to delete]</a>
Ronald	Mateisanwa	13-12344555-A-12	Wancho	Client	<a href="#">[click to delete]</a>
Ronald	Mateisanwa	13-22222222-A-14	Wanchoe	Client	<a href="#">[click to delete]</a>
sam	sam	12-23345555-A-12	sam	Client	<a href="#">[click to delete]</a>

**Fig 5.22 Administrator Delete User form**



## Administrator Edit Users

The following form shows the menu of an administrator editing the users of the system. Only the administrator is permissible to edit users and can only edit email and phone number but not name and surname.

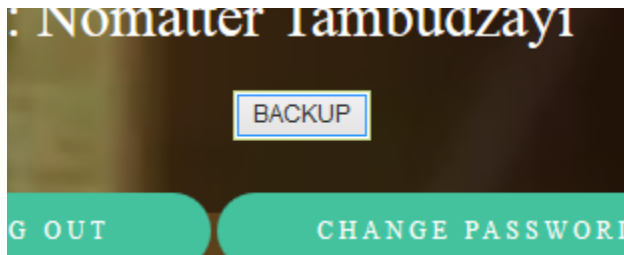


Name	Ronald
Surname	Mateisanwa
E mail	wancho@gmail.com
Contact Phone Number	224343434
	<input type="button" value="Update"/>

**Fig 5.23 Administrator Edit Users Form**

## Testing 8: System Back-Up

For security reasons only the administrator is permit to do the system back-up. This is a fundamental procedure to prevent loss and enhance information security.



**Fig 5.24 Administrator Back-up form**

### 5.3.8 Verification

Verification testing proactively examine and study the system with the aim of authenticating if it is in same direction with the standardised technical and regulatory principles. Therefore in nutshell, it necessitate the evaluation of the system performance in terms of appropriateness and specifications compliance. The following tests cases disseminates the system verification compliance.

### 5.3.9 System versus Objectives

The developer had to compare the system objectives versus the written objectives whether they were successfully done.

#### Objective 1: Online booking

This objective was met as clients are now able to book online for inspection. The booking form is shown below.

**lay you Enter your details below to book for stand inspection!!!**

*Note: All fields should be filled.*

Name

Surname

E mail

Sex

Contact Phone Number

National ID Number

**Stand Details**

Stand Plan Picture  m12.jpg

Location

Stand N#

Description

**Login Credentials**

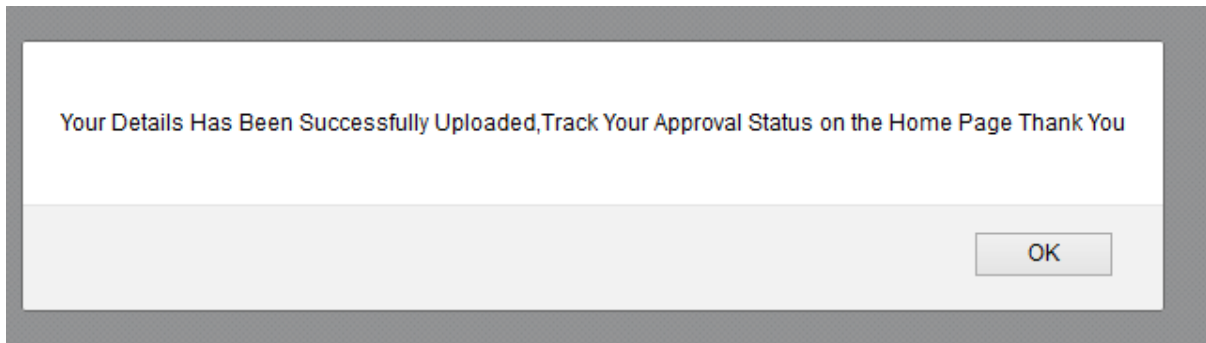
User Name

Password   
A value is required. Password too short atleast 8.

Confirm

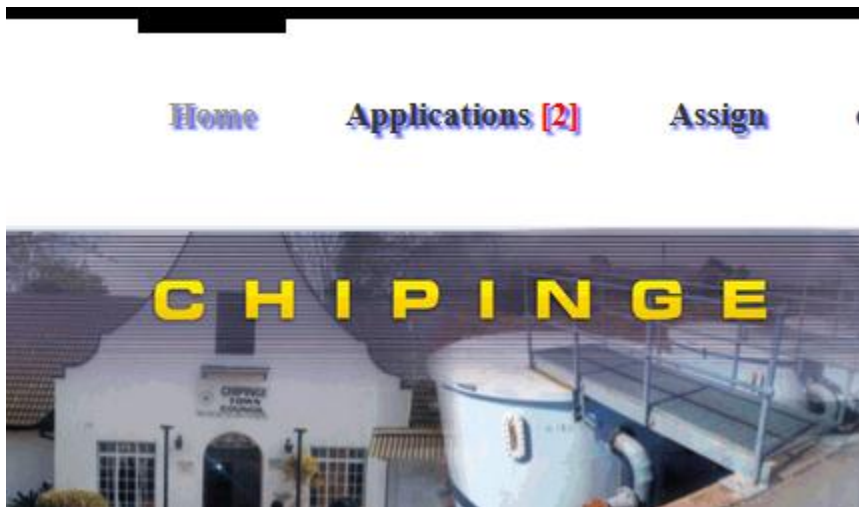
**Fig 5.25 Inspection Booking Form**

If the client successfully book for inspection the client is prompted of successfully booking as shown overleaf.



**Fig 5.26 Client successfully booking form**

The following form showing the Housing Director receiving applications send by clients.



**Fig 5.27 Administrator Receive Applications**

**Objective 2: Online communication**

This objective was successfully met where clients can send queries and receive the answers. The housing director will receive the query and reply as shown overleaf.

query

any anomalies ??

enter name enter surname enter email

chavondoka chavondoka chabvo@gmail.com

Submit query

CHIPINGE TOWN COUNCIL

chavondoka

thank you...your query is being processed

Your query number is:7 . Enter this number to view your reply later

**Fig 5.28 Client sending Query**

The following form shows the Housing Director receiving queries.

Assign queries [1] Manage Stages

**Fig 5.29 Director receiving Queries**

The following shows the director replying to queries.

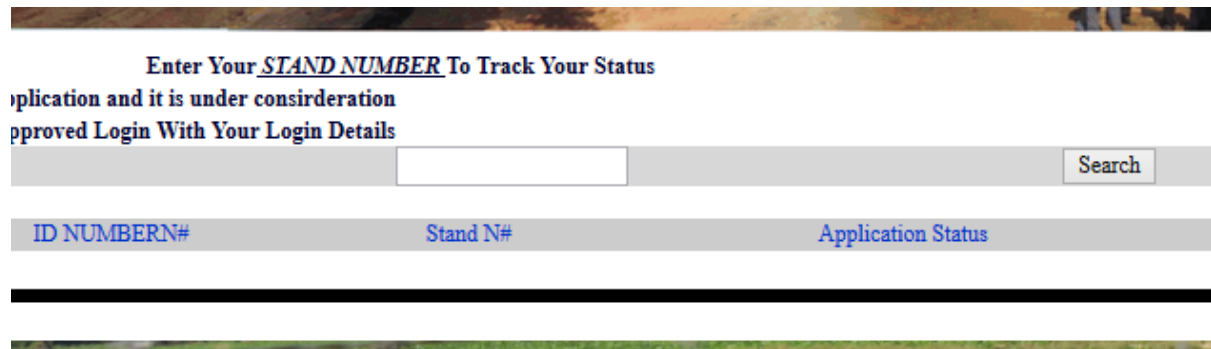
Reply the Query

Please put your query reply below.

Reply

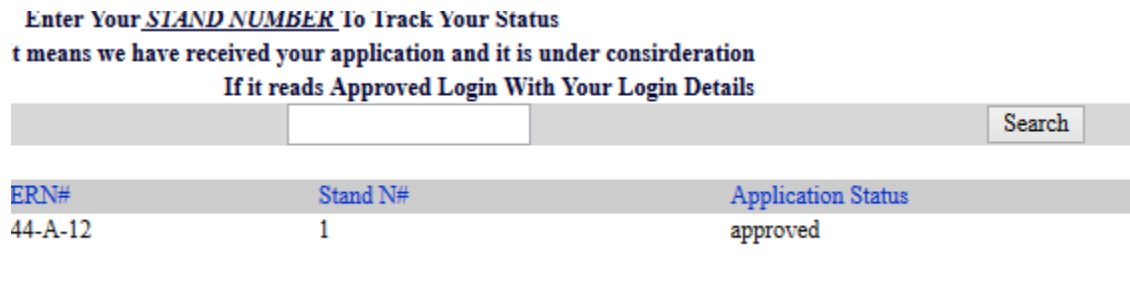
**Fig 5.30 Director Reply Query**

After booking for inspection clients are now able to track for their application on the platform shown below.



**Fig 5.31 Client Tracking Application**

If the client has been approved or their applications are received by the Housing Director an approval notice is shown to them. The figure below the approval notice after tracking.



**Fig 5.32 Client Tracking Response**

**Objective 4: System Audit Trail**

This object was also met. This is where the administrator is able to retrieve the history of the activities done by the users in the system with purpose of identifying those who do not work and who manipulate the system. The system audit trail is shown overleaf.

SYSTEM ADMIN Logged in as : Nomatter Tambudzayi

Specific System Operations Report  
Date format is mm/dd/yyyy e.g 01/21/1991

Start Date:  End Date:  User: All  Search

Name	Surname	Operation	Time
Nomatter	Tambudzayi	Logged Out	04/08/2015 - 09:01:03
Nomatter	Tambudzayi	Logged In	03/27/2017 - 20:00:53
Nomatter	Tambudzayi	Logged In	04/18/2017 - 17:21:50
Nomatter	Tambudzayi	Logged Out	04/22/2017 - 18:57:48
Nomatter	Tambudzayi	Logged Out	03/27/2017 - 20:32:26
Nomatter	Tambudzayi	Logged In	04/09/2015 - 13:50:43
Nomatter	Tambudzayi	Logged In	04/07/2015 - 22:03:32
Nomatter	Tambudzayi	Logged Out	03/24/2017 - 18:43:46
Nomatter	Tambudzayi	Logged In	04/03/2017 - 01:59:44

**Fig 5.33 System Audit Trail**

**Objective 5: Assigning Inspectors Online**

The objective was also met where the Housing Director is able to assign the inspectors online. The following screen shots shows the processes of assigning inspectors online.

*Paid and Approved Stands From Clients*

---

Click the link to ASSIGN to Inspectors

Stand Location	Stand Number	Date Payed	ASSIGN STAND FOR INSPECTION
Gaza O	1801	04/24/2017	<a href="#">Assign to Inspector</a>

---



**Fig 5.34 Assign Inspector**

## **5.4 Installation**

This is the procedure done to move from the old system to the fresh one. (George et al, 2012). This phase consists of system analysts making sure that the end user were fully trained and the decision concerning the changeover strategy that was supposed to be applied being examined. In this case after the completion of tests series deemed viable to implement the new system, the obsolete one had to be swapped with the fresh system and there were numerous changeover approaches which the experts had to examine the appropriate one to be used. The developers relied heavily on the architectural design which they unanimously agreed upon which has a dedicated server and several clients and a database server.

### **5.4.1 User Training**

User training acknowledges the teaching of users on how to operate the system in order to make them be aware of all the functions and features of the new systems to fuel effectiveness and efficiency (Pressman, 2005). This process included in cutover training and on-going training. It is paramount to deliver the correct drill for the right persons at the accurate time throughout the installation phase whilst complying with effective training budgets and emphasizing much on business assessments, and IT team to work with the available resources, rather than the funds they wish them to be available. This system trainers had to apply less expensive methods which included training user manuals and handouts. They also employed slides designed which contained the actual system screen shots, which resembles the true system which enabled users to understand easily. Hands-on training was also used as the second stage of training where tasks were given to trainees using typical daily work.

### **5.4.2 Data Migration**

Chang (2005), explains data migration as the process of transferring the necessary data between storage formats, types or computer systems. When transforming from the manual based system to the new computerised system, it was essential to transfer data from the old system to the new system. Risks of losing data during data migration was inevitable so the developers made use of security controls measures to diminish these risks through proper validation which guarantee data integrity. Verification of data was paramount after data was loaded into the system so as to determine whether it was correctly transformed, complete and comply with the procedures in the new system.

### **5.4.3 Changeover Strategies**

According to (Dennis et al, 2012) is the process of replacing the old system with an innovative system. The four main changeover strategies that the developing team evaluated based on the suitability and appropriateness to the case study were pilot changeover, direct changeover, parallel changeover and phased change over. These strategies are further described below.

#### **5.4.4 Pilot Changeover**

According to Hazra (2012) puts forward that this conversion strategy is a discriminatory implementation technique where the novel system is only conveyed to those departments that require the use of the system. The major advantages of this strategy were, costs were relatively moderate because only one site runs both systems. Risks were likely to be minimum as risks of failure were only confined to the pilot site. However the drawback of pilot run which made it impossible to adopt was that it going to take a long time to achieve the complete change.

#### **5.4.5 Direct Changeover**

This strategy entails the complete overhaul of the old system and totally replace it with the new one abruptly, (Kendall and Kendall 2011). Replacing was done after the old system was terminated from functioning thereby switching off completely from existing system to the new system since a comprehensive testing had been carried out and deemed necessary without doubt that direct changeover was appropriate and paramount to replace the status quo. Direct changeover was conversely regarded as risky because it was subjected to complete organisation shutdown during the implementation process, however it was the quickest strategy to achieve a complete change.

#### **5.4.6 Parallel Changeover**

This strategy makes use of both the new and old systems running concurrently such that if the new system failed, the current system will be a backup to the users where they can refer to it and proceed their processes. A complete changeover is realised after the new system is on the users' fingertips. Its advantages to the scenario were that there was going to be reduction in system failure as the systems had to support each other and it was going to facilitate limited disturbance on organisation operation as a result of shutdown that the direct changeover emphasizes.



However this approach was not suitable to adopt since it was regarded as costs intensive especially on implementation as a result of simultaneously running systems.

#### **5.4.7 Phased Changeover**

The new system is put into place in different stages whilst the old system is being slowly wiped away (Roberts, 2001). Users can adjust easily to the new system since there is no abrupt change because it will be implemented slowly in phases. The advantage of this strategy is it facilitated clear understanding of the new system and when the system was found to be astray correct measures were done before the whole system corrupt the whole organisation. However users had to take time with confusion as some had to continue relying with the old phase whilst there is a new phase to be used so it was not necessary to the situation.

#### **5.4.8 Recommended Changeover Strategy**

The developing team had a full analysis of all the changeover strategies in relation to the Chipinge Town Council status quo where they unanimously agreed on direct changeover strategy. This strategy proved to be paramount considering the fact that it is effective on cost reduction as the town council is facing limited resources, complete overhaul of the old system reduce confusion among users as to which system to embrace between both. Also after a through system testing and assessment of the users on the new system it was inevitable that this new system will have failure risks and the users can quickly copy their data from old system to the new system much easier.

### **5.5 Maintenance**

Hughes et al. (1999), argued it as the amendments that are carried on the software and hardware of the system once the system has been conveyed with the aim of improving its performance to adapt to the dynamic environment. Maintenance monitors system performance, security and manages changes to meet the user specifications whilst a superb change procedures intrinsically ensures those desired changes made does not tantamount to pandemonium to the system. The maintenance types that are available for use are corrective, adaptive and perfective maintenance.

#### **5.5.1 Adaptive Maintenance**

Sommerville (2001) defined adaptive maintenance as the adjustment to the system after implementation for it to cope up with environment changes. Changes that occur maybe either

external or internal environment where user needs and requirements might shift or increase. Adaptive maintenance includes making modifications to the system to alter its functionality to changing organisation requirements. The adaptive maintenance will be carried out in cases where there is need of hardware swapping or changing. This maintenance is done for the software to fit into the changing hardware so that the system will not fail.

### **5.5.2 Corrective Maintenance**

According to Sommerville (2001) explains it as the rectification done to the faults that may occur when the system is in operation. The errors that maybe found include program freezing, crashing and these repairs done maybe short-term so as to give room for the system designers to work further on a permanent panacea to those errors. Corrective maintenance mainly intents to rectify errors and faults found on current system with no additional functionality being included to the system. The corrective maintenance will be carried out whenever the error is detected on the system.

### **5.5.3 Perfective Maintenance**

This strategy comprises changing the software to meet the user's wishes which include supplying innovative functions that enhance performance. End users request and issue changes while the maintenance team will carry out perfective maintenance to improve processing performance, interface usability to meet their desired state. Perfective maintenance will be carried out after each and every request by the users is issued and a thorough analysis of those requests proved to be of value addition.

### **5.5.6 Recommendation for Maintenance**

The system developing team recommended the use of adaptive maintenance since the system was established due to technological changes to automate the building inspection process as well as collaboration among users therefore to stay ahead, adaptive maintenance is of greater paramount if implemented considering this dynamic changing environment.

## **5.6 Recommendations for Further Development**

The future developers should focus on the following issues:

- The system should include the payment system whereby clients' will be allowed online payment.

- The system should incorporate others issues like application of stands and their approval.
- This system should also be joined with the Promun system which is also being used at Chipinge Town Council to reduce confusion among users.
- The software should be continuously upgraded to meet changing user requirements.

### **5.7 Conclusion.**

The Chipinge Town Council Inspection system successfully passed all the system development life cycle. The objectives were met within the budget. The implementation phase shed light on the system testing. System testing was done through verification and validation. All the security issues were depicted that were supposed to be included in to the system supplemented with screen shots. System versus objective was also carried whereby the system was tested whether it has meet the specified objectives which proved to be successful. The developing team went on to discussing about the changeover strategies whereby they agreed on direct changeover. Maintenance strategies were evaluated and adaptive maintenance was ideal for this system and they concluded with the recommendations for further development.

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## **APPENDICES**

### **APPENDIX A: USER MANUAL**

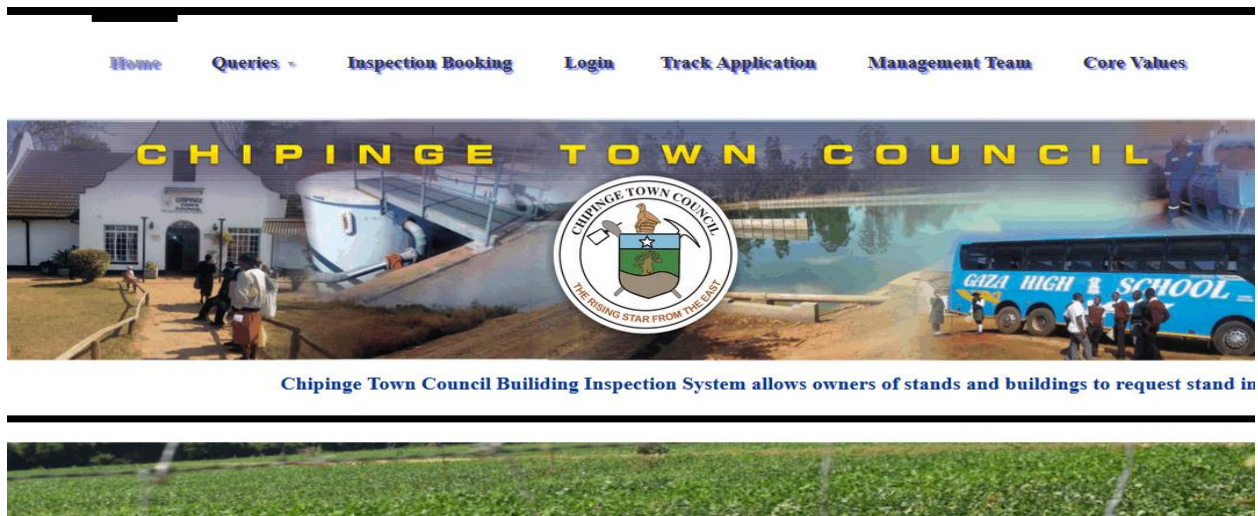
The main purpose of this user manual is to equip the users with the necessary knowledge on how to use this system. This user manual incorporates all the steps that are needed to use this system. Whenever the user is facing challenges about the system should refer to this manual for guidance.

#### **Getting Started.**

Chipinge Town Council Building Inspection System is a web based system that allows Chipinge residents to apply and book for inspection and receive their response online whilst able to send their queries online. For the users to get access to the system they should type the name <http://localhost/chipinge/index.php>.

#### **Main Menu**

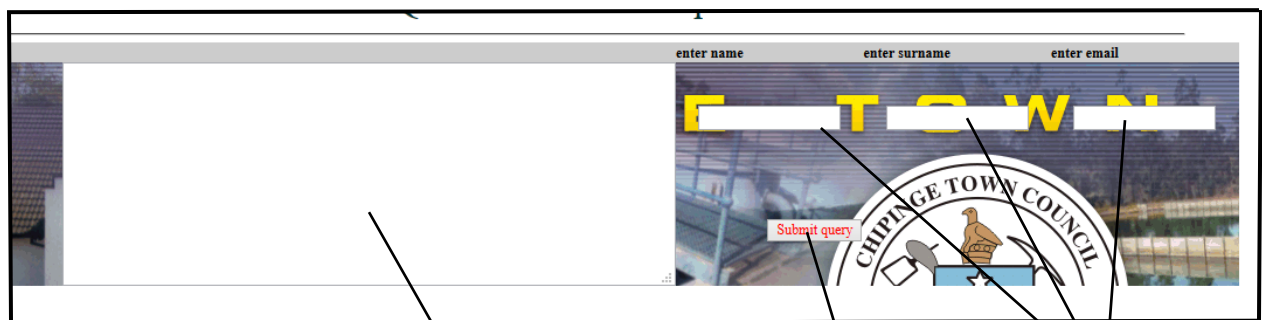
After the users typed the above address they will come across with the main menu which follows and for them to access the system they should be authorised and authenticated, thus the homepage has the login platform and for the clients they, should start by creating their account. Staff members do not create their own accounts but will be added by the administrator.



**Fig A1 Home Page**

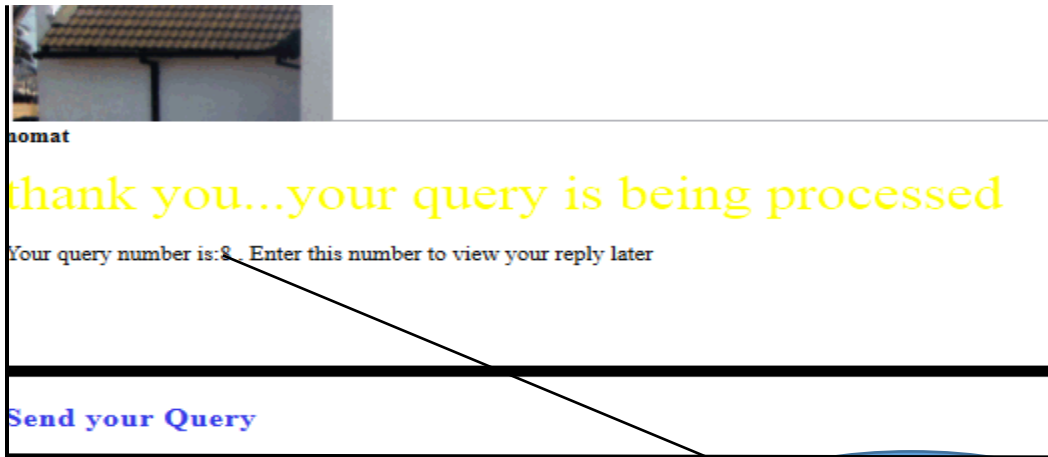
**Home:** Clicking this home button will refer you back to the homepage which is the starting point of the system. The homepage contains the brief information about the organisation.

**Queries:** This is where the clients or stakeholders will be able to send their queries to the housing director by moving your mouse to the heading query drop down headings will pop up where it is written send query and check query answer. Clicking send query the following platform will come out.



**Fig A2: Send Query** <write your query here> <submit your query here> < enter your details here>

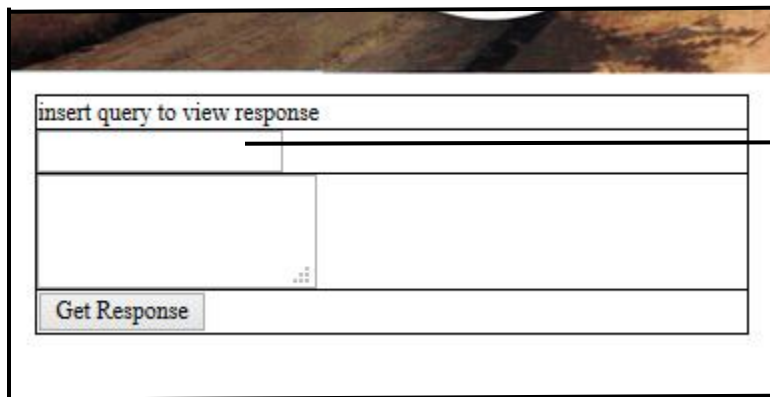
Upon sending a query the clients should keep the query number so that they will going to use it when checking for reply. The number is generated after submitting the query.



**Fig A3: Query Number Confirmation**

Keep this query number  
for response

Clicking the button check query answer that is where the user is able to check for the answer, the following page will pop and users are supposed to insert the query number you were given earlier when sending the query.



Insert your  
query number  
here

**Fig A4: Query Response Platform**

**Inspection Booking:** This platform is where clients will book for inspection whilst creating their account. Note that client will not access the system if their booking is not received and accepted by the housing director. The following page is for the client booking.



Please May you Enter your details below to book for stand inspection!!!

*Note: All fields should be filled.*

Name

Surname

E mail

Sex male

Contact Phone Number

National ID Number  A

*Stand Details*

Stand Plan Picture  Browse... No file selected

Location

Stand N#

Description ground level

*Login Credentials*

User Name

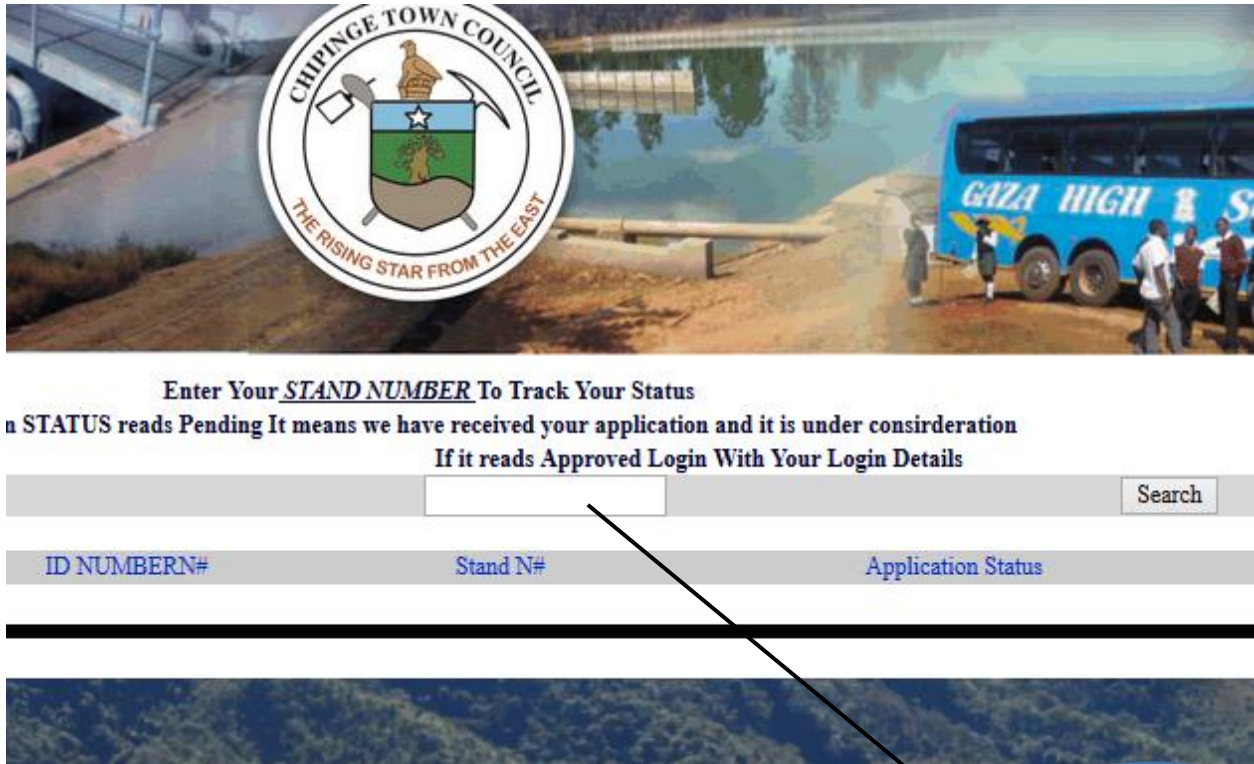
Password  A value is required. Password too short atleast 8.

Confirm

BOOK

**Fig A5: Client Booking Page**

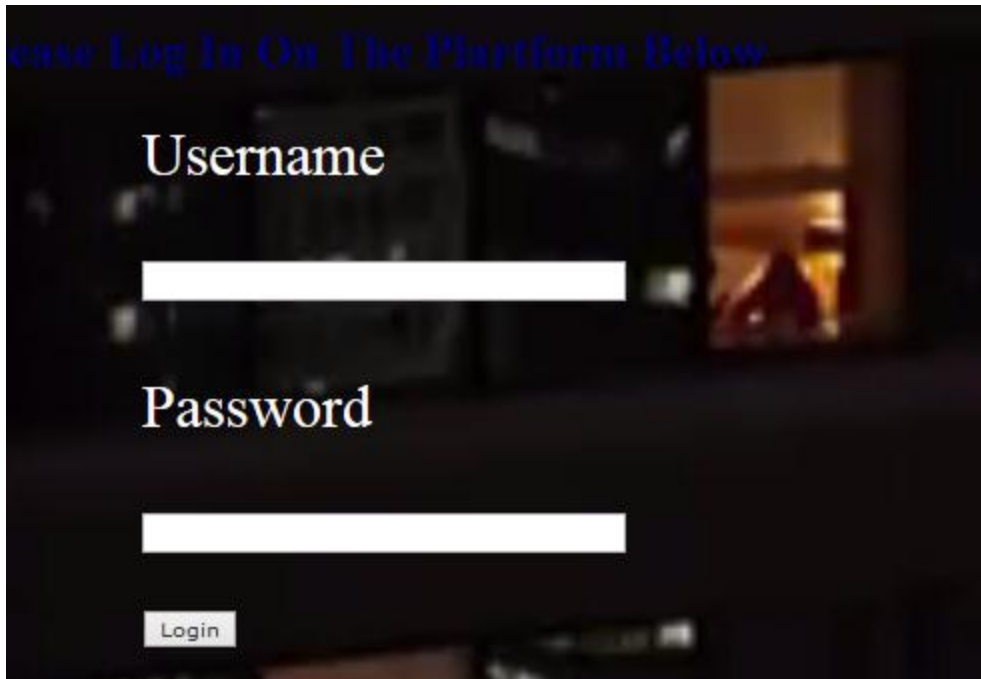
**Track Application:** This is where after the clients book for inspection client will be able to track their applications whether it has been received by the Housing Director. Only those with their applications received are legible to log in. Clients should use their stand number to check for application approval on the platform provided as shown below.



**Fig A6: Application Tracking**

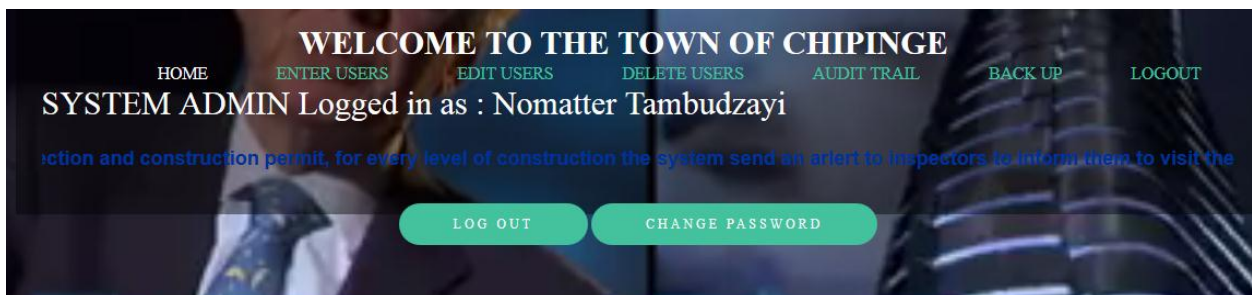
Insert your stand number here

**Login:** All system Users should click here in order to access the system note that only those clients who are accepted by the housing director will log in. Only staffs who have been added by the administrator will have the ultimatum to use the system. Correct credentials are pre requisite issue and failure to insert correct details you are disallowed to access the system. The login platform is shown on the next page and all users uses the same platform.



**Fig A7: Users log in**

**Administrator Homepage:** If the administrator successful log in he will be directed to the next homepage.



**Fig A8: Administrator Homepage.**

**Enter Users:** When the administrator clicks here, it is where the users like Housing Director, inspectors, payment clerk are entered. Administrator enters users on the following page.

IN Logged in as : Nomatter Tambudzayi

Please Enter User details below!!!  
*Note: All fields should be filled.*

Name

Surname

E mail

Sex

National ID Number  -  -  -

**Login Details**

User Name

Password   
*A value is required.Password too short atleast 8.*

Confirm

Access level

**Fig A9 Administrator Add User Page.**

**Edit Users:** If the users are to change their phone number and emails only the Administrator will click here and the following page will be provided to edit users where only email and phone number are editable.

IN Logged in as : Nomatter Tambudzayi

*Edit User Details*

**Fig A10: Administrator Edit Users Page.**

**Delete Users:** The administrator will click this link to delete users and the following page comes.

List of system users					
Name	Surname	ID Number	Username	User Type	Delete
Bob	Mabangure	12-12334444-A-12	BOB	Client	<a href="#">[click to delete]</a>
Carlynie	Mupando	13-23455566-A-13	Cero	Client	<a href="#">[click to delete]</a>
marve	baso	12-19090554-A-12	baso	Client	<a href="#">[click to delete]</a>
Marve	Baso	15-1233444-A-15	Basera	Inspector	<a href="#">[click to delete]</a>
nomatter	hlahla	13-19090554-A-14	nomta	Client	<a href="#">[click to delete]</a>
Nomatter	Hlahla	12-190906-A-12	Hlax	Client	<a href="#">[click to delete]</a>
Nomatter	Hlahla	13-1909055-A-13	Noman	Clerk	<a href="#">[click to delete]</a>
Nomatter	Hlahla	13-190905-L-13	basobaso	Clerk	<a href="#">[click to delete]</a>
Nomatter	Hlahla	33-11234455-A-12	NOX	Client	<a href="#">[click to delete]</a>
Nomatter	Tambudzay	13-190905-P-13	Nomtank	Chief Inspector	<a href="#">[click to delete]</a>
Nomatter	Tambudzayi	14-190905-P-14	nomanoma	Inspector	<a href="#">[click to delete]</a>
Ronald	Mabangure	33-23456-A-12	Rony	Client	<a href="#">[click to delete]</a>
Ronald	Mateisanwa	13-12344555-A-12	Wancho	Client	<a href="#">[click to delete]</a>
Ronald	Mateisanwa	13-22222222-A-14	Wanchoe	Client	<a href="#">[click to delete]</a>
sam	sam	12-23345555-A-12	sam	Client	<a href="#">[click to delete]</a>
spa	DH	33-22222222-A-23	dghh	Client	<a href="#">[click to delete]</a>

**Fig A11 Administrator Delete Users page.**

**Audit Trail:** If there are anomalies with the system users, the Administrator will click here to check as to when and time did the users log in and out the system and check whether are they working or they don't not use the system. The audit trail page is shown below.

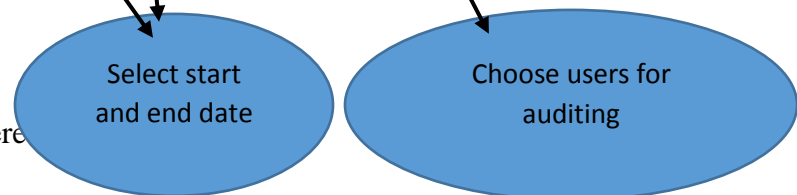
Specific System Operations Report  
Date format is mm/dd/yyyy e.g 01/21/1991

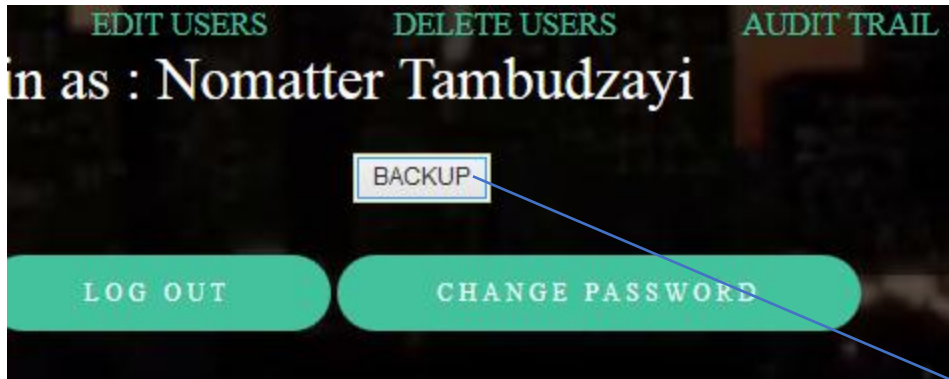
Start Date:  End Date:  User:

Name	Surname	Operation	Time
Nomatter	Tambudzayi	Logged Out	04/08/2015 - 08:02:02
Nomatter	Tambudzayi	Logged Out	03/25/2017 - 01:08:42
Nomatter	Tambudzayi	Logged Out	04/23/2017 - 01:39:17
Nomatter	Tambudzayi	Logged In	04/03/2015 - 09:29:32
Nomatter	Tambudzayi	Logged Out	03/27/2017 - 20:13:27
Nomatter	Tambudzayi	Logged Out	04/14/2015 - 15:36:40
Nomatter	Tambudzayi	Logged Out	04/07/2015 - 09:15:40
Nomatter	Tambudzayi	Logged Out	04/07/2015 - 22:51:01
Nomatter	Tambudzayi	Logged Out	03/24/2017 - 20:14:42
Nomatter	Tambudzayi	Logged In	04/02/2017 - 22:44:34
Nomatter	Tambudzayi	Logged In	03/27/2017 - 20:00:53
Nomatter	Tambudzayi	Logged Out	04/07/2017 - 23:03:23
Nomatter	Tambudzayi	Logged Out	04/22/2017 - 23:58:49
Nomatter	Tambudzayi	Logged In	04/08/2015 - 09:07:38

**Fig A 12: Audit Trail page**

**Backup:** The system administrator will click here

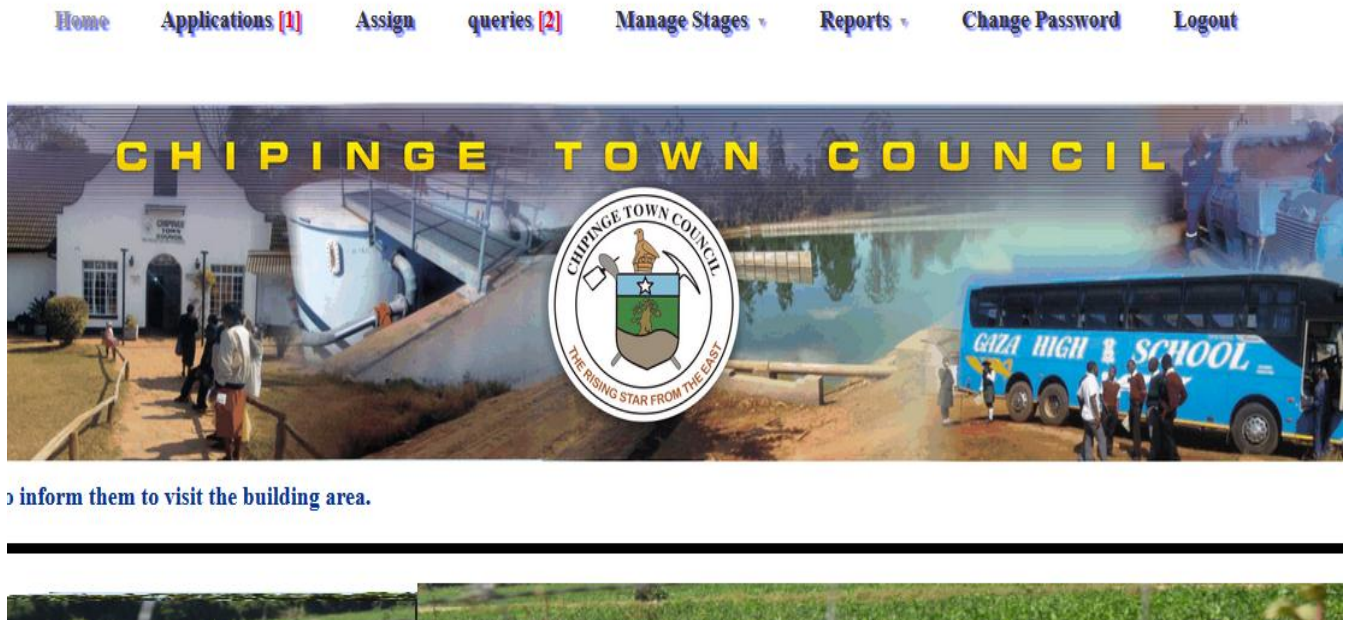




**Fig A: 13 Back-Up page**

### Housing Director Homepage

The housing director is the one who approve all the booking and reply to all the queries. The director has to assign the inspectors, adding and deleting the inspection stages. The homepage for the director is shown below.



**Fig A14: Housing Director Homepage**

**Applications:** All clients’ applications will be shown here. In order to approve, the housing director clicks here and will be redirected to the page where the acceptance of inspection booking is done as shown below.



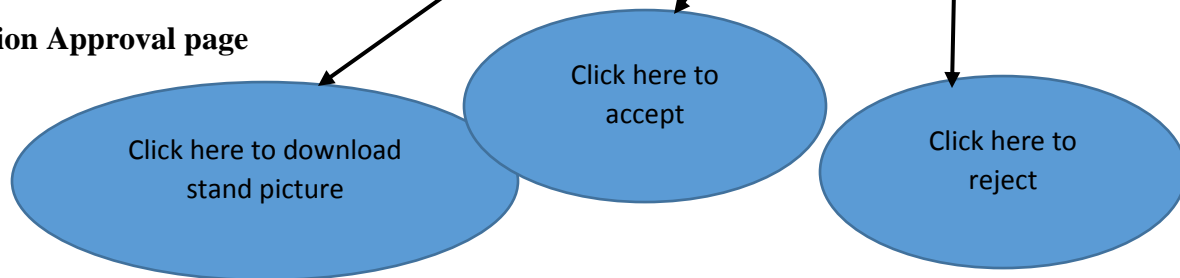
*Stand Inspection Applications From Clients*

Click the links to download, confirm and reject

Name	Surname	ID Number	Contact Number	Stand Location	Stand Number	Description	Date Applied	Download Plan	Accept	Reject
chavondoka	chavondoka	3-2245-A-12	122243563636	Gaza	2	ground level	04/23/2017	[DOWNLOAD]	[ACCEPT]	[REJECT]



**Fig A15: Application Approval page**



**Assign:** This is where the housing director will click in order to assign the inspectors online. The housing director will be redirected to the following page.



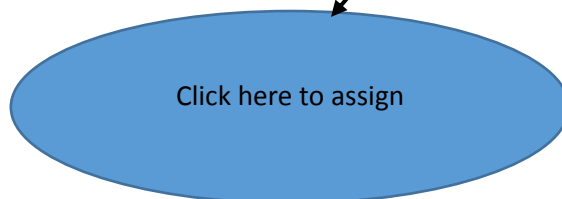
*Paid and Approved Stands From Clients*

Click the link to ASSIGN to Inspectors

Name	Surname	ID Number	Stand Location	Stand Number	Date Payed	ASSIGN STAND FOR INSPECTION
spa	DH	33-22222222-A-23	Gaza O	1601	04/24/2017	[Assign to Inspector]



**Fig A16: Director Assign Form**



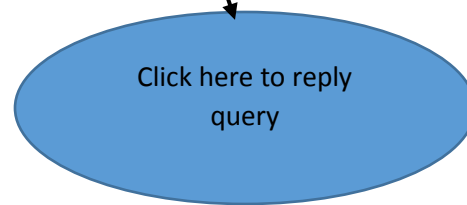
**Queries:** This is where the housing director will click when replying the queries. Below is the screen shot that depicts how the director reply queries.



Surname	Email	Reply Query
shavondoka	chabvo@gmail.com	REPLY
ila		REPLY



**Fig A17 Query Response page**



**Manage Stages:** The housing Director has to click here to insert the building stages or delete them. To add stage the following page will appear.

**Add Stages**  
Stage Name:

**Fig A18: Add Stage page**



**Reports:** All the system reports are shown here the housing director should put the start date and the end date to search for the desired reports.



Report of Stand Inspection Application  
Date format is mm/dd/yyyy e.g 12/31/1985

Start Date		End Date		Status	approved	Search
------------	--	----------	--	--------	----------	--------

**Fig A19: Retrieve reports platform**



**Client Homepage:** The client homepage allows them to apply and view the inspection response. The client homepage looks like the next screen shot.



**Fig A20: Client Homepage**

**Request Inspection:** This is where the client will request for their inspection response. Clients' requisition will be directed to the inspector who had been assigned for the task. The requisition page will look like the next screen shot.

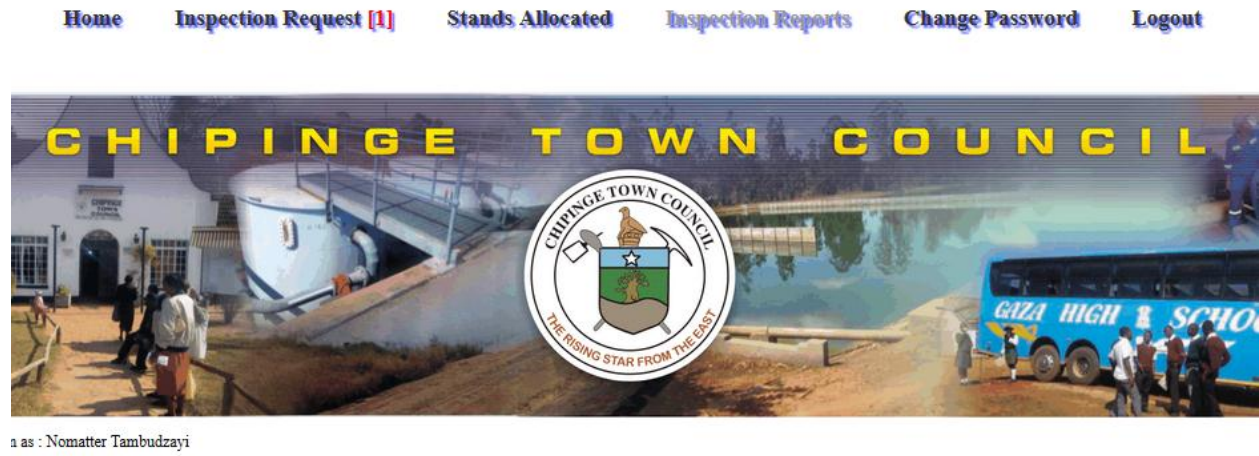
**Fig A21: Client Inspection requisition**

**Inspection Response:** This is where the response from the Inspectors will be viewed. The form for the inspectors will be as follows.

<i>Inspection Ruling By the Inspector</i>				
<i>Inspection Ruling By the Inspector</i>				
Inspection Request	Description	Inspector's Ruling	Inspector's Comment	Date Inspected
eita	hei	passed	yse we do	04/26/2017

**Fig A22 Inspection Response Page**

**The Inspector Homepage:** This homepage will depict the tasks of the Inspectors starting from replying the inspection request up to viewing the allocated stands. The Inspector Homepage will be as follows.



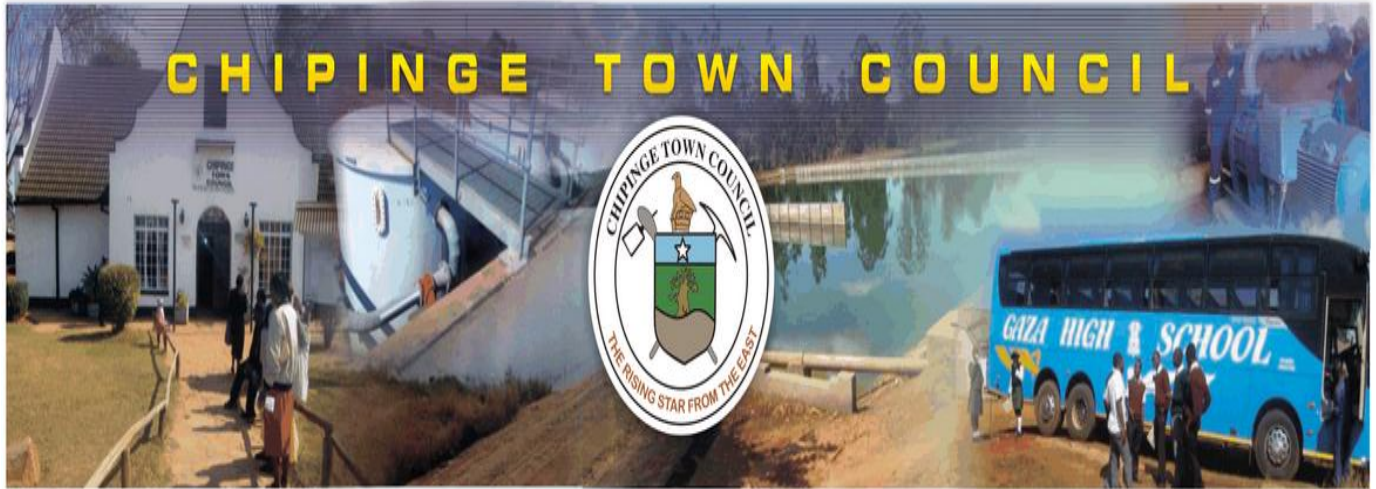
**Fig A23: Inspector Homepage**

**Inspection Request:** After the inspector has been allocated the stand to inspect, the client can ask for the response. The requisition will reach to the inspector as messages and by clicking the message button written Inspection Request the Inspector is able to reply the client.

Stand Location	Stand Number	Inspection Request	Descripton	Date Requested	Pass	Fail
gaza	1	roof level	what are results for my roof level	04/26/2017	[PASSED]	[FAILED]

**Fig A24: Inspection Request Page**

**Stand allocated:** this is where the inspectors will view the stands which have been assigned to them. The stand allocated page will be as follows.



INSPECTOR Logged in as : Nomatter Tambudzayi

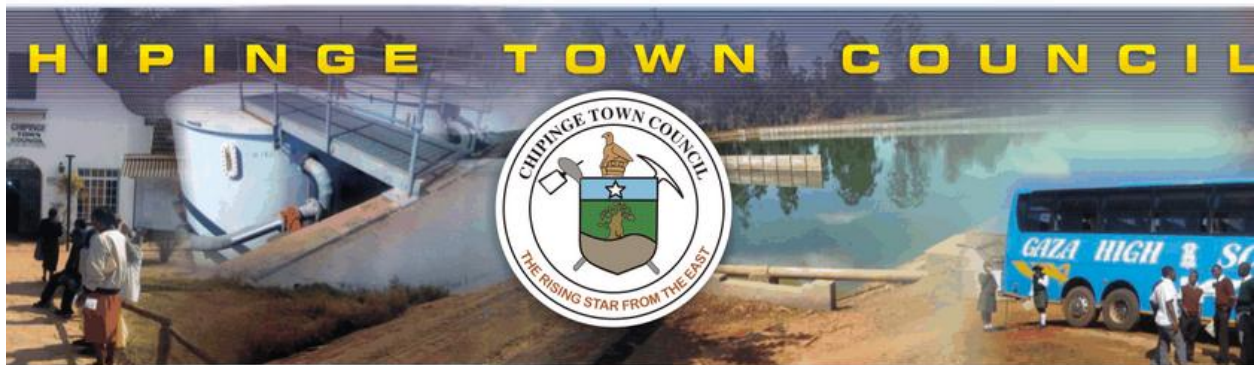
*Paid and Approved Stands From Clients*

May You Please Inspect The Following Stands which You Were Assigned for!!!!

Name	Surname	ID Number	Stand Location	Stand Number	Date Assigned
Bob	Mabangure	12-12334444-A-12	gaza	1	04/18/2017

**Fig A25: Inspector stand Allocation Page.**

**Payment Clerk Homepage:** The following Homepage is for the payment clerk whose main task is to approve the payment confirmation. The payment clerk will have to search for the clients who had paid their inspection and approve them. Clients who had not paid are not approved. The inspection fee for all the stages is **\$20**. The homepage for the payment clerk look like this.

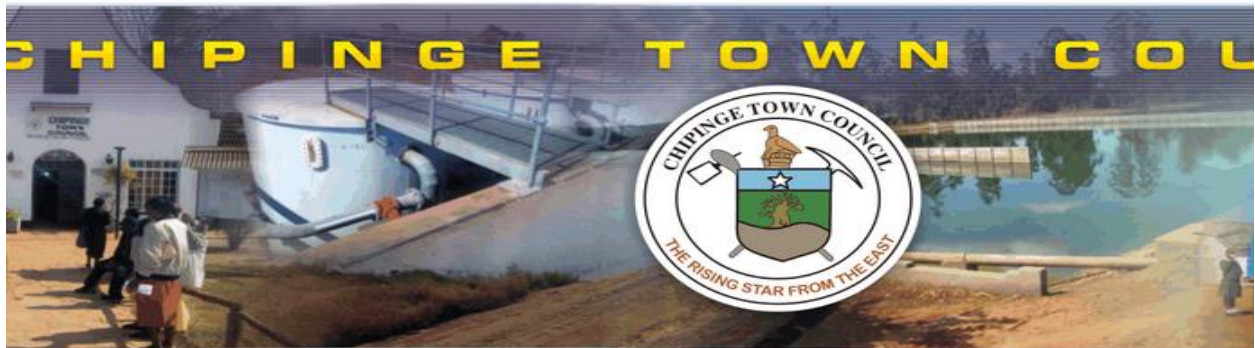


atter Hlahla

Chipinge Town Council Building Inspection System allows owners of stands and buildings to request

**Fig A26: Payment Clerk Homepage**

**Inspection payments:** This is where the payment clerk will confirm the clients who had paid the inspection fee. Only those who paid the inspection will be inspected for.



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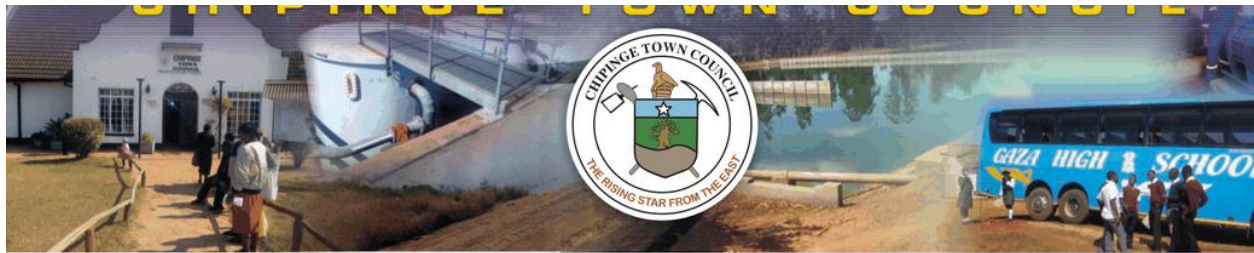
**Inspection Payment Confirmatin**  
Please Select the Stand Number

Stand Number	▼	Submit	
Owner ID	Stand N#	Location	

**Fig A27: Payment Confirmation page**



**Payments reports:** This is where the history concerning payments are retrieved. Dates are required when searching for the reports. The payments report will be look like the next page.



it Clerk Logged in as : Nomatter Hlahla

Report of Paid Stand Inspection Fee  
Date format is mm/dd/yyyy e.g 12/31/1985

Start Date	04/03/2017	End Date	04/26/2017	Search
------------	------------	----------	------------	--------

Print

**Fig A28: Payment report Page**



**APENDIX B: INTERVIEW CHECKLIST**

**Housing Director**

**1. How do you assign the inspectors their tasks?**

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

**2. How do you manage queries from clients? Are there any problems that you are encountering with the system?**

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

**3. How do you manage the long queues of clients who want to book for inspection?**

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

**4. Are there any precautions in place to safeguard against unauthorized access of organization information?**

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

**5. How do you rate your current system?**

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

**6. Do you wish to shift from the current system to the system?**

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

**Inspectors**

**1. How do you carry out the inspection activity?**

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

**2. How are you coping with the current system? Are there any problems that you are encountering with the system?**

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

**3. How do you rate the system performance?**

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

**4. Are there any precautions in place to safeguard against unauthorized access of organization information?**

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

**5. Do you support an idea of building a computerized system?**

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

**6. What are you expecting from the new system?**

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



## APPENDIX C: QUESTIONNAIRE

April 2014

Dear Participant

I Nomatter Tambudzayi, a Midlands State University student studying Information Systems honour's degree. I wish to work with your organization in partial fulfilment of my fourth year project to gather information on how your construction inspection system operates specifically in the housing department. I have attached a questionnaire to this cover note and hereby request for your time to assist me with the information required in the questionnaire. You are assured that any information collected will be maintained on private and confidential basis and will be used only for academic purposes.

I am looking forward to receiving your favourable response. For any additional information or queries feel free to contact us on the details below.

Contact details:

[nomahla8x@gmail.com](mailto:nomahla8x@gmail.com)

[Mr. F. Madzikanda \(supervisor\)](#)

+263 771 496100

+26377.....

**Management**

**1) How does the approval and inspection of construction done?**

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

**2) What challenges are being faced with the existing system?**

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

**3) Tick where applicable**

**a) Do you think the current system is reliable, efficient and contributing to your organizational objectives and goals effectively?**

**Excellent system**       **Fair**       **Ineffective**

**b) Do you often experience very busy days and big workloads during your operations?**

**Very often**       **Infrequently**       **All the time**

**c) Are you satisfied with the existing system?**

**YES**       **NO**

**If NO suggest the reasons and recommendations.**

.....  
.....  
**4) Do you support the idea of developing an Online Construction Inspection System?**

**YES**

**NO**

**If NO give reasons.**

.....  
.....  
**5) Would you think the above idea will help to solve current system problems and meet organization goals?**

DATE..... TIME.....

**Clients**

**1. How do you rate services provided by the Chipinge Town Council?**

Good     better     worst

**2. Is your information secure with the current system in the Town Council?**

Insecure     secured     need for improvement

**3. Do you wish the system to be changed so as to offer more security features?**

Yes                       No

**4. How do you recommend your information to be more secured and kept privacy and confidential?**

.....  
.....

**5. What do you think the organization should do about the performance of the current system**

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

DATE..... TIME.....

**APPENDIX D: OBSERVATION SCORE SHEET**

**Date** \_\_\_\_\_ **Observer** \_\_\_\_\_

**Time** \_\_\_\_\_

**Department** \_\_\_\_\_

**Observation**

-----  
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**Conclusion** \_\_\_\_\_  
-----  
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-----  
-----  
-----

**Signed by Observer:** \_\_\_\_\_

**Date:** \_\_\_\_\_

## APPENDIX E: SNIPPET OF CODE

### Create client account

```
<?php

if(isset($_POST['Submit'])){

    $fn = $_FILES['file']['name'];

    /* if(($_FILES["file"]["type"] != "image/jpeg")){?>

<script language="javascript">

    alert("File Should Be A JPEG ONLY");

    location = 'index.php?page=new_prd.php'

</script>

<?php

exit;}*/

if(!move_uploaded_file($_FILES['file']['tmp_name'], "pic/" . $fn)){?>

<script language="javascript">

    alert("PLEASE CHOOSE A FILE");

    location = 'index.php?page=new_prd.php'

</script>

<?php

exit;
```

```

    }

$date = date('m/d/Y');

$name = $_POST['name'];

$surname = $_POST['surname'];

$username = $_SESSION['username'];

$id_no=$_POST['id_first_digit']."-".$_POST['id_second_digit']."-
".$_POST['id_third_letters']."-".$_POST['id_forth_digit'];

$rs1 = mysql_query("select * from users where username = '".$_POST[username]'");

$row = mysql_num_rows($rs1);

if($row == 1){

    <script language="javascript">

alert("Username already in use");

location = 'index.php?page=addusers.php'

$rs1 = mysql_query("select * from users where idnumber = '$id_no'");

$row = mysql_num_rows($rs1);

if($row == 1){

<script language="javascript">

alert("ID Number already in use");

location = 'index.php?page=addusers.php'

```

```
$rsv = mysql_query("select * from apply where stand = '$_POST[stand]'");

$rw = mysql_num_rows($rsv);

if($rw == 1){

?>

<script language="javascript">

alert("Stand N# already in use");

location = 'index.php?page=addusers.php'

}

if($_POST['password']!= $_POST['cpass']){

?>

<script language="javascript">

alert("Password did not match with confrim password");

location = 'index.php?page=addusers.php'

</script>

<?php

exit;

}

if(strlen($_POST['password']) < 8 )

alert("Password should be above 8 charactors");
```



```
location = 'index.php?page=addusers.php'
```

```
mysql_query("insert into apply(idnumber,location,stand,disc,date,pic) values  
('$id_no','$_POST[location]','$_POST[stand]','$_POST[disc]','$date','$fn')") or  
die(mysql_error());
```

```
$rs=mysql_query("insertinto  
users(name,surname,email,sex,phone,idnumber,username,password,access,date,suspend) values  
('$_POST[name]','$_POST[surname]','$_POST[email]','$_POST[sex]','$_POST[phone]','$id_no',  
'_POST[username]','$_POST[password]','5','$date','NULL')") or die(mysql_error());
```

```
alert("Your Details Has Been Successfully Uploaded,Track Your Approval Status on the Home  
Page Thank You");
```

```
parent.location = 'index.php'
```

```
</script>
```

```
<?php
```

```
}
```

```
else
```

```
{
```

```
echo "problem occured";
```

```
<script src="SpryAssets/SpryValidationTextField.js" type="text/javascript"></script>
```

```
<script type="text/javascript">
```

```
<!--
```

```
function MM_validateForm() { //v4.0
```

```

if (document.getElementById){

var i,p,q,nm,test,num,min,max,errors="",args=MM_validateForm.arguments;

for (i=0; i<(args.length-2); i+=3) { test=args[i+2]; val=document.getElementById(args[i]);

if (val) { nm=val.name; if ((val=val.value)!="") {

if (test.indexOf('isEmail')!=-1) { p=val.indexOf('@');

if (p<1 || p==(val.length-1)) errors+="- "+nm+" must contain an e-mail address.\n";

} else if (test!='R') { num = parseFloat(val);

if (isNaN(val)) errors+="- "+nm+" must contain a number.\n";

if (test.indexOf('inRange') != -1) { p=test.indexOf(':');

min=test.substring(8,p); max=test.substring(p+1);

if (num<min || max<num) errors+="- "+nm+" must contain a number between '+min+' and
'+max+'.\n";

} } } else if (test.charAt(0) == 'R') errors += '- '+nm+' is required.\n'; }

} if (errors) alert("The following error(s) occurred:\n"+errors);

document.MM_returnValue = (errors == "");

} }

```

## Users login

<?php

```

ob_start();

error_reporting(0);

include 'opendb.php';

include 'functions.php';

if(isset($_POST['login'])){

session_start();

$username = clean($_POST["username"]);

$password = clean($_POST["password"]);

if($username == " OR $password =="){

        echo ("<SCRIPT LANGUAGE='JavaScript'> window.alert('Please Enter
Password or Username,fields can not be empty')

        javascript:history.go(-1)

        </SCRIPT>");

        exit;

}

        $resul = mysql_query("SELECT * from users where username='$username'
AND password = '$password' and suspend='0'");

```

```

        $rows = mysql_num_rows($result);

        if($rows==1)

        {

                echo("<SCRIPT LANGUAGE='JavaScript'> window.alert('You Have Been Suspended
Contact The Administrator')

                javascript:history.go(-1)

                </SCRIPT>");

                exit;

        }

        else{

$query = "SELECT * from users where username='$username' AND password = '$password'
and suspend='1'";

$result = mysql_query($query);

$rows=mysql_fetch_array($result);

$access=$rows['access'];

$dept=$rows['department'];

//echo $dept;exit;

$q1=$rows['name'];$id=$rows['id'];

$q2=$rows['surname'];

```

```

$full=$q1." ".$q2;

$_SESSION['id'] = $id;

$_SESSION['dept'] = $dept;

$_SESSION['username'] = $username;

$_SESSION['name'] = $full;

$_SESSION['access'] = $access;

if(!$result)

{

    die( "\n\ncould'nt send the query because".mysql_error());

    exit;

}

$row = mysql_num_rows($result);

if($row==1 && $access== '1')

{

    // $time = date('m/d/Y-h:m:s');$date = date('m/d/Y');

    mysql_query("insert      into      audit_tray(id,username,operation,time,date,login)
values('NULL','$username','Logged In','$time','$date','login')") or die(mysql_error());

    mysql_query("update users set online='1' where id='$id' ") or die(mysql_error());

    header("location: admin/index.php");

```

```

exit;

}

elseif($row==1 && $access== '2')

{

    mysql_query("insert      into      audit_tray(id,username,operation,time,date,login)
values('NULL','$username','Logged In','$time','$date','login')") or die(mysql_error());

    mysql_query("update users set online='1' where id='$id' ") or die(mysql_error());

    header("location: chief/index.php");

    exit;

}

elseif($row==1 && $access== '3')

{

    mysql_query("insert      into      audit_tray(id,username,operation,time,date,login)
values('NULL','$username','Logged In','$time','$date','login')") or die(mysql_error());

    mysql_query("update users set online='1' where id='$id' ") or die(mysql_error());

    header("location: inspector/index.php");

    exit;

}

elseif($row==1 && $access== '4')

{

```

```
mysql_query("insert into audit_tray(id,username,operation,time,date,login)
values(NULL,'$username','Logged In','$time','$date','login')") or die(mysql_error());
```

```
mysql_query("update users set online='1' where id='$id' ") or die(mysql_error());
```

```
header("location: payment/index.php");
```

```
exit;
```

```
}
```

```
elseif($row==1 && $access== '5')
```

```
{
```

```
mysql_query("insert into audit_tray(id,username,operation,time,date,login)
values(NULL,'$username','Logged In','$time','$date','login')") or die(mysql_error());
```

```
mysql_query("update users set online='1' where id='$id' ") or die(mysql_error());
```

```
header("location: client/index.php");
```

```
exit;
```

```
}
```

```
elseif($row==1 && $access== '6')
```

```
{
```

```
mysql_query("insert into audit_tray(id,username,operation,time,date,login)
values(NULL,'$username','Logged In','$time','$date','login')") or die(mysql_error());
```

```
mysql_query("update users set online='1' where id='$id' ") or die(mysql_error());
```

```
header("location: guest_rela/index.php");
```

```
        exit;
    }

    else

    {

    echo("<SCRIPT LANGUAGE='JavaScript'> window.alert('Wrong Username And Password : If
    Client Pay Up Approval Fee To Login)

        javascript:history.go(-1)

        </SCRIPT>");
```