Project Documentation

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Name Ahmad Nuhu

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Supervisor Mr. Anuj

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DEDICATION

I am dedicating this project to the people I love most in my life, which are nobody but my beloved mother. Hajiya Samira Isa Ahmad, Alhaji Ahmad Salihu, my grandmother Hajiya Rahmatu Isa Ahmad and my lovely brother and sister Halima Ahmad and Yusuf Ahmad special salutation to my uncle Tijjani Isa Ahmad and the entire beloved family of Alhaji Isa Ahmad for their support, love, encouragement, guidance and prayers their offered to me in my entire life endeavor. **Thank you all**

DECLARATION

I hereby declare that this project report is based on my original work except for citations and quotations which have been duly acknowledged. I also declare that it has not been previously and concurrently submitted for any other degree or award at MAHATMA GANDHI UNIVERSITY or other institutions.

Signature : _____

Name : Ahmad Nuhu

Enrollment No. : MGU122TI1106004231

Date : 05/05/2014

APPROVAL FOR SUBMISSION

I certify that this project report entitled **WAMBALL RENTALS** was prepared by **AHMAD NUHU** has met the required standard for submission in partial fulfilment of the requirements for the award of Bachelor of Information Technology (Hons) at Mahatma Gandhi University

Approved by,

Supervisor : Mr. Anuj

Signature : _____

Date : _____

ABSTRACT

The rapid growth and advancement of Information Technology over the years has made it almost a necessity for all businesses that want to reach wider audiences and remain competitive within the market adopt it. Information Technology has become part of our daily lives be it in the health sector, educational and businesses even though the cost of use and maintenance might be high. The internet has made easier and cheaper to share data, information and resources. And also made easier to plan businesses using same medium, with regard to this solution to many business problems are most often than not related to Information technology.

The project is intended to solve the problems Wamball Rentals are currently facing in taking care of their daily business. To reach a wider audience and gain competitive advantage over its main business rivals.

AKNOWLEDGEMENT

First and famous, I wish to express my sincere thanks and gratitude to ALLAH (SWT); the Cherisher of mankind and the Lord of the heavens and the earth, all praise is to Him; Bearer of the most beautiful names and unto Whom we worship and seek help and blessing. May His peace and blessings be upon our noble Prophet Muhammad (SAW), his household, his companion and those who follow his path till the day of resurrection.

My humble parents; my pride! I wish to acknowledge their efforts, support, guidance, advice and prayers. Alhaji Ahmad salihu and Hajiya samira ahmad isa are a good example of lovely parents. I thank you for taking the burden of sponsoring my education from nursery school up to this undergraduate level. I will like to also thank a wonderful grandmom who has been a mother to me in person of Hajiya Rahmatu Isa. May Allah continue to bless and reward you all abundantly for every endeavour in life may Aljannal firdausy be your final destination, Ameen.

Furthermore, I acknowledge the support and prayers of my family members such as my loving uncles; Alhaji Abdulmajid isa, Alhaji kabiru isa, Alhaji Barrister Jamil Isa Uncle IT and my favourite uncle Tijjani isa , my loving brother and sisters (Halima Ahmad Surraya Kabir and Yusuf Ahmad) as you have been with me throughout this journey may Allah be with you throughout your life time and may your final destination be Aljannal Firdausy.#Amin

On the other hand, I will like to commend **my humble supervisor; Mr. Anuj** for his assistance and guidance during this exercise. In addition, I wish to thank other lecturers, my class mates and entire peace(bluecrest) campus staff; for their love and support, that my presence at MGU pleasant and successful.

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CHAPTER 1: INTRODUCTION

Today many businesses, no matter the size or budget, face an increasing competition with each other in promoting their goods and services. Capturing and retaining customers, as well as maximising profit becomes a quest that must be satisfied through the use of various tools and technologies available. It is arguably true that Information Technology has become the life line of many businesses around the globe today.

Nowadays the use of the internet and web applications grows higher in number to support almost day-to-day business aspects in our lives. Customers purchase online, make flight bookings and even register into educational institutions online. Small to medium enterprises (SME's) a not left behind if they still want to compete in the market and reach a wider audience. Making it easy for customers to access and continue to patronise them.

However, car and home rentals are also part of businesses that automate their day-to-day activities and allow customers to rent cars and make reservations online. Making it easier for customers to get services, search houses and sometimes cars delivered to their doors. In other to compete the ever growing competitive market, with rivals organisations and increase profit generation to Wamball rentals.

1.1 BACKGROUND

Wamball rentals is a firm that deals with car and house rentals to people or visitor that come into the country or city for business purposes. It is located in Accra the capital of Ghana with many business opportunities.

The currents system of operation is; customers call or walk-in to the organisations office and signup rent a car, the employees looks up into the file and see which car is available and see if it is what the customer wants. Customer's details are then collected if that is his/her first time of renting a car. Pays a certain percentage of the total amount and all the details, car issued, and payments made including the balance, date and also time for return. It is basically a manual process, which is very error prone and customers are usually not satisfied as sometime the queue is much and it takes time to look up and see the car available. A thorough investigation carried out shows problems in the following areas also:

- ✓ Traditional system of registering customers and keeping records which renders the system inefficient, due to errors and duplication of records. ✓ Lack of proper

information system to handle records ✓ Ineffective resources to manage too many clients.

- ✓ Errors in calculation of payments
- ✓ Problems with checking up availability of car present at the time and keeping track of reservation.
- ✓ The manual process is hectic and time consuming.

1.2 SCOPE OF THE PROJECT

The scope of the project will be within the activities of Wamball car rentals and how to automate the daily business aspects, including a centralized database for employees, customers and cars. The project will also provide an option of payment online as well registering for their newsletters.

1.3 AIMS OF THE PROJECT

The primary aims of this project work are to:

- ✓ Understand the basic activities and responsibilities of Wamball car rentals.
- ✓ State out the problems of the current system.
- ✓ Automate the basic working and business activities of the firm.
- ✓ Develop an online system capable of making customers rent cars and possibly make payments online.
- ✓ Provide security for customers and employees by allowing access to only authorised personnel.

1.4 OBJECTIVES OF THE PROJECT

At the successful completion and implementation of this project, the system should be able to carry out the following tasks:

- ✓ Central repository or database for which all details of all employees, cars and staffs will be kept
- ✓ Perform basic operations of any formal online system with a database at the back end (create, update, delete, view and search records).
- ✓ Register cars and customers which are the main targets of Wamball car rentals.
- ✓ Allow user to make reservations and payments online.
- ✓ Send instant feedback to customers after successful completion of any transaction.

- ✓ Generate report daily or weekly about car rents and payments.

1.5 OVERVIEW

The report is formal and it is to be submitted for assessment, therefore, it follows a standard way of documentation. Based on this the report is arranged into chapters and every chapter holds an important aspect or task as required. This report consists of a dedication, declaration, abstract, acknowledgement, table of contents, chapters and appendices.

- ❖ Chapter One

This chapter comprises of the introduction, background of the organisation, scope, aims and objectives of the project.

- ❖ Chapter Two

This chapter covers the literature review and research on tools and methodology to be used in the development of the project.

- ❖ Chapter 3

Cover research and results of similar rental websites carried out.

- ❖ Chapter 4

This chapter covers the detail explanation of how the requirement gathering and elicitation both the user and system requirements. It also contains how the approach was carried and different approaches that were used in collecting the data and information needed. Then the tools that were used in modelling these requirements such as use case and enhanced ER diagram etc.

- ❖ Chapter 5

This chapter shows how the requirements gathered in the previous chapter were transformed into the system design. It contains sketches and layouts of the web pages and forms.

- ❖ Chapter 6

This chapter explains the various tasks that took place in the development and implementation of the system.

- ❖ Chapter 7

This chapter demonstrates the system testing, the results and test cases including screen shots.

❖ Chapter 8

This chapter evaluates the system giving its overview, weaknesses and future enhancements of the system.

❖ Chapter 9

This concludes the project report by reviewing the overall project objectives and how they were realised.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

'A literature review is an account of what has been published on a topic or projects by accredited scholars and researchers. It is also a piece of discursive prose, not a list describing one piece of literature after another.' (Taylor, 2013)

'It is also a summary and synopsis of a particular area of research, allowing anybody reading the work to reason at why the researcher is pursuing this particular research work and the topic he/she has chosen.' (Experiment-resources.com, 2008)

2.2 TECHNOLOGY AND BUSINESS

Businesses are formed or established in other to provide better service to customers and generate income/profit to the organisation. Profit generation among business is mainly done by providing services at a price that makes the organisation gain from its customers. Customer satisfaction is the first priority of any business organisation whatever their products or services they offer might be, so reaching a wide audience and providing continuous services 24 hours a day and 7 days a week is their primary goal. It is however a strategic decision of the management to define the processes to be followed in providing good service and raising profit for the organisation. Wamball Rentals is also an organisation that will always love to achieve this over its competitors. Moreover, the process followed by Wamball Rentals in providing good services to their customers is the manual file and cabinets; any attempt to the adoption of technology is at the minimum level. This raises the need why some processes need to changed by the rapid growth and adoption of technology in the modern business environment.

Before the millennium whenever, people or individuals wants to rent a car, you either go to the rentals office to pay and pick up the car, check for houses available and visit the house with the employee in-charge or place a call to make the necessary reservation which is usually using a manual process or simple databases designed by the staffs responsible. But due to the rapid growth in Information technology as the years goes by, and the extensive use of web applications in our daily business transactions. It has become necessary for nearly all businesses that want to reach a wider audience and retain existing customers, to make it easy for their customers to rent and make reservations via the internet or online. However, other organisations and business that uses this type of systems will also be checked and researched online.

2.2 DEVELOPMENT TOOLS

For every project there are many ways in which it could be carried out. For the software to be developed for Wamball Rentals, there are different development tools that can be used. It is therefore important and relevant to also review the different development tools and options available in the design and implementation of the software, so as to choose the best option that will provide the delivery of a suitable system for the rental organisations. In this section I will discuss the web application development tools and the justifications or reason why I have chosen them to develop the software for Wamball Rentals. PHP was chosen for the design of the web pages (frontend) and MySQL as the database (backend). In this I will also discuss the relevant issues in the design of the system mainly the human computer interaction (HCI) and factors to be considered during development to make the system accurate and user friendly.

2.2.1 DIFFERENT WEB DEVELOPMENT TOOLS

There are different programming languages that could be used to develop web pages for any software under development. They are C++, Java, Visual Basic, PHP etc. But PHP was chosen as to develop the frontend.

2.2.1.1 PHP

PHP **H**ypertext **P**re-processor is an open source, server-side, and HTML embedded scripting language used in the creation of dynamic Web pages.

'PHP is a general-purpose scripting language that is especially suited to server-side web development where PHP generally runs on a web server. Its clarity in design, well organized modules and better upkeep of various technologies, make it the most popular language in the online industry today. Its popularity and credibility can be gauged by the fact that reputed organizations like Harvard University and popular social Networking site Facebook, both are based on PHP. This is possible because PHP websites can be easily maintained, improved and updated from time to time.' McGrath (2012)

2.2.1.2 JUSTIFICATION FOR THE USE OF PHP

The justification for the use of PHP in the design of the system has to do with numerous advantages that PHP has over other languages in web page development, even though it is relatively slower than other programming languages and it is interpreted differently. The advantages it has over other programming languages are as follows:

- 'Open Source, PHP is completely free.
- PHP can be easily embedded directly into HTML.

- Platform independent can run on Windows Linux or Mac servers.
- Run faster on the internet and easily integrate AJAX, Callback etc.
- Interfaces very easily with Apache/MySQL ❖ Lots of good books to research and learn online.
- It's available with documentation in many languages.
- Easy to learn compared to many other scripting languages. It has a syntax that is easy to parse and is actually rather human-friendly.' Webdesign.org (2012)

2.2.2 BACKEND DEVELOPMENT TOOLS

For most web applications there is a need for a backend which is the data store that save the information, mostly a relational database management system. Over here I would discuss MySQL Relational database management systems.

2.2.2.1 MYSQL

'MySQL is a free and open source relational database management system originating from Scandinavia. MySQL includes an SQL server, client programs for accessing the server, administrative tools, and a programming interface for writing your own programs. It comes in two versions one is free for non commercial use and the other is paid for maintenance i.e. for commercial use.' DuBois (2009)

2.2.2.2 JUSTIFICATION FOT THE USE OF MYSQL

The choice of MySQL for developing this project is because of it being a free and an open source software and also easily compatible with PHP for using web applications

Features that MySQL has over other relational databases are:

- 'Ease of use: MySQL is a high-performance but relatively simple database system and is much less complex to set up and administer than larger systems.
- Connectivity and security: MySQL is fully networked, and databases can be accessed from anywhere on the Internet.
- Portability: MySQL runs on many different operating systems such as Unix, Linux, Windows and NetWare.
- Small size: MySQL has a modest distribution size, especially compared to the huge disk space footprint of certain other database systems.
- Open distribution and source code: MySQL is easy to obtain and the source code is open' Dubois (2009).

2.2.3 KEY ISSUES USE IN DESIGN

For every system to be developed the developer has to look into how the users are going to interact with the system and how user friendly it is going to be. This interaction is referred to as Human Computer Interaction (HCI). And with the aspect of this design principle I will like to mention Graphical User Interface (GUI) which is easy to understand and use. And it is also the basis of most software's and web applications in the modern world. The principles of the GUI which helps in the HCI are:

- Feedback: this talks about the ability of the system to show the progress of a process or the outcome after it is successfully completed. It should also be direct and easily understood by the user and also use a friendly language.
- Visibility: this aspect looks at the visibility of the process they should be designed in such a way that they are visible to the users and labelled correctly an example is Print label. It is direct and easily understood by any user.
- Constraint: these talks about access levels and rules that are laid down on certain task or processes, as there are tasks that can be done only by the system administrator.
- Uniformity: the rules in using the system should be the same; follow a certain process for all users labelled at a particular group.

These design principles are to be used in the development of Wamball rentals to make it easy to use by both the staff and customers and conform to the basic trend of all e-commerce websites.

2.3 SYSTEM DEVELOPMENT METHODOLOGIES

For every project there are different ways in which it can be done. Therefore, there are several approaches to system development. The choice of the methodology to use solely depends on the developer who might consider the three constraints of time, budget and quality or the type of project that is going to be developed. It is however argued that a methodology should provide:

- 'A framework for evaluating the problem the project is intended to address.
- A guide to the project, ensuring that no important stages are left out and everything is proceeding according to plan.
- Tools and techniques that enables user to represent or model different aspects of the system' (ISE:COMP1304, 2007).

Below is a description of some methodologies and the choice and justification of the one chosen for this project work.

2.3.1 LINEAR SEQUENTIAL MODEL

'This is popularly known as Waterfall model which sometimes it is also referred to as the classical life cycle model, it follows a systematic, sequential approach to software development that begins at the system level and progresses through analysis, design, coding, testing, and implementation. It is regarded as the oldest and the most widely used paradigm for software development; but it has its own setbacks and limitations' Pressman (2001).

- ❖ 'A working version of the software will not be available until late during coding. ❖ Too much documentation and dependencies of the tasks
- ❖ Changes are difficult to adapt, as other stages also needs to be changed first' (RAD:COMP1487. 2010).

2.3.2 SPIRAL MODEL

'The model was originally proposed by Boehm, it is an evolutionary software development method that couples the iterative nature of prototyping with the controlled and systematic aspects of the linear sequential model. It provides the potential for rapid development of incremental versions of the software. Using the spiral model, software is developed in a series of incremental releases. During early iterations, the incremental release might be a paper model or prototype. During later iterations, increasingly more complete versions of the engineered system are produced' Pressman (2001).

'It is more suitable when developing large complicated, large and very expensive projects' Boehm (1986).

2.3.3 DYNAMIC SYSTEM DEVELOPMENT METHODOLOGY (DSDM)

'DSDM provides a flexible and controlled process used to develop and implement a system, which combines the most effective use of people's knowledge, tools and techniques to achieve tight project delivery within the time and budget' (DSDM Consortium, 2008). DSDM is an agile development methodology that provides a Rapid application development (RAD) framework that incorporates the delivery of a qualitative system, at a low cost and in time.

DSDM is based on four essential parts which are tools, people, management and methodology. DSDM also uses some tools and techniques; prototyping, facilitated/JAD workshop, time boxing technique and MOSCOW prioritisation.

2.3.3.1 DSDM PRINCIPLES

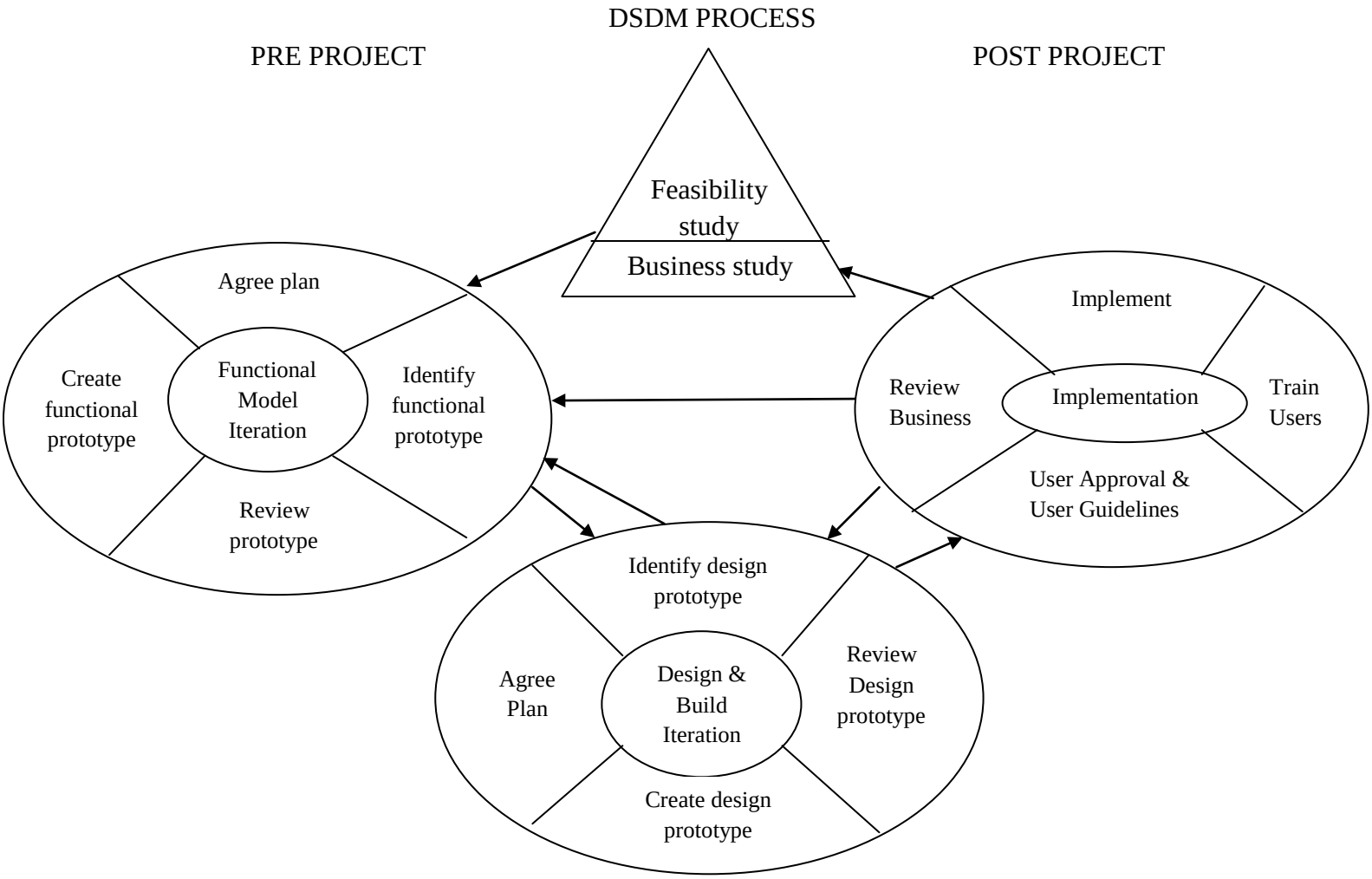
DSDM involves nine principles that guide in the system development, which are as follow:

- Active user involvement is imperative
- DSDM teams are empowered to make decisions
- The focus is on frequent delivery of products
- Fitness for business purpose is the essential criterion for acceptance of deliverables
- An iterative and incremental approach is necessary to converge on an accurate business solution
- All changes during development are reversible
- Requirements are baseline at a high level
- Testing is integrated throughout the lifecycle
- A collaborative and co-operative approach between all stakeholders is essential. (RAD COMP1487: 2010)

2.3.3.2 DSDM PROCESSES

The DSDM process starts from the pre project activity through feasibility study, business study, functional model iteration, design and build iteration, implementation and post project.
This is the process that is going to be followed accordingly in the development of this system.

Below is a diagram for the description of the DSDM processes:



DSDM process diagram. (DSDM consortium, 2008)

2.3.4 JUSTIFICATION FOR THE USE OF DSDM

The reason behind the adoption and choice of this methodology is, considering the system to be developed for Wamball Rentals and the time in which it is going to be developed which is 5months DSDM is the methodology providing quality, low cost and on time delivery. And also due to its advantages over other software development methodologies. Other reasons include:

- Satisfy the real user requirements of business, in order of importance.
- Support the needs of the business and work of the users.
- System that is delivered on time and within budget.
- The users are more likely to claim ownership of the system as they take part in the development.
- The risk of building the wrong system is greatly reduced.
- Errors are more likely to be identified and corrected in the earlier stages of the development.

CHAPTER 3: ANALYSIS AND RESEARCH

3.1 INTRODUCTION

The rapid growth in Information technology in these modern times, and the extensive use of web applications in our daily lives and business transactions. It has become necessary for nearly all businesses that want to reach a wider audience and retain existing customers, to make it easy for their customers to rent and make reservations via the internet or online. In a bid to develop Rentals Management System for Wamball Rentals it is however, of immense importance if I review and research on existing Rental Management System. This would be an added advantage and great importance as it will help develop a system that meets the user requirements. As while developing Wamball Rentals system I will eliminate to highest level possible the problems and shortcomings of other systems researched.

However, to do this certain websites where found using the Google search. These websites visited have similar functions and characteristics as all of them are into the rental business. But none of them incorporates both car rentals and house rentals together.

Below are the websites and outcome of the research:

3.2 ST. MICHEALS RENT A CAR (http://www.stmichaelrentacar.com/index.php)

3.2.1 OVERVIEW

The screen capture above is the index page of the rental organisation. It clearly shows it is a car rental organisation. And show a picture of an aeroplane and a heading of travel service and

a lady posing which is very confusing as she neither looks like an employee nor what the company does. Further research into the website shows they mainly deal with jeeps and SUV's (Sport Utility Cars).

3.2.2 USABILITY

As stated earlier the website was located using Google search and it is one of the results that will be displayed, the labels are clear and understandable, but there is no guide or answers to frequently asked questions by customers. The navigations are working well but there pick up and drop off locations are mainly at the airports.

3.2.3 APPEARANCE

The text and pictures in the site are visible, but the colour combination is too dull and very unattractive red, green with blue for the links and white in the main page. And also the unattractive dark colour at the sides. Then a picture of lady not posing as a professional nor does she looks like an employee of St. Michaels rent a car.

3.2.4 SECURITY

The act of protecting confidential information from been accessed or tempered with by unauthorised users is very essential. Security is an important factor to consider when developing any software application. The above site does not provide any user login interface.

3.2.5 WEAKNESS

Even though the page is user friendly, it contains too much text. Most web pages nowadays do not contain too much text for users', as attitudes toward development web pages have changed. Users' do not admire web pages with much text; rather they prefer images and links.

3.3 YOKS RENT-A-CAR (http://www.yoksghana.com/)

3.3.1 OVERVIEW

The screen capture above is the index page of the rental organisation. It clearly shows it is a car rental organisation. Further research into the website shows they deal with all type cars ranging from executive, economic, standard, SUV's (Sport Utility Cars) etc.

3.3.2 USABILITY

As stated earlier the website was located using Google search and it is one of the results that will be displayed, the labels are clear and understandable, just like St Michaels rent a car, there is no guide or answers to frequently asked questions by customers. The navigations are working well but there pick up and drop off locations are mainly at the airports and any other address given by the customer during reservation.

3.3.3 APPEARANCE

The text and pictures in the site are visible, but the colour combination is good and very attractive. And also other promotions, latest news related to their area of expertise and also the organisation vision and mission is straight and clearly stated. This is a good design that I can follow during my own design of Wamball Rentals system. However they also deal with only car rentals.

3.3.4 SECURITY

As said earlier security deals with the protection of information and data from unauthorized users. The website also has no login for users or customers.

3.3.5 WEAKNESS

When compared to St Michael's Rent a car, Yoks Rent a car website is more attractive, understandable and user friendly and it follows the basic trend in website development but it has links that are there but are not working properly. Just like the user login page and the creation of user account which seems to be there for decoration.

3.4 PHUKETRENTHOUSE (http://phuketrenthouse.com/)

3.4.1 OVERVIEW

The screen capture above shows the index page of the rental organisation. It clearly shows it is a house rental system and also the company deals with properties. The properties the company handles ranges from homes, mansions to apartments.

3.4.2 USABILITY

This website was also found through Google search like the other two above. But this deals with house and house rentals not cars. The message there are passing across is clearly stated and easily understood by the users. The links are all working good and navigation is easy and user friendly.

3.4.3 APPEARANCE

The design, layout and colour combination is very attractive and the links and texts are clearly visible and readable. They even have a tab for users who want to advertise on their site. This

is also a good design that needs to also be considered when designing Wamball Rentals house rentals page.

3.4.4 SECURITY

The website security is good and very protective as it requires the correct username and/or password before you login as a user and unlike the other two car rentals websites it does provide login for users.

3.4.5 WEAKNESS

As from what I have seen and the research I made so far the only setback for this particular website is that it deals with only properties and that it also did not give a clear view of the process a user should follow to place a reservation.

3.5 RENT GHANA (http://www.rentghana.com/)

3.5.1 OVERVIEW

The screen capture above also show the index page of this website, clearly showing it is a house rental system. Even though it is not located in Ghana it was researched to find additional aspect and information that may be needed during my own development.

3.5.2 USABILITY

This website was also found through Google search like the other ones before it. But this also deals with house rentals not cars. The message there are passing across is clearly stated and

shown within the index page, easily understood by the users. The links are all working good and navigation is easy and user friendly.

3.5.3 APPEARANCE

The design, layout and colour combination is very attractive and the links and texts are clearly visible and readable. They also provide a user login interface.

3.5.4 SECURITY

The website security is good and very protective as it requires the correct username and/or password before you login as a user. With the research I have done it seems to be good.

3.5.5 WEAKNESS

As the research I made so far the only setback for this particular website is that it deals with only properties and that it also did not give a clear view of the process a user should follow to place a reservation or the steps to join them and offer them a house.

3.6 CONCLUSION

I will like to conclude by saying that due to the fact that Wamball Rentals have no present online or automated system that they use. So when considering the websites that have been researched above, I can say Wamball Rentals system will be regarded as the lowest. This is the reason why as an IT student and a part time employee at the organisation, I have been contracted to design and build the system that will best fit the organisation and its business needs.

CHAPTER 4: REQUIREMENTS GATHERING AND ANALYSIS

This is considered to be one of the most important phases in system development because it is here that the requirements of the users are gathered, analysed and used to design and develop a system that would meet the purpose for which it is developed. ‘Requirements analysis involves the investigation of the business and user requirements of an information system’ Bocij et al (2001)

Due to the fact that stakeholders usually give vague requirements that are hard to understand and interpret, this stage of the project will help in analysing, representing, documenting, validating and managing the entire user requirements.

Requirements gathering involve eliciting user expectations and system specification for the system to be developed. The requirements of a system are divided into two which are the functional and non-functional requirements.

Sommerville (2011) defined Functional requirements as statements of services the system should provide, how the system should react to particular inputs, and how the system should behave in particular situations.

He again further defined Non-functional requirements as constraints on the services or functions offered by the system. They include timing constraints, constraints on the development process, and constraints imposed by standards. They often apply to the system as a whole, rather than individual system features or services.

To model these requirements there are tools that can be used such as Rich Picture, Use Case, and Entity relationship diagram and class diagrams. These tools will all be used later in this chapter to model the system requirements laid out by the users after the initial Facilitated workshop.

4.1 DSDM AND REQUIREMENTS GATHERING

As earlier stated DSDM is the methodology that is going to be used for the Wamball Rental system development. However DSDM has a life cycle that start from the Feasibility studies down to business studies, Functional model iteration, design and build iteration, and implementation.

The first three stages of the DSDM life cycle are going to be used to gather and elicit the system requirements at this stage and the rest of the phases will be carried out in the subsequent chapters.

The facilitated workshop was conducted at the Royal Tropicana Hotel in Accra with the following attendees:

- Owner/Sponsor which are, the Wamball Rentals management representatives.
- Facilitator.
- Participants who include a sampled staff of Wamball Rentals.
- Scribes who serve as secretary during the meeting (note taking).
- Prototypers: quick prototype designers.

At successful conclusion of the three-day long workshop; the initial system requirements were produced. Moreover, the Moscow prioritization technique was used to prioritize the requirements produced during the workshop. However, these requirements were discussed

under the Proposed Wamball Rentals system requirements and the Moscow prioritstion headings discussed under the stages in the life cycle below.
Furthermore, the other two techniques would be used in chapter five (system design) and chapter 6 (Implementation).

4.2 FEASIBILITY STUDY

Based on the analysis and description given above, DSDM is the most appropriate methodology to be used for the development of Wamball Rentals system, due to the fact that it is going to deliver a high quality, low cost and within the time. The tools/techniques available within the methodology will help in the completion of this work within the shortest possible time. Also the active user involvement in the development and feedback is very important as the system is going to be built iteratively and incrementally, DSDM is a rapid application method (RAD) that supports both aspects in its framework.

The following are the solutions that the new system is going to provide for Wamball Rentals:

- Allow customers to book or reserve a car.
- Allow customers to check properties (houses and apartments).
- Maintain accurate inventory of all cars and properties in the organisation.
- Allow the administrator and staff to login (authorised users).
- Perform the basic action of (add, search, update and delete).
- Generation of daily and monthly rent report.

To complete the system development as mentioned earlier in this chapter the DSDM processes are going to be followed sequentially in order.

4.3 BUSINESS STUDY

After the feasibility study of the project is carried out then comes the business study; ‘which provides the basis of all subsequent work’ (DSDM Consortium, 2008). The aim is to gather the user requirements and priorities them and to achieve this various fact finding techniques and a 3-day JAD workshop was carried out as stated earlier in this chapter.

4.3.1 FACT FINDING TECHNIQUES

The fact-finding used are as follows:

- Questionnaires
- Ethnographic approaches

- Observation
- Being part of the working process ❖ Study and review of documents.

(ISE COMP1304, 2007).

4.3.1.1 QUESTIONNAIRES

As defined by Longman active dictionary (2010), are a set of written question that you answer in order to give information about a topic. The questionnaire was developed and distributed to a sample of people selected during the research. The sample of the questionnaire used for this project is attached in Appendix.

4.3.1.2 ETHNOGRAPHIC APPROACHES

Observation: it involves watching or looking at someone carefully. It can be direct (people are aware) or it can be indirect (people are not aware). I used the indirect way of observing people during work which has helped me gather and understand many aspects that takes place in the environment and due to the Hawthorne effect. 'Hawthorne effect is a situation where people work properly whilst they know they are been watched or observed' (Informatics academy, 2008).

The observation carried out revealed that 80% of the customers complain about the queue in the office at certain times and the slow services provided by the employees due to the traditional way of writing and filing both the cars and properties. Therefore, they need a web based system that can be accessed 24 hours a day and 7 days a week.

I also take my time to be part of the employees working together to get a better understanding of how the business process goes and how records are being stored. I took part in the processes for 2-days in which the problem is the same as highlighted above.

4.3.1.3 STUDY AND REVIEW OF DOCUMENTS

This was also carried out during the time that I work together with the employees in Wamball Rentals. I went through their files, forms, inventory and rent records.

4.3.2 SYSTEM REQUIREMENTS

After all these fact finding techniques were used to gather the overall Wamball Rentals system requirements, and facilitated workshop. The requirements gathered were further divided into

functional and non-functional requirements and later on the requirements were also MoSCoWed within the chapter. And the requirements catalogue will be in APPENDIX

4.3.2.1 FUNCTIONAL REQUIREMENTS

Functional requirements as defined earlier in this chapter as the basic working solution of the system i.e. what the system should do.

The functional requirements for Wamball Rentals system are as follows:

I. Login (User Authentication)
II. Basic system operations – add, search, view, update and delete (Administrative, user Functions)
III. Create User login details (Administrative Functions)
IV. Create user account (External Interface) V. Make Reservation (External Interface)
VI. Record Customer Rent (Administrative Functions)
VII. Generate reports (Reporting requirement)
VIII. Log Complain (Administrative Functions)
IX. Register Newsletter (External Interface)
X. Record Cars/Properties (Administrative Functions) XI. Logout (User Authentication)

4.3.2.2 NON-FUNTIONAL REQUIREMENTS

Non-functional requirements as defined earlier specify criteria that judge the operation of a system, rather than specific behaviours of the system.

I. **Reliability:** the system should be available 24hours a day and 7days a week. It should be accessed at any time.
II. **Recoverability:** the system should be able to recover from certain errors and give access after error recovery.
III. **Performance:** the system should perform within the standard. And response time should good.
IV. **Security:** the system should reject incorrect login details (username and/or password) and also provide access to only authorised users.
V. **Usability:** the system should be used by an average computer literate person and very user friendly.

4.3.3 MOSCOW PRIORITISATION

'Even though all requirements are important, it is the prioritisation of requirements that can help you deliver the largest and immediate business benefits early on in the project' (Waters, 2009). The requirements are based on the user demand and its importance to system. 'Must Have' are features that must be included in the system, 'Should Have' are features that are not critical to the system and are considered important because of its higher value to the user, Could Have are features that add value to the system and can be included without incurring too much effort or cost, 'Won't Have' features that have been requested by the users, but are explicitly excluded from scope for the planned duration, and may be included in a future phase of development or enhancement of the system.

4.3.3.1 MUST HAVE

- Login
- Basic operation (Add, Update, Delete, View and Search records)
- Make Reservation
- Create user login
- Logout

4.3.3.2 SHOULD HAVE

- Record Customer Rent
- Record Cars/Properties
- Generate Report

4.3.3.3 COULD HAVE

- Register Newsletter

4.3.3.4 WON'T HAVE

- Create User Login for Customers

4.3.4 SYSTEM USERS

I would like to talk at this point about the target system users. The system to be developed is a rental management system it should allow customers to check properties and cars; and also to allow customers to place a car reservation. Moreover it should be able to allow the employees in Wamball Rentals to manage cars and properties. The users of the system as discussed in the facilitated workshop are customers, employees and the system administrator/manager.

4.4 FUNCTIONAL MODEL ITERATION

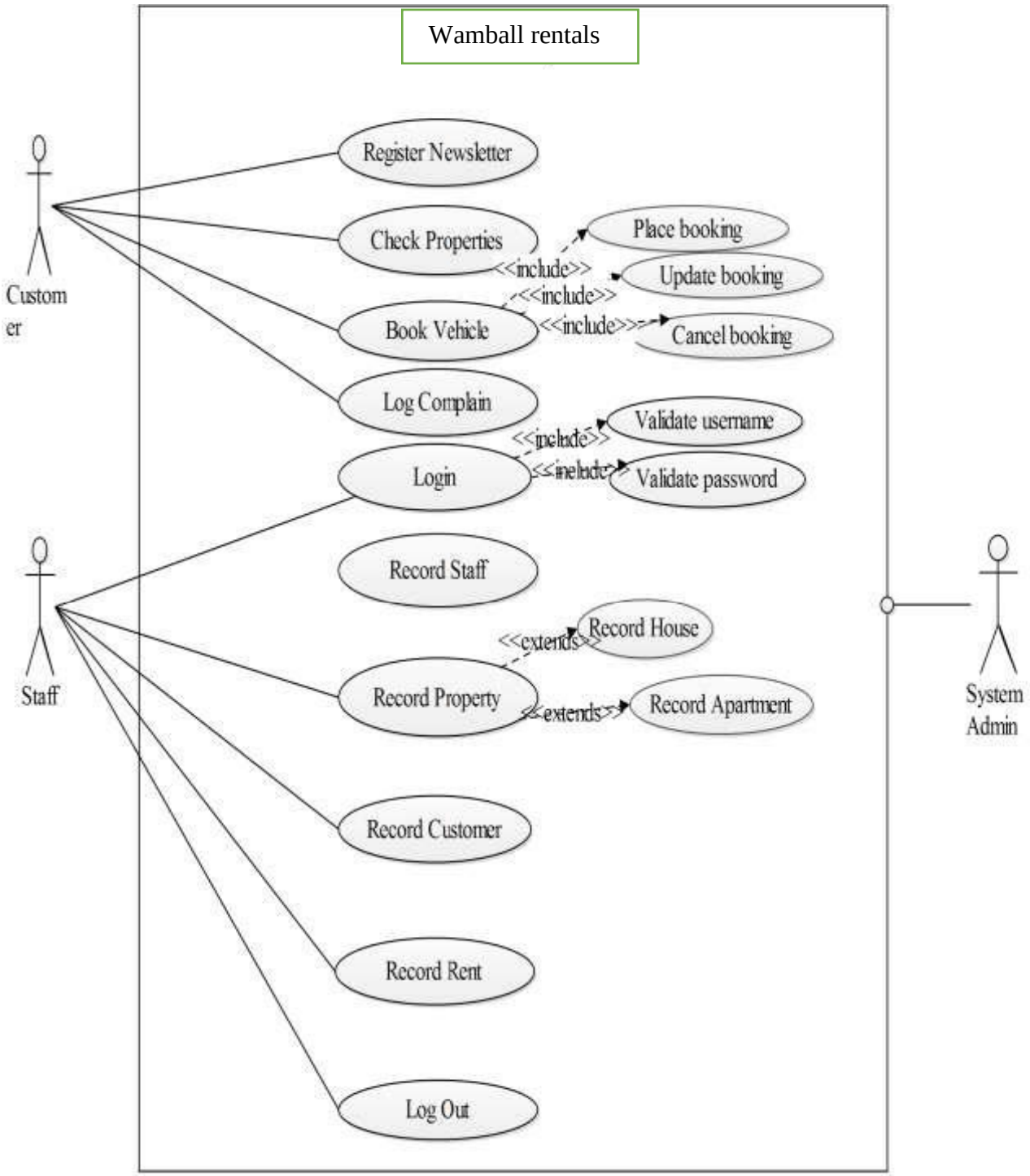
The functional model iteration focuses ‘on building on a high-level processing and information requirements identified during the Business Study. In this phase some requirement analysis tools were used to model the requirement gathered in the business study such as use case and Enhanced entity relational diagram.

4.4.1 USE CASE

‘Use-cases model the system from the end-user’s point of view. Created during requirements elicitation, use-cases should achieve the following objectives:

- To define the functional and operational requirements of the system (product) by defining a scenario of usage that is agreed upon by the end-user and the software engineering team.
- To provide a clear and unambiguous description of how the end-user and the system interact with one another.
- To provide a basis for validation testing’ Pressman (2001).

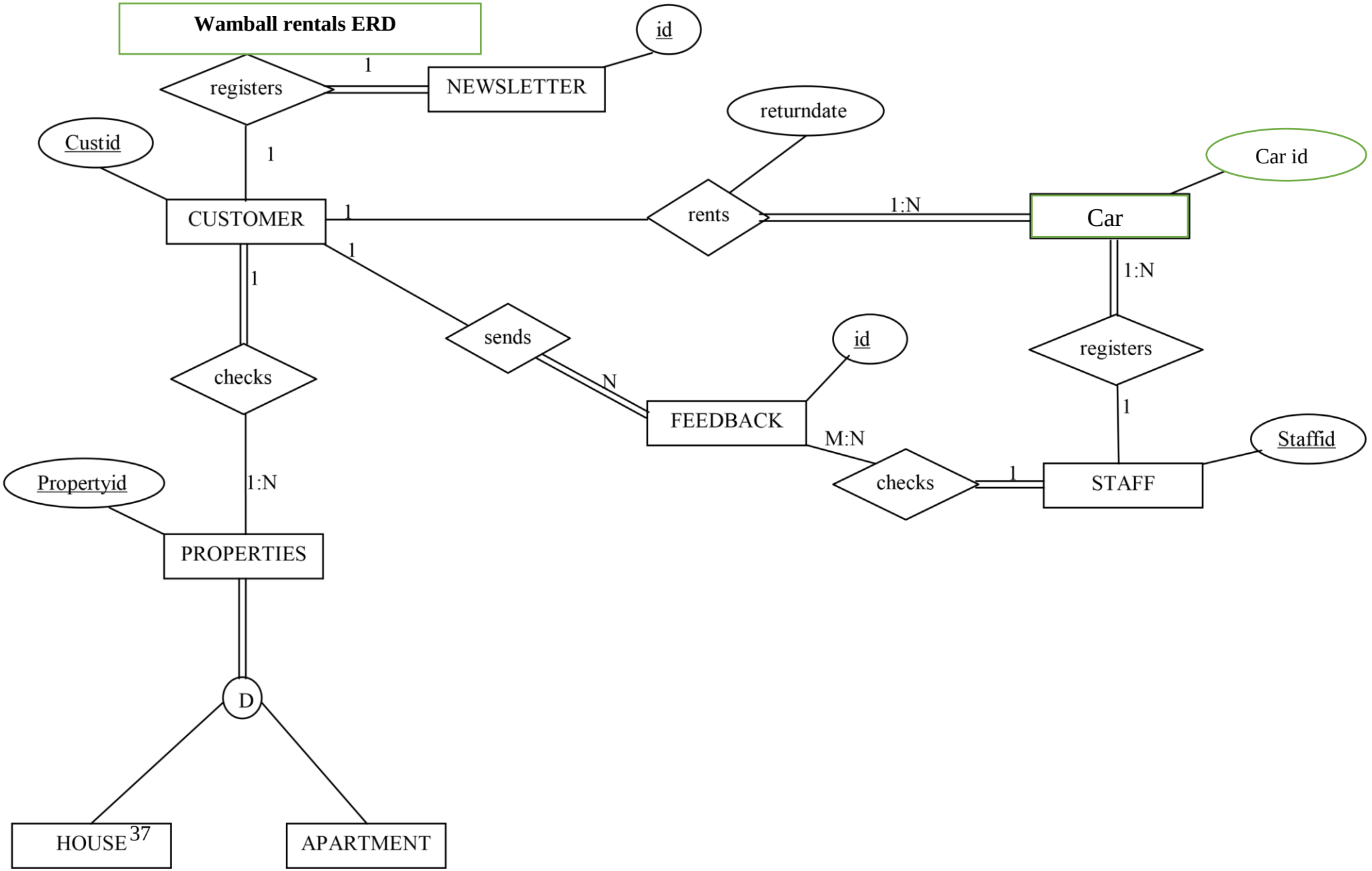
It shows actors (users) and how they interact with the system. And come with scenarios (primary and secondary) that give a detail description of how the function is carried out, problems or errors that may arise and how to solve them.


Wamball rentals
Register Newsletter
Check Properties
Place booking
<<include>>
Update booking
<<include>>
Book Vehicle
<<include>>
Cancel booking
Log Complain
Validate username
<<include>>
Login
<<include>>
Validate password
Record Staff
Record House
<<extends>>
Record Property
<<extends>>
Record Apartment
Record Customer
Record Rent
Log Out
Custom er
Staff
System Admin

4.4.2 ENHANCED ENTITY RELATIONAL DIAGRAM

‘ER modelling is a top-down approach to database design that begins by identifying the important entities and relationships between those entities that must be represented in the model’ Connolly & Begg (2005).

As the basic concepts of ER modelling are not sufficient to represent complex relationships, therefore there is a need for a model that supports semantic relationships. ‘The ER model supported by additional semantic concepts is the Enhanced ER Model’ Connolly & Begg (2005).


Wamball rentals ERD
id
registers
1
NEWSLETTER
returndate
Custid
1
Car id
CUSTOMER
1
rents
1:N
Car
1
1
1:N
sends
id
registers
checks
N
FEEDBACK
1
M:N
Staffid
Propertyid
1:N
checks
1
STAFF
PROPERTIES
D
HOUSE
APARTMENT

4.4.2.2 NORMALISATION CHECK

The normalisation of the relations in the database is use to avoid anomalies whether insertion anomalies, update anomalies and deletion anomalies. And it is usually done to the 3rd Normal Form (3NF).

As stated in the work of Connolly & Begg (2005) 'A relation that is in First and Second Normal Form and in which no non-candidate-key attribute is transitively dependent on any candidate key.

RELATIONS IN 3NF

Apartment: ApartmentID[PK], street, city, state, postcode, block, flatno, apartmentno, type, rooms, image, monthlyrent.

Booking: BookingID[PK], carID[FK], fname, lname, gender, driv_lic, phone, con_ad, email, pickupdate, returndate, image, status.

Customer: CustID[PK], title, fname, lname, gender, dob, phone, address, postalcode, email.

Feedback: id[PK], fullname, email, subject, type, comment, date.

House: apartmentID[PK], street, city, postcode, type, rooms, image, monthlyrent.

Newsletter: ID[PK], name, email, dateregistered.

Houserental: rentid[PK], custID[FK], apartmentID[FK], type, rentdate, enddate, monthlyrent, months, payment.

Staff: staffid[PK], fname, lname, gender, dob, address, phone, post, email, salary.

Users: Userid[PK], username, password, accesslevel, staffid[FK].

Carrental: rentno[PK], bookingid[FK], amount, payment.

Cars: carid[PK], plateno, model, manufacturer, type, colour, transmission, fuel, hourlyprice, dailyprice, odometre, image, date.

4.4.3 CLASS DIAGRAM

'A class diagram is a Unified Modelling Language (UML) tool and is the mainstay of objectoriented analysis and design. Class diagrams are used for a wide variety of purposes, including both conceptual/domain modelling and detailed design modelling. Class diagrams shows the classes of the system, their interrelationships (including inheritance, aggregation, and association), and the operations and attributes of the classes.' Ambler & Lines (2012).

As can also be found in the book of Ambler (2005) 'Class diagrams are typically used, although not all at once, to:

- Explore domain concepts in the form of a domain model.
- Analyze requirements in the form of a conceptual/analysis model.
- Depict the detailed design of object-oriented or object-based software.'

Ambler (2005) later on highlighted that 'a class model comprises one or more class diagrams and the supporting specifications that describe model elements, including classes, relationships between classes, and interfaces.'

Class diagram composes of classes, attributes of the class, relationships and also functions to be applied to the classes.

However class diagram functions and attribute data types mainly depends on the type of programming language you are using for your software development. So that it will make it easy to understand and use when developing the application. The class model of the Wamball Rentals systems is as shown below:

4.5 CONCLUSION

The chapter discussed how the user and system requirement were gathered. It also explained how those requirements were modelled using tools such as use case, enhanced ER diagram and class diagrams.

The modelled requirement and the applications discussed in the chapter will aid in the development of the system.

CHAPTER 5 DESIGN AND BUILD ITERATION

This is where the system is engineered or developed to meet the business requirements of the users as per the requirements gathered and modelled from the functional model iteration. As the system is being developed it is being tested as it was stated in one of the DSDM principles that testing is integrated throughout the life cycle.

Furthermore the lesson learned from the research carried out and literature review will be used to develop the system, together with the non-functional requirements discussed. This will be done so as the make the system meet the user business requirement and for the system to be effective.

5.1 LAYOUT

A research carried out revealed that people or visitors of website tend to view the webpage in clockwise direction starting from the top. The usually pay less attention to items on the left hand side of the webpage. The page will contain Wamball Rentals banner at the top, the link and the body will hold all the other important information in the webpage.

5.2 CONTENT

Over here it depends on the name of webpage and the page itself contains the banner and the footer which are static, the hyperlinks in the pages change, also depending on the page and what it should contain. The contents in the body of the page vary from webpage to webpage.

5.3 SCREEN DESIGN

The screen serves as the interface through which the user interact with the website, it shows the necessary feedbacks, response to user inputs and also the progress of the activities carried out. During the screen design there is also a need to take into consideration the categories of users of the system.

5.4 SYSTEM USERS

The users of the system are not that much we only have the staffs, administrator and customers. But however, the system will be designed based on two classes of system users namely: intelligent users and naive users; those who have computer knowledge and those who do not have computer knowledge respectively Connolly & Begg (2005).

5.5 SCREEN DESIGN SKETCHES

Below are going to be sketches of the screen design of some page for Wamball Rentals system.

5.5.1 HOME/INDEX PAGE

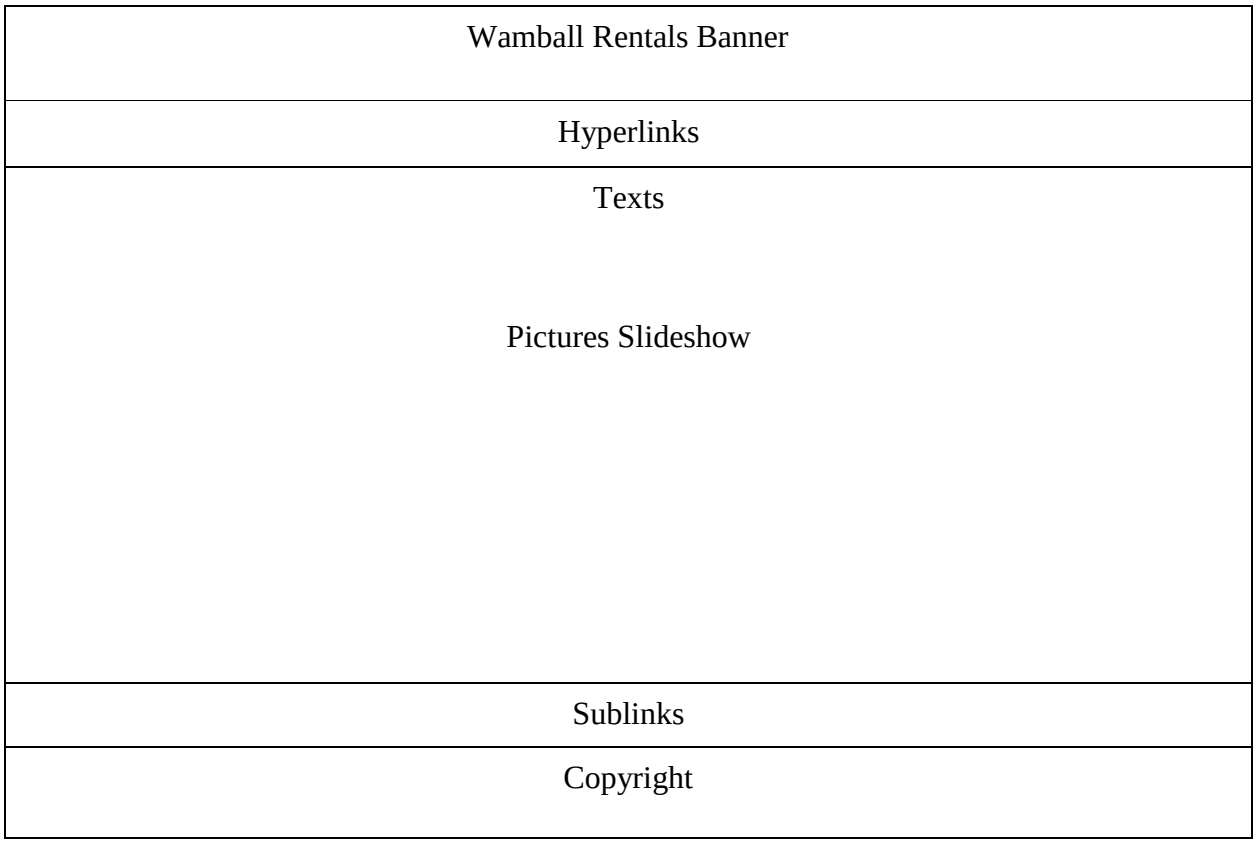


Figure 1: Home Screen Design

5.5.2 ADMIN/STAFF LOGIN PAGE

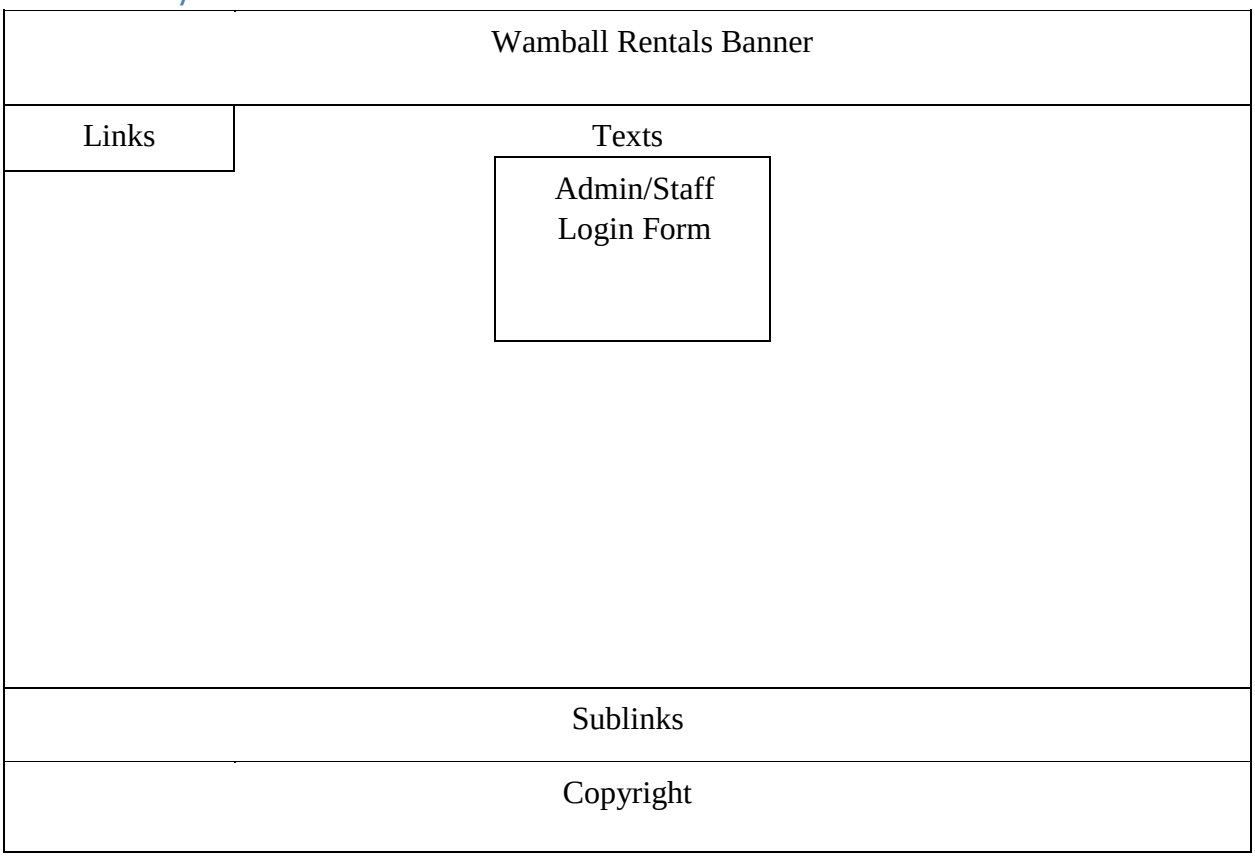


Figure 2: Admin/Staff Login Screen Design

5.5.3 ADMIN HOMEPAGE

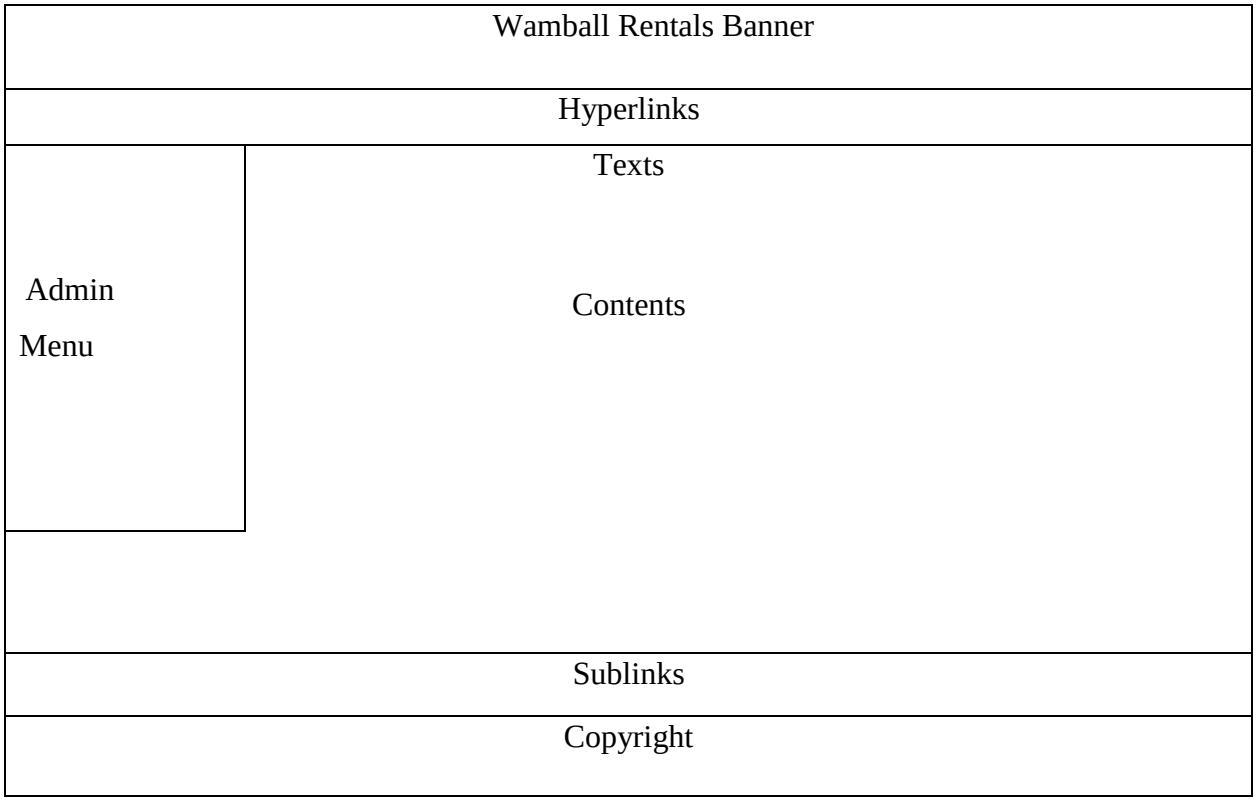


Figure 3: Admin Home Screen Design

5.5.4 STAFF HOMEPAGE

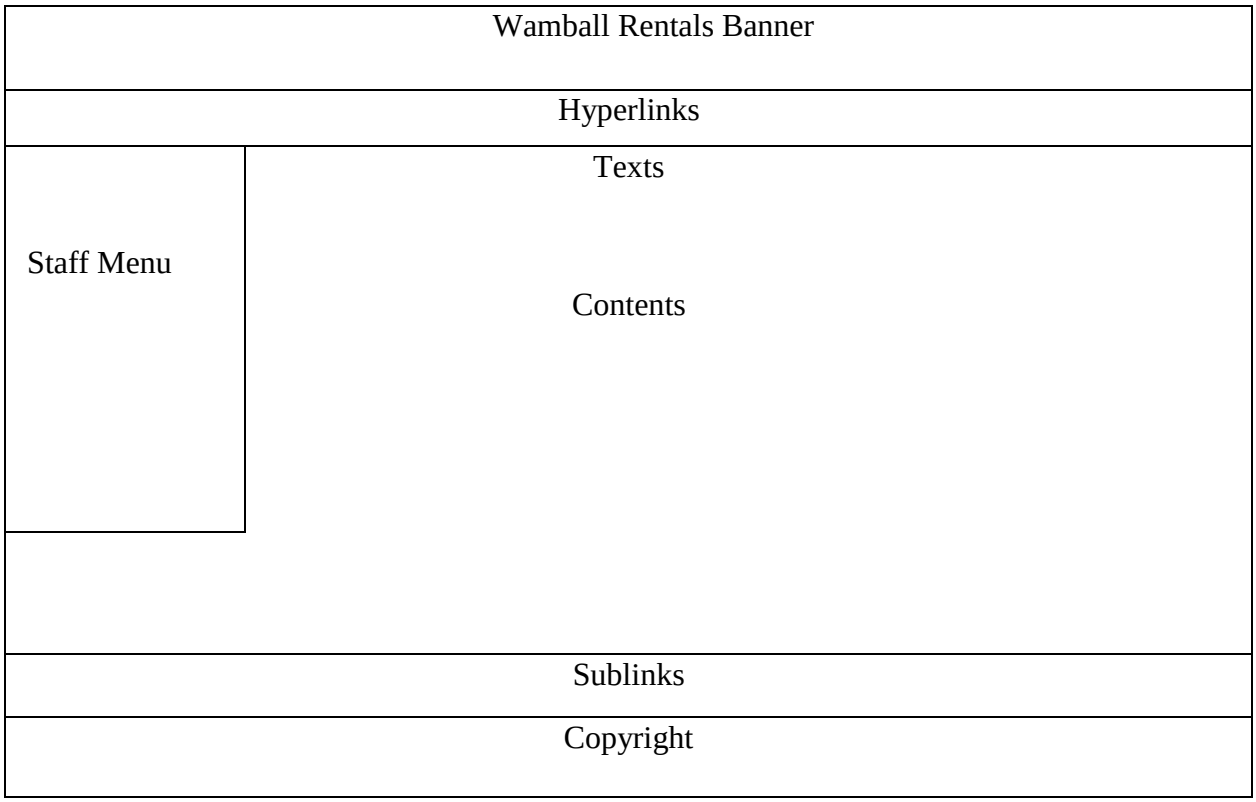


Figure 4: Staff Home Screen Design

5.5.5 CAR RENTAL PAGE

Wamball Rentals Banner
Hyperlinks
Texts Contents
Sublinks
Copyright

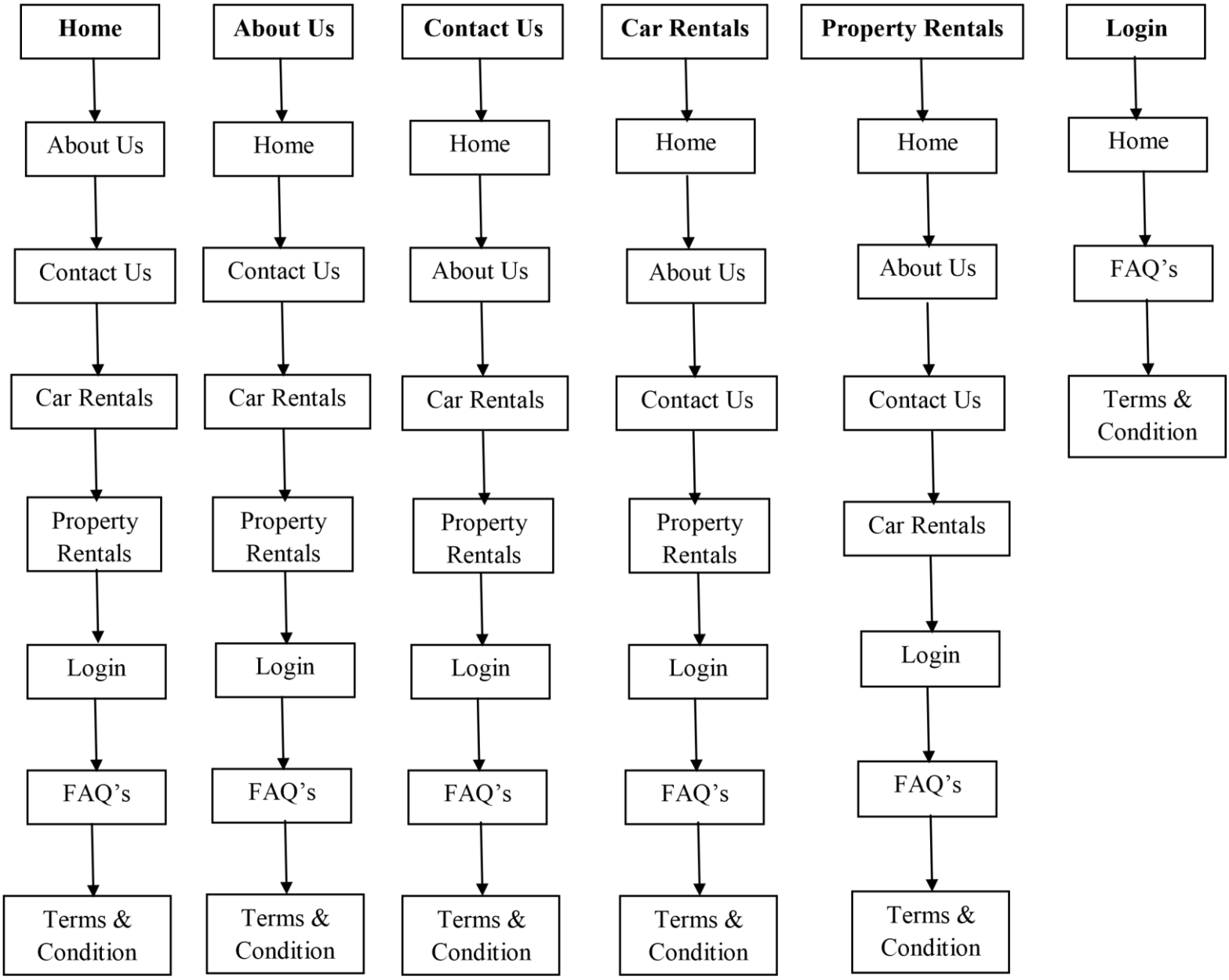
Figure 5: Car Rental Screen Design

5.5.7 HOUSE RENTAL PAGE

Wamball Rentals Banner
Hyperlinks
Texts Contents
Sublinks
Copyright

Figure 6: House Rental Screen Design

5.6 SITE MAP



5.7 FORM DESIGN

Forms collect data from users or employees and keep the record in the database. There are several forms to be designed in the system that will be used to post record to the database. They are an integral part of the system as they will be used to keep records of rent in the system and they will be use for several aspects of add, update, search and delete operations.

Title: The title of the form should give an idea of what the form is going to be used for; it should be brief and very descriptive. It should be use to accurately capture information about what it is specifically going to be used for, the form is going to be used in register, update and search.

Entry Label: This will be found by the right hand side of each entry, it is going to describe what that it is going to be written or needed example textbox that is going to collect the first name and radio buttons use for select.

Listed Options: these are listed options that the users will choose from it is a drop down list that will be used for certain inputs that are going to be specific an example is type of houses.

5.7.1 FORM VALIDATION

Validation will be used to check the entries made on the form are correct and accurate. 'Spry validation is the most recent validation used in Dreamweaver' Gadasu (2012). Spry validation has customised textbox, select, radio buttons etc. it eases the whole aspect of validation; as it can show the user that a field is required when it is left empty and it will not allow the form to be submitted if the correct input within the field is not correct.

5.7.2 FORM DESIGN AND INSTRUCTION

The following are the forms to be designed and used, together with the instructions and the purpose they are going to serve.

5.7.2.1 LOGIN FORM (ADMIN AND STAFF)

There is going to be one log in form for both the administrator and staff, but it is going to be differentiated by the access level. The access level will define the security and access that particular user has with the system and what he will be able to do. Below is the design of the form.

Username:	Spry Textfield1
Password:	Spry Textfield2
	Login Button

Figure 1: Login Form design

The spry text field will accept numbers and alphabets including special characters because the username should be unique for every user and therefore they will both accept texts, but will not

allow the field to be submitted empty. It will notify the user even before submit that the field is empty ‘A value is required’.

5.7.2.2 CAR REGISTRATION FORM

This form is going to be used to add or register new car into the system; it is both an admin and user function.

Plateno:	Spry Textfield1
Model:	Spry Textfield2
Manufacturer:	Spry Textfield3
Type:	Spry Select1
Colour:	Spry Textfield4
Transmission:	Spry Select2
Fuel:	Spry Select3
Hourly Price:	Spry Textfield5
Daily Price:	Spry Textfield6
Odometre:	Spry Textfield7
Date:	Textfield1
	(Add button) (Reset button)

Figure 2: Car registration form design

Same design and validation is going to be applied here too. Over here, a spry select is added to the form, it is a drop down select menu and is going to ask to user to select on item from within the list. The add button is used to add the record to the database and the reset button to clear all entries made before they being saved.

5.7.2.3 HOUSE REGISTRATION FORM

The form here is going to be used to register properties into the system. However, there are going to be two forms one is going to be used to register a house and the other one to register an apartment, this is due to the fact that even though they share common attributes, they also have attributes that differentiate them as such they need to be in separate tables.

5.7.2.3.1 APARTMENT REGISTRATION FORM

Street:	Spry Textfield1
City:	Spry Select1
State:	Spry Select2
Post Code:	Spry Textfield2
Block:	Spry Textfield3

Flat Number:	Spry Select3
Apartment Number:	Spry Select4
Type:	Spry Select5
Number of Rooms:	Spry Select6
Monthly Rent:	Spry Textfield4
	(Add button) (Reset button)

Figure 3: Apartment addition form design

The form is with spry selects it is that much because most of the data are specific, take an example of number of rooms in an apartment since it is a number it can be 1, 2, 3 or more etc. it is easier for the users if they can choose from options instead of typing them.

5.7.2.3.1 HOUSE REGISTRATION FORM

This is the form to be used in adding a house to the system.

Street:	Spry Textfield1
City	Spry Select1
Post Code:	Spry Textfield2
Type:	Spry Select2
Number of Rooms:	Spry Select3
Monthly Rent:	Spry Textfield3
	(Add button) (Reset button)

Figure 4: House Registration form design

As it can be noted here the difference will be clearly seen about the difference in the details needed for the apartment and that of the house.

5.7.2.4 STAFF REGISTRATION FORM

This will be used to get the details of all staffs working at Wamball Rentals. The form will have the format below:

First Name:	Spry Textfield1
Last Name:	Spry Textfield2
Gender:	Spry Radio Group
Date of Birth:	Textfield1
Address:	Spry Textfield3
Phone:	Spry Textfield4
Post:	Spry Select
Email:	Spry Textfield5

Salary:	Spry Textfield6
	(Add button) (Reset button)

Figure 5: Staff registration form design

A spry radio group is added here it will also ask for one of the options to be selected there which is either male or female.

5.7.2.5 CUSTOMER REGISTRATION FORM

The form will be used to register customers who rent properties (house or apartment) in the company and the record will be used in the house rental table as it is going to be shown later.

Title:	Spry Select1
First Name:	Spry Textfield1
Last Name:	Spry Textfield2
Gender:	Spry Radio Group
Date of Birth:	Textfield1
Phone:	Spry Textfield3
Address:	Spry Textfield4
Postal Code:	Spry Textfield5
Email:	Spry Textfield6
	(Add button) (Reset button)

Figure 6: Customer Registration form design

5.7.2.6 CAR BOOKING FORM

The form will allow customers to book any car they so desire. Below is the design of the form:

CarID:	Textfield1
First Name:	Spry Textfield1
Last Name:	Spry Textfield2
Gender:	Spry Radio Group
Driver's Licence:	Spry Textfield3
Phone:	Spry Textfield4
Contact Address:	Spry TextArea1
Email:	Spry Textfield5
Pickup Date:	Textfield2
Return Date:	Textfield3
Image:	Image holder

Status:	Spry Select
	(Add button) (Reset button)

Figure 7: Car Booking form design

5.7.2.7 NEWSLETTER REGISTRATION FORM

This form is also going to be used by customers, it going to allow them to register for Wamball Rentals weekly newsletter.

Full Name:	Spry Textfield1
Email:	Register Button

Figure 8: Newsletter registration form design

5.7.2.8 CUSTOMER FEEDBACK FORM

This form will allow customers to give us feedback on Wamball Rentals services and suggestions.

Full Name:	Spry Textfield1
Email:	Spry Textfield2
Subject:	Spry Textfield3
Type:	Spry Textfield4
Comment:	Spry TextArea1
	Submit Button

Figure 9: Customer feedback form design

In conclusion, all the forms have an identification that is used as the primary that is hidden from the user as it is recorded by the system as automatic incremented numbers.

5.8 CONCLUSION

The design in this phase is based on the requirements gathered and analysed from the previous chapter. The systematic and careful conversion of the analysis into design will help highlight areas where there are defects so that amendments can be made before the actual software development.

It is believed that with the system design any software developer can follow to develop a system that will successfully meet the needs of the organisation.

CHAPTER SIX: DEVELOPMENT AND IMPLEMENTATION

This is the most important phase in the system. As this is the point where the design is used to develop the system, all the necessary design considerations of the layout, content, screen design, users, form design and the site map are well highlighted and laid out for the development.

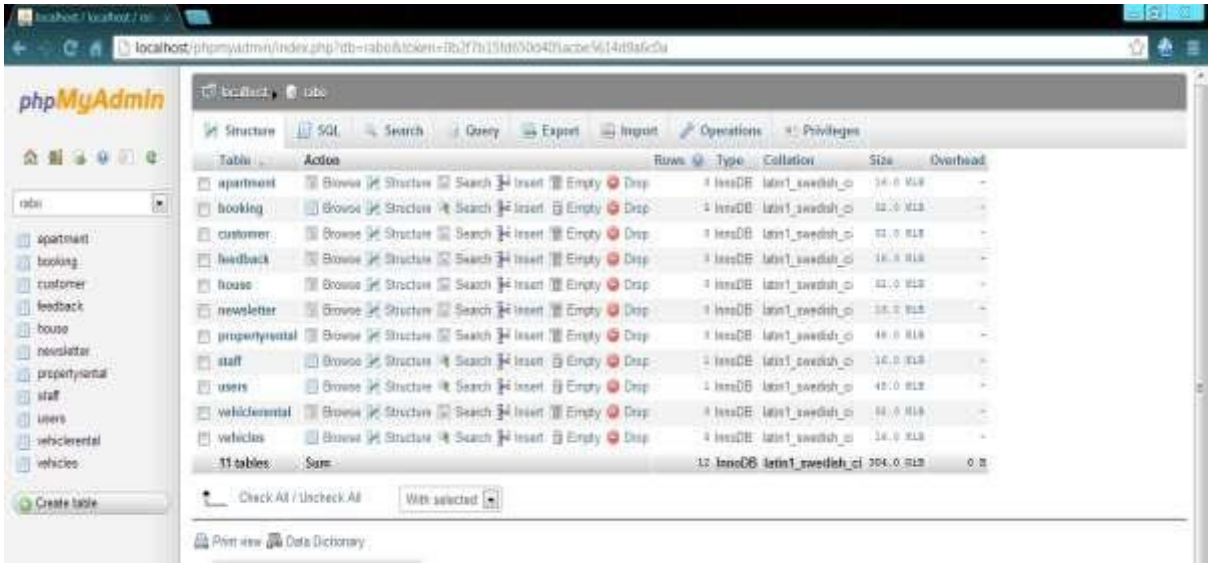
However, all the aspects listed above are based on the user and system requirements gathered and modelled earlier on in the previous chapters. For a start the database will be developed first as it is the most important and critical part of the system, it is going to hold the records in the organisation and also retrieve the information. Then the user interface for the user of the system; to utilise the database and later on the real world implementation in the organisation.

6.1 DATABASE DEVELOPMENT (PHPMYADMIN)

A lot has been researched and discussed in chapter two and chapter four about the Enhanced entity relational diagram (EERD), normalisation, database and MySQL. Therefore, the development of the database will be done using PhpMyAdmin including the database connection.

6.1.1 DATABASE RELATIONS

These relations (tables) are based on the entities drawn in the Enhanced entity relationship diagram in chapter four and the normalisation to 3NF. Consequently, using WAMP server the PhpMyAdmin interface was used in the development of the relations and their respective attributes. Below is the screen capture:



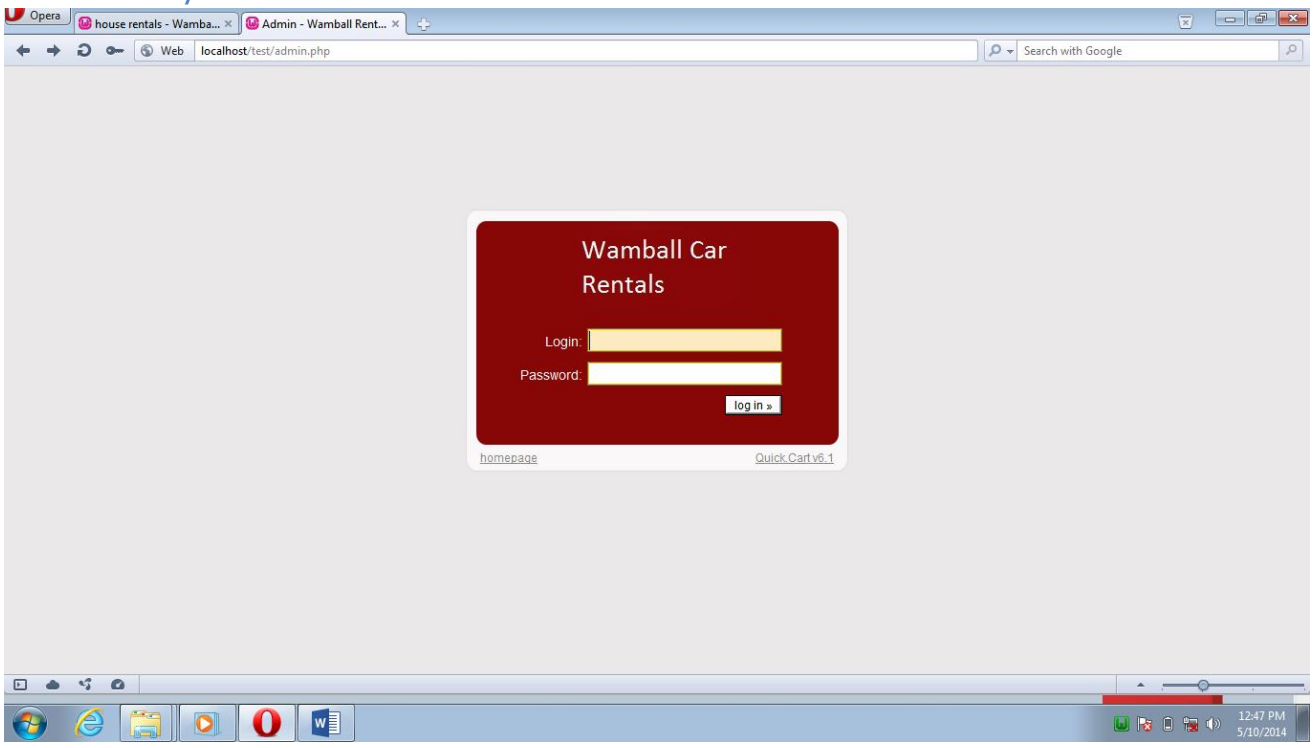
6.2 INTERFACE DEVELOPMENT

After the successful development of the database, the next phase is to develop the interface or web pages.

6.2.1 HOME PAGE

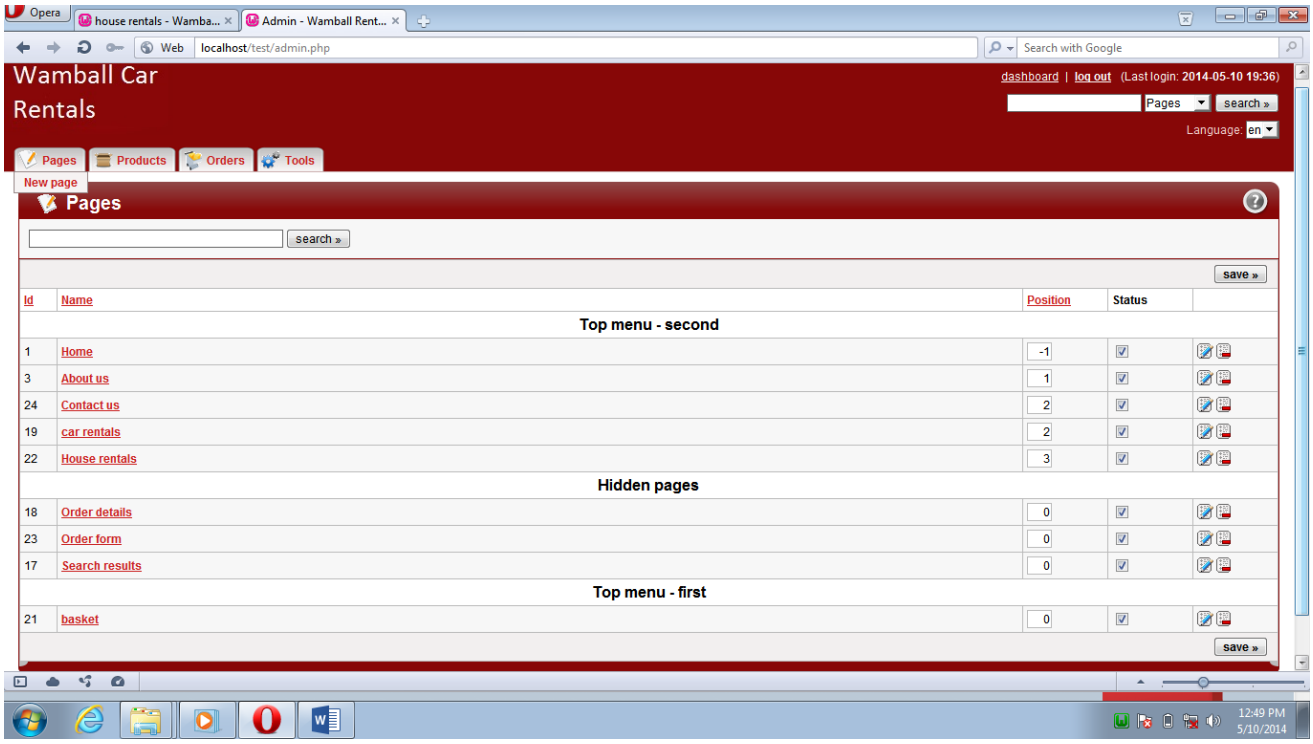
The home page is designed to effectively give communicate with users. In chapter five some sketches about important pages were done, the screen capture of the pages will be shown under the next headings.

6.2.2 ADMIN/STAFF LOGIN PAGE



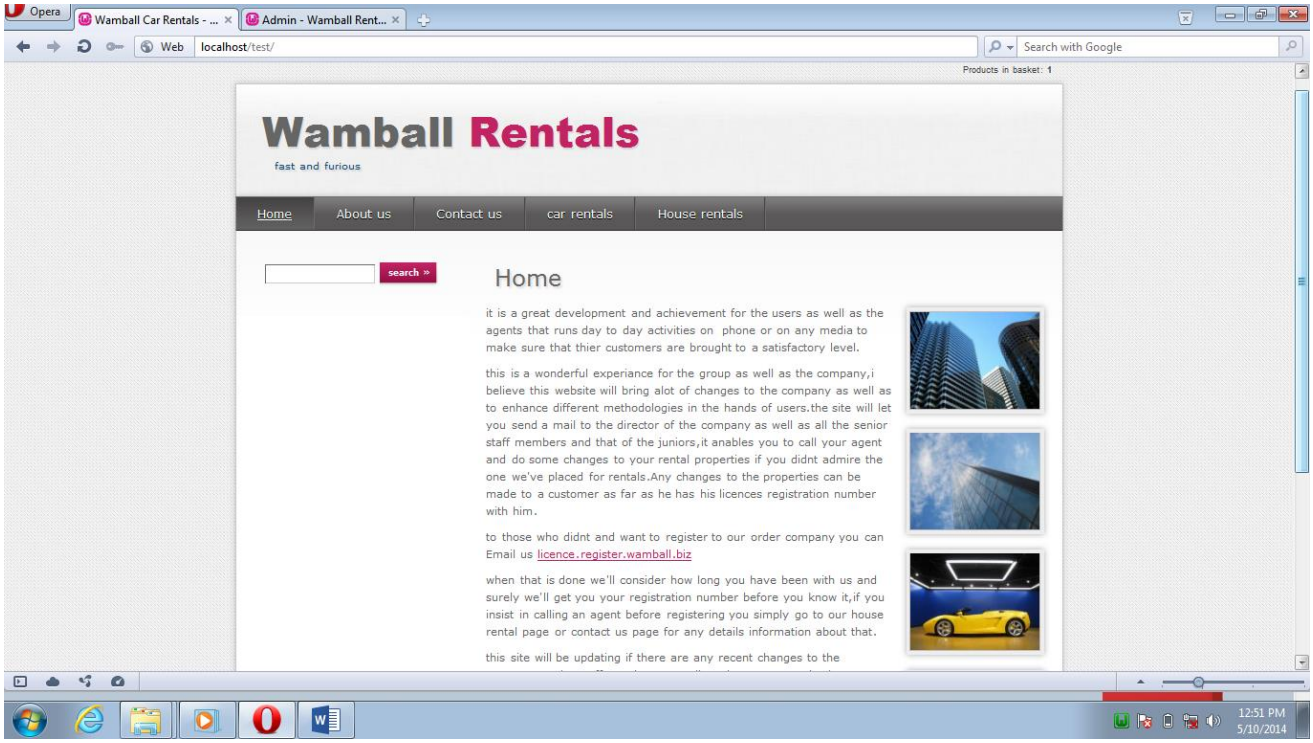
The staff and admin login into the system using the same interface but as discussed earlier they are being separated by their access privileges.

6.2.3 ADMIN HOME



The admin home page has six links including the staff, but will be missing in the staff home. This shows that the staffs do not have access to the record.

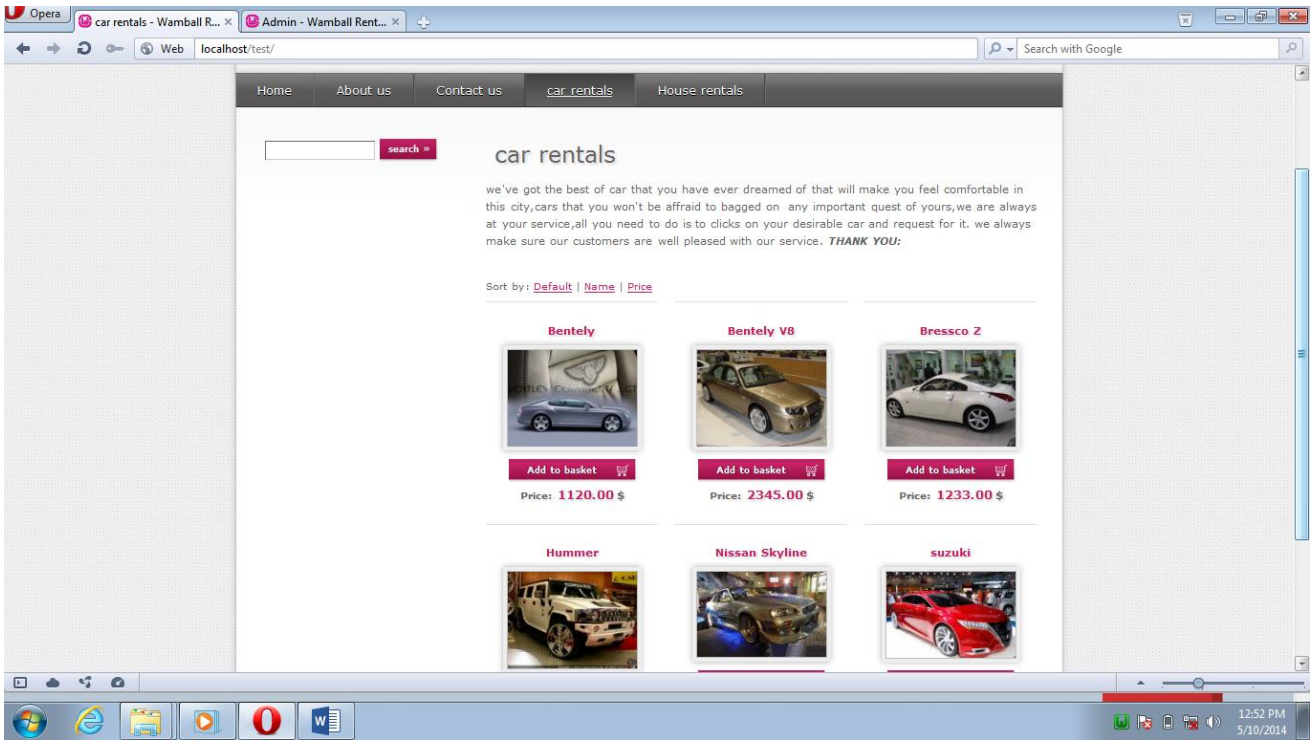
6.2.4 STAFF HOME



It can be seen clearly that the staff home only has five links as explained earlier.

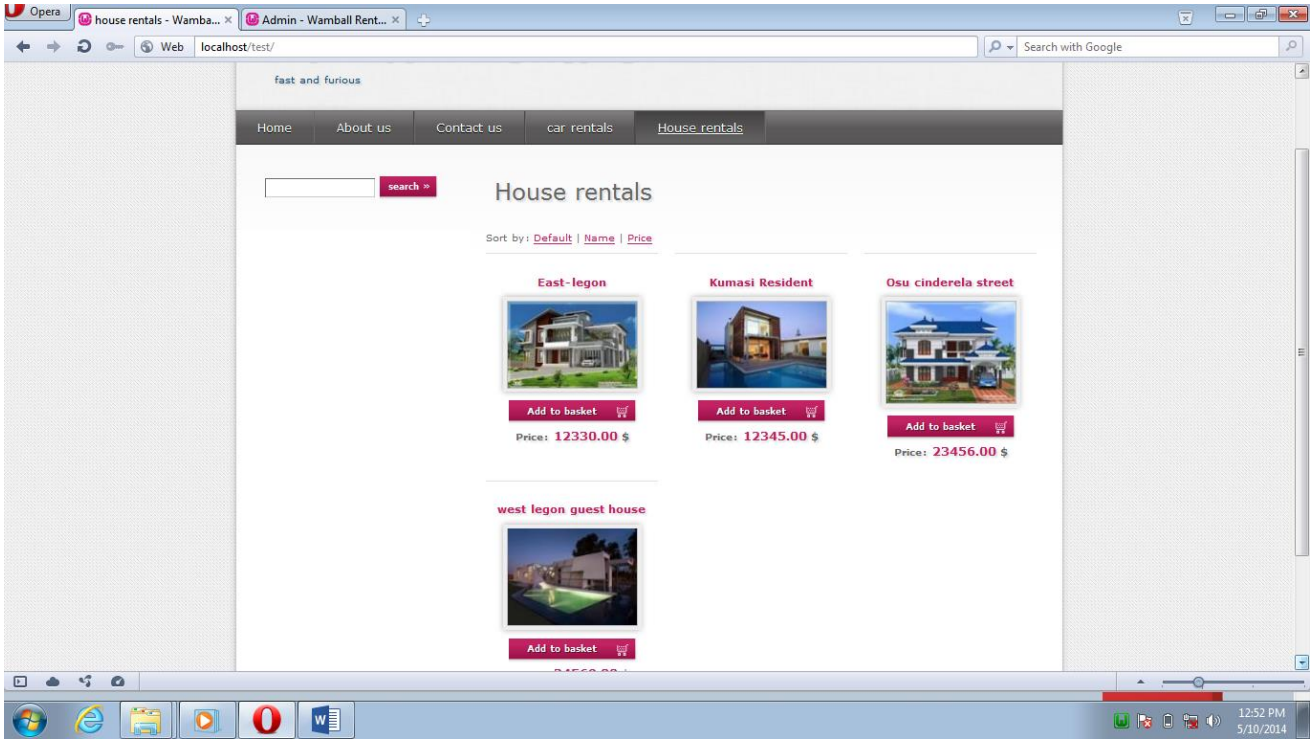
6.2.5 CAR RENTAL

This page displays the cars within the company and a customer can choose from there to place a booking.

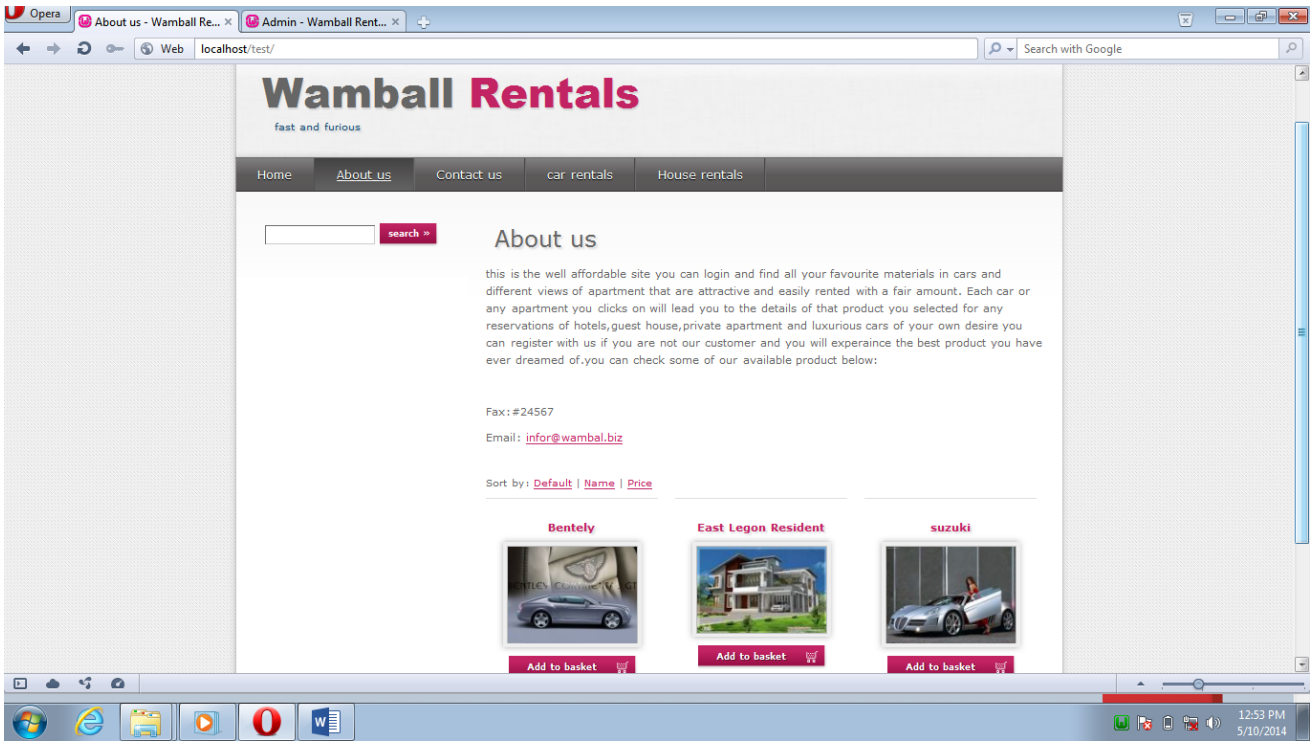


6.2.6 HOUSE RENTAL

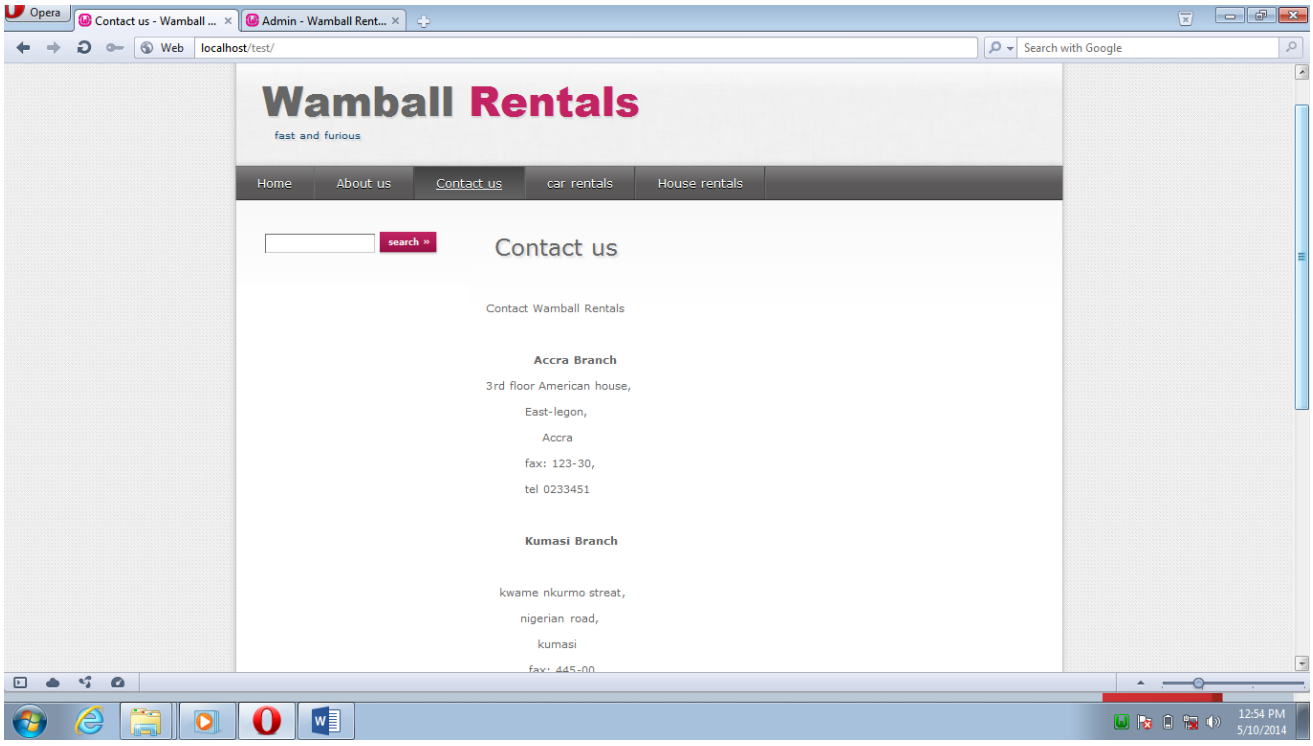
This displays properties (apartments and houses) so the customer can view and later contact us to know more about the properties and visit with a staff to check.



6.2.7 ABOUT US



6.2.8 CONTACT US



6.3 PHYSICAL IMPLEMENTATION

This involves the necessary procedures to be followed to install the system in the user environment. This will be done immediately after testing, and then the hosting of the system online will be done. After the successful web hosting the system will be available for access worldwide.

6.3.1 SYSTEM INSTALLATION

The system installation involves the hosting of the system on the internet. However, the report of the hosting is not available in this report as the system was not hosted till this point. Moreover it is going to be used as an academic research and dissertation. The system will be hosted in Wamball Rentals company as they are the owners of the system and a thorough testing will also be carried out.

6.3.2 USER TRAINING

Even though the system is made as user friendly as possible, it is going to be a new way of work and introduction into the environment, and it is certain that some users will have difficulty in using it effectively. Therefore there is a need for training to users who were not part of the development team. This can be as a result of very less or lack of IT knowledge by some of the employees in the organisation. The training will help them to overcome the fear and accept the system, they will be trained on how to use and effectively maintain the system.

6.3.2 USER MANAUL

It is certain that the training will only be for certain period of time and might not be enough to tackle the problems and issues of the users. A user manual will be designed, documented and given to the organisation. The user manual will contain systematic guide and instruction on how to effectively use the system; and also solutions to certain errors when they arise.

6.4.4 DATA CONVERSION

As stated earlier in the proposal the current system used in Wamball rentals is a manual system of keeping records. As such all the data and information available as hard copies will be entered manually into the computerised system; which will also take some few days.

CHAPTER SEVEN: TESTING

Testing is a critical element of Software Quality Assurance (SQA), it is to show that a programme of software does what it is intended to do and to discover defects in the software or programme before it is put into use. When testing software, it is tested using sample data or inputs and checking the results.

As stated by Sommerville (2011: p206) testing process has two distinct goals:

1. To demonstrate to the developer and customer that the system meets its requirements.
2. To discover situations in which the behaviour of the software is incorrect, undesirable, and does not conform to the system specification.

The objective of testing is to uncover errors early in the development, measure the effectiveness of the system and to look into the software carefully and see if it meets the business and user requirements.

However, it can be remembered that DSDM will be use in the development of Wamball Rentals software and it was stated earlier as one of the 9 DSDM principles that 'Testing is integrated throughout the life cycle'. Therefore, testing of the system was done as it is been developed. Meanwhile another testing also took place after the development before the implementation of the software in the organisation.

7.1 BLACK BOX TESTING AND WHITE BOX TESTING

These are approaches used in system or software testing. Black box testing also called behavioural testing, is used to test the system against its initial specification, Sommerville (2011: p. 459) highlights that 'black box testing focuses on the functional requirements of the software. That is, black-box testing enables the software developer to derive sets of input conditions that will fully exercise all functional requirements of the program. A black-box test examines some fundamental aspect of a system with little regard for the internal logical structure of the software.'

White box testing also called glass box testing is used on the predicated and close examination of procedural detail of the software. Sommerville (2011: p. 4) also highlighted that using white box testing methods, the software developer can derive test cases that have the following:

1. Guarantee that all independent paths within a module have been exercised at least once.
2. Exercise all logical decisions on their true and false sides.
3. Execute all loops at their boundaries and within their operational bounds.
4. Exercise internal data structures to ensure their validity.

However, black box testing is not an alternative to white box testing and vice versa. But, both approaches to testing are usually used to uncover different types of errors that might be found in a system.

7.2 TEST CASES

However, the following categories of testing will be covered in this phase:

- User Acceptance Testing
- Security Testing
- System Validation and Usability Testing

7.3 TEST LOGS

7.3.1 USER ACCEPTANCE TESTING

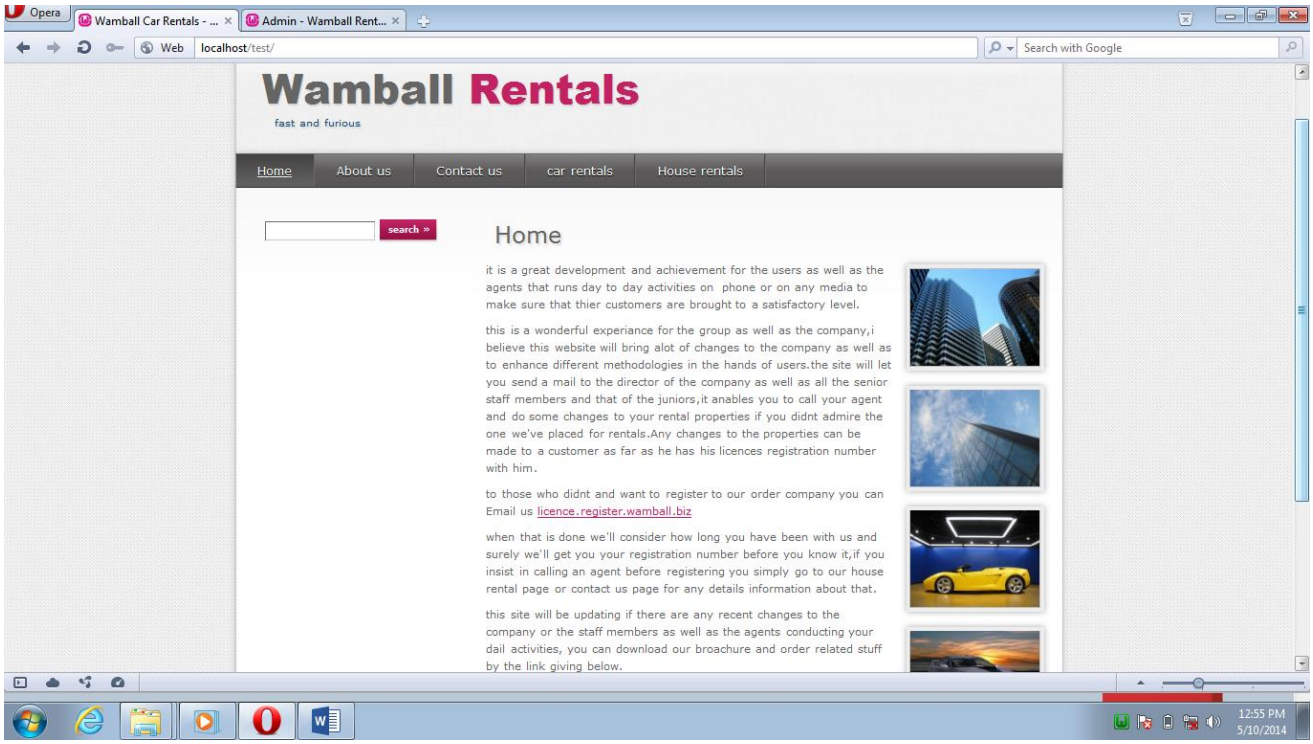
TEST CASE	OBJECTIVE	EXPECTED RESULT
Page links	Checking if the page links work properly by clicking on the page it should take you to that particular page.	The requested page should be open on clicking at the respective page link
Hyperlinks	Checking if the hyperlinks on the system are working, by taking you to the page on clicking.	The hyperlinks should enable users to navigate to another page in the system on clicking the hyperlink.
Form links	Checking if the form links on the system are working, by taking you to the page on clicking.	The forms should open and enable users to add records into the database. And should also open on clicking the form link.

Table 1.0: User Acceptance Testing

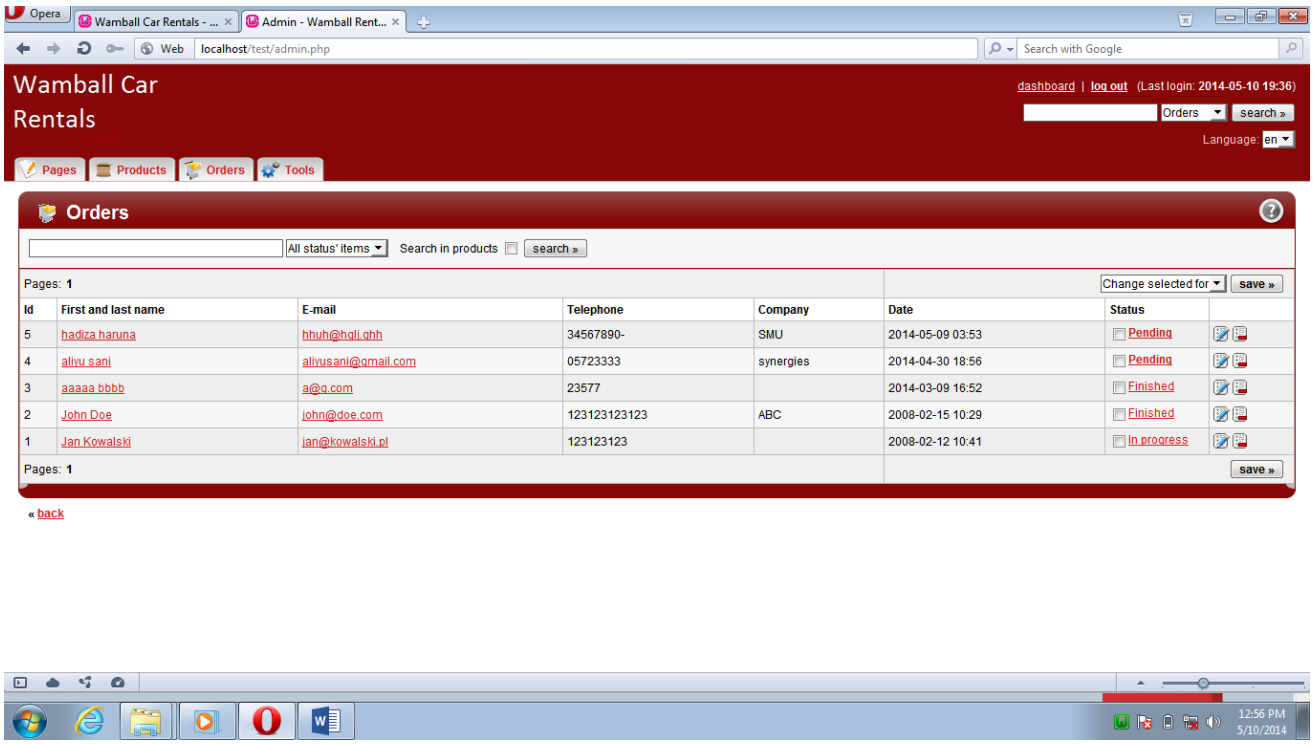
7.3.1.1 PAGE LINKS

TEST CASE	Page Links
TEST DATA	-
ACTUAL RESULT	As shown in the screen captures below
CONCLUSION	Successful

Table 1.1: Page links testing



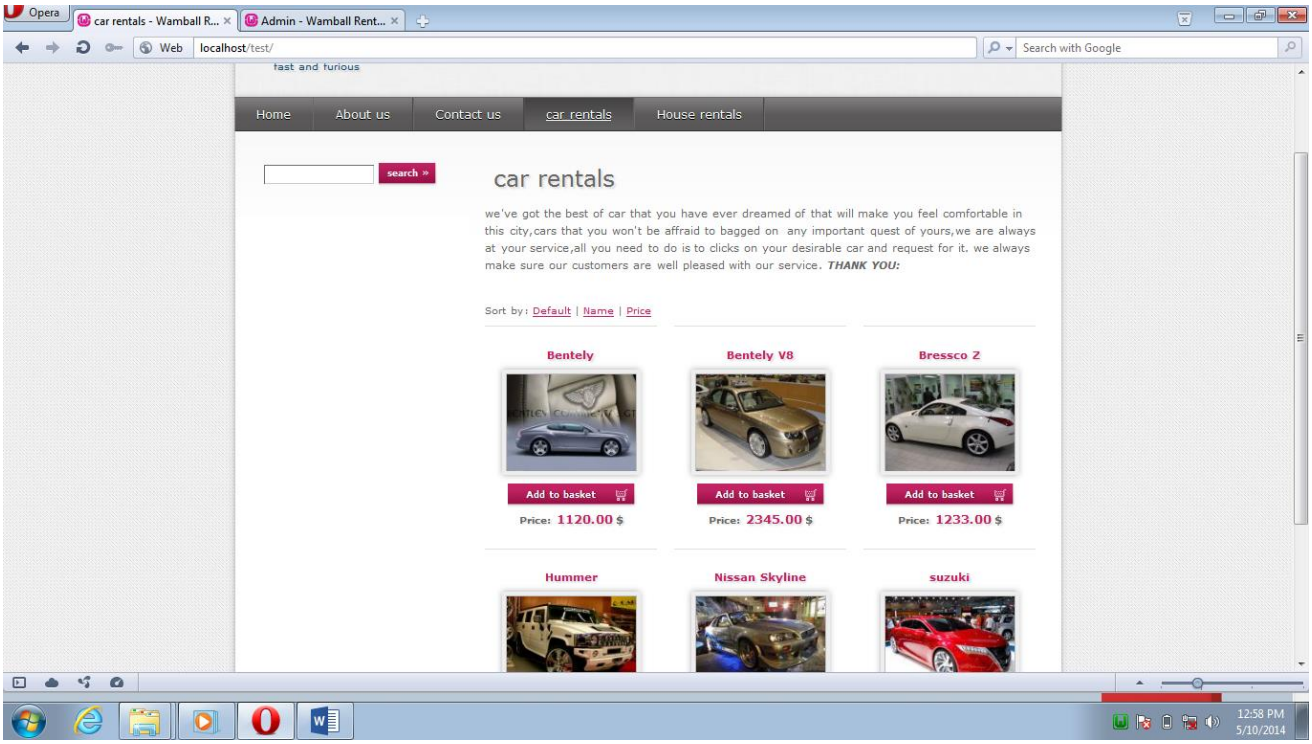
Admin page to customer menu page

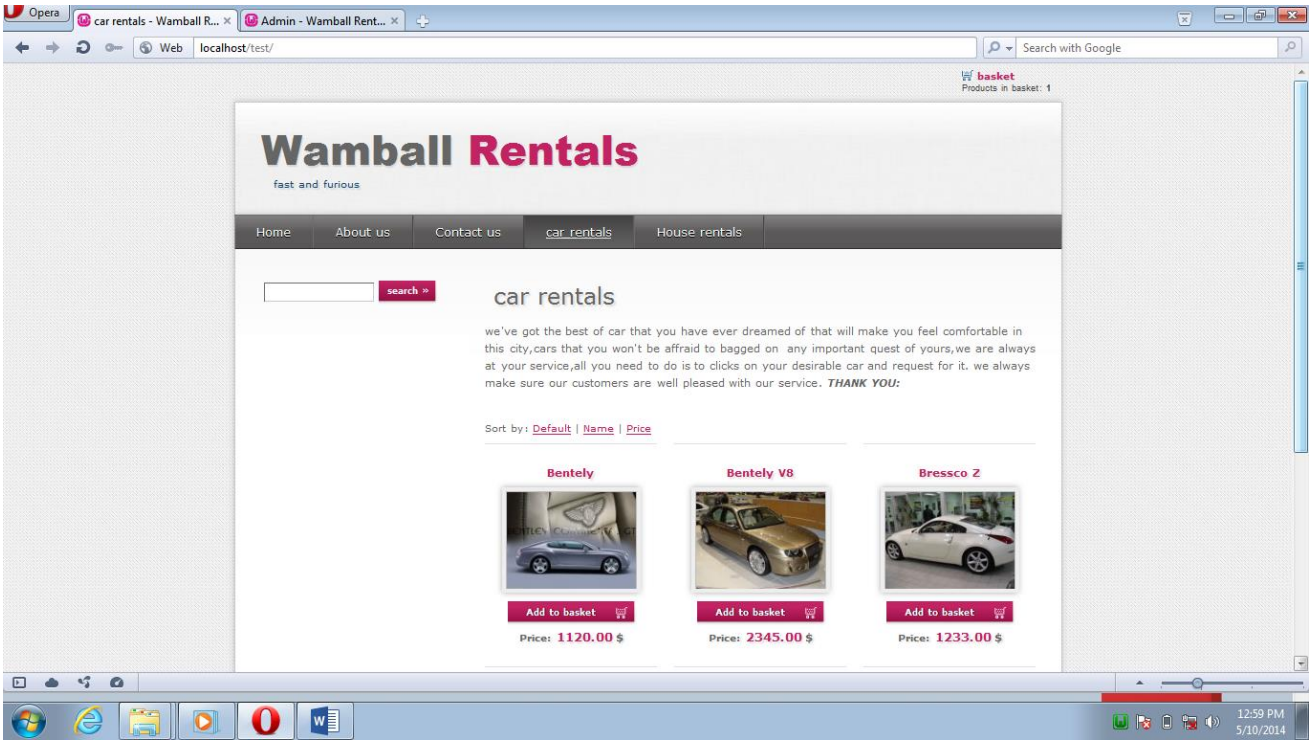


7.3.1.2 HYPERLINKS

TEST CASE	Hyperlinks
TEST DATA	-
ACTUAL RESULT	As shown in the screen captures below
CONCLUSION	Successful

From the car rentals page to the house rentals page



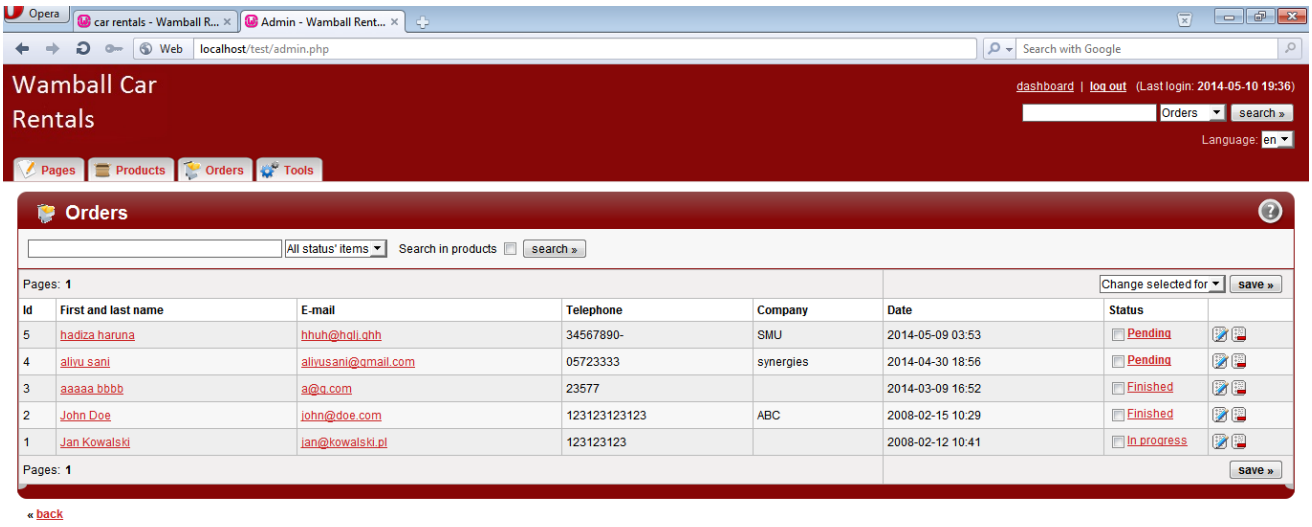


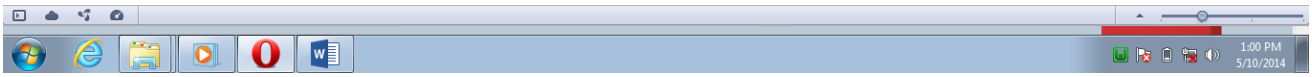
7.3.1.3 FORM LINKS

TEST CASE	Form Links
TEST DATA	-
ACTUAL RESULT	As shown in the screen captures below
CONCLUSION	Successful

Table 1.3: Hyperlinks Testing.

By clicking on add customer from the customer menu page it should display the add customer form. As shown below:





7.3.2 SECURITY TESTING

TEST CASE	OBJECTIVE	EXPECTED RESULT

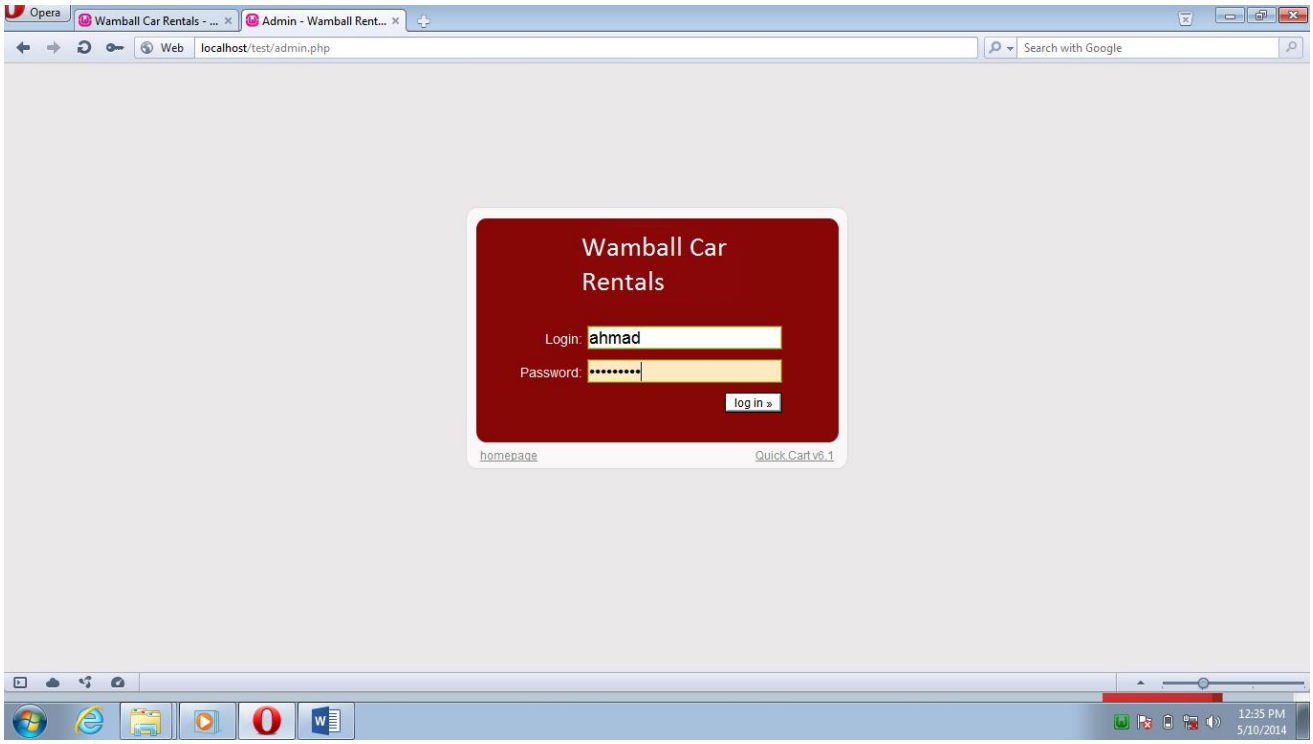
Admin Login: Success	Checking if the system will allow access to the adminhome.php when the correct details (username and password) are used.	Allows to user to access the system with full access or system privileges.
Admin Login: Wrong details	Checking if the system will restrict access to the	Restrict access to the system. Display Error message i.e.
	adminhome.php when incorrect details (username and password) are used.	username and/or password incorrect.
Staff Login: Success	Checking if the system will allow access to the adminhome.php when correct details (username and password) are used.	Allows to user to access the system with only staff access privileges. However the pages are different due to the user privileges.
Staff Login: Wrong details	Checking if the system will restrict access to the adminhome.php when incorrect details (username and password) are used.	Restrict access to the system. Display Error message i.e. username and/or password incorrect.

Table 2.0: Security Testing.

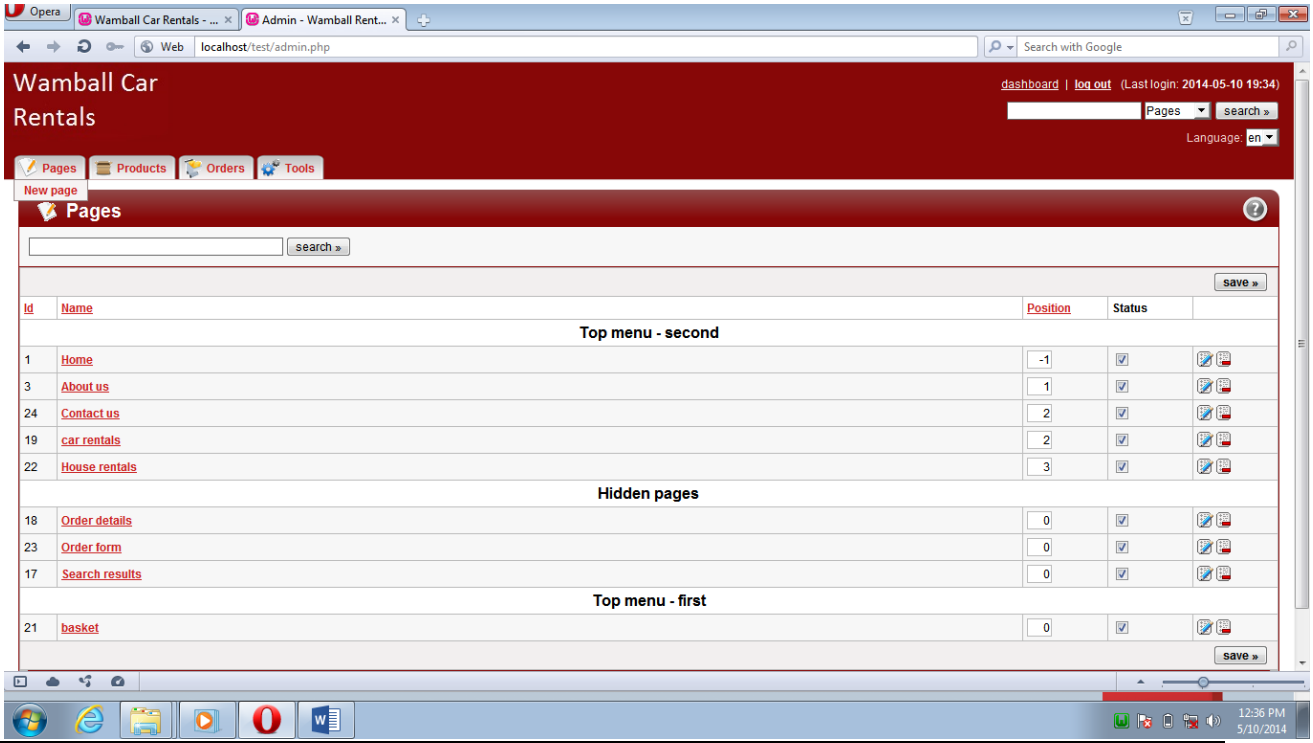
7.3.2.1 ADMIN LOGIN

TEST CASE	Admin Login
TEST DATA	Username ‘ahmad’ and password ‘wamball14’
ACTUAL RESULT	As shown in the screen captures below
CONCLUSION	Successful

Table 2.1: Admin Login

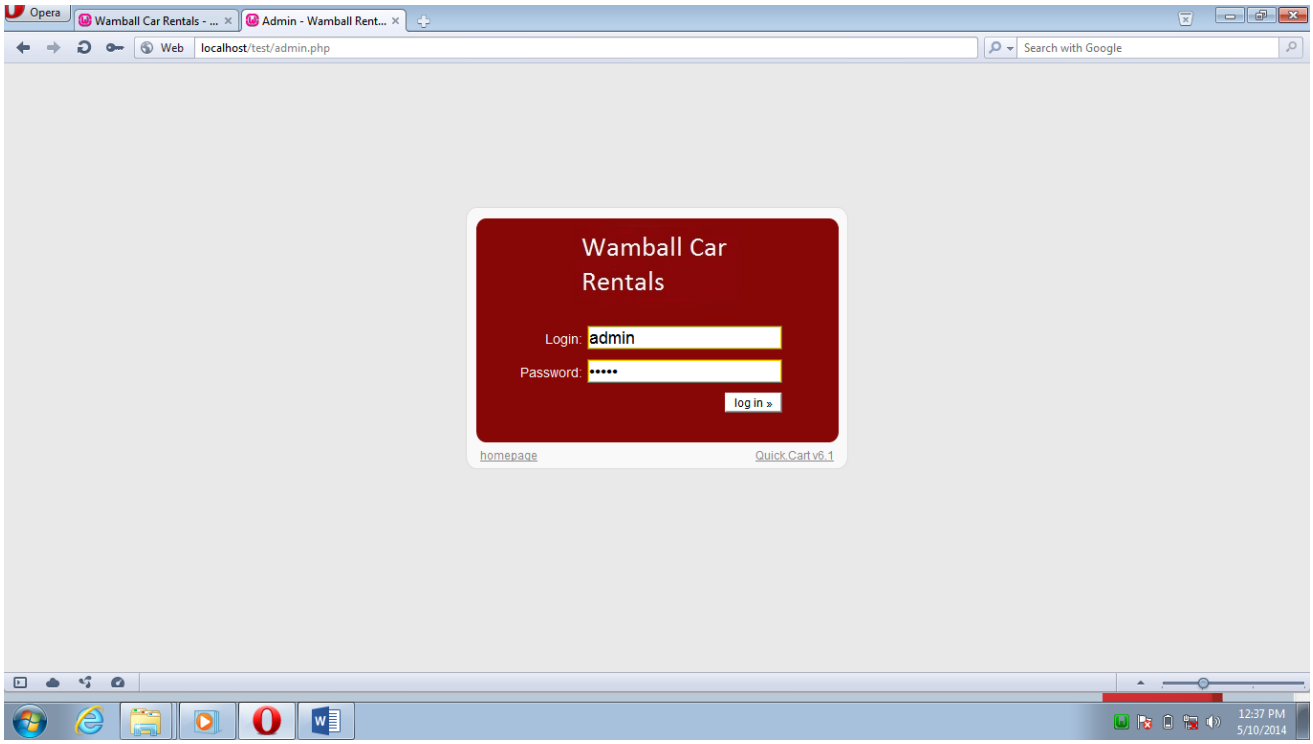


The result is as shown below:



TEST CASE	Admin Login wrong details
TEST DATA	Username: ‘admin’ and password: ‘admin’
ACTUAL RESULT	As shown in the screen captures below
CONCLUSION	Successful

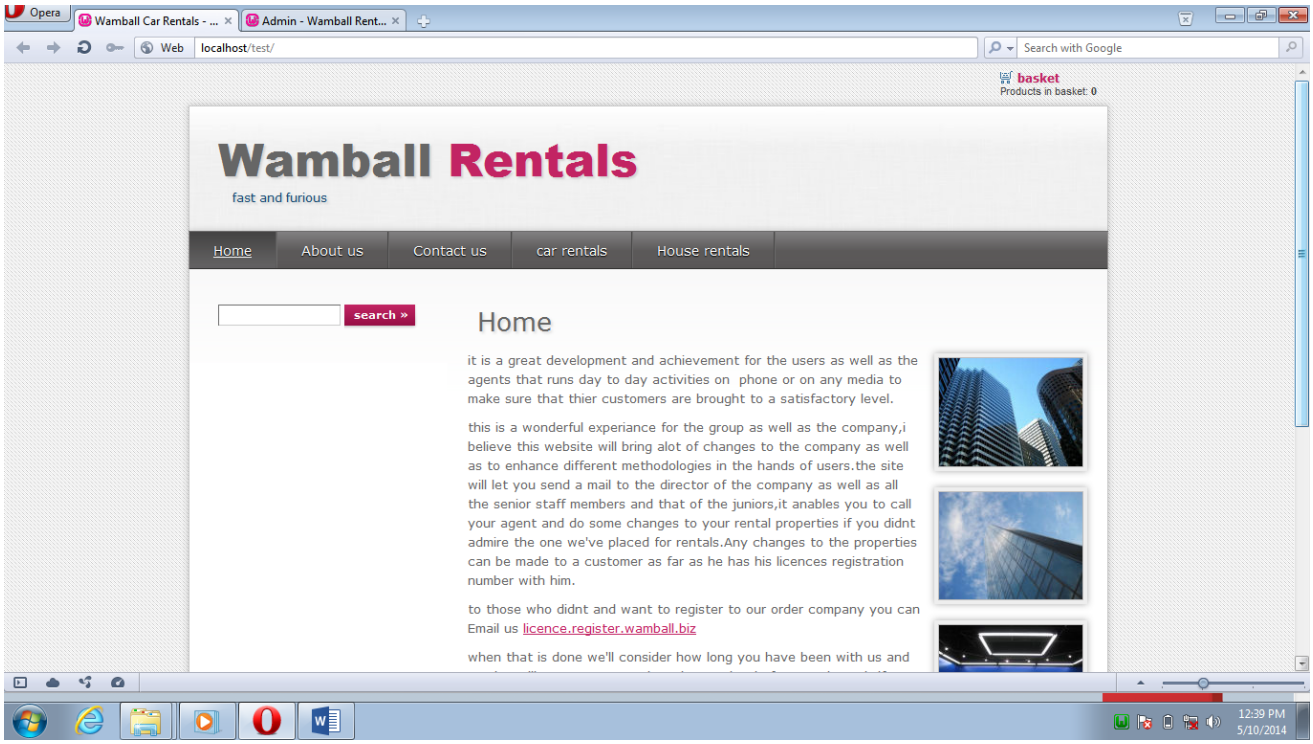
Table 2.2: Admin Login Wrong details



Access is denied and an error message is displayed as below:

7.3.2.2 STAFF LOGIN

TEST CASE	Staff Login
TEST DATA	Username ‘shuaibu01’ and ‘ringims3’
ACTUAL RESULT	As shown in the screen captures below
CONCLUSION	Successful



The error message displayed is the same as the one earlier shown in the admin login: wrong details.

7.3.3 SYSTEM VALIDATION AND USABILITY TESTING

Over here, forms validation testing is going to be checked out and tested with some inputs.

TEST CASE	OBJECTIVE	EXPECTED RESULT
Spry Text Field	Enter an incorrect value to show that the spry validation is working.	Error message is displayed. A value is required.
Spry Text Area	Enter an incorrect value to show that the spry validation is working.	Error message is displayed. A value is required.
Spry Radio Group.	Enter an incorrect value to show that the spry validation is working.	Error message is displayed. Select one item.
Spry Text Field	Enter an incorrect value to show that the spry validation is working for the email which must contain '@' and '.com/org'	Error message is displayed. Invalid format.
Spry Select	Enter an incorrect value to show that the spry validation is working.	Error message is displayed. Select an item.

Table 3.0: System validation and usability testing

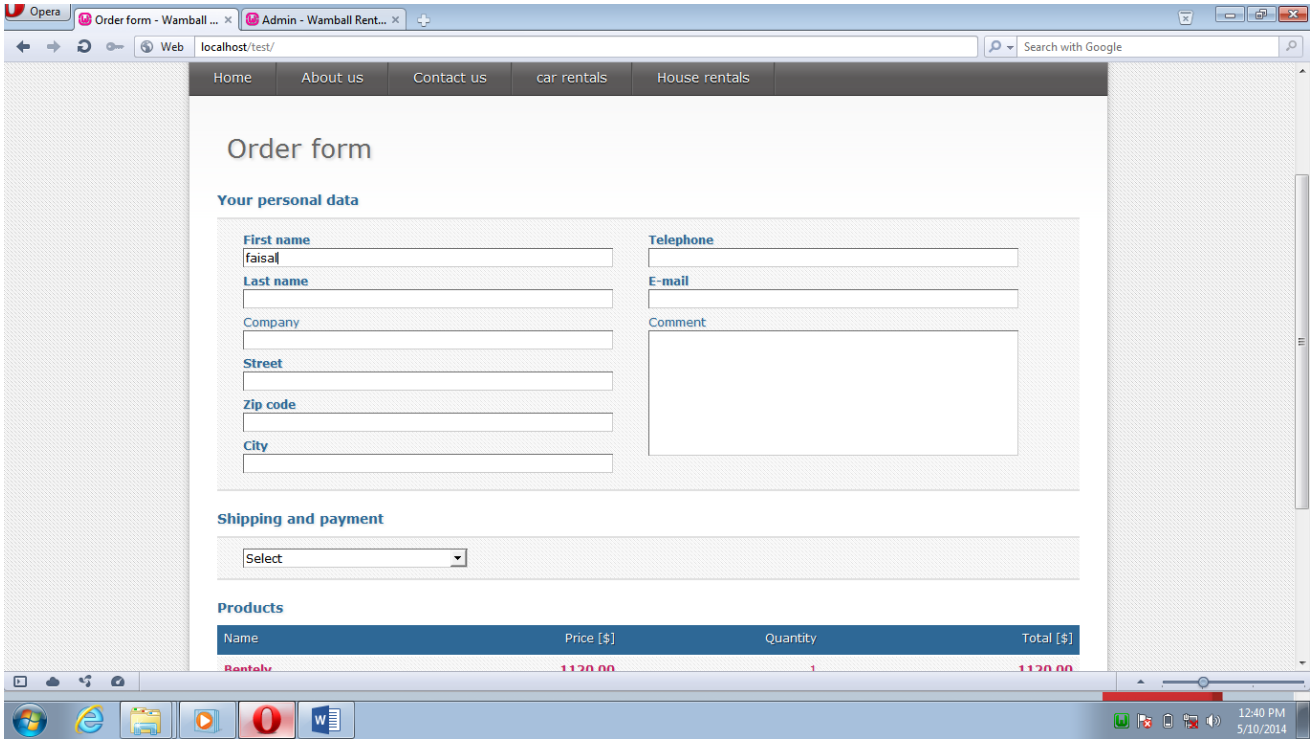
7.3.3.1 FORM VALIDATION

One form will be used for this test log because all the forms in the system use spry validations.

TEST CASE	Form Validation

TEST DATA	-
ACTUAL RESULT	As shown in the screen capture below
CONCLUSION	Successful

Table 3.1: Form Validation



CHAPTER EIGHT: SYSTEM REVIEW AND EVALUATION

Now that we have a developed and tested system in hand that will take care of Wamball Rentals organisation core activities. As proposed earlier on in the start of the project an online, computerised system is highly needed to support the organisations' cost effectiveness and reach to customers. Furthermore, the system should also allow customers to check properties online; it is therefore, regarded as an additional profit generation aspect in the organisation.

An in depth review of the system is done below.

8.1 OVERVIEW

Wamball Rentals system is developed to help the organisation gain competitive advantage and wider reach to its customers, as well as a profit generation. Wamball Rentals system is a web based system that allows customers to view properties and make car reservations online.

With reference to this, the system was designed with certain functions that will support the organisations primary objectives. These functions include making car reservation, house checking, and report generation e.t.c. As well as system basic function (add, edit, search, delete, view) were also incorporated and successfully implemented within the system. Then problem

of security was also considered and different login were provided with level of privileges for the staffs and admin. The customers do not have access to this part of the system; they can only check properties and then make car booking or reservations.

Moreover, to maintain data integrity, several validations and options were made available and embedded within the form to avoid and limit to a minimum wrong entries made by the users which were encapsulated. Example is the type of car to be added, it is made as a drop down list for users to choose one of the option of different car types. Another example is the email that must be written the way any email address should, containing the '@' and '.com or .org'. These were all achieved with the spry validation that was used in the forms, which helps notify users immediately wrong inputs are been made.

8.2 INTERFACE

The system graphical user interface (GUI) layout was design to be nice and user-friendly with the text and graphics balanced i.e. it is not too much nor too minor. The use of too many animations was also avoided. This is due to the analysis and research carried out in chapter three; about similar web based rental systems where some have poor quality and appearance.

These technical and non-technical issues were avoided in the development and implementation of Wamball Rentals system.

The same format of the pages was maintained, even though the contents of the pages differ. The same header and footer were maintained throughout the pages, which made it very simple and attractive. The colour chosen was also simple and might suit both sexes (male and female), all age ranges and backgrounds. Finally, the system interface can be said to satisfactory.

8.3 USABILITY

No matter how good and attractive any system is without it being actively useful it is regarded not to be useful. Therefore, it is considered to be one of the most important aspects of the system. The design is simple and the system is user friendly.

The system instructions and feedbacks with embedded texts informing the users of what to do. This enables people with average computer literacy to use the system with very minor difficulty. The font type, size and colour are visible, short and meaningful. The links in the system hold simple short phrases and words that easily describe the functions and tasks they are going to perform.

8.4 PROJECT PROCESS REVIEW

The successful approval of the proposal marks the start of the overall project process. The next step was using the proposal to start the documentation and development of the system. The next phase was the review of related literature, which includes books, journals, publications and websites, then the study of Rental systems that were online. Then, the subsequent study of the users of the system.

Furthermore, the review of different development methodologies such as spiral model, waterfall model and DSDM, then the choice and justification of DSDM as being the most appropriate.

Then followed by requirement gathering, elicitation and analysis, methods such as research and current system review were done. And the tools I used to model the requirements that I have gathered using ER diagram, use case and class diagram. Then the system design based on the analysis which was followed by the development and implementation.

The user acceptance testing marked the final process of the project. Due to the time frame and tight schedule certain users weren't part of the testing that took place. But the team of developers including the staffs available were able the use the limited resources available to successfully carry out the task. Errors found were debugged and corrected before they are being recorded in test logs.

8.5 SYSTEM WEAKNESS

'There is no system in this world that one hundred percent error free' Chowdary (2012). Even though errors might not be found in Wamball rentals system, it is a good programming and development practice to be truthful and maintain confidence. For every system must have weaknesses and enhancements that might be done in the future.

1. The first system weakness is that some links do not contain information this is to due limited time. And also the approach of DSDM that delivers 80% of the solution in 20% of the time.
2. The system also does not allow users to make payments online. This might be due to the fact the system has not been hosted and the need for links with the bank and other authorities involved.
3. The system also does not allow users to search for cars and properties within the system.
4. Also does not allow user to make house reservations or bookings.
5. Finally the system does not allow user to modify and update bookings made.

8.6 SYSTEM FUTURE ENHANCEMENT

These are additional future enhancement to the system that will make the system more usable and effective. The future enhancements of the system are as follows:

1. The system only allows users to make car reservations, it can be an additional advantage if they can also make reservations on properties before they make contact and check the apartment.
2. Allow user to make payments online using credit cards.
3. Automatically send receipt and booking details to the persons email address provided during booking.
4. Should also allow user to update and cancel bookings made using the system.

CHAPTER NINE: CONCLUSION

This project was designed to solve the problems Wamball Rentals are facing; the system has met the user requirements and expectations. The basic aim of the system is a web based online rental system for the organisation.

The system was developed using software tools such as PHP, MySQL, Apache etc. the careful use of these tool and DSDM development methodology has helped in the successful completion of this work. During the course of development, I have learned a lot of things such as, the use of the software mentioned above and the application of theoretical knowledge in development a system. And I also learned, how to manage time and resources available at my disposal to develop a system.

I will like to conclude by saying that the objectives listed within the proposal found in Appendix A were completed successfully, some were able to be tested and others were not due to the fact that the system was not hosted in a live environment and the project is used for educational purposes.

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APPENDIX

APPENDIX A PROJECT PROPOSAL

Undergraduate Final Year Project Proposal to Be Submitted To Mahatma Gandhi University For Partial Fulfilment Of The Award of a Bsc (Hons.) Information Technology

Wamball Rentals System

Ahmad Nuhu

MGU122TI1106004231

Bsc (Hons.) Information Technology

Supervisor: Mr. Anuj

1.0 OVERVIEW

Before the millennium, whenever people or individuals wants to rent a car, you either go to the office of the car rental to pay and pick up the car or place a call to make the necessary reservation which is usually using a manual process or simple databases designed by the staffs responsible. But due to the rapid growth in Information technology as the years goes by, and the extensive use of web applications in our daily business transactions. It has become necessary for nearly all businesses that want to reach a wider audience and retain existing customers, to make it easy for their customers to rent and make reservations via the internet or online.

The goal of this project is to develop an online rental and reservation system in order to reduce to a minimum or eliminate loss of customers to other competitors, and make benefits cost effective and gain a higher return on investment. To give the customer a chance to rent the car and house he/she so desires, which is available at that point in time or to make a reservation.

The aim of this project is to design a website with a car rental and reservation system to meet the global trend. That should contain an online catalogue and prices, payments, car records and customer reservations. The programming language to be used in this project work is PHP for the frontend and MySQL for the backend as the Database for the storage. And therefore, to build a good web application a good research is required in both the design and implementation.

1.1 PURPOSE OF THE STUDY

The purpose of this work is to write and submit a project proposal for the fulfilment of the award of Bsc.(Hons) Information Technology from the mahatma gandhi university. The project proposal introduces the project area, the scope, project objectives and how those objectives will be achieved, the proposed schedule, as well as system development methodology to be used.

2.0 THE CURRENT SYSTEM

The current system of operation in the organisation is manual system of reservation through phone calls or customers walk-in to make their own reservations with the help of an employee, where the employee has to check through the file and see if the cars or houses is available, then the use of simple databases to keep customer records and use of spreadsheet application by some of the customers to help in the calculation and report compilation of customer payments

and reservations. But with this it is almost certain that irregularities might occur, duplication of records and difficult to index and search for records. It is slow, not cost effective and customers are highly dissatisfied with the services offered.

2.1 PROBLEMS OF THE CURRENT SYSTEM

Although everything in the organisation seems to be carried out well, there are still problems associated with its operations. Investigation carried out shows problems in the following areas:

- ✓ Traditional system of registering customers and keeping records which renders the system inefficient, due to errors and duplication of records. ✓ Lack of proper information system to handle records ✓ Ineffective resources to manage too many clients.
- ✓ Errors in calculation of payments
- ✓ Problems with checking up availability of car/house present at the time and keeping track of reservation.
- ✓ The manual process is hectic and time consuming.

3.0 PROPOSED NEW SYSTEM

As quoted from the IT project and quality management slide. “If you fail to plan, you are planning to fail” and also that “an idea can change your life”. Considering the two statement above it can be said that since the problem is known an idea and a good plan can change the present system and a proposed new system to be built that will solve all the problems of the organisation.

3.1 OBJECTIVES OF THE NEW SYSTEM

The main objectives of this project are:

1. To analyze and overview both the current system problem and proposed system solution.

   The main purpose of this assignment is to analyze and overview both the current system problem and proposed system solution, in order to improve services to the customers. Allow customers to make reservations and rent cars online.

2. To research on the present trend in a basic rentals system on the web.

   This will include academic literatures as well as publications and journals which will explain the technology used and, what the web application should be able to do and data it holds, and reports it’s going to generate.

3. To design the system’s model that would meet the gathered system’s requirements.

This is to be choosing the development strategy to be used and how that is going to help in achieving the aim of this project, considering scope, time and cost.

4. To review the Web based application development technologies
   So as to determine the most recent and suitable programming language and database management system for the development of this proposed assignment to be more efficient and effective system model that will furnish the problems and weaknesses discovered in the current system by including high security to the new system for the efficient protection measures as the system will deal. And were already stated as PHP and MySQL respectively.
5. To provide security and information not to accessed by unauthorized users.
   Provide usernames and password for both staffs and system administrator that will be using the backend of database for viewing and accessing their respective information based on privileges.

3.2 HOW THIS OBJECTIVES CAN BE ACHIEVED

1. To analyze and overview both the current system problem and proposed system solution.
   i) Analyse the current system in use by the organisation with its limitations.
   ii) See how the proposed new system can solve the problems of the present system.
2. To research on the present trend in a basic car rental web applications.
   i) Research includes academic literatures surfing through the internet and other means.
   ii) Researching through existing rental systems, write ups and books.
   iii) Research possible textbooks, tutorials and e-books on use of PHP and MySQL. iv) Research all projects and journals related to this project subject area.
3. To design the system's model that would meet the gathered system's requirements.
   i) Use requirements analysis ii) Using the various fact-finding techniques to gather information and evaluate it.
   iii) Use the models and project management techniques I learned from the IT project and quality management course.
4. To review the Web based application development technologies
   i) Reviewing software and language to use in the development of the application.
   ii) The Database Management System to use for storing data at the backend.
5. To provide security and information not to accessed by unauthorized users.

i) To provide authorized users with username and password

3.3 NEW SYSTEM FUNCTIONALITIES

The proposed new system will have these functionalities after its implementation.

- Add new records
- Edit existing records
- View existing records
- Search existing records
- Delete existing records
- View weekly or monthly reports
- Create new login details for administrators and employees

4.0 PROJECT APPROACH

There are several approaches to system development. The choice of the methodology to use solely depends on the developer who might consider the three constraints of time, budget and quality or the type of project that is going to be developed. It said that the traditional approaches to system development have the following problems;

- "The system fails to meet the business requirements for which it was developed. The system is either abandoned or expensive to implement.
- There are performance shortcomings in the system being developed, which make it inadequate for the users' needs. Again, it is either abandoned or amended incurring extra costs.
- Errors appear in the developed system causing unexpected problems. Patches have to be applied at extra cost and time.
- Users reject the system, for some reasons e.g. lack of their involvement in the development or lack of commitment to it.
- Systems are initially accepted but over time become impossible to operate and maintain; so pass into disuse."

Based on this problem with the traditional approach and the type of project going to be developed, I as the developer choose to use Dynamic system development methodology (DSDM). The reason why I choose this methodology is of it advantages of developing projects in time within the given budget and of high quality. And other advantages it has over the traditional or other approaches to system development.

DSDM framework was created by a group of researchers in January 1994 who came to discuss the problem of the traditional software developments and how to meet the needs of the growing technology. It is part of the agile manifesto.

Using the DSDM framework I will be able to have these advantages:

- Users are more likely to claim ownership of the system as they will be part of the development team.
- The risk of building the wrong system is greatly reduced.
- The final system is more likely to meet the users' real business requirements as the development is a collaborative effort.
- The users will be better trained, since their representatives will define and co-ordinate the training required i.e. users that are part of the development team.

- Implementation is more likely to go smoothly, because of the co-operation of all parties concerned throughout development of the system. (DSDM Consurtiom:2008) Moreover, the DSDM framework has five steps or phases which I am going to adopt and strictly adhere to when developing my project, which are as follows:
- Feasibility study.
- Business study.
- Functional model iteration.
- Design and build iteration.
- Implementation.

5.0 RESOURCES

The resources to be used in this project work include:

Hardware:

- Personal Computer
- Multi-Function device
- Modem

Software:

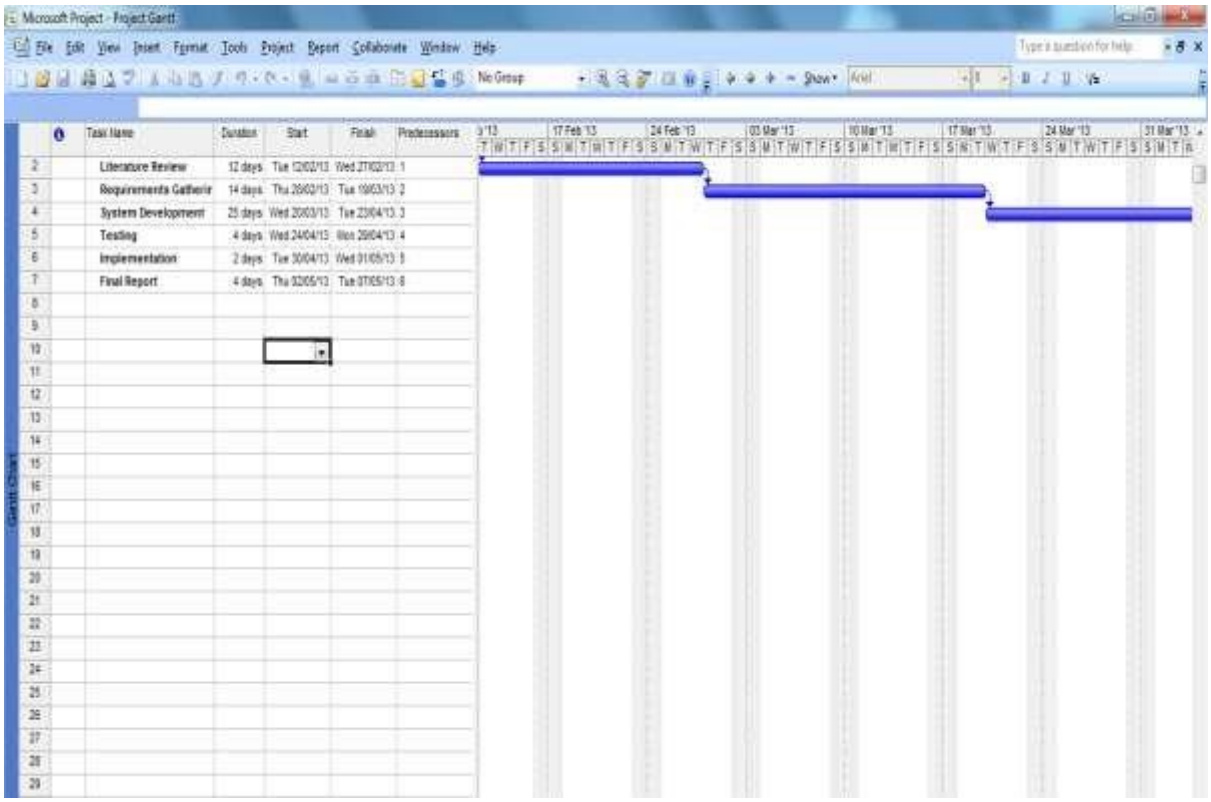
- Dreamweaver (for PHP)
- MySQL (for the backend Database)
- Microsoft Office for writing reports.
- WAMP Server

Others:

- Textbooks and websites used for research.
- Publications and tutorials read and learned.

6.0 GANTT CHART

A Gantt chart is pictorial or graphical representation of the schedule and time elapsed in carrying out the task required to complete the project.



REFERENCE

- DSDM Consortium. (2008). *DSDM Public Version 4.2.* Kent: White Horse Press Ltd.
- The University of Greenwich. (2007). ISE:COMP1304. *The Trouble with Information Technology*. London: the University of Greenwich.
- CNET YouTube tutorials on how to link SQL server with Dreamweaver template (2012)

APPENDIX B: DATA DICTIONARY

ENTITIES

These are relations available in Wamball Rentals database.

Apartment: holds information about the apartments

Booking: holds customer car booking details Customer:

Customer details who rents properties:

Feedback: feedback and complain details.

House: House details

Newsletter: weekly newsletter registration by customers

Houserental: Properties rented out to the customers and its duration

Staff: Employees working in the company

Users: system users, employees who have access to the system including their username, passwords and access levels

Carrental: cars rented out after booking were placed.

Cars: cars within the organisation used for businesses.

ABBREVIATIONS

ApartmentNo: Apartment number ApartmentID:

Apartment identification

Con_ad: Contact address.

CustID: Customer Identification.

DOB: Date of birth

Driv_lic: Drivers' Licence FlatNo:

Flat number.

Fname: First Name.

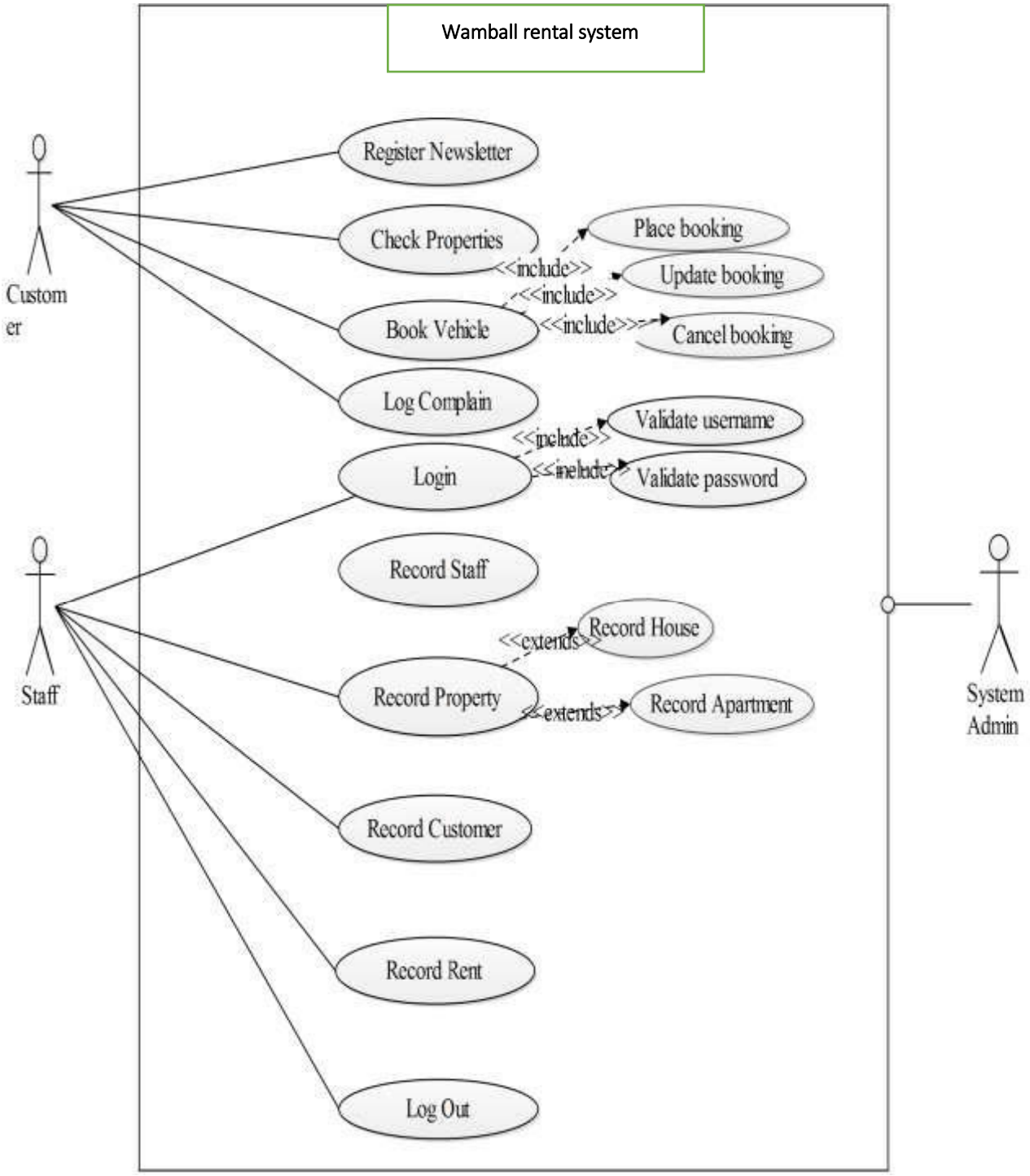
Lname: Last Name.

Rooms: Number of rooms.

Staffid: Staff identication

Userid: User identification.

APPENDIX C USE CASE DIAGRAM AND SCENARIOS



PRIMARY SCENARIOS

USE CASE	Login
ACTOR	Authorised user(staff, system admin)
DESCRIPTION	The user has decided to login into the system fills in his/her username & password and the system has successfully logs him in.
PRE-CONDITION	The use case starts when the user decides to login into the system
MAIN FLOW	1. The user will click on the user login button. 2. The system will display the login screen. 3. The user will enter his/her username and password. 4. The user will press the login button. 5. The system will validate the details enter and log in the user.
POST CONDITION	The system has successfully login the user

Table 1.0: Login Primary scenario

USE CASE	Book car
ACTOR	Customer
DESCRIPTION	Customer has chosen to place car booking.
PRE-CONDITION	The use case starts when the customer has decided to book car
MAIN FLOW	1. Customer clicks on proceed to booking 2. The system will display the car booking form. 3. Then he/she will enter their details of the customer e.g. first name, last name, address, licence number etc. 4. The customer will press the book button. 5. The system saves the booking and displays a summary. 6. The customer can click on print and printout a copy
POST CONDITION	The system has successfully saves the booking details and a copy is printed out.

Table 1.1: Book car Primary scenario

USE CASE	Check properties
ACTOR	Customer
DESCRIPTION	Customer has chosen to place Check properties.
PRE-CONDITION	The use case starts when the customer has decided to Check properties
MAIN FLOW	1. Customer clicks house rental 2. The system will display the house rental page. 3. Then he/she will see the house they are interested in. 4. The customer will press the view more button. 5. The system displays a summary of the house details.
POST CONDITION	The system has successfully shows the customer the house details

Table 1.2: Check properties Primary scenario

USE CASE	Record Customer
ACTOR	Staff, System Admin
DESCRIPTION	Staff has decided to record customer details into the system, fills in

	the details e.g. customer ID, firstname, lastname, address e.t.c. and saves.
PRE-CONDITION	The use case starts when the staff decides to record customer
MAIN FLOW	1. The user will log into the system. 2. The staff will click on the add customer button. 3. The system will display the customer registration form. 4. The staff will enter the details of the customer e.g. first name, last name, address, email etc. 5. The staff will press the add button. 6. The system saves the customer record.
POST CONDITION	The system has successfully saves the customer details.

Table 1.3: Record customer Primary scenario

USE CASE	Register Newsletter
ACTOR	Customer
DESCRIPTION	Customer has chosen to place Register Newsletter.
PRE-CONDITION	The use case starts when the customer has decided to Register Newsletter
MAIN FLOW	1. Customer fills in the required details on the newsletter form on the home page. 2. The customer will press the register button. 3. The system saves the details.
POST CONDITION	The system has successfully saves details.

Table 1.4: Register Newsletter Primary scenario

USE CASE	Log Complain
ACTOR	Customer
DESCRIPTION	Customer has chosen to log complain or give a feedback on our services.
PRE-CONDITION	The use case starts when the customer has decided to log complain or give a feedback
MAIN FLOW	1. Customer clicks on contact us. 2. The system will display the contact us page. 3. Then he/she fills in the details i.e. name, email, subject, type, comment. 4. The customer will press the submit button. 5. The system has saved the record.
POST CONDITION	The system has successfully saves the record.

Table 1.5: Log complain Primary scenario

USE CASE	Record Staff
ACTOR	System Admin
DESCRIPTION	System admin has decided to record staff details into the system, fills in the details e.g. staffID, firstname, lastname, dob, address etc. and saves.
PRE-CONDITION	The use case starts when the System Admin decides to record staff.

MAIN FLOW	1. The user will log into the system as an admin. 2. The user will click on the staff button. 3. The system will display an interface he will then click Add staff. 4. The system displays the staff registration form. 5. The system admin will enter the details of the staff e.g. staffID, firstname, lastname, dob, address etc. 6. The user will press the save button. 7. The system saves the staff record.
POST CONDITION	The system has successfully saves the staff details.

Table 1.6: Record staff Primary scenario

USE CASE	Record House
ACTOR	Staff, System Admin
DESCRIPTION	The staff has decided to record a new house into the system, fills in the details e.g. street, city, postcode, rooms e.t.c. and saves.
PRE-CONDITION	The use case starts when the Staff decides to record house.
MAIN FLOW	1. The user will log into the system. 2. The user will click on the house button. 3. The system will display an interface he will then click Add house which is either (house or apartment). 4. The system displays the house registration form. 5. The user will enter the details of the house e.g. street, city, postcode, rooms e.t.c. 6. The user will press the save button. 7. The system saves the house record.
POST CONDITION	The system has successfully saves the house details.

Table 1.7: Record House Primary scenario

USE CASE	Record Rent
ACTOR	Staff, System Admin
DESCRIPTION	The staff has decided to record a rent into the system, fills in the details e.g. custid, rentdate, enddate e.t.c. and saves.
PRE-CONDITION	The use case starts when the System Admin decides to record staff.
MAIN FLOW	1. The user will log into the system. 2. The user will click on the house button. 3. The system will display an interface he will then click Add house which is either (house or apartment). 4. The system displays the house registration form. 5. The user will enter the details of the house e.g. street, city, postcode, rooms e.t.c. 6. The user will press the save button. 7. The system saves the rent record.
POST CONDITION	The system has successfully saves the rent details.

Table 1.8: Record Rent Primary scenario

USE CASE	Logout
ACTOR	Authorised user(staff, system admin)

DESCRIPTION	The user has decided to logout of the system.
PRE-CONDITION	The use case starts when the user decides to logout into the system
MAIN FLOW	1. The user will click on the user logout button. 2. The system logs out the user. 3. The system returns the user to the login page.
POST CONDITION	The system has successfully logout the user

Table 1.9: Record Rent Primary scenario

SECONDARY SCENARIO

USE CASE	Login
ACTOR	Authorised user(staff, system admin)
DESCRIPTION	The user has decided to login into the system fills in his/her username & password and the system has successfully logs him in.
PRE-CONDITION	The use case starts when the user decides to login into the system
MAIN FLOW	1. The user will click on the user login button. 2. The system will display the login screen. *2.1 The user might have clicked on a wrong button e.g. home button.* *2.2 The system will display the home interface.* *2.3 The user will realize the mistake and close the interface.* 3. The user will enter his/her username and password. *3.1 The user may enter a wrong username and or password.* *3.2 The system will display an error message and prompt the user to re-enter username and (or) password.* *3.3 The user will then enter the correct username and password.* 4. The user will press the login button. 5. The system will validate the details enter and log in the user.
POST CONDITION	The system has successfully login the user

Table 2.0: Login Secondary Scenario.

USE CASE	Book Car
ACTOR	Customer
DESCRIPTION	Customer has chosen to place car booking.
PRE-CONDITION	The use case starts when the customer has decided to book car
MAIN FLOW	1. Customer clicks on proceed to booking 2. The system will display the car booking form. *2.1 The user might have clicked on a wrong button e.g. home button.* *2.2 The system will display the home interface.* *2.3 The user will realize the mistake and close the interface.* 3. Then he/she will enter their details of the customer e.g. first name, last name, address, licence number etc. *3.1 The system spry validation will take effect here*

	3.2 Any field will be checked based on its type of entry e.g.
	email should have '@domainname.com/.org *3.3 User enters the correct format.* 4. The customer will press the book button. 5. The system saves the booking and displays a summary. 6. The customer can click on print and printout a copy
POST CONDITION	The system has successfully saves the booking details and a copy is printed out.

Table 2.1: Book Car Secondary Scenario.

USE CASE	Check properties
ACTOR	Customer
DESCRIPTION	Customer has chosen to place Check properties.
PRE-CONDITION	The use case starts when the customer has decided to Check properties
MAIN FLOW	1. Customer clicks house rental *1.1 The user might have clicked on a wrong button e.g. car rental button.* *1.2 The system will display the car rental page.* *1.3 The user will realize the mistake and close the interface.* 2. The system will display the house rental page. 3. Then he/she will see the house they are interested in. 4. The customer will press the view more button. 5. The system displays a summary of the house details.
POST CONDITION	The system has successfully shows the customer the house details

Table 2.2: Check Properties Secondary Scenario

USE CASE	Record Customer
ACTOR	Staff, System Admin
DESCRIPTION	Staff has decided to record customer details into the system, fills in the details e.g. customer ID, firstname, lastname, address e.t.c. and saves.
PRE-CONDITION	The use case starts when the staff decides to record customer

MAIN FLOW	1. The user will log into the system. *1.1 The staff might have clicked on a wrong button e.g. home button.* *1.2 The system will display the home screen.* *1.3 The staff will realize the mistake and close the interface.* 2. The staff will click on the add customer button. *2.1 The user may click on a wrong icon e.g. edit customer.* *2.2 The system will display the edit customer page.* *2.3 The user will then realize the mistake and close the interface.* 3. The system will display the customer registration form. 4. The staff will enter the details of the customer e.g. first name, last name, address, email etc. *1.1 the staff might have entered the wrong details or live the field empty e.g. numbers in name, or alphabets in dob* *1.2 the system prompts the user to enter correct format and save again* 5. The staff will press the add button. 6. The system saves the customer record.
POST CONDITION	The system has successfully saves the customer details.

Table 2.3: Record Customer Secondary Scenario

USE CASE	Register Newsletter
ACTOR	Customer
DESCRIPTION	Customer has chosen to place Register Newsletter.
PRE-CONDITION	The use case starts when the customer has decided to Register Newsletter
MAIN FLOW	1. Customer fills in the required details on the newsletter form on the home page. *1.1 The customer might have entered the wrong details or live the field empty e.g. numbers in name.* *1.2 The customer might also have registered before the system might reject that particular email.* *1.3 The system prompts the user to enter correct format and save again* 2. The customer will press the register button. 3. The system saves the details.
POST CONDITION	The system has successfully saves details.

Table 2.4: Register Newsletter Secondary Scenario

USE CASE	Log Complain
ACTOR	Customer
DESCRIPTION	Customer has chosen to log complain or give a feedback on our services.
PRE-CONDITION	The use case starts when the customer has decided to log complain or give a feedback

MAIN FLOW	1. Customer clicks on contact us. *1.1 The customer might have clicked on a wrong button e.g. home button.* *1.2 The system will display the home screen.* *1.3 The customer will realize the mistake and close the interface.* 2. The system will display the contact us page. 3. Then he/she fills in the details i.e. name, email, subject, type, comment. *3.1 The customer might have entered the wrong details or live the field empty e.g. numbers in name.* *3.2 The customer might also have registered before the system might reject that particular email.* *3.3 The system prompts the user to enter correct format and save again* 4. The customer will press the submit button. 5. The system has saved the record.
POST CONDITION	The system has successfully saves the record.

Table 2.5: Log Complain Secondary Scenario

USE CASE	Record Staff
ACTOR	System Admin
DESCRIPTION	System admin has decided to record staff details into the system, fills in the details e.g. staffID, firstname, lastname, dob, address etc. and saves.
PRE-CONDITION	The use case starts when the System Admin decides to record staff.
MAIN FLOW	1. The user will log into the system as an admin. 2. The user will click on the staff button. *2.1 The admin might have clicked on a wrong button e.g. car button.* *2.2 The system will display the car page.* *2.3 The admin will realize the mistake and close the interface.* 3. The system will display an interface he will then click Add staff. *3.1 The user may click on a wrong icon e.g. edit customer.* *3.2 The system will display the edit customer page.* *3.3 The user will then realize the mistake and close the interface.* 4. The system displays the staff registration form. 5. The system admin will enter the details of the staff e.g. staffID, firstname, lastname, dob, address etc. *5.1 the admin might have entered the wrong details or live the field empty e.g. numbers in name, or alphabets in dob* *5.2 the system prompts the user to enter correct format and save again* 6. The user will press the save button. 7. The system saves the staff record.

POST CONDITION	The system has successfully saves the staff details.

Table 2.6: Record staff Secondary Scenario

USE CASE	Record House
ACTOR	Staff, System Admin
DESCRIPTION	The staff has decided to record a new house into the system, fills in the details e.g. street, city, postcode, rooms e.t.c. and saves.
PRE-CONDITION	The use case starts when the Staff decides to record house.
MAIN FLOW	1. The user will log into the system. 2. The user will click on the house button. *2.1 The user might have clicked on a wrong button e.g. car button.* *2.2 The system will display the car page.* *2.3 The staff will realize the mistake and close the interface.* 3. The system will display an interface he will then click Add house which is either (house or apartment). *3.1 The user may click on a wrong icon e.g. edit customer.* *3.2 The system will display the edit customer page.* *3.3 The user will then realize the mistake and close the interface.* 4. The system displays the house registration form. 5. The user will enter the details of the house e.g. street, city,
	postcode, rooms e.t.c. *5.1 the admin might have entered the wrong details or live the field empty e.g. numbers in name, or alphabets in rooms* *5.2 the system prompts the user to enter correct format and save again* 6. The user will press the save button. 7. The system saves the house record.
POST CONDITION	The system has successfully saves the house details.

Table 2.7: Record House Secondary Scenario

USE CASE	Record Rent
ACTOR	Staff, System Admin
DESCRIPTION	The staff has decided to record a rent into the system, fills in the details e.g. custid, rentdate, enddate e.t.c. and saves.
PRE-CONDITION	The use case starts when the System Admin decides to record staff.

MAIN FLOW	1. The user will log into the system. 2. The user will click on the house button. *2.1 The user might have clicked on a wrong button e.g. car button.* *2.2 The system will display the car page.* *2.3 The staff will realize the mistake and close the interface.* 3. The system will display an interface he will then click Add house which is either (house or apartment). *3.1 The user may click on a wrong icon e.g. edit customer.* *3.2 The system will display the edit customer page.* *3.3 The user will then realize the mistake and close the interface.* 4. The system displays the house registration form. 5. The user will enter the details of the house e.g. street, city, postcode, rooms e.t.c. *5.1 the admin might have entered the wrong details or live the field empty e.g. numbers in name, or alphabets in rooms* *5.2 the system prompts the user to enter correct format and save again* 6. The user will press the save button. 7. The system saves the rent record.
POST CONDITION	The system has successfully saves the rent details.

Table 2.8: Record Rent Secondary Scenario

USE CASE	Logout
ACTOR	Authorised user(staff, system admin)
DESCRIPTION	The user has decided to logout of the system.
PRE-CONDITION	The use case starts when the user decides to logout into the system
MAIN FLOW	1. The user will click on the user logout button. 2. The system logs out the user. 3. The system returns the user to the login page.
POST CONDITION	The system has successfully logout the user

Table 2.9: Logout Secondary Scenario

APPENDIX D REQUIREMENTS CATALOGUE

This is based on the functional and non-functional requirements in chapter four.

FUNCTIONAL REQUIREMENTS

- R01: Login
- R02: Basic system operations – add, search, view, update and delete (Administrative, user Functions)
- R03: Create User login details
- R04: Create user account
- R05: Make Reservation
- R06: Record Customer Rent

- R07: Generate reports
- R08: Log Complain
- R09: Register Newsletter
- R10: Record Cars/Properties
- R11: Logout

FUNCTIONAL REQUIREMENTS CATALOGUE

Source: Wamball Rental	Signoff: Wamball Rental	Requirement ID: R01
Functional Requirement: R01: Login		
Non-functional Requirements(s)		

Description: Volume: Print Time:	Target Value:	Acceptable Range:	Comment:

Table 3.0: Login Requirements Catalogue

Source: Wamball Rental	Signoff: Wamball Rental	Requirement ID: R02
Functional Requirement: R02: Basic system operations – add, search, view, update and delete		
Non-functional Requirements(s)		

Description: Volume: Print Time:	Target Value:	Acceptable Range:	Comment:

Table 3.1: Basic system operation Requirements Catalogue

Source: Wamball Rental	Signoff: Wamball Rental	Requirement ID: R03

Functional Requirement: R03: Create User login			
Non-functional Requirements(s)			
Description: Volume: Print Time:	Target Value:	Acceptable Range:	Comment:

Table 3.2: Create user login Requirements Catalogue

Source: Wamball Rental	Signoff: Wamball Rental	Requirement ID: R04
Functional Requirement: R04: Create user account		
Non-functional Requirements(s)		

Description:	Target Value:	Acceptable Range:	Comment:
Volume: Print Time:			

Table 3.3: Create user account Requirements Catalogue

Source: Wamball Rental	Signoff: Wamball Rental	Requirement ID: R05
Functional Requirement: R05: Make Reservation		
Non-functional Requirements(s)		

Description: Volume: Print Time:	Target Value:	Acceptable Range:	Comment:

Table 3.4: Make Reservation Requirements Catalogue

Source: Wamball Rental	Signoff: Wamball Rental	Requirement ID: R06
Functional Requirement: R06: Record Customer Rent		
Non-functional Requirements(s)		

Description: Volume: Print Time:	Target Value:	Acceptable Range:	Comment:

Table 3.5: Record Customer Rent Requirements Catalogue

Source: Wamball Rental	Signoff: Wamball Rental	Requirement ID: R07
Functional Requirement: R07: Generate reports		
Non-functional Requirements(s)		

Description: Volume: Print Time:	Target Value:	Acceptable Range:	Comment:

Table 3.6: Generate reports Requirements Catalogue

Source: Wamball Rental	Signoff: Wamball Rental	Requirement ID: R08

Functional Requirement: R08: Log Complain			
Non-functional Requirements(s)			
Description: Volume: Print Time:	Target Value:	Acceptable Range:	Comment:

Table 3.7: Log Complain Requirements Catalogue

Source: Wamball Rental	Signoff: Wamball Rental	Requirement ID: R09	
Functional Requirement: R09: Register Newsletter			
Non-functional Requirements(s)			
Description:	Target Value:	Acceptable Range:	Comment:
Volume: Print Time:			

Table 3.8: Register Newsletter Requirements Catalogue

Source: Wamball Rental	Signoff: Wamball Rental	Requirement ID: R10	
Functional Requirement: R10: Record Cars/Properties			
Non-functional Requirements(s)			

Description: Volume: Print Time:	Target Value:	Acceptable Range:	Comment:

Table 3.9: Record Cars/Properties Requirements Catalogue

Source: Wamball Rental	Signoff: Wamball Rental	Requirement ID: R11
Functional Requirement: R11: Logout		
Non-functional Requirements(s)		

Description: Volume: Print Time:	Target Value:	Acceptable Range:	Comment:

Table 4.0: Logout Requirements Catalogue

Source: Wamball Rentals	Signoff: Wamball Rentals	Requirement ID: R12

Non-functional Requirement(s):

The new system should have this additional requirements

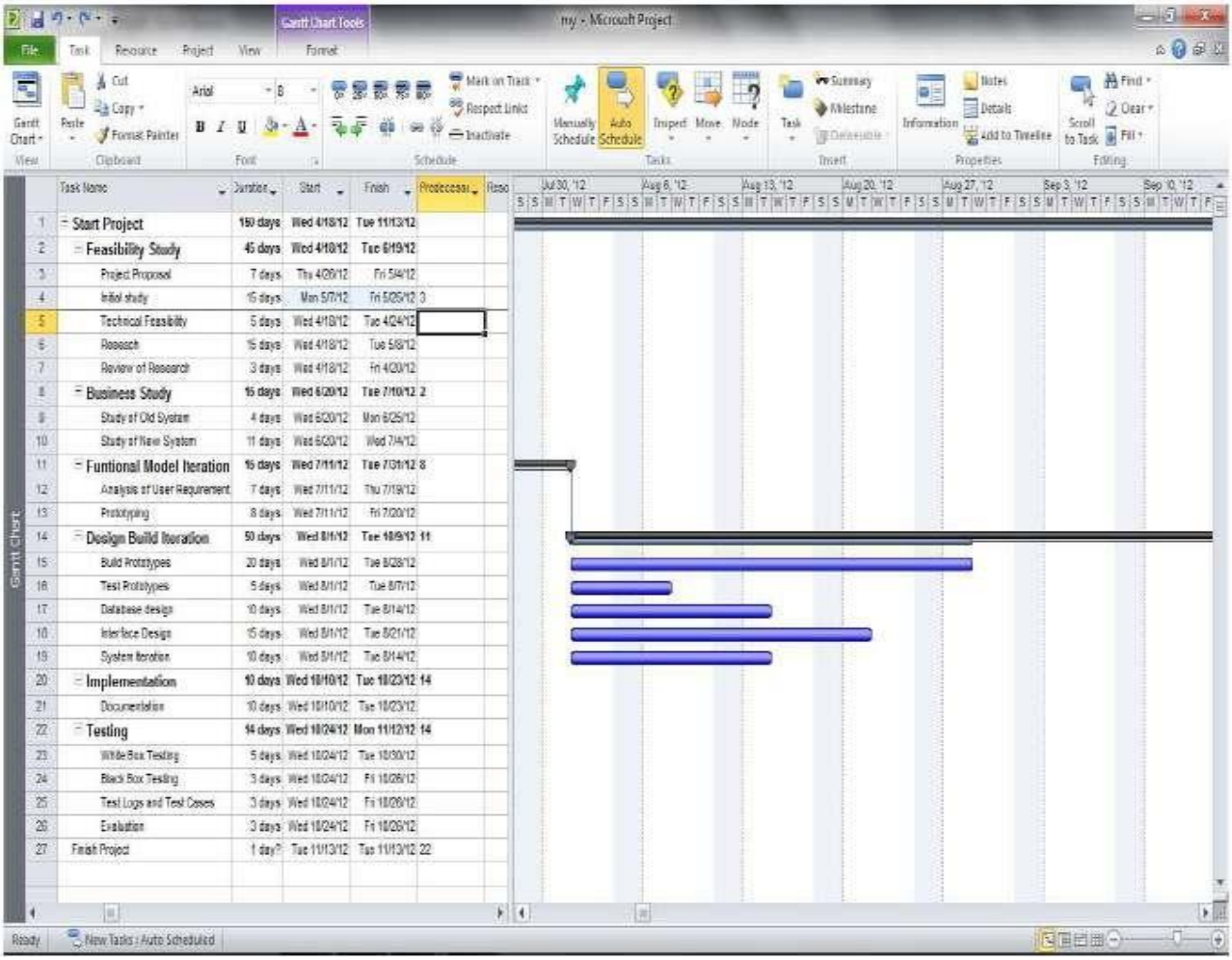
- Creation of different access levels.
- **Reliability:** the system should be available 24hours a day and 7days a week. It should be accessed at any time.
- **Recoverability:** the system should be able to recover from certain errors and give access after error recovery.
- **Performance:** the system should perform within the standard. And response time should good.
- **Security:** the system should reject incorrect login details (username and/or password) and also provide access to only authorised users.
- **Usability:** the system should be used by an average computer literate person and very user friendly.

Table 4.1: Non-Requirements Catalogue

APPENDIX E TIME BOXING

S/N	DATE	DURATION	DELIVERABLES
1	30/Jan/2013 – 13/Feb/2013	2 Weeks	Analysis modelling: use case, ER modelling, normalisation and database design.
2	15/Feb/2013 – 8/Mar/2013	3Weeks	Database creation, banner design, form and page design.
3	9/Mar/2013 – 19/Mar/2013	1Week 3days	Development and coding of home page, about us, contact us, house rental and car rental
4	20/Mar/2013 – 10/Apr/2013	3Weeks	Development and coding basic system operations pages (add, view, edit, delete)
5	10/Apr/2013 – 19/Apr/2013	1week 2days	Development and coding of login page and user authentication.
6	20/Apr/2013 – 23/Apr/2013	0Weeks 3days	Linking of all pages and interfaces.
7	23/Apr/2013 – 25/Apr/2013	0Weeks 2days	Necessary corrections, modifications and enhancements.

APPENDIX F GANTT CHART



APPENDIX G QUESTIONNAIRE

QUESTIONNNAIRE

Due to the ongoing system development as requested by the organisation we would like to gather some information from both staffs and some customers.

PERSONAL INFORMATION

Do you want your identity known? YES ☐ NO ☐

NAME: _____

GENDER: MALE ☐ FEMALE ☐

DEPARTMENT: _____

POST: _____

MOBILE: _____

DATE EMPLOYED: _____

QUESTIONS PART A

1 Do you consider the current system effective? YES ☐ NO ☐

1.1 If you answer to the above question is No. What do you think is the solution?

_____

_____

_____

_____

2 Do you think the new system is needed? YES ☐ NO ☐

3 Do you support the development of the new system? ☐ NO YES ☐

3.1 If your answer to question 3 is YES, what features would like to have on the new system?

_____

_____

_

_____

_

_____

_

_____

_____

3.2 If the answer is NO, then why?

_____

_____

_____

_____

_____

4 What is your reaction to the new system under development?

_____

_____

_____

_____

_____

PART B

5 Have you ever heard of an online rentals system? ☐ YES NO ☐

5.1 If your answer to question five above is YES, where did you heard of it and what is the web address?

_____

_____

_____

6 What colour do you think will be appropriate for the new system? _____

7 Do you think it is a good idea for an online payment? YES ☐ NO ☐

7.1 If your answer is YES Why? And if it is no why?

_____

_____

_____ 8 If you were to be in charge, what do you think is the best solution?

_____

_____

_____

9 If you have any suggestion, please state it here.

_____

_____

_____

_____

_____

Thank you for your time and cooperation.