WEB-BASED VEHICLE MANAGEMENT SYSTEM

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ABSTRACT

The Vehicle Management System is a system providing management functions which allows companies to remove or minimize the risks associated with vehicles owned by the companies. This web-based system runs on computer systems and access through the web browser of any choice. The goal of a VMS is to reduce maintenance costs of the vehicles and optimize usage. This Vehicle Management system is not restricted to managing the individual vehicles, but includes the daily management of vehicles, fuel and services, drivers, etc. When it comes to improving efficiency, productivity and reducing the overall costs involved with a company's vehicle fleet it is essential to have Vehicle Management Software in place. This kind of system contributes and forms a firm basis of effective Vehicle Management System. Being able to provide excellent records when it comes to auditing, formulating strategies, designing and implementing policies, procedures and systems is regarded as a quick and simple task when you are making use of a good Vehicle Management System.

The goal of this work is to develop a Web Based Vehicle Management System framework to enhance Productivity through effective Vehicle management and utilization in a most conducive manner.

Our Objectives were to review Vehicle management Systems existing and propose one that is customized and suitable for the Zambian environment. Lastly to implement a Web based Vehicle Management System that will be used within the organization and coordinate with other department and the main player will be the transport officer. Transport Departments uses manual in the operations of the Vehicles keeping track of important tasks such as Insurance Cover and Fitness certificate.

The development and implementation of a web-based Vehicle Management System is to aid the Organization manage its transport department well. Once the system is in place, the vehicles will be made to serve its primary purpose. The system will only have two Users, Transport coordinator and the Head of Departments

- The system will be the centralized Vehicle Management System controlled by Transport Coordinator, and other departments will have to send request once approved that when the driver is assigned for a task.

- The vehicle that is assigned to be used for local duties will work as per the assignment. This system once implemented will increase vehicle life span and on the other hand, the organization will be spending less in terms of maintenance and running of the vehicles.

- There will be no more use of manual records, as the system will be able to give alerts for attention in terms of Road Tax, Vehicle Fitness and Insurance, mileage will also be recorded for any movements made to track on fuel usage.

- In addition, the system will provide the mechanism for Reports on Assigned and Unassigned Vehicles for admin.

The framework is able to provide solutions to the many challenges the Organizations is facing as regards to Transport services and utilization.

Key words: Sarver; access levels; Desktop/ Laptops; Current Vehicle Management situation; information communication technology

DEDICATION

This project is dedicated to my (Late) mother Mrs. Beatrice M Chabushiku, who had all the hope and that one day will be a key and instrumental figure in my educational upbringing. To My Beautiful wife Innocenciah Chikopa your determination and encouragement made this project possible and my lovely Daughter Beatrice for the late nights drive spent with me while watching your cartoons. While this project as they would not disturb me when I was doing my research to you guys I say love you all and God bless you in your future endeavors. I would also like to dedicate the project to my Elder brother and siblings for the confidence they have in me as their inspiration. To the almighty God thank you for the life uphold, I will forever dwell in you!

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LIST OF ACRONYMS AND ABBREVITIONS

ERD	Entity relationship diagram.
TMS	Transport Management System.
VUS	Vehicle Utilization System
VMS	Vehicle Management System.
MYSQL	**My Structured Query Language**
GPS	The Global Positioning System

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CHAPTER 1
INTRODUCTION

1.1 Background

The development of a Vehicle Utilization System came to light due to the fact that the companies has been experiencing problems in taking audit of usage and Utilization of the Vehicles. The other reason is simply to see to it that the company does not spend too much money on maintenance of the vehicles due to the misuse by some individuals taking advantage of lucky of Management System in place. This System is an Interactive system from the top management to the operation level, hence easy for decision making. Once the System is implemented, Distribution and Utilization will address the pressure that the transport department has been facing in recent past. For efficiency and effective manner, organizations entirely demand the need for vehicles Management System. In undertaking huge projects, the implementation cost has been weighed against the project's benefit and it has been found that the benefits overweigh the cost by far, hence the great move to develop and implement the said project. Overall the new system will automate the process of vehicle management thereby increasing productivity.

1.2 Motivation for the Project

Most of the companies are non-profit making organization; they focus on the service delivery to the people of the Republic of Zambia. Keeping the vehicles in a running condition will mean great production for the organizations and Zambia at large. The system will be a distributed system that wills employee a three – tier Architecture. Access will be through a web service, the fronted technology that will be used is HTML and MYSQL server 5.1 will be used in the back-end technology for the database. The system will have different uses and users will have different access rights. The department users will have to login into the system and request the vehicle through the coordinator approval. Vehicles will be assigned by the transport Coordinator; the drivers will also be required to login to check if has been assigned any task by the supervisor.

1.3 Aims and Objectives

Aim

- **To design and implement a Web Based framework for enhancing and complementing the delivery efforts in Zambia, using a Vehicle Management System for effectively and reliability.**

Objectives

- To enable the Users use Vehicle Management System and not Manual in running of Vehicles.
- To ensure other departments to request for Vehicles from the portal,
- To establish the Departments, use vehicles for intended purposes and hand over the keys after the task.
- To enable the Vehicle Management System be able to send reminders for important Tasks such as **Insurance Cover**, **Vehicle maintenance service**, **Road Tax** and **Vehicle fitness** is almost due.

CONCLUSION

In this introduction the author has given a detailed background to the problems that have necessitated this research proposal. Out rayed the various challenges the country is facing as regards to transport i.e. permanent assignment of vehicles to Departments and Drivers, and high maintenance cost, no proper record keeping of insurance and fitness, and has given the background to the motivation of undertaking such a very important and key application development in Vehicle Management System.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

Literature review means searching, collecting, analyzing and drawing conclusion or conclusions from all debate issues raised in relevant bodies of literature.

In this chapter, we will consider looking at the most widely used Vehicle Management Systems and review the various languages powering the Vehicle Management Systems platforms that are existing.

EVALUATION OF THE PROJECT AREA

The government of the republic of Zambia has a policy in place on how the vehicles are to be used and the private vehicles are not an exception. All government vehicles are to be used in a certain way;

GOVERNMENT VEHICLE USAGE

Policy statement

All government owned, leased or hired vehicles/ equipment shall be used for government business only. Private use is strictly prohibited.

Application

This policy applied to all employees who utilize government owned, leased or hired vehicles/ equipment in their assigned work.

- Definition
- Vehicle
- Responsibility
- Department

It is the responsibility of individual department to; ensure that all employees are aware of all policies related to the use of any government owned, leased or hired vehicles or equipment; and monitor usage of vehicles and equipment, where necessary.

Employee

It is the responsibility of employee to; use vehicles and equipment for work related purposes, and not to participate in any activities which are in violation of new found land or Canadian laws or this policy.

Vehicle usage

Failure to abide by the following guidelines will result in discipline by the employer and including dismissal;

Any person using government vehicles shall do so only with the proper department authorization and in accordance with fleet management policy.

Persons operating a government owned vehicle must have a valid driver's license, only authorized passengers shall be carried in a government vehicle. All drivers shall comply with the rules and regulations of driving, and traffic laws in the city or town where operating. Any traffic violations shall be the responsibility of the operator and outstanding fines must be paid immediately; safety belt must always be worn when operating a government vehicle, operators are responsible for completing the log books and report forms places in the vehicles by fleet management. Operators shall be responsible to keep the vehicles always clean and tidy, operators are required to comply with maintenance schedules set out for the vehicle. Operators should follow any guidelines with reference to fuel conservation that may be placed in the vehicle; operators may be required to participate in safe driving programs from time to time. And in the case of accidents, involving government vehicles, operators must comply with practices outlined in section 6, accident report, vehicle fleet management policy.

Permanent Assigned Vehicles/ equipment

All government vehicles / equipment operated from a permanently assigned place of work are to be parked at the end of day at work or assigned location. Exceptions are as follows;

On occasion when it is advantageous for an employee to leave directly from his/ her place of residence on government business, the vehicle may be parked overnight at the employee's place of residence and for periods during which the employees is officially on call. The government vehicle may be kept at his/ her place of residence.

During circumstance where a government vehicle is parked at employee's residence, the vehicle shall not be mobile for any other reason than official government business the policy is there for parking only.

No employee shall be permitted to use a government vehicle from his /her place of residence to work on a daily basis unless such use is authorized by the department head.

Travel status

Vehicles /equipment operated by employee on travel status shall be used for government related business only.

Other policies

- Employees should also be aware of the department of transportation and works polices

Transport Management system (TMS)

ZESCO the electricity company is using Transport Management System which was developed and installed by Soluziona a consultation firm of Spain.

Overview

TMS is a technology-based system designed to keep online record of Motor Vehicles to monitor the usage of motor vehicles, to assist in maintenance scheduling and cost control and to record Motor Vehicles involved in accidents.

The objectives of TMS is to make more efficient usage of motor vehicles, make better monitoring of maintenance cost and make optimized usage of resources.

TMS consist of 5 system modules;

1. Vehicle management
2. Motor vehicle maintenance
3. Vehicle utilization
4. Accident's management
5. Reporting

VEHICLE MANAGEMENT MODULE

Vehicle management module is concerned with the adding of the new vehicles, updating of existing vehicles and disposal of the vehicle. The information stored or captured in this module include; identification data, brand, model type, manufacturers information, technical data, Road Licenses, insurance policies and government inspection.

MOTOR VEHICLE MAINTENANCE

This module is generally used to keep track of the vehicles maintenance involving the repair, service and the sub-contacting of repair jobs. The module maintains details on the materials/parts used to repair the vehicles, labor cost for the repairs as well as details on the servicing. Data recorded in this module includes: repairs (in house or sub-contracted), Servicing of Vehicles, Labor incurred, invoices for the sub-contracted repairs and job, invoices for fuel and oils and vehicle valuation

VEHICLE UTILISATION

This module is concerned with keeping track of the usage of the motor vehicle, tracking expenses and their cost centres and allocating motor vehicles. The information captured includes;

- Vehicle used for the trip
- Cost centres and expense codes
- Driver information
- Start and End times and dates
- Start and End Odometer reading
- Fuel and oil consumption
- Performance of vehicle and driver
- Incidents

ACCIDENTS MANAGEMENT

This is the module which is used to keep track of the corporation vehicles involved in accidents. The information maintained by this system module includes;

- The vehicle/s involved
- The Driver and other people involved
- Location, dates and time of accidents.
- Description of the scene
- Damages and police statements
- Other pertinent details

REPORT TOOLS

This module generates report and other outputs based on the parameters dictated by the user. Some of the examples of report that are generated include:

- Utilization and efficiency of the vehicles
- Daily vehicles usage and efficiency
- Transport availability (downtime and available time)
- Operation and maintenance costs
- Summaries by vehicles, cost centre, time period, type of repair, maintenance etc.

TRANSPORT MANAGEMENT SYSTEM BENEFITS

1. Improvement of motor vehicle management by planning the utilization of resources using the system criteria.

2. Saving of time and by reducing manual tasks, having information available at the click of the mouse, improving efficiency of the service.

3. Improvement of corporate management by having global information for decision making.

4. Reduction of maintenance cost by improving planning, reducing spare parts stock, improving productivity.

Source: (Manual Transport Management System TMS) Developed for ZESCO ltd by Soluziona a consultant firm of Spain.

PROBLEMS FACED WITH TRANSPORT MANAGEMENT SYSTEM

As much as the system have been welcomed and it has taken care of many problems the manual system had. The TMS also have problems which have been identified by the current users of the system. Some of these problems include;

1. Insurance cover Reminder

The system does not have provision to remind when the insurance cover will expire.

2. Maintenance Service Reminder

The system does not alert the users when the service is due

VEHICLE MANAGER ONLINE

Vehicle Manager Online is an online analysis tool suite that helps you manage and track the performance and costs of your Vehicles.

At a time when the cost of driving is never far from the headlines maximum cost efficiency is critical to all. Every penny counts and this is where Vehicle Manager Online can be a help to you.

All you need to do is each time you visit a fuel station keep the receipt and make a note of your milometer or Kilometer (Odometer) readings. Input the data into the Vehicle Manger Online Analysis Tool and a whole range of analytical information will be available to you. The data is saved online in a secure database which builds a detailed record of your Vehicle Performance and cost which can then be views in user-friendly graphics and tables to analyze how your vehicles are performing. The online tool will provide a detailed cost analysis and can indicate potential future vehicle service maintenance costs.

FEATURES OF THE FREE VERSION VEHICLE MANAGER ONLINE

- Online System – No software to download or data to store. System upgrades are completely automatic.

- Fuel Usage records database

- Service History records database

- Vehicle Reminder system including Emailing you a reminder

- Business Mileage log database ideal for tax assessments

- Up to Ten vehicles can be loaded

- Analyze and manage cars, Trucks, Vans and Motorbikes.

- Configurable for worldwide measures for instance you can input and measure in US Gallons or analysis Tools.

- Mass upload process- if you have data in another system such as in an Excel spreadsheet then use the mass upload option to submit your data.

- Simple data entry tool ideal for us on the road using a smart phone

- Available anywhere there is an internet connection.

ADDITIONAL FEATURES OF THE PAID FOR VEHICLE MANAGER ONLINE

- A dedicated website with the vehicle manager online application loaded.

- Website configured to a livery and header banner of your choice.

- Dedicated online database

- No advertisements

- Driver fuel Usage Analysis

- Save reporting view for ease of use

- Weekly report views

- Add as many vehicles as required

- Administration account.

The vehicle Manager Online tool is simple to use just load the fuel Usage, coast of the fuel and the odometer reading in kilometers or miles each time you purchase fuel, and this will start the analysis of the costs and performance.

The analysis reporting tool includes many views such as vehicle economy, price of fuel, monthly and yearly costs and performance and plenty more.

Vehicle manager Online will provide a graphical view making it easy to see how your vehicle performance and costs changes over time.

You can also automatically set up indicators in the service indicators Database to use for such items as Loans, Vehicle Insurance and car Breakdown Assistance and service maintenance services. These tools can then predict the next date the service indicator will occur and send you an email reminder.

Literature Critic

As mentioned, and reviewed the TMS and an Online Manager System compared to the Web based Vehicle Management System. The above Systems specifications are not according to user's needs and mostly focus on Vehicle tracking. Administrator's rights are restricted to specification.

BENEFITS FOR THE PROPOSED SYSTEM.

The system will resolve the highlighted problems by providing the solutions that will be distributed in an IT environment. In addition, the system will;

• Have an administrator that will create users of the system different access levels

• Remind users of the system when important tasks are due, for example when the motor vehicle insurance, Road tax and certificate of fitness expires or is due.

• Vehicle assignment to be carried out in a manner that is correct and unbiased

• Allow vehicles to be used only for the intended purpose and not abused

• Reduce the cost of maintenance of the said vehicles

• Allow drivers to remotely know which vehicles are assigned to them and plan in advance

• Maintaining running sheets for all vehicles

• Allow the department to keep track and follow which vehicles are rightfully due for service.

• Identify deficiencies

• Will be able to keep and maintain sufficient performance information which will be complete and accurate to support decision making. In short it will deliver comprehensive report

• It will be easy to carry out regular audit of VUS practices.

The system will allow user to login to the with their collect user login details as supplied by the administrator. The administrator will have the exclusive right to create and even delete a user of the system and do other tasks that users are not able to do.

CHAPTER 3

METHODOLOGY

1 Introduction

In this chapter the research methodology used in the study is described. The geographical area where the study was conducted, the study design and the population sample are described. The instrument that was used to collect the data which includes methods implemented to maintain validity of the instrument and the design methodology chosen for Vehicle Management System (VMS) development.

Research Approach and Design

A quantitative approach was followed. (Burns and Grove 1998) defines qualitative research as a formal, objective, systematic process to describe and test relationships among variables. Surveys maybe used to collect original data for describing a population too large to observe directly (Mouton 1996). A survey obtains information from a sample of people by means of self-report, this is the people respond to questions posed by the investigator. In this study the information was collected through self-administered questionnaires distributed personally to the respondents by the researcher.

The Study Population and Sample Space

According to (Burns and Grove 1998) a population is defining as all elements (individuals, objects and events) that meet the sample criteria for inclusion in a study. A convenient sample of 22 participants was selected. Mouton (Mouton 1996) defines a sample as elements selected with the intention of finding out something. This was composition of 13 Transport coordinators and 9 Drivers from the Companies.

Validity

The validity of an instrument is the degree to which an instrument measures what it is intended to measure (Polit & Hunger 1998). To achieve content validity, questionnaires included a variety of questions on the knowledge of the respondents regarding Vehicle Management System (VMS).

The questions were formulated in simple language for clarity and ease of understanding. Clear instructions were given to the subjects and the researcher made it a priority to explain questions that were not understood by the respondent.

All the respondents completed the questionnaires in the presence of the researcher. This was done to

prevent the respondents from giving other people to fill in on their behalf and to make sure that the questionnaires where returned after they were completed.

Research Process Model

A software process is defined as (Bennett, 2007) a structured set of activities required to develop a software system. The major stages involved are Specification, Design, Validation and Evolution. While as a process model is defined as an abstract representation of a process or represents a description of a process from a perspective.

This project's methodology implementation is the agile way of software design also referred to as soft methodology Dynamic Systems Development Methodology.

Rajasakr.S (2013) defines research as being a logical and systematic search for new and useful information on a topic. Research is done with the help of study, experiment, observation, analysis, companion and reasoning. Rajasakr then describes a methodology as being a systematic way to solve a problem, and a science of studying how research is to be carried out.

Having made a few definitions of some terms above, in this chapter of the proposal, I describe the research methodology or methods that I shall use to implement the Vehicle Management System.

Data Collection Instruments.

Data-collection techniques allow us to systematically collect information about our object of study (people, objects, phenomena) and about the settings in which they occur. There are various data collection techniques that can be used, for example, Observing, Interviewing, administering written questioners. (Chaleunvong, 2009).

The data collection techniques to be used in the project are Interviews and Observations. Observation means selecting, watching and recording behavior of a living being or people, while Interviewing means oral questioning of respondent's ether individually or as a group. The reasons for choosing the techniques are:

1. Interviews were appropriate for data collection because I was able to get real time answers from users regarding the system.

2. Observations were also an appropriate data collection technique because it helped me observe how the users are using the current systems and had given me an idea of how I improved the System.

Waterfall Model

The waterfall model is the first published model of software development process that was derived from more general system engineering process. It is an example of a plan driven process in principle, the waterfall model requires that you plan and schedule all process activities before you start working on them. The figure below shows the diagrammatic illustration if the model. (Sommerville, 2011).
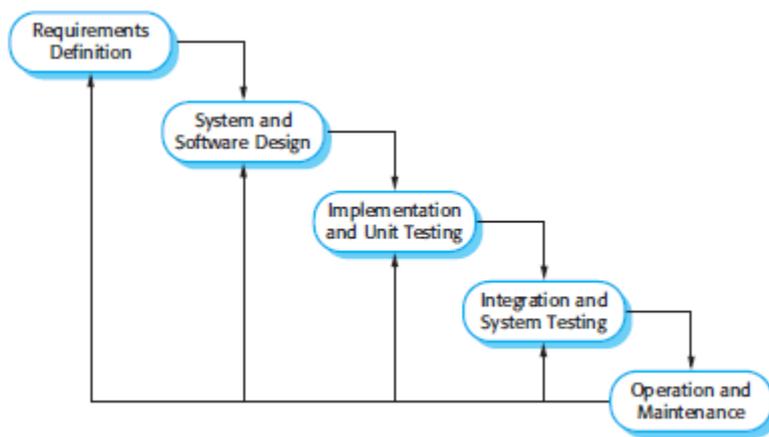
Figure: 3.1

Source: (Sommerville, 2011)

The waterfall model basically has five activities as shown in the figure above.

1. Requirements analysis and Definition: System services, constraints and goals are established by consulting system users. (Sommerville, 2011)

2. System and Software Design: Allocates requirements either to hardware or software, software design involves identifying and describing the fundamental software system abstractions and their relationships. (Sommerville, 2011)

3. Implementation and Unit Testing: Software design is realized as a set of programs or program units, unit testing involves verifying that each unit meets its specification. (Sommerville, 2011)

4. Integration and System testing: Individual program units or programs are integrated and tested as a complete system. After testing, the software is taken to the customer. (Sommerville, 2011)

5. Operation and Maintenance: This is the longest life cycle phase, where the system is installed and put into practical use. Maintenance involves correcting errors which were not discovered in the life cycle. (Sommerville, 2011)

Agile

The term Agile is a term that stands for 'moving quickly', It is a software development methodology that is based on iterative and incremental model of software development. Agile is a lightweight software development model which was developed in the 1990's.   The most important principle of this model is customer satisfaction by giving rapid and continuous delivery of small and useful software.   (McCormick, 2012).

Agile approaches to software development consider design and implementation to be the central activities in the software process.
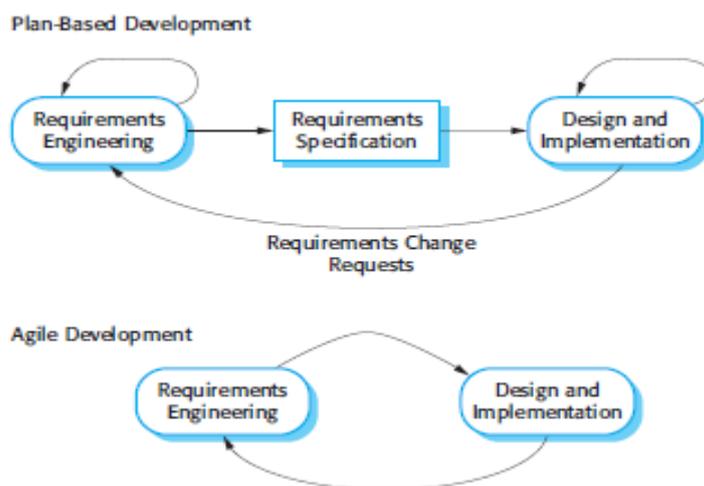
Source: (Sommerville, 2011) .

Figure 3.2

The figure above shows the difference between plan driven and Agile development. In Agile, iteration occurs across activities. Therefore, the requirements and the design are development   separately.

Research Process Model

A software process is defined as (Bennett, 2007) a structure set of activity required to develop a software system. The major stages involved are specification, Design, Validation and Evaluation. While as a process model is defined as an abstract representation of a process or a description of a process from a particular perspective.

The software development methodology to be used to implement the Vehicle Management System is the agile software development methodology.

Why Agile

According to Bennett et 1,2007 problems that had incorporated in traditional lifecycle e.g. waterfall model included unresponsiveness to change and highly bureaucratic approach that was heavily dependent on documentation, meaning without a clearer definition of user requirements which is usually never the case, systems where doomed to fail. The Agile methodology is most appropriate in situations that we need to respond to changing in requirements of a project. This ensures that the efforts of the development team are not wasted, which is the case with other development. (McCormick, 2012).

1. Agile works well with highly volatile requirements of Systems: meaning agile is ideal for projects with high levels of uncertainty and are appropriate for developing the Vehicle Management System. (Harlen K.Fora, 2014)

2. Agile increases reliability: Agile development with its iterative testing and quality assurance practices assists developers to build more quality and reliability through repeated cycles of testing.   (Harlen K.Fora, 2014).

Dynamic Systems Development Method (DSDM)

DSDM is defined as (Bennett et l, 2007) a management and control framework for rapid application development (RAD) meaning it is in fact built from the characteristics RAD has. RAD is an approach to systems development that aims at building a working system rapidly. The system to be built is done incrementally until it becomes a working system.

One of the key innovations of DSDM as given by Bennett and the colleagues (Bennett et l, 2007) is its perspective on project requirements. Instead of seeing the requirements as fixed, and then attempting to match resources to the project, DSDM fixes the resources for the project (including the time available for completion) and sets out to deliver what can be achieved within these constraints, meaning acquisition for requirements is dynamic and subject to change.

DSDM is based upon nine underlying or core principles (DSDM Consortium/Stapleton, 2003): -

1. Active user involvement is regarded as imperative.   Many other approaches especially in traditional methods restrict user involvement in the project design. In DSDM users are members of the project team. One user who sits on the team is referred to as an Ambassador

user.

2.   DSDM teams are empowered to make decisions. A team can make decisions that refine the requirements and possibly even change them without the direct involvement of higher management.   This is beneficial as it cuts down on wasted time waiting for approvals.

3. The focus is on frequent product delivery. A team is geared to delivering products in an agreed upon time period and it thereafter selects an appropriate approach to achieve the same. The time periods are referred to as time boxes and are normally kept short (2 to 6 weeks).   It helps team members decide in advance what is feasible.

4.   The essential criterion for acceptance of a deliverable is fitness for business purpose. Meaning the methodology is geared to delivering essential functionality meeting business needs at an appropriate and agreed upon time.

5.   Iterative and Incremental development is necessary to converge on an accurate business. Iterative development means allows user feedback to inform the development of later increments. The delivery of partial solutions is considered acceptable if it satisfies an immediate and urgent user need. They can be later refined and further developed later.

6.   All changes made during development are kept reversible.   If the iterative development follows an inappropriate path, then it is necessary to return to the last point in the development cycle that was deemed as appropriate (backtracking).

7.   Requirements are initially agreed at a high level. Once the requirements are fixed at a high level they provide the objectives for prototyping. They requirements are then investigated in detail by the development team to determine how best they can be achieved.

8. Testing is integrated throughout the lifecycle.   Since a partially complete system may be delivered, it must be tested during development, rather than after completion.   Developers test each component for technical compliance and the user tests for functional appropriateness.

9.   Collaborative and co-operative approach between all stakeholders is essential. The major emphasis here is on the inclusion of all stakeholders in a collaborative development process.

The DSDM lifecycle
The DSDM lifecycle has five phases:

1.   Feasibility study

2. Business study

3. Functional model iteration

4. Design and build iteration

5. Implementation

Below shows the diagrammatic representation of the relationships between these phases: -

Figure 1: Simplified DSDM lifecycle
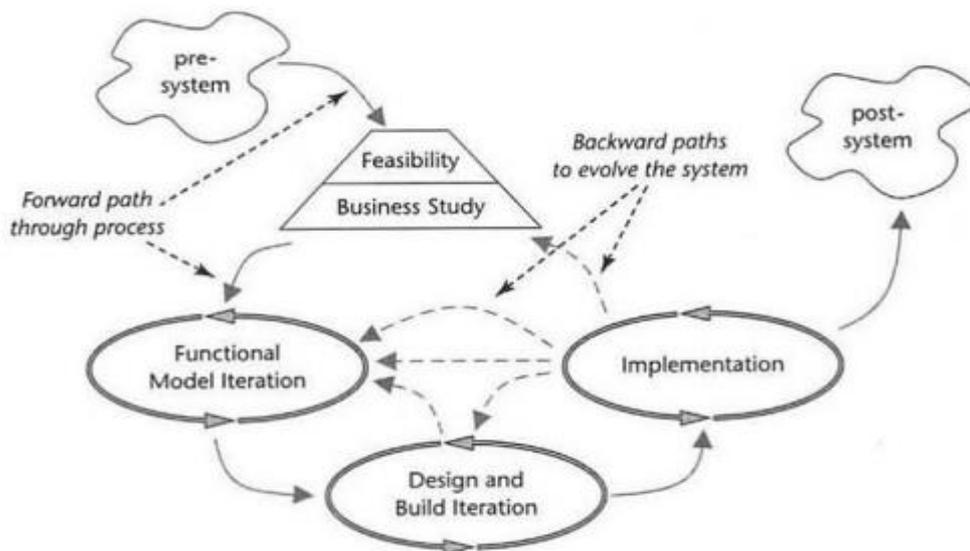
Figure 12: Simplified DSDM lifecycle (DSDM Consortium, 2004)

The feasibility study determines whether the project is suitable for a DSDM approach. This phase lasts for only a few weeks compared to feasibility study in traditional methods which can even go for months. The feasibility study should answer the following questions (Bennett et l, 2007): -

i. Is the computerized information system technically possible?

ii. Will the benefit of the system be outweighed by its costs?

iii. Will the information system operate acceptably within the organization?

The business study phase identifies (Bennett et l, 2007) the overall scope of the project and results in agreed high-level functional and non-functional requirements. This is the phase where maintainability objectives are set; these determine control activities for the remainder of the project. The three levels of maintainability are: -

i. Maintainable from initial operation

ii. Not necessarily maintainable when first installed but this is addressed later.

iii. Short life-span system that will not be subject to maintenance

The Functional model is concerned with development of prototypes to elicit or mimic detailed requirements. The prototypes are delivered as operational systems; hence they are developed sufficiently robust for operational use and to satisfy any non-functional requirements e.g. performance. When completed it models high level (Bennett et l, 2007) analysis models and documentation, combined with prototypes that are concerned with detailed functionality and usability. The activities (Bennett et l, 2007) that are under during this phase are: -

     i. The functional prototype is identified.

     ii. A schedule is agreed

     iii. The functional prototype is created

     iv. The functional prototype is reviewed

The **design and build iteration** phase are concerned with developing the prototypes to the point where they can be used operationally.   The distinction between this model and the functional model is not clear, they can work concurrently.

The **implementation phase** deals with installation of the latest increment, (Bennett et l, 2007) that includes user training. It is at this point were a critical review of how far the requirements have been met. If some requirements haven't been met the project may return to the design and build iteration phase and if they have been met the project is considered to have finished.

Below show the utilities that were used in coming up with the project.

Project Development Utilities.

Development Language

- Object Oriented PHP.

Database Management Tool

- MYSQL

Development Platform

- Net beans IDE and Notepad++

Graphical User Interface Tools.

- HTML

4.0 CHAPTER 4

ANALYSIS AND DESIGN

Object-oriented analysis and design (OOAD) is a popular technical approach to analyzing, designing an application, system, or business by applying the object-oriented paradigm and visual modeling throughout the development life cycles to foster better stakeholder communication and product quality.

4.1 Systems Analysis

Systems analysis is a process of collecting factual data, understand the processes involved, identifying problems and recommending feasible suggestions for improving the system functioning. This involves studying the business processes, gathering operational data, understand the information flow, finding out bottlenecks and evolving solutions for overcoming the weaknesses of the system to achieve the organizational goals. System Analysis also includes sub-dividing of complex process involving the entire system, identification of data store and manual processes.

The major objectives of systems analysis are to find answers for each business process: What is being done How is it being done, who is doing it, when is he doing it, why is it being done and How can it be improved? It is more of a thinking process and involves the creative skills of the System Analyst. It attempts to give birth to a new efficient system that satisfies the current needs of the user and has scope for future growth within the organizational constraints. The result of this process is a logical system design. Systems analysis is an iterative process that continues until a preferred and acceptable solution emerges.

4.2 Systems Design

Based on the user requirements and the detailed analysis of the existing system, the new system must be designed. This is the phase of system designing. It is the most crucial phase in the developments of a system. The logical system design arrived at as a result of systems analysis is converted into physical system design. Normally, the design proceeds in two stages:

➢ Preliminary or General Design
➢ Structured or Detailed Design

Preliminary or General Design: In the preliminary or general de-sign, the features of the new system are specified. The costs of implementing these features and the benefits to be derived are estimated. If the project is still considered to be feasible, we move to the detailed design stage.

Structured or Detailed Design: In the detailed design stage, computer-oriented work begins in earnest. At this stage, the design of the system becomes more structured. Structure design is a blue print of a computer system solution to a given problem having the same components and inter-relationships among the same components as the original problem.

4.3 USE CASES

A use case is a description of the functionality (a specific usage of a system) that a system provides. The use case descriptions may exist in textual form (simple table), where the use case diagrams provide additional information about the relationship between use cases and external users. The diagram also allows definition of the system's boundary. Use cases are described only as viewed externally by the user (a system's behavior as the user perceives it), and do not describe how the functionality is provided inside the system. Use cases are not object oriented, but they are included in the UML to simplify the approach of the project's lifecycle -- from specification to implementation (Magic Draw, 2005). Web Based Vehicle Management System in terms of use cases is being modeled from two perspectives firstly is from a Transport Officer interaction with system, a Driver interaction with the system and lastly a Department Team Leaders interaction with the system as well. Below show various use cases that Web Based Vehicle Management System is using and their descriptions.

The use case diagram for the vehicle management system has:

- Login and logout function
- Create user
- Change password
- View user
- Request for the vehicle
- Approve the request
- Assign drivers
- Report on assigned and unassigned vehicles

Non-function Requirement of proposed System

Dawson 2005 defines non- functional requirement as "requirements that refers to various constraints, standards, limitations (cost, delivery date, configuration, language, resources etc), performance requirement verification requirement (that ensure conformity with the system specification) and validation criteria (which form a basis for system testing after the system has been written and tested)'.

Identification of actors and user cases

The system will have a set uses and there use cases. The actors of the system include:

- Department Manager (Team lead)
- Transport Coordinator and
- System Administrator

Below are the respective use cases diagrams for the above actors.

User

Department Manager use case

login

Request for A vehicle

Transport Coordinator (Admin)

View Requests

Login

Add users and Vehicles

Approve Requests

Assign Driver

View Reports
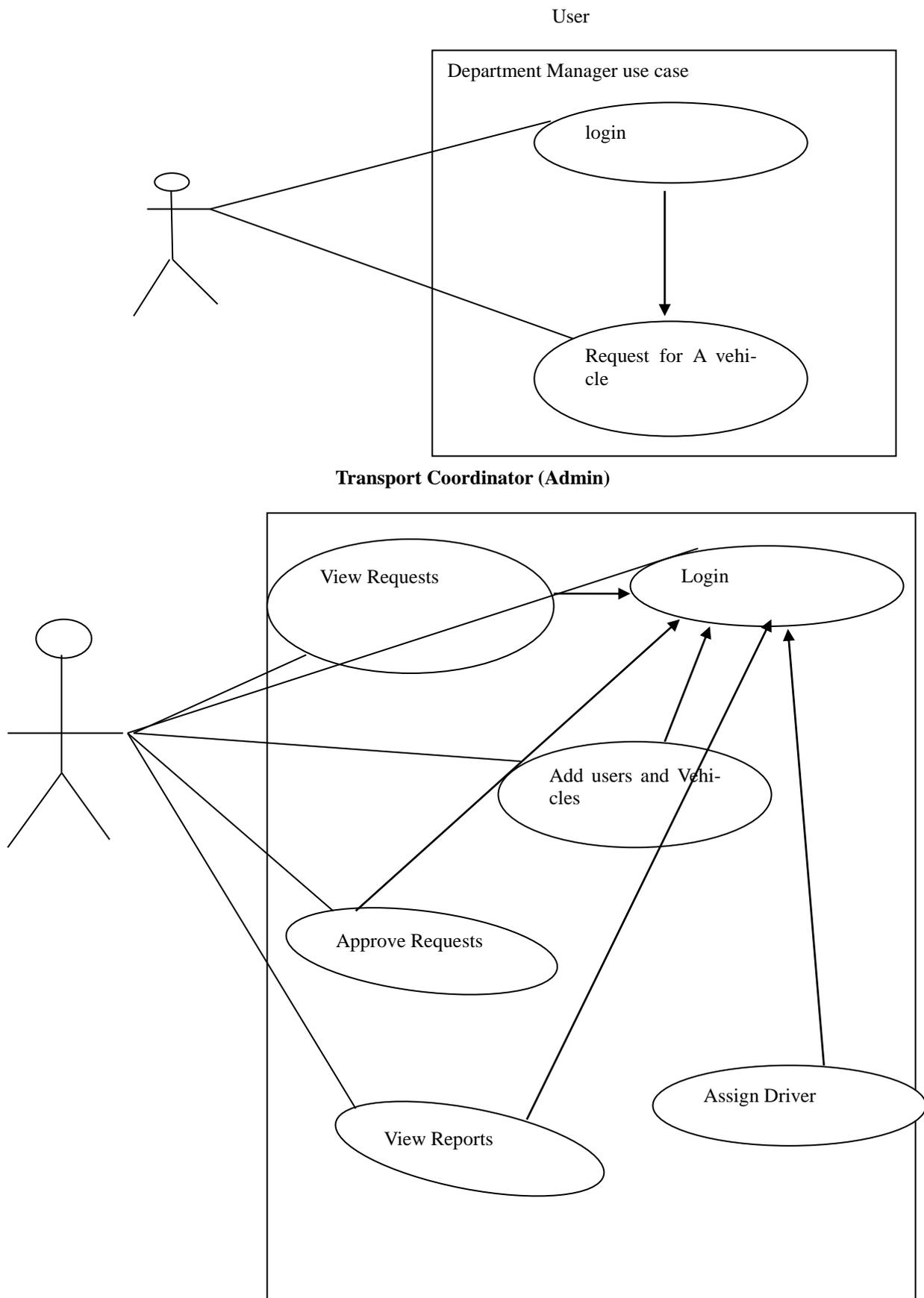
4.4 DATABASE DESIGN DIAGRAM.

The Vehicle management system database has been designed using the MYSQL database, the diagram below shows the database architecture and tables used.

Entity Relationship Diagram

An entity relationship diagram (ERD), also known as an entity relationship model, is a graphical representation of an information system that depicts the relationships among people, objects, places, concepts or events within that system. An ERD is a data modeling technique that can help define business processes and be used as the foundation for a relational database.

Entity relationship diagrams provide a visual starting point for database design that can also be used to help determine information system requirements throughout an organization. After a relational database is rolled out, an ERD can still serve as a referral point, should any debugging or business process re-engineering be needed later.

Below is an entity relationship diagram of the Vehicle management system.

VEHICLE MANAGEMENT SYSTEM ERD
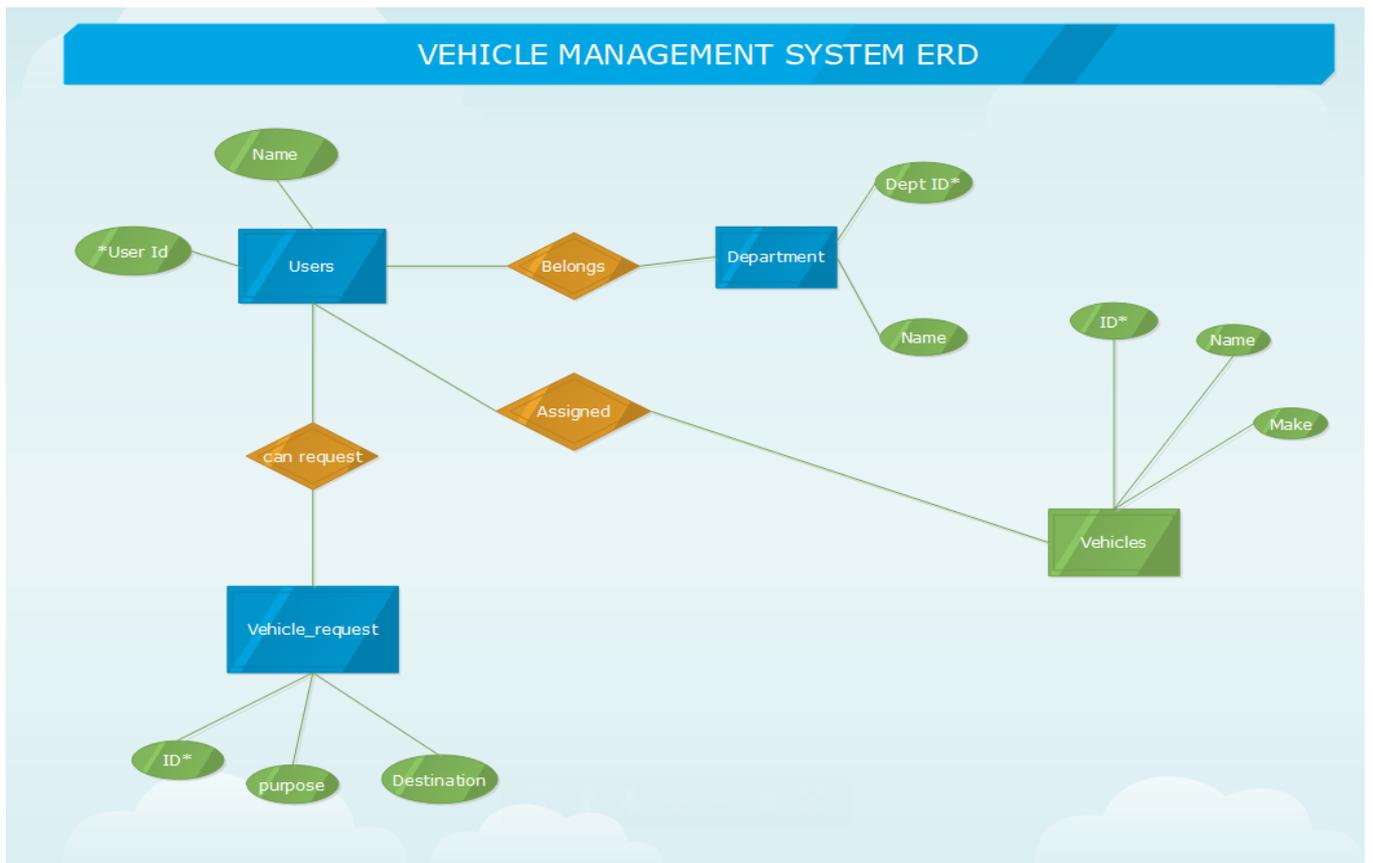
CHAPTER 5
DESIGNED PROTOTYPE

1.1. Testing

It is the process of performing a variety of tests on a system to explore functionality or identify problems. It is usually done before and after a system is put in place. There are several testing strategies that are employed during the implementation of any system within the project.

As every system is designed its prudent to test the system before fully deploying it. The designed prototype will be tested with the intension of finding errors in the system. Find attached the test plan in the addendum section.

Input	Code/Method	Expected Output	Actual Output	Pass/Fail
Username, Password and Role	authenticateUser(username.password)	Successfully Login	Success	Pass
Adding of Users	Add User(user details) DeleteUser(userId)	User added successfully	Success	Pass
Request for Vehicle	RequestForVehicle(vehicle details)	Successfully request for vehicle.	Success	Pass
Department Management.	AddDepartment(Department Details) DeleteDepartment(departmentId)	Successfully add / delete departments from System.	Success	Pass
Vehicle Approval/ decline	RequestVehicle(RequestDetails)	Successfully Approval/Decline	Success	Pass
Department Management	AddVehicle(Vehicleid) DeleteVehcle(delete)	Successfully Delete	Success	Pass
Department Management	ViewReport(Approves/DelinedApprovals)	Successfully Report	Success	Pass
Admin/User Invalid Login	Login(AdminDetails/UserDetails)	Successfully Login	Success	Pass

CRITICAL EVALUATION

This chapter will discuss on the experiences whilst doing the project, challenges encountered and how they were resolved.

Below is detailed account of various challenges encountered whilst doing the project and how they were resolved.

There was a challenge in the following:

There was a challenge acquiring information from drivers and other relevant stake holders as they were not usually available to provide enough information for the project implementation.

Learning new technologies such as PHP, HTML and others while implementing the system has been time consuming and a constraint implementing the project.

Information relevant for literature review is scarce on the internet and from libraries.

Transport and stationary costs have been a challenge for requirements gathering for the vehicle management system.

CHAPTER 7
CONCLUSION

7.2 Main Learning outcome

Doing a project of such magnitude for the first time hasn't been an easy task but there has being a lot of lessons learnt along the way, lessons of effective time management, the essence of full stakeholder involvement so as not develop a product that won't be accepted by the users but on that reflects and aids on their day to day tasks.

But above all undertaking this project has been the best thing that I have done so far in my academic career as it has opened my eyes to a lot things that happens in the development theme where the main theme is to put the user as top priority in all the stages of the system's design.

I have also learnt the basic web application development techniques using PHP, HTML and MYSQL database.

7.3 FUTURE WORKS

- In future will add the tracking module so that the vehicle is monitored from wherever it is and the time spent on certain location using GPRS and other monitoring tools.
- Fuel will be monitored also using the gauge.
- Sending of SMS when a violation is done on the vehicle for example over speeding and overloading.

7.8 Conclusion

In conclusion, with what has been implemented on this project all the proposed project objectives have been met successfully.

REFERENCES

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DESIGNED PROTOTYPE

Appendix I: Interview Guide

Graphical User Interface.

Login page.
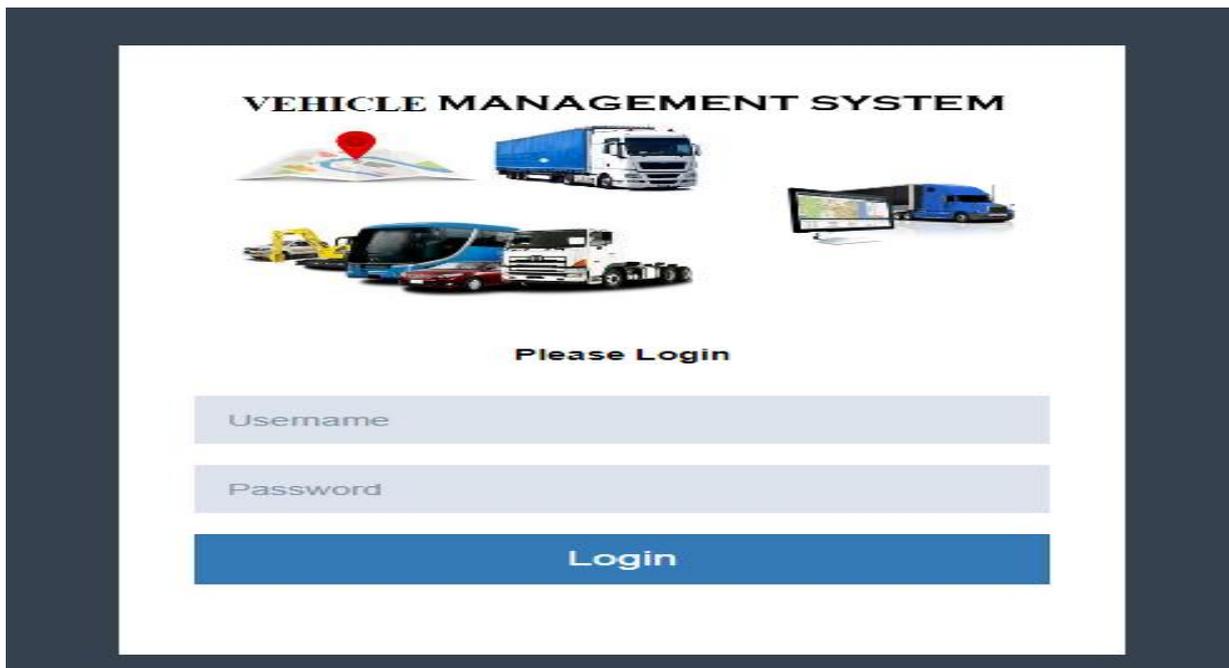
Login Error Validations (Admin)

Admin Interface

Admin Add User

Delete User
Department Tab

Add Department

Delete a Department

Vehicles Tab

Reports Tab

Reminder Tab

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USER DASHBOARD

User Interface

Vehicle Requested	Vehicle Reg No	Request Date	Destination	Purpose	Status
Spacio	ABCALK	2018-08-27 15:01:12	Kabwe	Cargo transfer	Pending Approval
Toyota Land Cruiser	ABC2211	2018-08-25 18:58:13	Chudleah	To get some money for company.	Declined Approval
Truck	BAD 2000	2018-08-27 12:25:30	mansa	customer service	Declined Approval

Showing 1 to 3 of 3 entries

← Previous 1 Next →

Vechile Management System @ 2018

Vehicle Request
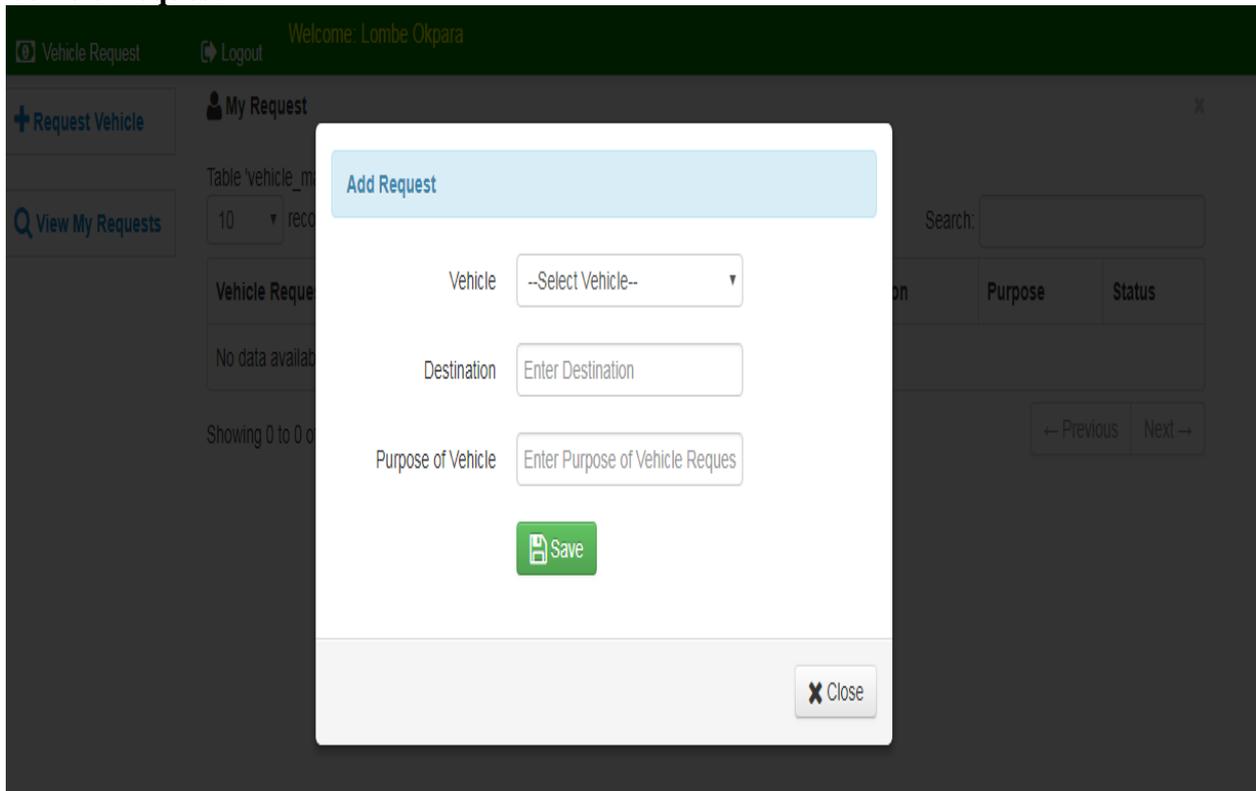
Source Codes for sending Request

```php
$userId = $_SESSION['userId'];
$user_query = mysql_query("select * from vehicle_requests_tb INNER JOIN vechiles_tb"
    . " on vehicle_requests_tb.vehicle_id = vehicles_tb.id  AND vehicle_requests_tb.user_id='$userId' ")or die(mysql_error
while ($row = mysql_fetch_array($user_query)) {
    $id = $row['id'];
    ?>
    <tr class="del">
        <td><?php echo $row['name']; ?></td>
        <td><?php echo $row['reg_no']; ?></td>
        <td><?php echo $row['date_request']; ?></td>
        <td><?php echo $row['destination']; ?></td>
        <td><?php echo $row['purpose']; ?></td>
        <td><?php
            $status = $row['status'];
            if ($status == "Active") {
                echo '<h5 style="color:green">Approved</h5>';
            }else if($status=="declined"){
                    echo '<h5 style="color:red">Declined Approval</h5>';
            }
             else {
                echo '<h5 style="color:red">Pending Approval</h5>';
            }
        ?></td>
    </tr>
    <?php } ?>
</tbody>
</table>
<script type="text/javascript">
</script>
</div>
</div>
</div>
</div>
<?php include('footer.php') ?>
```

Appendix II: Interview Guide

This interview was done using questionnaires to get user requirements from the stakeholders who in this are Transport and Logistics.   Below is a sample of the questions that were asked.

1.   How many employees does your Organization have?

       Less   than 50
       Less than 50 but less than 150
       Greater than 50 but less than 150
       Greater than 150 but less than 500
       Greater than 500 but less than 1000
       Greater than 1000

2.   Do you think Web Based Vehicle Management System can help you in your work to collaborate with fellow Drivers and Departments?

       Yes
       No
       Do   not know

3.   Are you aware of the impact that Computer applications have on Information sector?

          Yes
          No

4. Does your Organization have a policy for e-governance?

       Yes
       No