CERTIFICATION

The undersigned certifies that has read and hereby approves for acceptance by Ardhi University a dissertation proposal titled: "**WEB AND MOBILE APPLICATION FLEET MANAGEMENT SYSTEM FOR ARDHI UNIVERSITY**". In fulfillment of the requirements for the degree of Bachelor of Science in Computer Systems and Networks of Ardhi University.

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1.0 INTRODUCTION

1.1 General Introduction

Fleet management is a critical aspect of many organizations as it directly impacts their efficiency and productivity. Fleet management is crucial for the development of any organization as it helps to optimize the use of vehicles and other assets, reduce operating costs and increase efficiency. With proper fleet management, organizations can keep track of vehicle usage, maintenance schedules, fuel consumption, and driver behavior, allowing them to make informed decisions about their fleet. This can lead to cost savings through reduced fuel consumption and improved vehicle utilization. By implementing effective fleet management practices, organizations can improve and facilitate efficiency in their productivity.

According to Silva (2018), the management and monitoring of the vehicles in the Ceylon Electricity Board are done manually. Then problems such as data duplication, lack of integrity, data inconsistency, and missing data have become major problems. To overcome the above-mentioned problems web-based system was implemented. Also, In Kenya, transport companies must face new challenges requiring constant tracking, and cost savings while guaranteeing timely delivery and having backup plans for any anticipated problem. There are also heightened security concerns. This has caused a focus on Intelligent fleet management systems to cut operational costs and better manage their vehicle fleets (Nelson, 2000).

For the newly proposed solution, some gaps are going to be filled as one of the key unique features of this new system is its cost efficiency. Unlike other systems that rely on proprietary technologies such as cloud platforms for management, this system will utilize free and open-source technologies. This will greatly reduce the cost of implementing and maintaining the system.

Additionally, the system will also include a mobile app for drivers. This app will help staff to streamline the manual paper-based procedure for vehicle booking. Also, will allow drivers to navigate to different routes, as well as send reports to managers about the status of their vehicle and any issues that may arise. This will greatly improve communication and coordination among drivers and managers, leading to a more efficient and effective fleet management system. Overall, this new system will fill the gaps in the existing manual system and will improve the University's operations and performance.

1.2 Problem Statement

Current fleet management systems used by many public and private organizations in Tanzania, specifically Ardhi University are outdated and inefficient as they rely heavily on manual processes, such as paper-based booking of vehicles by staff, which this process is time-consuming as involves many procedures to follow. This not only consumes a significant amount of time, but also prevents such organizations from accessing important smart services such as scheduled vehicle maintenance, routing planning, real-time tracking of vehicles, fuel usage estimation, and others. Whereby having such kind of services to an organization result to facilitate effective productivity

There are several existing systems for fleet management. Among the major limitations of the existing fleet management systems is their high cost. This makes it difficult for small and medium-sized businesses to adopt them. Another is, some are incompatible with modern technologies such as IoT and AI. This is because they are often designed and developed using outdated technologies that are not compatible with these modern technologies, where which limits their ability to effectively manage their fleet. An effective IFMS would ensure that transport companies experience operational success through reduced transportation costs, business process improvement, and improved customer service (Said, Nicoletti, & Perez-Hernandez, 2014).

The lack of effective fleet management systems has led to several challenges for organizations. Poor maintenance scheduling is one of the major challenges, leading to frequent breakdowns and unexpected downtime of vehicles, resulting in a loss of productivity. Additionally, poor maintenance scheduling may also lead to increased fuel costs due to decreased efficiency and performance. Another challenge faced by organizations without effective fleet management systems is the difficulty in tracking and reporting. This makes it challenging for organizations to monitor their fleet and gain insights into their performance. As a result, they are unable to identify and address potential issues on time, leading to further inefficiencies. where, these challenges highlight the need for a more effective and cost-efficient fleet management system that can address these issues and provide organizations with the tools they need to manage their fleet effectively in their business (Jonsson & Waters, 2009).

1.3 Objectives

There are two types of objectives which are general and specific objectives.

1.3.1 General Objective

The general objective of this research is to develop a web and mobile application fleet management system for Ardhi University.

1.3.2 Specific Objectives

i. To gather system requirements for the fleet management system.
ii. To design the fleet management system.
iii. To implement the fleet management system.
iv. To test and validate the fleet management system.

1.4 Research Questions

i. What are the main challenges and issues with the current manual fleet management system?
ii. What are the most appropriate technologies and approaches to be used in the design of the new fleet management system?
iii. What are the most efficient and cost-effective methods for implementing the new system?
iv. What are the most appropriate methods and techniques for testing and validating the system's functionality and performance?

1. 5 Significance of the Study

The significance of this study lies in the fact that it addresses a critical problem facing Ardhi University the inefficiency and limitations of its current manual fleet management system. By implementing a new, technology-based system, the university will be able to streamline the process of booking vehicles and access important smart services such as scheduled vehicle maintenance, routing planning, and real-time tracking of vehicles. This will greatly improve the overall efficiency and productivity of the fleet management system, leading to a more effective and efficient operation for the university.

Another important aspect of this study is the cost efficiency that it brings. By using free and open-source technologies in implementation such as MySQL database, Laravel which is the PHP framework, and flutter framework instead of proprietary technologies such as Oracle DBMS and online cloud platforms, the cost of implementation and maintenance will be greatly reduced. This will allow the university to allocate more resources to other important projects and initiatives.

Finally, the study will provide a valuable opportunity to gather important user feedback and performance data to monitor and evaluate the system's performance. This will allow the university to make necessary adjustments and improvements to the system over time, ensuring its longevity and effectiveness. Overall, this study will have a significant impact on the university's operations and performance, leading to improved efficiency and cost savings in the long run.

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter covers previous studies done by other writers that have a similar topic to this project where I used these studies as a source of information for my project.

2.2 Related Works

The fleet management system by Ramanathan, Kamar, et al. (2016), authors of this work were concerned with the development of a system that applies to fleet management in general where, their system incorporated the power of a concurrent Global Positioning System (GPS), Global system for mobile communications (GSM), Arduino Uno R3 micro-controller and also web-based management software. In which the GPS was used to capture the coordinates of each vehicle location and then submit them to the web-based software for further processing. The system was capable of functionalities such as routing, dispatching, and tracking.

Fleet management by Challa (2016), the author developed the system which consisted of an android app, a server application, and a client application. The server application exposes a REST API (Web Services developed using Representational State Transfer (REST) protocol) using, which the consuming client applications can make use of various functionalities as services across the network. The Android app was to be installed in the smartphone present in each vehicle of the fleet, this app was required to send live location data to the database using the REST API. The manager uses the client application (web application) to track the vehicles in real-time, the manager can also choose to track a particular vehicle.

Web-Based Fleet Management System for Ceylon Electricity Board (CEB) in Sri Lanka by Silva (2018). This project involved the development of a web-based fleet management system in which the entire system was mainly divided into vehicle registration management, vehicle allocation, booking details, running & fuel management, vehicle management, and report generation. In the implementation of this project, the three-tier architecture with XAMPP, MySQL workbench 6.0 community edition, and .NET technology were used to develop this system. The object-oriented concept was also used to draw use case diagrams, sequence diagrams, class diagrams, etc. Microsoft Visio 2013 was used as the modeling software at the analyzing and designing stage of the project.

Ganorkar, A. (2020), developed a live Tracking System. He employed the use of GPS technology in conjunction with a common feature of smartphones, SMS messaging. A parent-side application allows guardians to send a request for a child's location, which is then retrieved and displayed on a Google map. Meanwhile, the child's device collects GPS data, including latitude and longitude, as well as the time, and sends it to the pre-registered parent phone via SMS. This method of communication allows the system to function without internet access and can be utilized on

smartphones that do not have GPRS capability. The system will send the location of the child's phone to the parent's phone upon request.

In the vehicle management system for bus operators of Luwinzo bus services company by Seif (2013), this project was about the implementation of a vehicle Management System for Luwinzo Bus Service Company located in Kenya. Where the company's work was dominantly handled using a paper-based system to keep records of different transactions made each day whereby all the jobs of the bus routes management were done manually. Then, the author solved the problem by developing a java desktop application that was used to automate all daily company record-keeping activities such as bus management, route management, employee management, and passenger management. In the implementation, the author managed to use the java programming language to develop a desktop application, Ms. Access 2007 for database management, and java JDK 7 as a development kit for the NetBeans IDE.

Design and Implementation of a Fleet Management System Using Novel GPS/Global Navigation Satellite System Tracker and Web-Based Software by Saghaei (2016). This article presents a method for managing and monitoring a fleet of vehicles through the use of three components which are GPS-enabled vehicle trackers (referred to as Rad100), GPRS/SMS and GSM cellular technology, and web-based software. This approach allows for the precise tracking of vehicles on various maps, as well as the ability to generate detailed reports on the vehicle's mission, route, fuel efficiency, speed limits, and other relevant data as requested by the client. The key advantages of this proposed system include its worldwide coverage, precise location tracking, user-friendly interface, and efficient energy management.

Mustafa, A., Aal-Nouman, M. I., & A. Awad, O. (2020), developed a cloud-based vehicle tracking system. The authors of this paper presented an integrated vehicle tracking system in real-time to track vehicles anywhere at any time. This system is mainly divided into two parts: vehicle tracking part and monitoring part. The tracking part is represented by the installation of the electronic devices in the vehicle using Arduino UNO R3 and SIM800L GSM/ GPRS modem. the coordinates are changed to add a type of protection to the information before sending it via a General Packet Radio Service (GPRS). The monitoring part is in the cloud and will receive the coordinates and displays it on a Google map on a web page.

Smart vehicle Tracking System by Kamble (2012), in this project the author used a microcontroller for interfacing with various hardware peripherals. The design was just an embedded system in which a microcontroller was interfaced serially to a GSM Modem and GPS Receiver. A GSM modem is used to send the position (Latitude and Longitude) of the vehicle from a remote place as was recorded by the GPS modem from the satellite.

2.3 Research Gap

For the newly proposed solution which will be implemented, most of the functionalities as done by other researchers in the past are going to be placed, although there will be some unique features and hence the filled gap as compared to many other previously done solutions. For example, most of the past projects were concerned mainly with either the hardware or software part of the system, unlike this project, both parts are going to be combined with all important functionalities as apart from the IoT part of the system, the system will also include an android mobile application as well as a web application for users. By using free and open-source technologies such as frameworks, the system will also be going to be highly cost-efficient when compared to other systems which involved the use of proprietary technologies such as cloud platforms for management. Also, since the system will utilize IoT technology which is one of the emerging technologies, hence it will be much easier to expand the system and integrate it with other technologies such as AI, where this technology was not adopted by most previous projects.

3.0 METHODOLOGY

3.1 Introduction

A specific methodology will be used to reach each objective. Key concepts and research methodologies will be employed to develop the fleet management system. This chapter describes the tools, such as software and programming languages, that will be utilized to achieve the overall goal of the study.

Table 3.1 Summary of Methodologies used in the system

S/No	SPECIFIC OBJECTIVE	METHODOLOGY	TOOLS	DELIVERABLE
1	To gather users' requirements	Interview, Questionnaires, Literature Review	Notebook, pen, Google forms	User requirements specification document
2	To design the system	Object-oriented system analysis and design methodology and unified Modelling language	Star UML and Draw.io	System designs document
3	To implement the system	Agile	PHP, Google Maps API, Laravel, JS, HTML, CSS, Flutter, VS Code, Android Studio, MySQL DBMS, SQL	Fleet Management System
4	To test and validate the system	Alpha testing	Computer, Android smartphone,	Test and validation results

4.0 SCHEDULE OF ACTIVITIES

This chapter describes the various scheduled activities that have been planned for this system. These activities are carefully planned to ensure that the project will be completed within the specified timeframe and budget. To keep track of the progress of the project, a Gantt chart has been prepared that outlines the various tasks involved in the project and the expected duration of each task. This Gantt chart will provide a clear and concise overview of the project timeline and help to track the progress of the project.

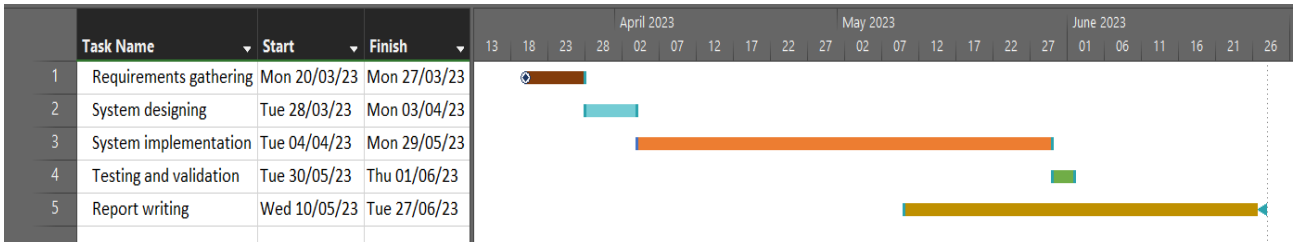

Figure 4.1 Gantt Chart to show scheduled activities

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