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PERIODIC VEHICLE SERVICE MAINTENANCE SYSTEM FOR SWEDISH MOTOR ASSEMBLIES

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This report is submitted in partial fulfillment of the requirements for the Bachelor of Computer Science (BITS)

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DECLARATION

I hereby declare that this project report entitled

DEVELOPMENT OF
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is written by me and is my own effort and that no part has been plagiarized without citations.

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DEDICATION

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ABSTRACT

This report is produced for Swedish Motor Assemblies in order to have a systematic vehicle management to support the maintenance scheduling process of vehicle service operations. This report had clarified the process of Periodic Vehicle Service Maintenance System (PVSM) for Swedish Motor Assemblies from beginning of the project until the end of the problem's closed. The PVSM is developed to enhance business management of scheduling and tracking services according to vehicle mileage. System is integrated from manual and paper-based into computerized systems in order to enhance the current process to become systematic and efficient. Swedish Motor Assembly (SMA) Sdn Bhd, KUTKM Transportation Unit are referred as a resource to gain the information and requirements of PVSM development. Currently, most vehicle servicing organizations in service centers are still using manual process in order to performing maintenance and track service details including the service history. It is insufficient and unsystematic process flow whereas the PVSM is required to enhance and transform the business flow of existing manual process. PVSM aim is to implement vehicle analysis as part of the system towards enhancing the capability of some modules and combine separate service filings into a single point of control. Rapid Application Development (RAD) is chosen as a methodology to develop the PVSM. This system is particularly used by service staff and admin. The main functionality of this system is maintenance scheduling system which provides auto-scheduling, service history tracking, service reminder and vehicle analysis. As a conclusion, the PVSM system provides the best practice scheduling management processes to manage the entire scheduling resolution process and to perform service.

ABSTRAK

Kertas kerja ini dihasilkan untuk Swedish Motor Assemblies Sdn Bhd yang bagi mengaplikasikan sistem penjadualan berkala untuk operasi servis kenderaan yang lebih efisien. Dokumen ini menerangkan proses-proses yang berlaku untuk membangunkan setiap fasa proses Periodic Vehicle Service Maintenance System (PVSM) dari permulaan projek sehinggalah ke fasa akhir. PVSM dibangunkan untuk memperbaiki sistem pengurusan penjadualan servis dan pencarian rekod servis berdasarkan masa dan bacaan *mileage* kenderaan. Sistem telah diintegrasikan dari sistem manual kepada sistem berkomputer untuk menjadikan sistem dan maklumat sedia ada lebih efisien dan sistematik. Sebagai keperluan untuk sumber rujukan dan keperluan projek, Swedish Motor Assembly (SMA) Sdn Bhd, Unit Kenderaan KUTKM dan beberapa organisasi lain telah dipilih. Sebelum ini, kebanyakan pusat servis masih lagi menggunakan sistem secara manual yang berasaskan kertas untuk bagi merekod proses penjadualan dan pencarian rekod servis yang terdahulu. Oleh itu banyak kekurangan yang berlaku kerana ia tidak sistematik dan tidak lagi sesuai untuk diaplikasikan sekarang di mana akan ditampung oleh PVSM yang akan menukar sistem menjadi lebih baik. Objektif PVSM adalah untuk memastikan pengurusan kenderaan yg baik serta analisis kenderaan sebagai modul dalam sistem yang akan membantu meningkatkan keupayaan sistem dan menggabungkan semua sistem fail lama yang tidak lagi relevan menjadi suatu sistem yang bersepadu. Application Development (RAD) telah dipilih sebagai metodologi sistem untuk PVSM. Pengguna utama sistem adalah staf syarikat. Fungsi utama sistem adalah aplikasi untuk penjadualan servis kenderaan menghasilkan penjadualan automatik, pencarian maklumat mengenai maklumat servis, maklumat *alert* dan jangkaan hayat kenderaan. Sebagai rumusan, PVSM menyediakan keseluruhan proses pengurusan servis yang baik dan praktikal untuk keperluan semasa untuk menjalankan servis kenderaan.

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NO	TERM	DESCRIPTION
1	PVSM	Periodic Vehicle Service Maintenance System
2	OOAD	Object-oriented Analysis and Design
3	OOADA	Object-oriented Analysis and Design with Application
4	UML	Unified Modeling Language
5	ERD	Entity Relationship Diagram
6	SMA	Swedish Motor Assemblies
7	CMMS	Computerized Maintenance Management System
8	SMS	Short Message System
9	RAD	Rapid Application Development

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CHAPTER I

INTRODUCTION

1.1 Overview

In today's technology-driven world, vehicle has become as essential part of our life that enables us to ease our life flow. Thus, vehicle industry has been growing very fast due to increasing needs of the automotive market among customers. Among the most important parts of vehicle lifecycle is vehicle maintenance.

A properly maintained vehicle will be more dependable, safer, last longer and increase satisfaction with their product. Vehicle manufactures and owners have a responsibility to make sure emissions controls receive regular service and are functioning properly. Regular maintenance helps accomplish these goals by keeping the engine running efficiently and eliminating critical problems that may leave driver stranded in the middle of the road.

In applying vehicle maintenance, detailed maintenance schedules outlining specific operations on various components and systems will be created. These services are done at different time and mileage intervals and to ensure proper operation and prevent premature wear.

Therefore, in order to provide outstanding service, a system is created to fulfill the requirements of implementing a maintenance service tool for vehicle either for vehicle owners or organizations. This system is called Periodic Vehicle Service Maintenance System (PVSM). The main objective of developing this system is to provide computerized management for vehicle maintenance. It will shift the traditional way of managing vehicle maintenance from manual to system.

The system is able to indicate full schedule of service and vehicle maintenance better known as recommended or maintenance schedule support for the vehicle. This will enhance the performance of the vehicle itself and ensure appropriate vehicle management.

1.2 Project Background

This application developed for Swedish Motor Assemblies (SMA) which is committed to have an efficient vehicle maintenance management and further enhance customer satisfying experience.

A computerized vehicle service maintenance system capability is to provide detailed data for vehicle such as its make and model to ensure that vehicle repairs and maintenance are always compliance with the vehicle's usage. Besides, it will help to ensure trouble-free operation of vehicle by auto-scheduling of the service and maintenance date based on the vehicle mileage and day of usage.

Vehicle Service Maintenance System is proposed combined with maintenance and service features. This is essential for keeping track of vehicle maintenance history in terms of its condition based on service received. To be specific, this system is equipped

with the ability of displaying alerts for service due and customized service reminder based upon their previous maintenance date.

This research and design of service schedule is based on time interval. The system will give recommendation and alerts through the calculated interval on vehicle's maintenance management either on list of vehicle due for service, service schedule, service type, next service schedule and other significant detail based on time and mileage of the vehicle.

The system will include all the relevant information obtained from vehicle for example, makes and models, with common options of functions .Other data includes the latest service procedures or details, scheduling and graph generating.

1.3 Problem Statements

Most vehicle fatalities as well as vehicle breakdowns are mainly caused by vehicle maintenance neglect. Therefore following simple and inexpensive preventive checks will greatly extend the life of the vehicle, ensure safer operation and even benefit the environment.

The aim of this project is to provide a system and solve existing problem of manual approach. The problems identified are:

i) **Inconvenient of service log book**

Each vehicle has a service book or also known as service manual. For each time of service, the organization will get service list complete with prices while the service center will get another copy. The mechanic will tick on the conditions that he have checked or serviced previously and inform when is their next schedule of service manually. At this point it is

apparent that the problem lies on the way of recording service details which is on paper.

ii) **Time Consuming and inefficient**

Existing maintenance service program is based on paper. Service maintenance particular such as previous maintenance and next due date are recorded in several service logs that require service staff to fill each forms according to service done.

iii) **Inability to generate maintenance scheduling and service**

Using the manual paper-based way, service history records and maintenance scheduling will have to be calculated manually. Therefore every data must be kept and arranged carefully to record each time services and calculate next due service date. Thus, a complete report is hard to produce accurately.

1.4 Objective

The objectives of PVSM are as following:

i) Generate maintenance scheduling date and service checklist using computerized system
ii) Improve operational efficiency by providing time-based service schedule to the customers.
iii) Ensure the system have a software qualities such as correctness, reliability, efficiency, integrity and usability to achieve paperless vehicle maintenance system

1.5 Scopes

This system will be implemented in Swedish Motor Assemblies by service staff to enhance the management of Volvo Service Maintenance and provide their customer with the better service maintenance program. Furthermore it will benefit both parties in terms of recording all the service history in a proper manner and lessen customer burden to remember the service due based on the onboard mileage indicator (odometer). Below is the scope of the system.

i. **The Register Vehicle Module.**

This module is used to manage new records of vehicle that is dealing with the company and storing them in database.

ii. **The Vehicle Search Module.**

This module is used for managing searching process. This module gives staff capability to search the vehicle information by using vehicle registration number.

iii. **The Preventative Maintenance Module**

This module has is used to manage maintenance scheduling of the vehicles in the database and reschedule next service date and particulars. It also performs the calculation of service payment that has been done based on service particulars.

iv. **The Vehicle Service Alert Module.**

This module is used to provide programmable reminders that include text messages in the means which vehicle is due for next service or conditions that require immediate attention.

v. **The Service History Module**

This module is used to store previous maintenance service information for further reference.

vi. **The Vehicle Service Report Module.**

Produces customized reports of the vehicle's mileage and last service visit, enabling vehicle to obtain better plan and vehicle schedule service. The report contains the vehicle's current mileage, mileage at last service and predicted time and mileage for the next scheduled maintenance.

vii. **The Vehicle Analysis Module**

This module will emphasize on performing analysis of the vehicle data. It is driven from manipulated data which are Volvo service time for each model and service cost that will produce analysis in graphs.

1.6 Project Significance

The system will benefit Swedish Motor Assemblies in many ways particularly to ease the process flow through paperless and efficient system.

The importance of each module proposed lies in the ability to overcome the problems that occurred in the previous system due to the manual method used for recording information. The approaches that are proposed will apply the new technologies which are computerized information, systematic data handling and reports. Furthermore, it will be able to perform analysis which will help the process of maintaining vehicle.

In addition, the system is able to establish a good customer relationship management between companies and customer itself. It will benefit customer in many ways, mainly in giving the best service as a result from good car condition providing service schedule and other relevant information.

1.7 Expected Output

Periodic Vehicle Service Maintenance System consists of seven modules. The aim of the system is to combine all the related modules from previous system that is done manually towards a more systematic approach of computerized system. Many approaches are implemented using the latest technology in order to overcome the problems and enhance the features offered occurred in the previous system.

In this case, user will input vehicle information from odometer and the service date to generate the next due service date. All the maintenance information will be stored in the database and data can be retrieved at any time by user to obtain information for the vehicle that has been registered.

To achieve the objectives of this system, the application will be used in order to replace the current approach of paper-based service record that burden both parties especially customers. Besides, it will also enable the lifetime of the