



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DEVELOPMENT OF SPREADSHEET BASED PROGRAMMING
FOR MAINTENANCE MANAGEMENT SYSTEMS**

This report submitted in accordance with the requirements of the Universiti Teknikal Malaysia Melaka (UTeM) for the Degree of Bachelor of Manufacturing Engineering (Manufacturing Management) with Honours

By

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DECLARATION

I hereby declare this report entitled “Development of Spreadsheet Based Programming for Maintenance Management Systems” is the result of my own research except as cited in the references.

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APPROVAL

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ABSTRACT

This paper examines the basis of vehicles maintenance management strategies used to date in JKR Mechanical in Kota Bharu, Kelantan which covers on Preventive Maintenance program only. These strategies assist the maintenance function and enable the process of maintenance to be optimized. The title of this project is, “Development of Spreadsheet Based Programming for Maintenance Management Systems” and special attention is given to Computerized Maintenance Management Systems (CMMS). The data was gathered through maintenance manual standard and has been compared with company visit, interview and the current system used in order to understand the Maintenance Management involved. The system was analyzed and the spreadsheet was developed. This program, made up of interconnected modules, can handle aspects of maintenance, including work order management; planned Preventive Maintenance; equipment costs and stock control; which connect from the data entry module and have been set by mileage. In order to improved system of maintenance at JKR, together with an enhanced Preventive Maintenance scheduling indicating precisely which maintenance work will be completed and providing parts available at that time to reduce time management. The spreadsheet have been develop by using Microsoft Excel as a tool and the project was focus on maintenance’s department which doing the vehicles service. Last but not least, this project elaborated the application of the spreadsheet developed and the importance of its usage in Maintenance Management System at JKR.

ABSTRAK

Projek ini dihasilkan berdasarkan kajian keatas strategi penyenggaraan kenderaan yg digunapakai di Jabatan Kerja Raya (JKR) Kota Bharu, Kelantan. Strategi yang digunapakai ini dapat membantu meningkatkan fungsi penyenggaraan ke tahap yang optimum. Merujuk kepada tajuk projek ini "Pembangunan *Spreadsheet* Berdasarkan Pengaturcaraan untuk Sistem Pengurusan Penyenggaraan", dan perhatian diberikan keatas '*Computerized Maintenance Management System (CMMS)*'. Data dikumpulkan melalui lawatan ke industri, temuduga dan kajian ke atas system yang digunakan di industri, melalui data yang dikumpul satu program telah dibangunkan. Program yang direka menggabungkan modul dalaman yang akan mengendalikan keseluruhan aspek penyenggaraan, termasuk pengurusan kerja, pencegahan penyenggaraan, rekod penyenggaraan ke atas barangan, harga barangan, penyenggaraan inventori, dan laporan. Oleh itu, untuk meningkatkan sistem penyenggaraan di JKR, satu sistem laporan yang ditingkatkan keatas kerja penyenggaraan yang telah selesai dapat mengurangkan masa tidak produktiviti pekerja. Perisian *Spreadsheet* yang dibangunkan menggunakan perisian Microsoft Excel dan projek ini dibuat menjurus kepada jabatan penyenggaraan di JKR yang mengendalikan bahagian servis kenderaan. Akhir sekali, projek ini akan menerangkan dengan lebih lanjut mengenai cara penggunaan perisian yang dibangunkan dan kepentingannya dalam Sistem Pengurusan Penyenggaraan di JKR.

DEDICATION

For my beloved dad, mom, family and my beloved friend.

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LIST OF ABBREVIATIONS

CM	-	Corrective Maintenance
CMMS	-	Computerized Maintenance Management Systems
EOQ	-	Economic Order Quantity
FDA	-	Food and Drug Administration
IFR	-	Increasing Failure Rate
MS	-	Microsoft
MTBF	-	Mean Time Before Failure
MTTR	-	Mean Time To Repair
PdM	-	Predictive Maintenance
PM	-	Preventive Maintenance
PMO	-	Project Management Office
RCM	-	Reliability Centered Maintenance
TPM	-	Total Productive Maintenance
WCM	-	World Class Manufacturing/Maintenance

CHAPTER 1

INTRODUCTION

This chapter provides the background of the project include the problem statement, objective, scope of the study, importance of the project, and report outline.

1.1 Background

For most government agencies, their services impact the delivery and cost of nearly every service provided to the public, impact the productivity of nearly every employee, support emergency services making the difference between life and death, and support maintenance of infrastructure which helps support local economy and quality of life.

Preventive Maintenance is an extremely critical part of operations at Jabatan Kerja Raya (JKR), *Cawangan Mekanikal* in Kota Bharu. Preventive Maintenance (PM) means all actions intended to keep durable equipment/vehicle in good operating condition and to avoid failures which help to prevent parts, material, and systems failure by ensuring that parts, materials and systems are in good working order. However, the spreadsheet was created to decrease the incidents of equipment arriving late for the PM's they are due for.

Due to that, the requirement of computer assisted in maintenance planning and management is no exception. The systems which are commonly referred to as Computerized Maintenance Management Systems (CMMS) is widely use and no longer consider as a luxury item.

A number of years ago, the application of Computerized Maintenance Management Systems were applied to hospital equipment maintenance only, where critical breakdowns could lead to the development of life threatening situations. In recent years, more manufacturers have come to recognize the value of these systems as a maintenance performance and improvement tool (Bryan Weir, 2004).

CMMS are applied for all aspects of maintenance management including planning and control, these include record of equipment history, preventive maintenance scheduling and predictive maintenance activities. Equipment spare parts can be monitored effectively. Vast array management reports are routinely performed by computer.

1.2 Problem Statement

Currently in the JKR, the problem of disparate data sources was occurred. It is very difficult to make optimal decisions because the information is not easily obtained and merged. Information about technical state, work order planning and scheduling, cost of maintenance activities or loss of production, and non-technical risk factors such as customer information, is required. Even they have the best information maintenance management systems, but were not presented on a consistent type of maintenance or in order word, not grouping it to separate the type of job.

The method used in JKR for Preventive Maintenance, normally by manual checklist and run by an operator. Seldom, this manual method brought late detection of due date for maintenance and only find out through customer complain. Moreover, they have problem with the part inventory that determine as important element in monitoring the maintenance system. In their system, they should order the parts first when they need to done some maintenance job without knowing the parts available or not. It can make their time management poor because if that so, the maintenance work can not be done without the parts available.

Therefore, to overcome this problem especially on preventive maintenance program, this project is to develop a spreadsheet based programming for maintenance management system that are user friendly and easy to understand by operator and at the same time can enhance the current system to the higher level for JKR Mechanical, Kota Bharu.

1.3 Objectives

The aim of this project is to develop a spreadsheet based programming for Maintenance Management system for Jabatan Kerja Raya (JKR), *Cawangan Mekanikal*, in Kota Bharu and the specific objectives are as follow:

- a. To study the current maintenance management systems applied in the JKR.
- b. To develop spreadsheet of the maintenance management systems for the JKR which include interconnect modules as below:
 - i. Data entry
 - ii. Mileage
 - iii. Workorder
 - iv. Parts
 - v. Planned Preventive Maintenance
- c. To analyze the maintenance management systems spreadsheet.

1.4 Scope of Study

There are many technique on develop this system, but in this study, it only concentrated on using Microsoft Excel to create maintenance management systems spreadsheet at Jabatan Kerja Raya (Mechanical Branch) in Kota Bharu, Kelantan. However, this project only covers on Preventive Maintenance program and two departments was involved for the work location which is Vehicle Department and Heavy Plant Department.

1.5 Importance of Study

The importances of the project are:

- i. Development the maintenance management systems spreadsheet to improve preventive maintenance systems in the JKR.
- ii. To control maintenance systems and production scheduler.
- iii. To demonstrate effectiveness by using spreadsheet on maintenance systems.
- iv. To reduce time management during the maintenance by identifying parts through links to equipment.

1.6 Report Outline

This report consists of six chapters:

Chapter 1 introduces of maintenance management system, problem arises in JKR which drive to develop this software; CMMS, objective, scope of this project and importance of the study.

Chapter 2 reviews on the literature from journals, books and internet. The area covered including principle for maintenance management, type of maintenance, procedures, etc.

Chapter 3 describes the methodology to develop the system, the requirement to ensure this software works based on Excel function.

Chapter 4 describes in depth about the process development of spreadsheet.

Chapter 5 presents the results and analysis on system development by comparison with the current system used in JKR.

Chapter 6 concludes the system development and recommendation for the future work.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

A literature search was performed to study implementation, function and development the maintenance management system and also Computerized Maintenance Management Systems or CMMS. It also included the investigation and review on previous studies on maintenance management systems.

2.2 Background of Maintenance Management

Maintenance and maintenance policy play a major role in achieving systems' operational effectiveness at minimum cost. The traditional approach to maintenance planning involves selecting optimal policies from known maintenance strategies such as scheduled inspection, preventive maintenance, corrective maintenance, etc.

Maintenance is understood as any activity carried out on a system to maintain it or to restore it to a specific state (Springer, 2004). Maintenance operations can be classified into two large groups which is corrective maintenance (CM) and preventive maintenance (PM). CM corresponds to the actions to carry out when the failure has already taken place. PM is the action taken on a system while it is still operating, which is carried out in order to keep the system at the desired level of operation. PM consists in carrying out the operations in machines and equipment before the failure or the breakdown takes place, and at fixed time intervals previously established. The objective of PM is to prevent failures before they happen and