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**Author** - Raja Roslan Bin Raja Abd (et al.)

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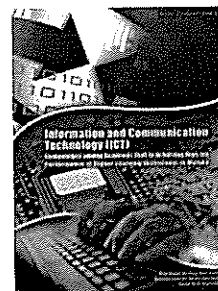
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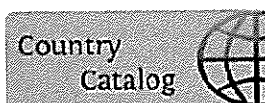
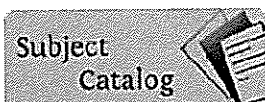
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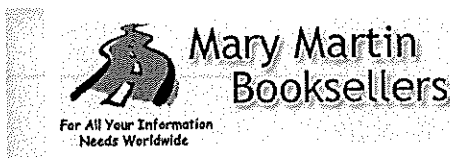
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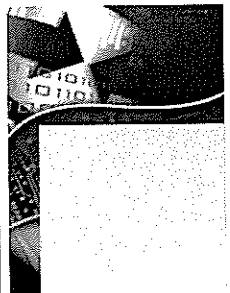
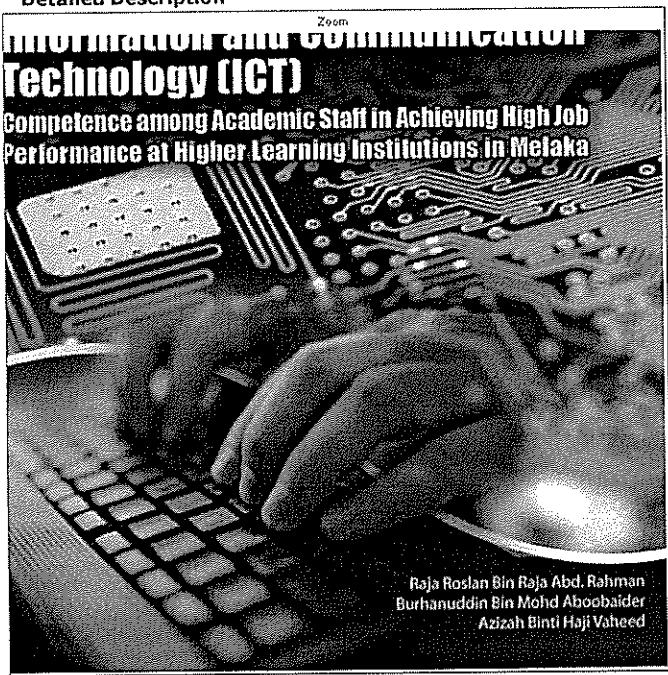
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# An Efficient Failure-Based Maintenance Decision Support System for Small and Medium Industries

M. A. Burhanuddin<sup>1</sup>, Sami M. Halawani<sup>2</sup> and A.R. Ahmad<sup>2</sup>

<sup>1</sup>*Universiti Teknikal Malaysia Melaka,*

<sup>2</sup>*King Abdulaziz University Rabigh*

<sup>1</sup>*Malaysia*

<sup>2</sup>*Kingdom of Saudi Arabia*

## 1. Introduction

Small and Medium Industries (SMI) are the key contributors to economic growth in developing countries. SMI contributes in generating employment and engage in small and medium-scale manufacturing lines to generate profit and employment.

In fact, the largest portion of manufacturing firms fall into SMI categories and the SMI businesses are the backbone of the large-scale industry (Shamsuddin et al. (2004)). However, Junaidah (2007) reported that SMIs lacking appropriate decision making. According to her, SMI do not have a good system to evaluate the overall system of machines, contractors performance and their business's principles. Therefore, maintenance decision support system (DSS) is essential to ensure maintainability and reliability of equipments in industries. Poor machinery maintenance management will result in capacity loss, poor product quality and customer dissatisfaction. These downturns usually occur depending on the efficiency of the reliability programs executed by the organization.

This chapter reveals on the important DSS models i.e. Decision Making Grid (DMG) to be embedded with computerized maintenance management system (CMMS) to aid maintenance strategies for the machines as an adoption of technology management in SMI. Next this chapter demonstrates on how DMG model can be used as a decision support module in Failure-based Maintenance (FBM).

## 2. Brief description of the maintenance issues in SMI

Shamsuddin et al. (2004) conducted a survey to study FBM issues faced by SMI. They have listed issues related to equipment maintenance, as follows:

- i. Lack of human resources, both in terms of number and skill or expertise;
- ii. Emphasis on short-term gains and lack of long-term plans;
- iii. Lack of state-of-the-art modern technology;
- iv. Lack of understanding about the role of technology;

## 7. Conclusion and further research

This chapter aim to improve maintenance strategies in FBM by extending some theoretical method introduced by Labib (1998b) and Burhanuddin (2009) in DMG model to provide maintenance strategies for SMI. The analysis provides insight by using collective approaches in two-dimensional matrices, and simultaneously measures multiple criterion of the downtime and frequency of failures.

Maintenance strategies are identified using the DMG model, based on important factors, including the machines' downtimes and their frequency of failures. The machines are categorized into the downtime criterions and frequency of failures, which are high, medium and low using tri-quadrant formulae. The experimental studies are conducted using maintenance dataset given by Fernandez et al. (2003). The proposed models can be used by decision makers to identify maintenance strategies and enhance competitiveness among contractors in FBM. There have been very promising development in computer science, which can help SMI to monitor and compare maintenance activities.

The analysis provides insight by using collative approaches in two-dimensional matrices, and simultaneously investigates three criterion of the downtime and frequency of failures. Tri-quadrant analysis is used to ascertain the model through the incorporation of multiple criterions of the decision-making analysis for SMI. The result of the analysis provides some decision-making strategies for machinery maintenance.

This study focuses on DMG based on few factors respond time, diagnostic time, repair time and frequency of failures. More research on organization procedures and underlying characteristics of the machines, such as their model, age, made, price, etc., can lead to a more comprehensive study in FBM. The external factors such as economic, geographical and social aspects could be incorporated into the models.

## 8. Acknowledgement

The authors would like to thank the management of Faculty of Information Technology and Communication, Universiti Teknikal Malaysia Melaka and Faculty of Computing and Information Technology Rabigh, King Abdulaziz University Rabigh for providing facilities and financial support.

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