

## A Proposed Total Productive Maintenance (TPM) Tool for Lean Dashboard, Statistics and Performance Efficiency in Malaysian Modern Manufacturer

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**DOI Link:** <http://dx.doi.org/10.6007/IJARBSS/v7-i6/3061>

**Published Date:** 14 June 2017

### Abstract

The development of manufacturing industries in Malaysia has started more than 50 years ago. Nonetheless, after more than 50 years Malaysian manufacturing has been established, the issues of maintenance, safety, quality, cost, and performance efficiency still receive criticism, complaints, and various suggested approach to improve their product quality, operation management, and customer satisfaction. As a result, in order to improve the quality of manufacturing industries, Malaysian government has supported and encourage for develop total solution especially for quality improvement, increase safety and setup low cost for productive maintenance. Thus, to help the Malaysian manufacturer to achieve national agenda, further Total Productive Maintenance (TPM) tool essential. Recently, manufacturing companies are moving toward maintenance engineering practices, lean dashboard methodology process, statistical engineering solution, audit quality maintenance control and performance efficiency improvement; lower cost of production, cheaper maintenance cost, just in time (JIT) operation deliveries, eliminate of waste in any aspect of its operations and finally produce high quality product and better service to customer compared to competitors. The objectives of this research is to develop propose TPM tool as an important catalyst for continually seek better maintenance performance and in turn against competitive advantage. By implementing prototype of TPM system, modern manufacturing companies will eliminate

waste in operation activities such as to reduce maintenance cost, reduce time monitoring and control's, reduce defect, to reduce lead time, and reduce variation process and also improve quality product and good service for customer satisfaction.

**Keywords:** Total Productive Maintenance, Lean Dashboard, Statistics, Performance Efficiency, Malaysian Modern Manufacturer

## **Introduction**

The maintenance concept is important in the manufacturing environment and it provides support for productivity. Maintenance practices like Total Productive Maintenance (TPM) are important to increase level of readiness to face any eventuality, keep product quality and safety. Besides that, safety factor is very important for employees to make sure that they can work very well. Occupational Safety and Health Administration (OSHA) practices can improve the safety and health at the selected industry. TPM and OSHA practices also directly affect the financial performance (Mberia, 2001). Hence, TPM also will directly affect the cost of maintenance in manufacturing industry (Al-Najjar & Alsyouf, 2003; Alsyouf, 2006; Hashim et al., 2012a). Manufacturing companies are under increasingly diverse and mounting pressure due to more sophisticated markets, changing customer choice, and global competition. With globalization broadening the market place and increasing competition, customers are placing greater demands on manufacturers to increase quality and flexibility while maintaining or decreasing costs (Dangayach & Deshmukh 2001).

Thus, to become relevant, maintenance performance measures such as financial, customer satisfaction, internal business process, and learning growth and innovation require for cooperation among all manufacturer employee in order to achieve TPM performance. important process and very much needed as a TPM tool for measuring and monitoring the Islamic business engineering operations initiative, performance measurement provides a contribution to improved operation and engineering process, and increased control customer satisfaction. Therefore, in this study focused on the development of TPM tool for sustaining lean dashboard methodology, statistical solution and performance efficiency improvement.

## **2. Literature Review**

### **2.1 Total Productive Maintenance (TPM)**

TPM is a maintenance system defined by Nakajima (1988) in Japan, which covers the entire life of equipment in every division including planning, manufacturing, and maintenance. It describes a synergistic relationship among all organizational functions, but particularly between production and maintenance, for continuous improvement of product quality, operational efficiency, capacity assurance and safety. TPM practices provide a new view on the maintenance organization system by stating that maintenance is not an activity which cannot produce profits. Profits will be generated indirectly from an effective and systematic maintenance system (Ahuja & Khamba, 2008). Therefore, TPM practices affect other functions within the organization for improving product quality, operational efficiency, productivity and safety. Hence, the TPM practices were introduced to achieve certain goals. In accordance with Venkatesh study (2006), the objectives of TPM practices are to avoid excesses in the use of equipment which is not used to the maximum level, producing the high quality product effect from orderly equipment maintenance, manage costs, and provide products which are free from damage to the customer.

TPM philosophy was introduced based on mastery, competence, and involvement of all employees of the organization. It has a relationship to the organization capabilities through

various dimensions (Wang & Ellinger, 2011). Typically, TPM practices are generally divided into two elements, namely short term and long-term element. The short-term elements are more focused in AM for production department. Then it also focused on PM for maintenance department and skill development for operation, and maintenance staff. Besides, the long-term element is more focused on the new equipment design which involves the innovation practice. Hence, it is also involves the elimination of sources of lost equipment time.

TPM is also very concerned about the kaizen and safety of its employees in performing equipment maintenance process (Hashim et al., 2012b; Hashim et al., 2012c; Hashim et al., 2013). Preventive measures of the accident were doing planned maintenance. Furthermore, safety cautions about the machine were mentioned so as to avoid any occurrence of accidents during initial cleaning (Chan, Lau, Chan, & Kong, 2005). Meanwhile, TPM goals via group preventive maintenance, small-group activities, maximization equipment effectiveness, zero-accident and zero-pollution aims, improving operating reliability, reducing the cost, and problem solving (Eti et al., 2004). In addition, current maintenance in the company is based on traditional practices and is reactive, i.e., breakdown. It is a practice that inherently wasteful and ineffective with disadvantages such as: unscheduled downtime of machinery, possibility of secondary damage, no warning of failure with possible safety risks, production loss or delay, and the need for standby machinery where necessary.

Based on this relevant issues and problems, TPM is classified into an independent preservation, quality preservation, an individual's improvement, an environment safety, a planned reservation, an activity supporting a business and education, training and prototype of decision making. Related on this also, in the world of information technology, business process requires a decision making tool that is effective and systematic organization and enhance its competitive edge. In literature and practitioner it appears very difficult to find studies that have developed TPM initiatives, sustainable lean dashboard improvement, statistical and performance efficiency improvement measurement for the manufacturing industry.

## **2.2 Lean Dashboard, Statistics and Performance Efficiency in Malaysian Modern Manufacturer**

Performance Measurement required to balance between financial and non-Financial (Habidin et al., 2016; Habidin et al., 2012). The propose TPM Tool The unpredictable maintenance has a crucial effect on the performance efficiency in Malaysian Modern Manufacturer. The Manufacture maintenance is normally based on the statistical analysis of the machine failure and maintenance history. Graisa and Al-Habaibeh (2011) suggest having tool in order maintenance modern manufacturer. In this study, the propose TPM tool is an evolve tool to monitor the lean dashboard, statistic and performance efficiency in Malaysia Modern Manufacturer.

Dashboard is a medium of communication that presents information. Karami and Safdari (2016) indicate the importance of dashboard in helping to informed decisions about workflow by creating a link between different information systems. In this study, lean dashboard present the dashboard of lean practice in Malaysian Modern Manufacturer. As Danese et al. (2017) explain that lean is a complex and often extended process and need to consider it as a whole rather than as a sequence of phases in organization. For these reasons, a tool to show the lean dashboard is needed. According to Graisa and Al-Habaibeh (2011), with the implementation of TPM it is a vitally important part of the business. As the

implementation of the available technology are also necessary to achieve Lean Dashboard, Statistics and Performance Efficiency in Malaysian Modern Manufacturer.

### **3. Purpose of the study**

The aim of this study is to develop and apply the dashboard, measurement solutions and, maintenance performance for the development of TPM system for sustaining maintenance engineering practices and total maintenance performance improvement. Even though, the competitive nature of manufacturing practices leads many organizations attention to the maintenance and performance improvement issues rising from collaboration efforts. Consequently, the purpose of this study is to start the measurement of Lean dashboard, statistics and performance efficiency systems for Malaysian modern manufacturer.

#### **3.1 Objective (s) of the Research**

1. To verify the prototype of measurement items of sustaining maintenance engineering practices, lean methodology and total maintenance performance improvement.
2. To evaluate TPM prototype tool road map and structure for lean dashboard methodology, statistical solutions and performance efficiency improvement for Malaysian Modern Manufacturer.
3. To evaluate a software-based tool was develop by using PHP and MySQL for lean dashboard methodology, statistical solutions and performance efficiency improvement for Malaysian Modern Manufacturer.

### **4. Methodology**

The aims of this study are develop and validate TPM tool for Malaysian modern manufacturer. Researchers propose to use validate as it is relatively considered as the most economical among methods available for data collection especially in term of cost, time saving, and approach. Moreover, by using validation case study methods, it can clarify the question for survey respondents, and able to perform efficient data collection by recording their responses. The following section describes the method that will be employed in this research. The first phase is the critical literature review. All these research activities will be conducted to establish the use of the proposed TPM tool; maintenance and engineering practices, lean dashboard methodology, statistical solutions and performance efficiency improvement for Malaysian manufacturer industry. This then paved the way towards formulating a research model developing the research hypotheses, and instrument in investigating the TPM implementation in the industry. For future research, author proposes another two phase of research activities. The research activities focus on data collection by determining the population, number of samples and selection, building and modifying the instrument, selection of the companies for pilot study and full survey, as well as the procedure for obtaining, and permission to engage case study. The final phase, the research activities were on data analysis. The input data was analyzing using SPSS and AHP software to build the tool.

### **5. Significant of the Study**

By developing a TPM tool, it is expected to help researchers, consultant and practitioners and identify opportunities for improvements in the processes of implementing TPM initiative and also enhancing decision facing the global competition and uncertain global economy, it is important to the organization to see if the quality initiative needs, and work environment by integrating TPM with sustaining lean dashboard, statistical solution and performance

efficiency improvement where necessary to be developed the model for Malaysian modern manufacturer.

## **6. Conclusion**

The increasing attentions is being paid to maintenance and engineering practices, lean dashboard methodology process, statistical solution and performance efficiency improvement, it is a phenomenon that is emergent and not yet widely studied explored the theory, practices and gap between lean methodology process, statistical solution control, and performance improvement initiatives for Malaysian manufacturing industry. Expected practices of TPM tool within local manufacturers, global industry, and future research as an important and problem solving. This study is expected to arrive at the following conclusion: This propose tool has important implication lean dashboard methodology Improvement and performance efficiency improvement and quality, environment, safety management system that are important to improve organizational performance in Malaysian manufacturing industry. As such, it is expected benefit to researches and practitioners. Future agenda, this study also suggest other quality practices such as lean (Hibadullah et al., 2013), green practices (Conding et al., 2013), green lean six sigma (Zamri et al., 2013), green innovation (Conding et al., 2012), corporate social responsibility (Fuzi et al., 2015) and Sustainable manufacturing practices (Habidin et al., 2015) need to integrate with TPM for better maintenance management services and performance improvement.

## **Acknowledgement**

The researchers also like to acknowledge the Ministry of Higher Education (MOHE) for the financial funding of this research thought Fundamental Research Grant Scheme (FRGS) and Research Management Innovation Centre (RMIC), UPSI for Research University Grant (RUG).

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