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Comprehensive Production Maintenance and its Role in Improving the Company Performance

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ABSTRACT

The study aimed to reveal the impact of applying comprehensive production maintenance on company performance in small and medium industrial Malaysian companies. The descriptive analytical secondary data was utilised as a tool for gathering data from 135 companies as a sample from 2009 to 2017, and after conducting the analysis of the data and testing the hypotheses, the study reached a number of results among them. There is a positive significant effect of the application of comprehensive productivity maintenance on company performance in in the small and medium industrial companies. Therefore, this study recommended that the total productive maintenance is a system that is also valuable for quality administration and safety administration in rapports of keeping the integrity of equipment and operating approaches. The study recommended giving more attention to the management of the industrial companies.

Keywords: Comprehensive production maintenance, company performance, small and medium industrial companies.

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INTRODUCTION

Comprehensive productive maintenance (CPM) it is a management practice that began in the 1970s and has grown worldwide over the last 20 years. CPM is not a new maintenance method but a complete equipment management system. Practical practice and research have shown that the use of CPM leads to better performance measured in terms of productivity, and quality, cost, response to purchase requests, occupational safety and worker morale. CPM is based on several pillars to achieve significant improvements in company performance (CP) (Easton, Jarrell, 1998).

However, the application of this system has also encountered a number of flaws in some of these countries. Among the obstacles that can be main to failure of CPM implementation: Weak senior management support of the institution for CPM implementation (Ahuja & Khamba, 2008). Failure to provide appropriate training for employees to enable them to apply this system (Abbas et al., 2022 & Abbas et al., 2023). This training contains training operatives on maintenance work, training maintenance experts to raise their competence, and training workers in overall to create them aware of the profits of CPM, its mechanisms, and how to put on it.

CPM has a positive effect on several performance indicators. This raises productivity by growing equipment availability and efficiency, growing quality, decreasing raw material production times, and growing the ability to meet supply windows. It also reduces injuries resulting from cleaning, organizing, and maintaining equipment, and increases worker morale (Rhyne, 1990). “Some of the results in many businesses indicate a decrease in the number of failures to 2% of the number before CPM was implemented, an increase in equipment availability by 20% and an increase in worker productivity by 40%, during three years from application CPM”.

CPM application cost. To perform full productive maintenance, we need costs. Restoring the device to its original or perfect state, which means removing existing faults and issues that may require the additional of certain parts or the adding of new devices or equipment (Bonavia & Marin, 2006). Train operators in main maintenance services and train maintenance methods to improve their skills. CPM worker training of course, it is not probable to control an exact amount of the CPM implementation cost for any organization, but this number varies depending on the skills of the operators and maintenance technicians. If the operator's maintenance skills are lacking or if the skills of the maintenance technicians are low, the cost

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of training to implement CPM will increase the speed at which CPM will be implemented. The CPM is implemented gradually over many years of three to five years.

LITERATURE REVIEW

Comprehensive productive maintenance financing is an effective strategy to improve maintenance in company's industrial, if it was widely used, especially during the last decades. As for the meaning of CPM, it is (Dillworth, 1996, 637). Maintenance: to maintain the state of inventory operation of machinery and equipment flexible during the operation, excision, examination for instance. Producer: performing maintenance work without having an impact on the production work, or at least it can affect the production workflow. Comprehensive: the participation of a huge number of individuals working in the factory in the construction and improving of the company (Abdullah et al., 2021).

CPM is based on several basic pillars to achieve its objectives. Planned maintenance: a group of operations that are regularly monitored and repaired according to a timely risk. Improvements center: Inventory of a small group of flexible employees in a symmetrical manner to achieve continuous incremental improvements in equipment operation. Early management of the world: developing new standards or making some modifications to the current one. Equipment maintenance process including teaching and training: teaching and training are provided to the staff, and the employees are provided with different skills (Aman-Ullah, Aziz, Ibrahim, Mehmood, & Abbas, 2021). So that you will be able to accomplish the responsibilities required of them efficiently and independently. Environmental health and safety: Maintaining a safe and healthy work environment. Comprehensive productivity maintenance in administration.

Company Performance

Company performance is a process that first goals to measure what the business has achieved over a specified period of time compared to what was planned, and performance requires several steps depend on a series of indicators and criteria that allow gaps to be identified or differences and the average to contract with them in "the short and long run".

The connection between production and company performance has abeen examined in previous works ("e.g., Saleh et al., 2011; Wan Ahmed et al., 2014"), and most of the results showed a correlation positive. The results of previous estimations have shown that production has a

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positive and important influence on company performance. The findings also show promising evidence for a long-term association between production maintenance and company performance. Therefore, compamy performance is measured utlising return on assets (ROA). Nevertheless, there is a little study had investigated the association between complete production maintenance on company performance in the small and medium industrial companies in Malaysia. Hence, this paper addresses the said gap by seeing such relation. The CPM could play a prominent role in improving company performance. Therefore, the hypothesis below is proposed:

H1: The comprehensive production maintenance are positively associated with company performance.

RESEARCH METHODS

This part explains the sample size and data in addition to the variables' contributing factor and "regression models" using in this study.

Data and sample size

Return on assets (ROA) data was collected from "Datastream" from 2009 to end of 2017. The current study chose the period up to 2017 due to diverse productive activities in the 2017 annual report. Annual reports listed in "Bursa Malaysia" are utilised to get data from 2009 to 2017. This study uses data from Bursa Malaysia from 2009 to 2017.

Measurements of variables

Since the reporting year, "135 companies in Bursa Malaysia were selected" as a final sample "covering the period from 2009 to 2017. This paper uses return on assets to measure company performance. The favourite for this method is it derives from the fact that it had times of approval and developed significantly and concluded the course of the earlier period. Figure 1 displays the situation from 2009 to 2017.

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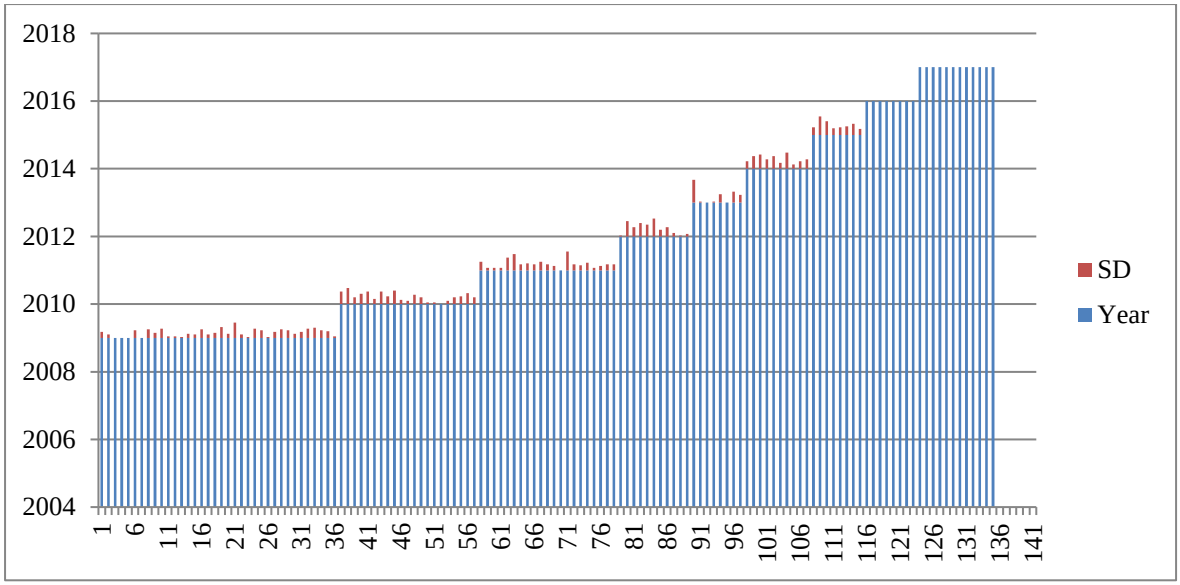

Figure 1: Displays the situation of productivity maintenance from 2004 to 2017.

"Apart from the productivity maintenance revealed earlier, many control variables are used in this study for instance board variables (manufacturing, profitability, and organization ownership)". This is to show that the current study controls the potential related between CPM on company performance in the small and medium industrial companies in Malaysia. "The choice of potential control variables relies on past evidence in Malaysian and non-Malaysian contexts (e.g., Mehmood, Mohd-Rashid, Ong, & Abbas, 2021; Ibrahim & Ismail, 2012; Chang & Kwon, 2020 & Abbas et al., 2023) and some of the studies connecting to the OP as displays in this section. In the current study, nevertheless, company performance, production maintenance, and control "variables measurements" are utilised, as clarified in Table 1":

This is to current that this study controls the potential connection between production maintenance with the company performance of "Bursa Malaysia". The meaning of each "control variable" is assumed in this section. The best of "control variables" could potentially depends on prior evidence in "Malaysian and non-Malaysian contexts" ("Abbas et al., 2023; Mehmood, Mohd-Rashid, Abdullah, Patwary., & Aman-Ulla. (2022) .Mehmood, Mohd-Rashid, Ong, & Abbas, 2021; Ibrahim & Ismail, 2012; Chang & Kwon, 2020") and other OP-connected studies as prominent in this section. "In the present study, however, company performance, CPM and control measures were used, as clarified in Table 1".

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Table 1

Measurements of Variables

Name	Measurement
"Dependent Variable"	
Company Performance	Return on assets (ROA)
"Independent Variable"	
Production Maintenance	PM is "measured by using an "index with a scale of 0 to 1, where a score of 1" is for information disclosure, and 0 for "non-disclosure".
Control Variables	
"Manufacturing"	"1 indicates "manufacturing" organization and 0 otherwise".
Profitability	"Return on equity (ROE) = net Income/shareholders' equity".
"Organization Ownership"	"The percentage of organization shares owned by executive directors".

3.3 Regression model

One experiential model is utilised to exam the linking between production maintenance and company performance. This study uses a many regressions technique using the "ordinary least squares". This paper proposed findings is applied using this model to approve their comparability to that of additional studies. The regression model under explains the link.

$$CP_{it} = \beta 0 + \beta 1\ CPM_{it} + \beta 2\ MANF_{it} + \beta 3\ PRO_{it} + \beta 4\ OOWN_{it} + \varepsilon$$

RESULTS AND DISCUSSION

Descriptive analysis

Table 2 shows "descriptive statistics" for all variables for a sample of 135 companies in "Bursa Malaysia", display the inferences for the main objective. CP, "which is the first variable measured with the ROA which covers the period from 2009 to 2017". Table 2 shows that the mean CP of the sample is 0.243 with a max of 0.849 and a min of -0.133, which shows the CP of "Malaysia" by the study period.

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Table 2

Descriptive Analysis

Variable	Obs	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
CP	135	0.243	0.179	-0.133	0.849	-0.286	0.351
CPM	135	0.121	0.323	0.000	1.390	2.503	8.355
MANF	135	0.741	0.488	0.000	1.000	-1.651	3.340
PRO	135	0.159	0.262	-0.692	0.804	0.678	0.000
OOWN	135	7.506	9.850	0.000	0.494	1.525	5.422

Note: "This table shows the descriptive statistics of the variables. The CP= Company performance, CPM = Comprehensive production maintenance; MANF = Manufacturing; PRO = Profitability; OOWN = Organization ownership; n =135".

Concerning the question of CPM, the mean score of the index for CPM most often informed was 0.121 and company performance the mean was shows as 0.243. From the "descriptive statistics", the range for MANF is wide, with the min 0.000 and the max being 1.000. PRO, the mean is the 0.159. Finally, "for OOWN, the average of the observed companies is 7.506, with min of 0.000 and a max of 0.494.

Correlation analysis

"Pearson's correlation coefficients between dependent variables, independent variables and control variables" are present in Table 3. "Multicollinearity" was not an problem in this research. The correlation values of all the variables display that there are no "multicollinearity" "problems because their values are less than 0.80 (Hair et al., 2010)". There are many correlations between "dependent variable and independent variable". As exposed in Table 3, CPM and PRO are positively connected to CP. Meanwhile, MANF and OOWN are negatively linked with CP. "In terms of "multicollinearity", the correlation matrix displays that there is no "multicollinearity" among the variables as "no variable is correlated above 0.80. All the variables in correlation value are less than 0.80.

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Table 3

Correlation Analysis

Variables	CP	CPM	MANF	PRO	OOWN
CP	1.000				
CPM	0.280***	1.000			
MANF	-0.010	-0.061	1.000		
PRO	0.198**	0.080	0.117	1000	
OOWN	-0.084	-0.164*	-0.183*	-0.010	1.000

Note: ***Correlation is "significant at the 0.01 level (two-tailed); **Correlation is significant at the 0.05 level (two-tailed); *Correlation is significant at the 0.10 level" (two-tailed).

Regression analysis

Ordinary Least Square (OLS) regression is used to study the research hypothesis. This includes checking for "collinearity" between normality (Table 2), independent variables, and "heteroskedasticity" and variance inflation factor (VIF) are showed in Table 4, there are no problem in the VIF value is less than 10, indicating the absence of "multicollinearity and "heteroscedasticity" in this study showed a p-value less than" alpha (5%)" .

Table 4

Regression Results

CP	OLS		VIF
Variables	t.stat	sig	
CPM	0.04	0.097*	1.60
MANF	0.42	0.070*	1.33
PRO	0.214	0.062*	1.98
OOWN	-0.59	0.058**	1.17
Constant	0.27	0.805	
"OLS Heteroskedasticity"		0.118	
Adjusted R2 (%)		70%	
n		135	
F-value		0.40	
p-value		0.96	
R2 (%)		45%	

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The findings defined for the model in the Table 4 show results on CPM display a positively and significantly connection with CP. (t=0.04, p-value=0.097). The linked state is found in an earlier study by "Iqbal et al., (2012)". As a significance "hypothesis" H1 which forecasts that CPM is positive associated to CP. The MANF and PRO has a positive and important connection with CP. OOWN has a negative link with CP.

DISCUSSION AND CONCLUSION

This study proposes examining the influence of CPM on the CP of Malaysian companies. The connection between CPM and CP is established using "regression analysis". This paper also uses profitability, manufacturing, and Organization ownership as the "control variables" informed a positively and negatively link with company performance. The findings of the analysis display that companies support the growth of company performance by given that best disclosure of CPM in their "annual reports".

The results of this paper add to the existing body of knowledge on the relation between CP and companies in "Bursa Malaysia". Some studies have examined the relationship between CPM and CP performs in "Malaysian" companies ("e.g., Wan Ahamed et al., 2014"). "Still, a little studies on the relation between CPM and the CP of Malaysian companies. The results of this study show that CPM practices raise CP". Meanwhile, the results for CPM found a positive relation with CP.

The findings give the investors with valued insight into how further investors determine the importance of CPM in CP. The recommendations to the regulators should also always know of the nature of CP achievements, given the CPM policy offered by the government and the changing listing requirements on "Bursa Malaysia".

The CPM system emphases on maintaining all equipment in the top working situations to avoid breakdowns and delays in manufacturing operations, particularly for a facility that practices mass or large-scale production. Therefore, this study recommended that the total productive maintenance is a system that is also valuable for quality administration and safety administration in terms of keeping the integrity of equipment and operating approaches.

The study emphases only on "Malaysian" companies. Future studies are predictable to principal to cross-industry corporations among Malaysia and other developing countries such as "Bangladesh, Cambodia Indonesia, Singapore, and Vietnam". The link between "developed

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and developing countries" can also increase the understanding of the link among CPM utilizing additional methods.

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