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The Relationship between Kaizen Event and Operational Performance in Malaysian Automotive SMEs

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Abstract

Manufacturing process must be implemented in order to remain competitive in current economic situation. The aim of this study is to develop a model that link KE and OP in Malaysian automotive industry. One of the most effective methods is to implement KE in the management. Exploratory factor analysis is use to test the construct validity test, for reliability and measurement were carried out. Based on the proposed conceptual model, research hypotheses are being developed. This is a comprehensive research which has undergone detailed methodology and analysis and contributing to the limited existing literature in the development of structural relationship between KE and OP especially in automotive industry. This study also provides a direction for researcher to further research to improve organizational performances through the implementation of KE

Keywords: Kaizen Event, Operational Performances, Automotive Industry, Small And Medium Enterprise

1. Introduction

The automotive industry is an important industry to the Malaysia economy because of the large contribution and closely related manufacturing and services industries. Malaysian automotive industry begins with Perusahaan Otomotif National Berhad (PROTONS) that was established on 7 May 1983. The challenges in Malaysia automotive industry were increased since major global automotive companies such as Toyota has decided to make Thailand and Indonesia as their hub-automotive vehicles product. Therefore, Malaysian automotive industry must focus on quality improvement, Innovation and corporate social responsibility to fulfill the specific needs and to exceed the customer expectations (Rahman *et al*., 2009; Habidin et al., 2012a; Habidin et al., 2012b; Conding et al., 2012; Conding et al., 2013; Fuzi et al., 2013;Habidin et al., 2014).

Malaysian automotive industry can implement Kaizen Event (KE) practices in their industry. KE is practices that emphasize continuous improvement process. Thus, the manufacturing industries also need a continuous improvement process to complete their operational

performances. KE practices also affects directly and indirectly to the OP because it emphasizes quality in every process improvement (Farris et al., 2009; Hashim et al., 2012a). It also emphasizes quality in every process in parallel with the goal (Chan et al., 2005).

KE means improvement, continuous improvement involving everyone in the organization from top management, to managers then to supervisors, and to workers. In Japan, the concept in KE is so deeply engrained in the minds of both managers and workers that they often do not even realize that are thinking KE as a customer-driven strategy for improvement. This philosophy assumes according Imai that ''our way of life – be it our working life, our social life or our home life – deserves to be constantly improved''.

Therefore, in this study will examine the relationship between KE practices in Malaysian automotive SMEs

2. Literature Review

2.1 Small and Medium Enterprise (SME)

SMEs are the backbone of the economics of many countries (Ghobadian and Gallear ,1996). There is no certain correct definition for SMEs and it varies between countries, industries and even between different government agencies within one country (Yusof, 2000). In fact in Malaysia, various definitions have been given to SMEs. Some agencies have classified SMEs based on certain criteria such as the number of full time employees, capital acquisition, fixed capital and yearly profit. In regardless to that, DTI addressed SMEs as those, which employ fewer than 250 workers in the organization. On the other hand, Parkin and Parkin (1996) have suggested that SMEs will have fewer than 500 employees in UK.

2.2 Automotive Overview

Malaysian automotive industry is a booming industry which encompasses areas of activities from car manufacturing to dealing auto business with foreign countries. Malaysian automotive industry is one of principal producers and exporters of vehicle parts, components and accessories, which are widely accepted to most of leading countries of world. According to Economy Watch (30 June 2010), foreign countries like Japan, United Kingdom, Thailand, Taiwan, Singapore and Indonesia are major importers of Malaysia's cars. Leading automotive manufacturing companies like Mercedes, Suzuki, Ford Generals Motors, Mazda, Nissan and Mitsubishi are using Malaysian automotive products and accessories because of their high quality and competitive prices.

The leading automakers in Malaysia automotive industry are PERODUA. Malaysia's first national car project is Perusahaan Otomobil Nasional or PROTON. Malaysian cars manufactures are trying to meet demands of customers by providing reliable and competitive automotive components and accessories (Economy Watch, 30 June 2010)

2.3 Kaizen Event (KE)

Kaizen means improvement, continuous improvement involving everyone in the organization. In Japan, the concept of Kaizen is so deeply engrained in the minds of both managers and workers that they often do not even realize that they are thinking kaizen as a customer-driven

strategy for improvement. This philosophy assumes according Imai that "our way of life-be it our working life, our social life or our home life-deserves to be constantly improved".

KE also aim at improving the process, so that workers yield efficient performance (Brunet et al., 2003; Hashim et al., 2012b; Norazlan et al., 2014). KE are team based activities, which aims at reducing production waste (PDTP, 2002). A successful KE is the result of a well-planned and well-structured effort that provides room for determining the root cause of problems and implementing the solution.

KE is more than just a means of improvement because it represents the daily struggles occurring in the workplace and the manner in which these struggles are overcome. A part from that, according to Liker (2004), KE practice are cultures that support to continuous improvement process. The culture in the organization changes in line with the objective the implementation of KE.

KE element is divided into just 3 parts to suit the automotive industry environment is the follow-up activities, working area impact and employee skill and effort. These elements are very important to the KE practice because it will affect the entire employee of the organization and these elements affect lower operating costs.

2.3.1 Follow up Activities

Follow-up activities involve the work area employees to complete the action that has been given. According to Glover (2008), although follow-up activities given freedom to the employees to make changes and innovation, but however all the changes and innovations must be related to Kaizen's goals.

2.3.2 Working Area Impact

Kaizen activities give effect on the work area because it assists employees who are improving their working area. A part from that, according to Farris et al., (2008), KE is also a complex phenomenon organizational and has the potential to affect both system, the technical system (work area performance) and social systems (participation employees and of work areas employees).

2.4.3 Employee Skill and Effort

Employee motivation, employee satisfaction, training and development, compensation, job security and organizational structure play an important role on influence employee performance), KE can improve the employee knowledge in managing an organization with more systematic and successful (Butterworth, 2001; Hashim et al., 2013) and it can also be the platforms for knowledge employees in principles, tools and techniques for continuous improvement (Watson, 2002).

2.4 Operational Performances (OP)

Operation is the tasks perform to turn an input into a value added output. It refers to both something that is small in scale, such as casting or machining an item as well as something that is large and complex, such as the set of interrelated activities used to manage and improve an organization (Knod & Schonberger, 2001). Operational Performances (OP) means the

effectiveness of an organization in converting inputs into outputs. OP can be defined as the process of quantifying the efficiency and effectiveness of action.

Over the year, OP is considered as a key management mechanism and is very effective to control and ensure the performance of the organization in line with the objectives set. Numerous studies have been done in connection with this matter, which mainly aims to improve the effectiveness of the performance appraisal exercise. To keep in mind, operational performance is a component that has been accepted as a doctrine to ensure the excellence of an organization. By conducting operational performances in automotive management system, there are still some weaknesses that can be improved.

3. Methodology

To be more understand the relationship between KE practices and OP in Malaysian automotive industry, the following hypotheses will be used and tested.

3.1 Research Design

In an attempt to understand the reality of automotive industry towards quality initiatives, a survey in automotive manufacturing vendor was conducted through a structured questionnaire approach. Design which made must be in accordance with objective of the study and method or method used. This study design has two big reasons namely allow researcher find one suitable method to carry out research and how researcher determined variable and ways of how the variable is handled. Survey method selected because his credibility degree high, cheap cost and time frame that is needed to carry it out was short.

3.2 Overall Structure of Research Methodology

In the first phase, the critical literature review on quality initiatives in Malaysian automotive industry, Kaizen Event (KE) and Operational Performances measurement (OP) were conducted. The researcher has also conducted a critical review on KE constructs, OP measurement and work done by other researchers in this research area and related. Then, it is proceeding by developing the research hypotheses, and survey instrument. Finally, initial procedures undertaken to determine the population and samples selection, build and modify the instrument, companies selection for pilot study and full survey, as well as the procedure for obtaining, and permission to engage the research undertaken were determined in this phase.

For the second phase, the research activities focused on data collection. Pilot study has been conducted. In relation to previous activities, the researcher had also to improve the questionnaire, if necessary and, finally implement the full survey to the Malaysian automotive industry.

In the third phase, data screening and analysis will be done by using the Statistical Package for the Social Sciences (SPSS) software. Next, discussions and implications of the survey results were presented. Finally, the researcher gives some conclusion and recommendation for future research.

3.3 Questionnaire Development

The questionnaire divided into three sections which start with some general information such as type of product, quality award and then focus on KE in second section. Then, the questionnaire also contain about the perception on performance measures for Malaysian automotive industry in third section. The questionnaire was evaluate by e-mail and reviewed by sustainable manufacturing expert from local and international academician and industrial expert. Then, the questionnaire was modified by based on their comments. Meanwhile, it's used the seven-likert scale, representative a range from very low = 1 to very high = 7 which has been used by management researchers before (Adler and Reid, 2008).In order to test the internal reliability, the researcher evaluated the common measure of construct reliability of the questionnaire through Cronbach's alpha measure.The Cronbach's all constructs in this research was larger than 0.900, indicating an acceptable level of reliability of the constructs. The result of reliability analysis of pilot data showed that the construct are sufficient as reliable measure to automotive industry.

3.3.1 Population and sampling of the study

Population of this research comprised on automotive industry in Malaysia and samples were selected from the list of Proton Vendor Association (PVA) and Kelab Vendor Perodua (KVP).

Through PVA and KVP website, all the information about the company such as classification of company, mailing and e-mail address, office and fax number can be obtained. Respondent's position such as Executive Manager, Director of Operations/Manufacturing or the person with the equivalent position in the organization was selected. Questionnaire has been distributed to the right person who is most likely to understand, knowledgeable, practical experience about Kaizen Event and Operational Performances of the company.

3.3.2 Data Collection

Questionnaire have been use to collect all the data in this research. The questionnaire was administered simultaneously in each PROTON and PERODUA vendor by researcher. The questionnaire was distributed to the Executive Manager, Director of Operations/ manufacturing or the person with the equivalent position in the company. The Executive Manager and Director of Operations/Manufacturing are the best suited to self-report the decisions made regarding the manufacturing practice and the results of the quality program implementation. The questionnaires that have been completed are collected.

3.3.3 Statistical analysis

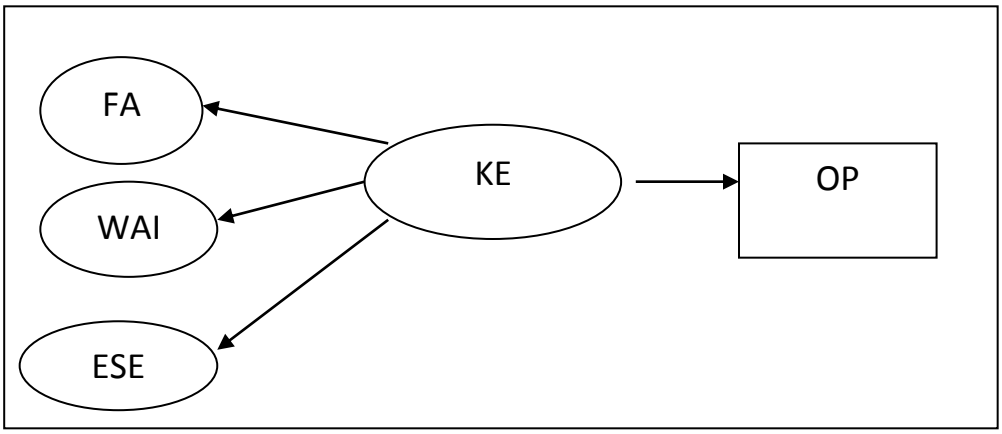
Correlation and regression analysis is used in order to find the relationship between KE and OP. The result of this analysis is an equation that represents the best prediction of a dependent variable from several independent variables. Generally, the regression model for this study is summarized as follows:

$$OP = \beta 0 + \beta 1\mathbf{FA} + \beta 2\mathbf{WA} + \beta 3\mathbf{ESE} + \varepsilon$$

Where,

OP = Operational Performances
FA = Follow Up Analysis
WA = Working Area Impact
ESE = Employee Skill and Effort
β = constant, and
ε = standard error

In this test, F value is used to test whether the regression model could statistically explain significantly the variance in the independent variables. In this study, the regression analysis was conducted using SPSS 17.0 software.



Note : FA= Follow up Activities, WAI = Working Area Impact, ESE = Employee Skill and Effort, KE = Kaizen Event , OP= Operational Performances.

Figure 1: Proposed Research Model

3.4 Research Hypotheses

H_1: There is a positive and significant relationship between Follow-Up Activities (FA) and Operational Performances (OP) in automotive industry.
H_2: There is a positive and significant relationship between WAI and OP in automotive industry.
H_3: There is a positive and significant relationship between ESE and OP in automotive industry.
H_4: There is a positive and significant relationship between KE and OP in Malaysian Automotive industry SME.

4. ANALYSIS AND DISCUSSION

The conceptual framework is developing to identify dimension that related to EP and BP. Figure 2 is presented to understand the relationship of EP and BP in Malaysia. The analysis done

proposed that EP dimension entrepreneurial traits, entrepreneurial experience, management skill, customer relation, training and education and environment might be able to help women.

4.1 Respondent Profile Descriptive Statistic

The first aspect investigated was the general background of the respondent including the number of years in business, type of product manufactured, number of employees and current position. For these, information on respondents criteria can be identified as company classification and respondents background for Malaysian automotive industry. Please refer Table 1.

Table 1. The profile respondent n=80

Constructs/measures	*Frequency*	*Percent*
The number of year in business		
Less than 10 year	78	97.5
10 to 20 years	2	2.5
More than 20 years	0	0
Types of product manufactured[1]		
Metal	38	47.5
Plastic	23	28.8
Rubber	23	28.75
Engine/Transmission	15	18.75
Electric/Electronic	21	26.25
Others	6	7.5
Number of employee		
Less than 50	75	93.75
Between 50 to 150	5	6.25
Current position		
Senior management	51	63.75
Middle management	25	31.25
Others	1	1.25

4.2 Exploratory Factor Analysis (EFA)

The EFA applied as the primary component analysis was used for extraction method. Varimax with Kaiser Normalisation was adopted before factor rotation, and at once it preserved the factors with eigenvalue of one or greater. This procedure was chosen to eliminate error variances as suggested by Tinsley and Tinsley (1987). In this study, EFA was conducted in:

1. Perform EFA to determine the underlying details (items) of KE constructs.

4.2.1 EFA on KE constructs

EFA with varimax rotation of 11 items of KE practices was done on random sample (n=80) of automotive industry to determine the basic details of each KE construct namely FA, WAI, and EFE. Kaiser- Meyer-Olkin (KMO) measurement showed the sampling adequacy as 0.765 which was more than 0.7 indicating that it was suitable for principal component analysis. Similarly, Barlett's test of sphericity was significant at ($p < 0.001$).

Table 2. KMO and Bartlett's test for KE constructs

Kaiser-Meyer-Olkin Measure	of Sampling Method	0.765
Bartlett's Test of Spherity	Approx.Chi-Square	899.18
	Df.	55
	Sig.	0.00

4.2.1.1 Initial Solution Results

Initial solution results estimate variance in every variable caused by all components. Three factors in initial solution had larger eigenvalues from unity as described in Table 4.3. This three factors contributed 85.28% from the total variance and sufficient for further analysis which requires at least 50% (Zakuan, 2009). This shows that three latent influences are associated. Meanwhile, the last column (cumulative percentage) indicated that the variance explained by extraction solution was also 85.28% similar to the initial solution. Therefore, there is no change explain by initial solution lost because of latent factors that reflects the method of KE.

Table 3. Result of Total Variance Explained for KE Items

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.590	50.819	50.819	5.590	50.819	50.819	3.397	30.879	30.879
2	2.302	20.924	71.743	2.302	20.924	71.743	3.274	29.766	60.645
3	1.489	13.535	85.278	1.489	13.535	85.278	2.710	24.633	85.278

*Note : Com = Component, Var= Variance, Cum = Cumulative

4.2.1.2 Rotated Component Matrix Results

In EFA, discriminant validity is only shown if the item loading is high towards related factor when compared to others factors. At least, 0.4 loads for each item on respective factor is considered sufficient for the factor (Hatcher, 1994). However, a minimum of 0.5 fits cross-load items to various factors which are considered as sufficient (Ngai *et. al.*, 2004).

The rotated component matrix helps to determine what represent the component. Matriz assists the researcher to identify items that correlate the highest to one factor and on lowest remaining factor. In this study, three factors for KE construct (refer to Appendix D1) were compared to the original construct from questionnaire. The first factor was made up of the four items from follow-up Activities (FA) including FA1, FA2, FA3 and FA4. No item was suggested to be removed.

The second factor was classified as working area impact (WAI) with four items (WAI1, WAI2, WAI3 and WAI4). No item was suggested to be removed. The third item was categorized as employee skill and effort (ESE). This factor comprised of three items (ESE1, ESE2, and ESE3). No item was suggested to be removed. The result of EFA exhibited three KE construct with 11 items.

4.3 Correlation

4.3.1 The relationship between KE and OP in automotive industry

This subsection represents the result of the test to investigate the relationship between KE and OP in automotive industry in Malaysia. Thus, to determine the association of the independent variables and dependent variables; and to test the hypotheses, The Pearson Product Moment Correlation Coefficients test were carried out. Table 4.4 represents the Pearson (r) correlation coefficient among the independent variables of the study. The result of the correlation reveals that the variables are statistically significant. The correlation coefficient ranges from 0.32 to 0.85 at $p < 0.01$. All the variables are correlated and statistically significant

Table 4. Pearson Product Moment Correlation Coefficient (n=80)

Variables	FA	WA	ESE	OP
FA	1	0.322(**)	0.495(**)	0.845(**)
WA		1	0.390(**)	0.329(**)
ESE			1	0.785(**)
OP				1

4.3.1.1 The relationship between Follow-Up Activities and Operational Performances

The hypotheses tested in order to determine the above relationship in as follows:

H_1: *There is a positive relationship between the implementation of follow-up activities and operational performances in automotive industry in Malaysia.*

To test these hypotheses, the Pearson product-moment linear correlation was applied. The correlation coefficient was $r = 0.85$, at $p < 0.01$. Thus, there was a significant positive association between the implementation of FA and OP in automotive industry in Malaysia. This result seems to imply that the companies with high degree of implementation of follow-up activities experience better operational performances.

4.3.1.2 The relationship between Working Area Impact and Operational Performances

The related hypotheses developed to determine the relationship between the implementation of WAI and OP is as follows:

H_2: *There is a positive relationship between the implementation of working area impact and operational performances in automotive industry.*

The Pearson product-moment linear correlation was used to test these hypotheses. The result shows that the correlation coefficient was $r = 0.33$, at $p < 0.01$, which seems to indicate that the relationship is not significant between the implementation of working area impact and operational performances in automotive industry in Malaysia.

4.3.1.3 The relationship between Employee Skill and Effort and Operational Performances

The hypothesis that follows is to determine the existence of relationship between the implementation of ESE and OP in automotive industry in Malaysia.

H_3 : *There is a positive relationship between the implementation of employee skill and effort and operational performances in automotive industry.*

By using the Pearson product-moment linear correlation to determine the existence of the above relationship, the correlation was found to be $r = 0.79$ at $p < 0.01$. The result revealed that there is a significant relationship between the implementation of employee skill and effort. Thus, the result suggests that the companies with high levels of the implementation of employee skill and effort experience better operational performances.

4.4 Regression Analysis

The objective of this section is to determine the aggregate effect of the independent variables (follow-up activities, working area impact and employee skill and effort) and operational performances in automotive industry in Malaysia. The formulated hypotheses are follows:

H_4: *The implementation of Kaizen Event (follow-up activities, working area impact and employee skill and effort) is significantly and positively related to the perceived operational performances in automotive industry.*

In testing the hypotheses, multiple regression analysis was employed. Based on this method, a regression model was developed in determining the relationship of the variables understudied. The model is as follows:

$$OP = \beta 0 + \beta 1\mathbf{FA} + \beta 2\mathbf{WA} + \beta 3\mathbf{ESE} + \varepsilon$$

Where,
OP = Operational Performances
FA = Follow-up Activities
WA = Working Area Impact
ESE = Employee Skill and Effort
β = constant, and
ε = standard error

Table 5 and 6 exhibit the results of the multiple regression analysis.

Table 5. Multiple Regression Result for Independent Variables and Dependent Variables

R	R^2	Adjusted R^2	Std. Error of the Estimate	F	Sig. F
0.946[a]	0.896	0.891	0.318	217.316	0.000

Table 6. Multiple Regression Result for Independent Variables and Dependent Variables

	Unstandardized Coefficients		Standardized Coefficients		
Variables	B	Std. Error	Beta	t	Sig.
(Constant)	1.199	0.167		7.174	0.000
FA	0.464	0.033	0.615	14.236	0.000
WA	-0.048	0.029	-0.067	-1.653	0.103
ESE	0.369	0.032	0.507	11.401	0.000

Level of Significance : a) $p < 0.01$

The result of multiple regression analysis indicates that the multiple regression coefficient, R = 0.946 with R2 = 0.896, signifies that 89.6 % of the variation in the operational performances was statistically explained or accounted for the regression equation.

The R2 was statistically significant, with F=217.316 at $p < 0.0001$. Thus, the general expression in the form of the regression equation can be stated as follows:

OP = 1.199 + 0.464FA+ (-0.048) WA+0.369ESE + 0.167

The result of the multiple regression analysis indicated by the value of R2 and p suggested that there is a strong and significant relationship to support the hypotheses that are the independent variables (follow-up activities, working area impact and employee skill and effort) can significantly explain the variations in the dependent variable (Operational Performances). However, the variable, working area impact was not statistically significant.

5. Discussion

In relation to the objective to identify the KEs constructs and OP for automotive industry, this study found that there is a significant relationship between implementation of follow-up activities, working area impact and employee skill and effort in OP of SMEs on automotive industry in Malaysia. This can be seen from the results of a significant correlation of the independent variables (OP), where $p < 0.01$ and $p < 0.05$ except for the independent variable working area impact which respectively $p = 0.013$.

This study also found that there were positive associations between the implementation of KE and operational performance of SMEs on automotive industry in Malaysia with the R square = 0.896. These further strengthen the independent variable on the dependent variable of OP.

6. Recommendation

The scope of this study was limited for SME in automotive industry in Malaysia, which has resulted in the inability for a larger sample size and longer duration of survey to take place. The larger the sample size, the better it can represent the situation. Hence, the result of the survey is dependent upon time and constraint of the particular outcome and could only provide some indication to the KE implementation among the sample of SMEs conducted based on the statistical test and not necessary be relied 100% upon.

Furthermore, the questions addressed in the survey were designed more on the principles and concepts of KE. It does not contain much of technical aspects towards implementation of KE except for which the researcher tries to measure some quality activities that were frequently adopted by the SME's. Perhaps, future researcher could continue to conduct a survey on how the implementation on the technical aspects of KE can be assimilated into SMEs. This research carried out was mainly a guideline to see the current involvement of SMEs in KE.

7. Conclusion

Many previous researches indicate that KE is a practice that affects the organizational performance. Therefore, these researches have been conducted to identify the relationship between KE and OP in Malaysian automotive industry. Based on the conceptual model and previous studies also, the hypothesis has been constructed. The next step is to design a quality questionnaire to ensure that research objectives are achieved. This questionnaire will be used on the future for pilot study data collection in the Malaysian automotive industry.

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