Critical Success Factors of Six Sigma in Original Equipment Manufacturer Company in Malaysia

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Abstract

Purpose – This paper aims to examine the five critical success factors (i.e., top management involvement and commitment, training and education, teamwork, cultural change, and organizational infrastructure) on Six Sigma implementation in the Original Equipment Manufacturer (OEM) industry.
Design/methodology/approach – Survey data are collected from 102 employees from a renowned OEM company in Malaysia. Multiple regression analysis is performed to test the research hypothesis.
Findings – The results show that top management involvement and commitment, as well as training and education are independent and positively related to six sigma implementation. However, teamwork has a negative relationship with Six Sigma implementation.
Practical implications – This study provides empirical evidence for critical success factors and their importance to Six Sigma adoption in OEM. The findings of this study provide a basis for the industrial practitioners to focus on top management involvement and commitment, as well as training and education in order to facilitate effective Six Sigma implementation.
Originality/value – The critical success factors in relation to the Six Sigma implementation in the OEM industries are under-studied, in particular, within the Asian region. Our study adds to the total quality management literature. First, top management involvement and commitment, as well as training and education appear to be significantly related to Six Sigma implementation. Second, this study reveals the role of teamwork that inhibits successful Six Sigma implementation in the OEM industry.
Keywords – Critical Success Factors, Six Sigma, Malaysia, Original Equipment Manufacturer, Total Quality Management, Synergy and Research.
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1. Introduction

Six Sigma is a methodical and data-driven approach to implementing process improvement in an organization (Gijo and Scaria, 2010). In fact, Six Sigma is one of new quality management innovations that several companies have implemented, with the aim of enhancing business performance and customer services (Braunscheidel *et al.*, 2011). The Six Sigma approach was first introduced in 1987 by Motorola, and its purpose was to improve organizational performance by reducing process output variation (Gijo and Scaria, 2010; Sadraoui *et al.*, 2010; Ng *et al.*, 2005). Numerous companies have gained substantial benefits from the Six Sigma programme, though not all are successful (Coronado and Antony, 2002).

Following Antony (2007), Six Sigma adoption will continue to gain popularity in countries (e.g., Malaysia, Thailand, China and India). There has been a great deal of academic research on the topic of Six Sigma. A review on the past and recent Six Sigma literature has shown that scholars have limited their research to focus on medical device industry (Braunscheidel *et al.*, 2011), automobile manufacturing company (Gijo and Scaria, 2010), hospital (Mandahawi *et al.*, 2010), food and beverage industry (Sadraoui *et al.*, 2010), small and medium enterprises (Bewoor and Pawar, 2010; Antony *et al.*, 2005), software industry (Mahanti and Antony, 2009), cargo containers (Ng *et al.*, 2005). According to Rockart (1979), the identification of critical success factors (CSFs) is very effective in guiding the management to define the information required to facilitate successful competitive performance of the company. Within the Six Sigma's context, CSFs are regarded as the areas of activity without which a project implementation is less likely to be successful (Coronado and Antony, 2002). Nevertheless, the topic of CSFs of Six Sigma practice seems to have been ignored in Original Equipment Manufacturer (OEM) industry in Southeast Asia.

OEM refers to a manufacturing company which makes products or components of products that other organizations buy and sell under the purchasing organizations' trademark (VanBaren, 2011). Over the three decades, the larger economies of Southeast Asia (i.e., Malaysia, Indonesia, Thailand and Singapore) have steadily outperformed other developing counties (Perry, 2003). In Malaysia, the international contracting associated with OEM has significantly contributed in Malaysian economic development. According to Malaysian Industrial Development Authority (MIDA) (MIDA, 2011), the Malaysian economy grew 7.2 percent in 2010, and the Central Bank of Malaysia has projected a growth of 5-6 percent in 2011. Given that OEM is one of the key drivers for economic development in Malaysia, this study is motivated by the need to examine the CSFs on Six Sigma implementation in OEM in Malaysia. Our study differs from existing Six Sigma research because it provides both theoretical and practical implications for the Malaysian OEM industries to gain sustainable competitive advantage.

In the following sections, a review of the literature on Six Sigma, and the CSFs is presented. The research hypotheses of this study are also suggested in this section. Next, the research design and methodology used in this study are articulated. This is followed by a discussion of the statistical results and research findings. In the final section, the research implications, limitations and direction for future research are presented.

2. Literature review and hypotheses development

2.1. Six Sigma implementation

Sigma has been used as a measurement standard after Frederick Gauss first introduced the statistical concept of normal distribution (Chakrabarty and Tan, 2007). In 1922, Walter Andrew Shewhart, who is also known as the father of statistical quality control, later introduced Three Sigma as a measurement of process output variation (Chakrabarty and Tan, 2007). From a statistical viewpoint, Three Sigma is associated with a defect rate of 2600 per million opportunities (Chakrabarty and Tan, 2007). The idea of Six Sigma is proposed by Mikel Harry at Motorola in 1980s (Thawani, 2004) and it is derived from the quality improvement philosophies of Edwards Deming and Joseph Juran (Sadraoui *et al.*, 2010; Thawani, 2004). According to Ng *et al.* (2005), Six Sigma is a program with a goal of reducing output variation so that no more than 3.4 defect parts per million opportunities.

The fundamental stage of Six Sigma program is its implementation (Miguel and Andrietta, 2009). The implementation of Six Sigma involves both management and technical components (Mahanti and Antony, 2009). The management components include selection of the right people for Six Sigma program, selection of the right process metrics, provision of training and education (Rohani *et al.*, 2010; Mahanti and Antony, 2009; Miguel and Andrietta, 2009). On the other hand, the technical components take into account the use of statistical tools and process improvement to reduce output variation (Rahman *et al.*, 2010; Mahanti and Antony, 2009). These management and technical components represent the critical factors which are important to the success of a Six Sigma implementation.

2.2. Critical success factors

In retrospect, several conceptual papers (e.g., Coronado and Antony, 2002; Henderson and Evans, 2000; Antony *et al.*, 2000) have been published on the CSFs for a successful Six Sigma implementation. In the early 2000s, Henderson and Evans (2000) posited that upper management support/involvement, organizational infrastructure, training, and tools (i.e., team, process and statistical tools) are key dimensions for implementing a successful Six Sigma program. In a related vein, Antony *et al.* (2000) proposed ten CSFs: (1) management commitment and support; (2) training and education; (3) teamwork; (4) process prioritisation and definition; (5) selection of process variables; (6) measurement system; (7) selection of control charts; (8) cultural change; (9) use of pilot study; and (10) use of computers and software packages. Although these factors identified in the conceptual paper of Antony *et al.* (2000) are important, these CSFs are yet to be validated through empirical studies.

Coronado and Antony (2002) later coalesced all the CSFs for Six Sigma implementation proposed in the existing literature, and summarized twelve CSFs as follows: (1) management involvement and commitment; (2) cultural change; (3) communication; (4) organization infrastructure; (5) training; (6) linking Six Sigma to business strategy; (7) linking Six Sigma to customer; (8) linking Six Sigma to human resources; (9) linking Six Sigma to suppliers; (10) understanding tools and techniques within Six Sigma; (11)

project management skills; and (12) project prioritisation and selection. However, these factors suggested by Coronado and Antony (2002) have not been empirically tested.

In a recent publication, Rohani *et al.* (2010) proposed a survey instrument comprising eleven scales (i.e., top management commitment, teamwork, training and education, control charts, identification of process/product parameter, process prioritization and identification, measurement systems analysis, pilot project, use of facilitator, cultural change, and deployment) to measure the effectiveness of statistical process control. This survey instrument has been tested and validated in manufacturing companies.

Because this study assesses the Six Sigma implementation in the context of OEM, not all abovementioned CSFs are appropriate to be included in this study. On the basis of a careful review (e.g., Rohani *et al.*, 2010; Coronado and Antony, 2002; Henderson and Evans, 2000; Antony *et al.*, 2000), the important CSFs for this study are measured by five elements, namely, top management involvement and commitment, training and education, teamwork, cultural change, and organizational infrastructure.

2.3. The Hypothesized relationship between critical success factors and Six Sigma implementation

2.3.1 Top management involvement and commitment

Top management support has been predominantly recognized as a critical success factor by those who have practised Six Sigma (Henderson and Evans, 2000). This notion is further backed by Coronado and Antony (2002) which posited that the Chief Executive Officers (CE0s) are the key people who have led the success stories in Motorola, General Electric and AlliedSignal. In the workplace, the management commitment and support are important in handling the causes of process output variation (Antony *et al.*, 2000). According to Zu *et al.* (2008), top management decisions on the organization's strategic objectives will affect the metrics and goals set for the Six Sigma improvement projects. In the past, many researchers (e.g., Chakrabarty and Tan, 2009; Mahanti and Antony, 2009; Zu *et al.*, 2008; Coronado and Antony, 2002; Antony *et al.*, 2000; Henderson and Evans, 2000) have reported that top management involvement and commitment is positively related to the Six Sigma implementation. Given that top management support is needed in the implementation of Six Sigma (Zu *et al.*, 2008; Coronado and Antony, 2002; Henderson and Evans, 2000), we propose the following hypothesis:

H1: Top management involvement and commitment will have a positive relationship with the Six Sigma implementation.

2.3.2. Training and education

Provision of training and education is important to the success of Six Sigma implementation (Coronado and Antony, 2002). It is necessary to design and plan for the Six Sigma project development, training and resources prior to implementating Six Sigma technique in a company (Heckl *et al.*, 2010). Many Six Sigma-based organizations (e.g., Motorola, General Electric and AlliedSignal) provides Master Black-Belt training for the process's champions (top management), process' owner (middle management), shop-floor operators and supporting divisions (implementation team) (Harry, 1994 as cited by Antony *et al.*, 2000). For example, the green belt training is provided in intentional sites for all staff members in General Electric (Henderson and Evans, 2000). Previous studies (e.g., Heckl *et al.*, 2010; Chakrabarty and Tan, 2009; Coronado and Antony, 2002; Antony *et al.*, 2000; Henderson and Evans, 2000) have found a positive relationship between training and education, and the Six Sigma implementation. In this instance, we expect that training and education will be positively related to the Six Sigma implementation. Hence, it is proposed:

H2: Training and education will have a positive relationship with the Six Sigma implementation.

2.3.3. Teamwork

Effective teamwork is the main component for the success of Six Sigma program (Thawani, 2004). It is value-added to have teams in any problem solving actions because different team players have different skills, talents, knowledge and experience (Antony *et al.*, 2000). In the Six Sigma working teams, roles and responsibilities of team members (e.g., champions, master black belts, black belts and green belts) are explicitly defined (Gutierrez *et al.*, 2009; Thawani, 2004). Since the Six Sigma working teams have profound ability and knowledge of Six Sigma techniques (Gutierrez *et al.*, 2009), teamwork will increase the likelihood of Six Sigma success. This assertion has been supported by prior literature (e.g., Chakrabarty and Tan, 2009; Gutierrez *et al.*, 2009; Thawani, 2004; Coronado and Antony, 2002; Antony *et al.*, 2000). As such, we suggest the following hypothesis:

H3: Teamwork will have a positive relationship with the Six Sigma implementation.

2.3.4. Cultural change

Cultural change is one major CSFs affecting Six Sigma implementation (Chakrabarty and Tan, 2007; 2009). According to Coronado and Antony (2002), Six Sigma is regarded as a breakthrough idea because it transforms the organization and culture. To nurture the Six Sigma culture, the organizational administrators should collect employees' feedback, plan the cultural change through a proper Six Sigma milestone, delegate jobs and empower staff in decision-making (Coronado and Antony, 2002). In a survey on service firms in Singapore, Chakrabarty and Tan (2009) has confirmed that cultural change is a critical factor of Six Sigma practice. In support of these findings, the hypothesis below is proposed:

H4: Cultural change will have a positive relationship with the Six Sigma implementation.

2.3.5. Organizational infrastructure

Certain organizational infrastructure needs to be in place prior to introducing Six Sigma program in an organization (Coronado and Antony, 2002). For example, an organization shall have sufficient resources and investment to engage in Six Sigma program. In addition, every worker in a Six Sigma-oriented organization shall have undertaken statistical courses and training, as well as have driven other co-workers to involve in Six Sigma activities (Henderson and Evans, 2000). To retain employees' interest in Six Sigma program, small quick wins are allowed in the initial stage, and subsequently emphasize complex projects which need more time and effort (Coronado and Antony, 2002). Drawing from the literature (e.g., Coronado and Antony, 2002; Henderson and Evans, 2000), the hypothesis below is proposed:

H5: Organizational infrastructure will have a positive relationship with the Six Sigma implementation.

3. Research Methodology

3.1. Measures

3.1.1. Independent variables

The survey items of this study are adapted from prior literature (e.g., Rahman *et al.*, 2010; Rohani *et al.*, 2010; Henderson and Evans, 2000, Rungtusanatham *et al.*, 1999). The instrument of critical success factors used in this study is an adaptation of the scale developed by Rohani *et al.* (2010), Henderson and Evans (2000), Antony *et al.* (2000), Rungtusanatham *et al.* (1999) and Gordon *et al.* (1994). In our study, each construct (i.e., top management involvement and commitment, training and education, teamwork, cultural change, and organizational infrastructure) is scored on a five-point scale. Anchors ranging from 1 = strongly disagree to 5 = strongly agree are used to measure the independent variables.

3.1.2. Dependent variables

The scale of Six Sigma implementation is accessed using the items from Rahman *et al.* (2010). A five-point Likert scale, anchored by very weak (1) to very strong (5), is used to measure the degree to which a respondent agrees with the status of Six Sigma implementation in his or her company. Appendix A shows the survey items used in this research.

3.2. Sample and Procedure

The hypothesized research model is illustrated in Figure 1. A sample of 102 is collected for the data analysis. The respondents for this study are employees (e.g., head of department, senior executives, executives and others) working in an OEM company. This particular company is appropriately selected to represent the population in this research for three main reasons. First, according to a survey published by digital measurement provider comScore, the company selected in this study is the top OEM Company with a 25.5 percent market share in the mobile industry (Shantharam, 2011). In other words, this company takes the lead in providing mobile devices for the global market. Second, this company is one of the OEM organizations which is highly ranked and listed in the category of Electronic Manufacturing Services (EMS) Industry under MIDA directory (MIDA, 2011). MIDA is the Malaysian government's main agency to promote both manufacturing and services sectors in Malaysia. The company selected in this study has Six Sigma success stories that have been reported and recognized by

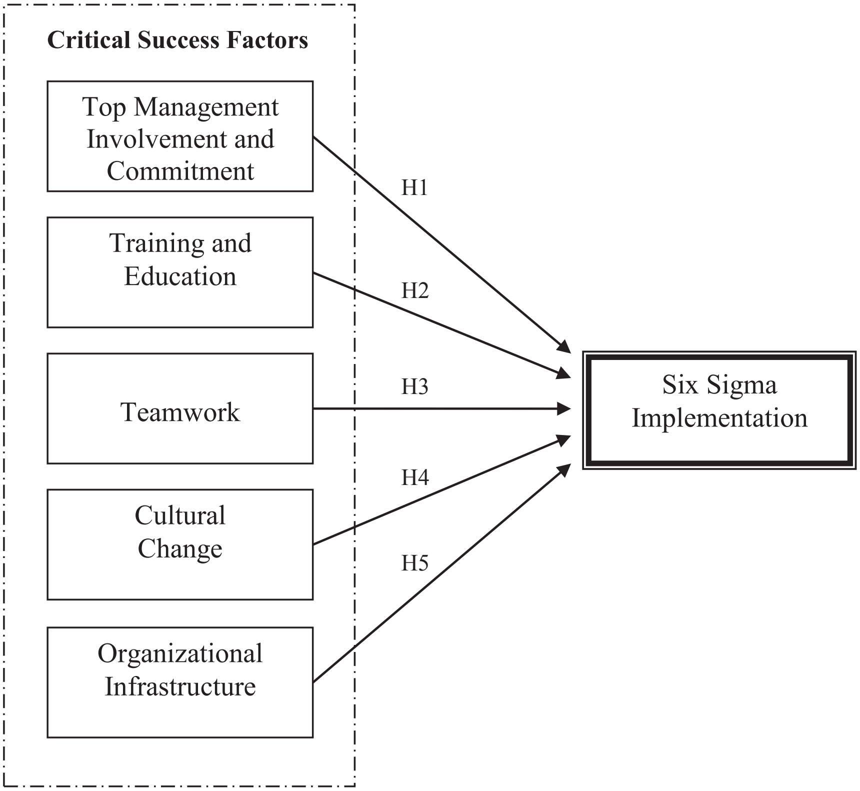

Figure 1: Research Model

MIDA. Third, this company has implemented Six Sigma approaches since 1996. This is a mean of proof that Six Sigma is the focus of the company and therefore, the responses collected from this company are valid and representative.

Survey data are collected using a stratified random sampling procedure. The stratum identified in this study is the qualification of six sigma belts and certificates. This stratum is an important indicator of an employee's knowledge and experiences on Six Sigma implementation. In this study, 200 survey questionnaires are distributed to employees who are champions, black belt, green belt, team members of Six Sigma projects and other six sigma certificate holders. Of the 107 survey returned, data analysis is performed using 102 usable data. As a result, the response rate for this research is 51 percent.

4. Data Analysis

4.1. Profile of Respondents

As shown in Table 1, survey respondents include 43.1% female and 56.9% male. The age groups of these respondents are as follows: 14.7% are between 21-25 years old, 5.9% are between 26-30 years old, 21.6% are between 31-35 years old, 35.3% are between 36-40 years old, and the remaining 22.5% are 41 years old or above. In general, the respondents hold different job positions in which 8.8% are head of department, 30.4% are senior executives, 52% are executives, and 8.8% are others. In terms of employees' qualification of Six Sigma, 2.9% are champions, 40.2% are black belt holders, 24.5% are green belt holders, 25.5% are team members in Six Sigma projects, and the remaining 6.9% are other Six Sigma certificate holders.

Profile	Number of respondents	Category	Count	Percentage (%)
Gender	102	Female	44	43.1
		Male	58	56.9
Marital Status	102	Married	83	81.4
		Single	19	18.6
Age	102	21-25 Years Old	15	14.7
		26-30 Years Old	6	5.9
		31-35 Years Old	22	21.6
		36-40 Years Old	36	35.3
		41 or Above	23	22.5
Qualifications	102	High School	1	1.0
		Diploma	21	20.6
		Bachelor Degree	70	68.6
		Master Degree	10	9.8
Job Position	102	Head of Department	9	8.8
		Senior Executive	31	30.4
		Executive	53	52.0
		Other	9	8.8
Sigma Belt	102	Champions	3	2.9
		Black Belt	41	40.2
		Green Belt	25	24.5
		Team Member	26	25.5
		Other	7	6.9

Table 1: Demographic of Survey Respondents

4.2. Scale Validation

Table 2 shows the results of reliability and normality test. In this study, the reliability test is measured using Cronbach's Alpha. As indicated in Table 2, the values of Cronbach's Alpha range from 0.787 to 0.876, meeting the desirable value of 0.70 suggested by Nunnally and Bernstein (1994). As a result, the survey items measuring the constructs of top management involvement and commitment, training and education, teamwork, cultural change, organizational infrastructure, and Six Sigma implementation are statistically assessed to be reliable.

The basic assumption in using multiple regression analysis (MRA) is normality. In our study, assessment of skewness and kurtosis statistics is made to test for normality. Referring to Table 2, the normality of all constructs is assumed as the absolute values of skewness and kurtosis are less than 1.0. To validate the presence of multicollinearity, the tolerance values and variance inflation factors (VIF) are examined. Multicollinearity occurs if the variables show tolerance values lower 0.10 and VIF of 10 or above (Hair *et al.*, 2010). As shown in Table 4, the multicollinearity problem is not significant because each variable has a tolerance value of more than 0.10 and the VIF values range from 1.678 to 2.810.

Constructs	Cronbach's Alpha	Skewness	Kurtosis
Top Management Involvement and Commitment	0.843	-0.164	-0.433
Training and Education	0.797	-0.125	-0.395
Teamwork	0.834	-0.213	-0.660
Cultural Change	0.787	-0.082	-0.372
Organizational Infrastructure	0.791	-0.071	-0.409
Six Sigma Implementation	0.876	-0.060	-0.501

Table 2: Results of Reliability and Normality Test

Factor analysis is performed to test the unidimensionality of the scales. Referring to Table 3, the values of Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy for each factor are greater than 0.60. All eigen-values of the factors analysed are greater than 1, meeting the recommended criteria of Hair *et al.* (2010). Given that all the items of each construct have high factor loadings greater than 0.60 on a single factor, all six factors (i.e., top management involvement and commitment, training and education, teamwork, cultural change, organizational infrastructure, and Six Sigma implementation) are validated.

Table 3: Results of Factor Analysis

Variables	No.of Items	Factor Number	KMO	Eigen-values	Factor Loadings				
					Item1	Item2	Item3	Item4	Item5
Top Management Involvement and Commitment	5	1	0.773	3.075	0.756	0.809	0.787	0.752	0.816
Training and Education	5	1	0.739	2.770	0.658	0.768	0.785	0.747	0.757
Teamwork	3	1	0.674	2.255	0.816	0.916	0.866	Nil	Nil
Cultural Change	4	1	0.637	2.466	0.683	0.894	0.868	0.668	Nil
Organizational Infrastructure	5	1	0.729	2.786	0.721	0.827	0.828	0.656	0.682
Six Sigma Implementation	5	1	0.789	3.539	0.808	0.794	0.886	0.849	0.866

4.3. Hypotheses Testing

The hypothesised model is tested using MRA. In our study, Cohen's rules for effect sizes are adopted to measure the magnitude of effects. Conventional effect size with *r*-value of 0.30 is regarded as medium (Cohen, 1977, p. 83). As shown in Table 4, the effect size of this study is considered as medium because the coefficient of determination (R^2) is 0.100; indicating 10% of Six Sigma implementation can be explained by the five CSFs. The parameter estimates of top management involvement and commitment, training and education, as well as teamwork have acceptable statistical significance levels. Results of MRA show that top management involvement and commitment (beta coefficient = 0.526; $p < 0.05$) are positively related to the Six Sigma implementation. Training and education (beta coefficient = 0.380; $p < 0.10$) are found to have a significant and positive relationship with the Six Sigma implementation. Interestingly, teamwork (beta coefficient = -0.567; $p < 0.05$) is negatively related to the Six Sigma implementation. Given the negative sign shown, Hypotheses H3 is not supported. On the other hand, cultural change (beta coefficient = 0.092; $p > 0.10$) and organizational infrastructure (beta coefficient = 0.039; $p > 0.10$) have no significant relationship with Six Sigma implementation. Therefore, Hypotheses H1 and H2 are statistically supported. Likewise, Hypotheses H3 through H5 are not supported.

5. Discussions

Our findings support the hypothesis that top management involvement and commitment are positively related to Six Sigma implementation. This result is consistent with Chakrabarty and Tan (2009), Mahanti and Antony (2009), Zu *et al.* (2008), Coronado and Antony (2002), Antony *et al.* (2000) and Henderson and Evans (2000). Our result suggests that it is highly desirable to have top management involvement and commitment in the Six Sigma implementation.

Table 4: Results of Multiple Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		β	Std. Error	β			Tolerance	VIF
1	(Constant)	-1.942	0.824		-2.357	0.020		
	Top Management Involvement and Commitment	0.526	0.248	0.326	2.117	0.037**	0.396	2.525
	Training and Education	0.380	0.217	0.220	1.750	0.083*	0.596	1.678
	Teamwork	-0.567	0.219	-0.419	-2.583	0.011**	0.356	2.810
	Cultural Change	0.092	0.202	0.060	0.458	0.648	0.543	1.841
	Organizational Infrastructure	0.039	0.232	0.023	0.167	0.868	0.507	1.971
	R^2	0.100						
	Adj. R^2	0.530						
	Sig. F	0.069						
	F-value	2.128						

a Dependent Variable: Six Sigma Implementation
Note. * $p < 0.10$ (two-tailed); ** $p < 0.05$ (two-tailed)

As expected, our study shows that training and education are positively related to Six Sigma implementation. This result is consistent with past studies from Heckl *et al.* (2010), Chakrabarty and Tan (2009), Coronado and Antony (2002), Antony *et al.* (2000) and Henderson and Evans (2000). Our findings indicate that adequate training and education are required to provide the necessary Six Sigma know-how, resulting in successful Six Sigma implementation.

Interestingly, our result reveals that teamwork is negatively related to Six Sigma implementation. This result is inconsistent with past studies such as Chakrabarty and Tan (2009), Gutierrez *et al.* (2009), Thawani (2004), Coronado and Antony (2002) and Antony *et al.* (2000). This may be due to resistance to change among the employees in OEM in Malaysia. Organizational change (i.e., Six Sigma practice) might not be readily embraced and understood by the employees, and teamwork has not taken effective control of the Six Sigma implementation.

6. Conclusion, Research Implications and Limitation

The Six Sigma implementation has evolved into a business strategy in OEM. This study has shed some lights concerning the CSFs in Six Sigma implementation in OEM. In fact, the proposed model in this study provides three important areas that organizational managers must be attentive when practicing Six Sigma. First, top management involvement and commitment directly affect the Six Sigma adoption. It is important that top management will provide full support to Six Sigma implementation, and allocate sufficient budget and resources for continuous improvement of Six Sigma program. Second, organizational managers shall free up employees to engage in training and education followed by execution of Six Sigma as their skills and knowledge are important to the day-to-day operations and problem solving within the organization. Third, to facilitate a positive teamwork outcome, organizational managers shall improve the effectiveness of communication among colleagues, increase the levels of motivation and team-working spirit among the employees.

Our study has some research limitations. First, our research model is tested using cross-sectional data. Future research should consider conducting longitudinal studies which involves repeated observations of the same CSFs variables (e.g., top management involvement and commitment, training and education etc) over longer periods of time. Second, this study uses a sample data collected from a single industry, that is, OEM in Malaysia. The generalization of this study may be strengthened by collecting data in OEM in other countries such as Thailand, Indonesia and Singapore. Third, our results are analyzed using multiple regression analysis. We recommend future studies to adopt Structural Equation Modeling (SEM) to examine the causal relationships between the CSFs and Six Sigma implementation.

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Appendix A

Questionnaire Survey Items	
Top Management Involvement and Commitment	
1.	Top management regularly spearheads Six Sigma project implementation.
2.	Top management provides visible support for the use of Six Sigma methodology.
3.	Top management provides adequate resources to facilitate Six Sigma efforts.
4.	Six Sigma issues are reviewed in organization's management meetings.
5.	Top management has objectives for Six Sigma projects.
Training and Education	
1.	Basic training is given to related production workers before doing the Six Sigma.
2.	Six Sigma related training is given to managers and supervisors in your organization.
3.	Real life examples from production floor are importance for effective training.
4.	Knowledge gained of Six Sigma methodology must be applied immediately after training.
5.	Refresher classes in the application of Six Sigma are regularly conducted.

Questionnaire Survey Items	
Teamwork	
1.	Cross functional teams meet regularly to discuss Six Sigma projects effort.
2.	Teams are recognized for superior productivity improvement.
3.	Supervisors encourage problem solving activity through teamwork.
Cultural change	
1.	Regular meetings are held to discuss Six Sigma problems based on data.
2.	Problems discovered through the use of Six Sigma are resolved based on data.
3.	Results of Six Sigma would be discussed with other related employee.
4.	The workers' resistance to change is communicated effectively by management.

Questionnaire Survey Items	
Organizational infrastructure	
1.	Champions are leaders who lead the deployment of Six Sigma in a significant area of the business.
2.	Master black belts responsible for Six Sigma strategy, training, mentoring, deployment, and results.
3.	Black belts lead improvement teams, who work projects across the business.
4.	Green belts are full-time teachers with quantitative skills.
5.	Team members are individuals who support specific projects in their area.
Six Sigma Implementation	
1.	Reducing production lot size
2.	Cycle time reduction
3.	Reducing inventory to expose manufacturing, distribution and scheduling problems
4.	Using quick changeover techniques
5.	Continuous / one piece flow

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