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Research Article

**Investigation on Quality Conformance: A Case Study on
Electrical and Electronic SME Industries in Malaysia**
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Abstract

The level of quality management implementation is defined based on the enterprises' vision for the future. Since today's electrical and electronic industries are supposed to have high-tech enterprises, it is sensible to periodically assess them in terms of level of quality management through empirical studies. There is hardly any study that extensively investigates the relevant factors which contribute into quality conformance level in electrical and electronic industries. Also there is no study that investigates the differences and similarities between electrical industry and electronic industry in terms of obstacles of implementation. Seven hypotheses are generated based on extensive literature review in order to intensively analyze the impacts of firm's size, ISO certification standards and length of

quality management maturity on quality conformance comprehensively. The data were collected from 187 small and medium size electrical and electronic industries in Malaysia. This empirical study has been conducted using online survey methodology. This study illustrates the results of statistical techniques which are used in order to investigate the correlations and interaction of contributed factors into quality conformance, investigation of the purpose of quality management implementation and comparison of obstacles between electrical and electronic industries in Malaysia. Findings of this study emphasized that ISO certification standards and adoption of quality maturity practices can significantly affect the quality conformance. It is noticeably stressed that the low to moderate response rate of responses and restricted access to

numeric data related to quality conformance can be considered as limitations of this study.

Keywords: Quality conformance; SMEs; ISO; Obstacles.

Introduction

Many organizations have implemented QM principles for quality improvement. Quality management improves competitiveness as well as productivity and reduces negative impacts of challenges (Yamada *et al*, 2013). Currently, many enterprises struggle to compete for the global business market status (Fekete, & Bocskei, 2011). Thus, it is always one of the critical challenging decisions for manufacturing managers to employ efficient quality initiators towards attaining organizational excellence.

One of the thrusts impacted to competitiveness is ASEAN Free Trade Agreement (AFTA). Ahmad et al., (2014) stated that globalization, capital movement and trade liberalization within the framework of AFTA have led to extremely challenging

environment for Malaysian organizations to compete in open markets. They observed that AFTA circumstance is not favorable news for local industries, which has less competitive advantage subsidizing in business in contrast with overseas enterprises. SMEs' today need to learn how to interconnect customers along with their expectations (Ošenieks & Babauska, 2014). To overcome this, some organizations utilize improvement process through the ISO certification link to the TQM framework to ensure quality and enhancement of the process (Lai & Cheng, 2003). In Malaysia, the level of quality in process and performance of electrical and electronic industries has been measured and observed to be lower than expected to attain the high tech enterprises view of 2020 (Best & Rasiah, 2003; Idris et al., 1996). Also, some studies investigate quality management practices in electrical and electronic industries (Agus, 2005),

Malaysian organizations (Eng & Yusof, 2003; Ismail *et al.*, 1998), size of organization (Price & Chen, 1993), years of adoption (Ahire, 1996) but there is a few empirical studies conducted on electrical and electronic industries in Malaysia stated by Abdullah *et al.* (2008). In addition there is no study that comprehensively examines all possible variables affecting performance, their correlations and interactions.

This study supports understanding to what extent factors such as size of organization, ISO certification standards and adoption of quality maturity contribute into their performance achievement throughout TQM framework. It is believed that the outcomes of the study would effectively help electrical and electronic enterprises especially local organizations in their efforts to be ahead and be sustaining at a competitive level in the market in

the future. It might be helpful to Malaysian SMEs to survive from the negative impacts of AFTA and attain the high-tech level in 2020.

Literature review

The reasons for selecting quality conformance as the main extent in this study are: It is measurable as cited in some TQM empirical studies (Arumugam et al., 2008; Prajogo & Sohal, 2006; Yang, 2006; Ahire *et al.*, 1996; Flynn *et al.*, 1994). Another reason is that, quality performance is used as a measure in MBNQA model as quality result. World-wide many researchers accepted MBNQA model which represents TQM practices (Prajogo & Sohal, 2004; Dean & Bowen, 1994). Finally, measuring through quality conformance is strongly stressed by experts in content validity of

questionnaire. Since there is the fact that ISO standards has similarity in terms of structure as well as dissemination processes (Corbett & Kirsch, 2001; Corbett, 2006; Marimón, et al., 2006; Molina-Azorín, et al, 2009), it is sensible to jointly analyses the effects of ISO 9001, ISO 14001 and ISO 27001 on quality conformance indicated by industry experts in this study.

Based on extensive literature review, it is found that in different industries and regions of the world, different obstacles arise. Jun et al. (2004), Kaynak (2003) and Whalen & Rahim (1994) believed that even though top management support is crucial, the lack of leadership engagement as well as shortage of proper training definitely leads organization to unsuccessful status in QM program. In addition to this concern, Yamada *et al.* (2013) stated that plentiful bureaucracy of implementation in Brazil can

result into failure of QM implementations. However, in addition to top management leadership and proper training, Tari & Sabater (2004) observed that lack of knowledge about quality tools and practices is an essential issue to consider in QM implementation in Spain. Masters (1996) listed a wide range of barriers which if properly managed can lead to TQM success. He listed the barriers as: Lack of management commitment, weak comprehension of quality management, inability to change organizational cultures, lack of quality planning, lack of training and lack of resources. Adebajo & Kehoe (1998) stated that QM obstacles can be seen as a quality culture in implementing QM progress. The following obstacles is provided by Adebajo & Kehoe (1998) which concentrate on communicational issues and cultural matters; Lack of measurement system, lack of training to enhance employees' skills involving quality improvement

activities, lack of communication with customer, lack of supplier involvement and lack of teamwork. Considering studies conducted in Malaysia, Ooi et al. (2012) figured out that culture of organizations can be a critical issue in TQM implementation of Malaysia's manufacturing organizations.

Methodology

The data of this study were collected through online survey sending via email. The electrical and electronic SMEs in Malaysia were considered as target population. The construction of this survey was generated after extensive literature review and conducting some field interviews with experts in electrical and electronic industries in Malaysia in order to testify the impacts of firm's size, ISO certification standards and length of quality

management maturity on quality conformance. It was emphasized by experts that ISO 9001, ISO 14001 and ISO 27001 have been agreed to be effective on quality conformance in this particular industry. Prior to data analyses, factors such as reliability, validity and normality of the entire data and variables must be strictly examined (Landau & Everitt, 2004). The next section will therefore attempt to ascertain the validity, reliability, etc of the study.

Content validity, response rate, Reliability and Construct validity

After developing the survey, a pilot study was conducted to assess the content validity. For this purpose, 15 questionnaires were distributed to academician and industry experts. The

response rate of 40% was achieved. Hence, it is believed that content validity was achieved. The total number of 872 small and medium size (SMEs) electrical and electronic companies involved in export trading was selected from the Federation of Malaysia Manufacturing (FMM) website of company listing. The online survey was developed based on literature review and was sent to the companies through emails. At first, 135 responses were received. For the purpose of improving the response rate, reminder follow up emails were sent to companies. By this action, the number of respondents increased to 187. In total, the response rate of 21.44% was obtained. In comparison with the response rate obtained in studies by the scope of Malaysia, Jusoh *et al.* (2008) achieved 12.3%, Ahmed *et al.* (2004) obtained 9.1% and Ahmed & Hassan (2003) achieved 12.3%. Jusoh *et al.* (2008) stressed that low response rate is not wondering in Malaysia for

postal surveys. Therefore, it is believed that 21.44% is sufficiently enough to start analysis of the data. To ensure the reliability of survey instrument, Cronbach's alpha is utilized to assess and evaluate the reliability by using SPSS 20. Any item which is lower than 0.7 must be dropped. Through the analysis conducted on CSFs of implementation, Cronbach value of 0.799, 0.743, 0.835 and 0.853 were obtained for CSFs in these industries and obstacles in electrical and electronic industries respectively. These values are higher than 0.7 which is a critical value. Thus, no item is deleted. For the purpose of validity test, Kaiser-Meyer-Olkin (KMO) measurement of sampling adequacy (KMO) test was performed. The value of 0.639, 0.577, 0.652 and 0.562 were obtained for electrical and electronic industries respectively. KMO values more than 0.5 shows that the survey is valid.

Normality test

Normality test was conducted to ascertain whether the data are based on normal distribution. The parametric tests must be conducted on normal data and non-parametric tests run on non-normal data (Landau & Everitt, 2004). Thus, the following hypothesis is generated.

H1: The data are normally distributed.

Normality test is conducted on all the data variables collected through survey. Since the sample size is less than 2000, the Shapiro-Wilk value is considered. Since (Sig. < α), the null hypothesis (H1) is rejected and the data are not normally distributed. Therefore, the action was taken to make the data

normal. Through transformation of computed variable, Lg 10 function was used. After testing the transformed data, it was observed that, the data are not normally distributed. Since the data are not normal, thus the non-parametric tests must be conducted on all the data of this study. Fig 1 demonstrates the overall research design overview based on non-parametric tests as well as comparisons.

Please See Figure 1 in the PDF Version

Results and discussion

Data collected and assessed form several hypotheses and series of statistical tests using SPSS 20.

Association of variables in electrical and electronic industries

Success rate, ISO, Size, Type of industry and adoption length are defined as categorical variable in this study. The most common method to summarize two categorical observations is drawing and analyzing Contingency tables (Landau & Everitt, 2004). To test hypotheses related to association between factors, the Pearson-Chi square and crosstabs were performed.

H2a: There is no evidence of association between size categories and type of industry.

H2b: There is no evidence of association between adoption categories and type of industry.

H2c: There is no evidence of association between ISO certification categories and type of industry.

H2d: There is no evidence of association between performance success categories and type of industry.

The Pearson Chi-Square calculated values are 0.198, 0.168, 0.930 and 0.688 (2-tailed) respectively, so the null hypothesis (H2) is accepted. Thus, there is no prior possible group difference between electrical and electronic industries as samples of study in terms of size of organization, adoption categories, ISO certification categories and performance success categories. Therefore it is believed that, these variables are independent in this study.

Data analysis of performance success rate

As the categorical variables in this study are independent variables, it is therefore sensible to find out whether categorical variables predict performance success or not in electrical and electronic industries. In other words, it was analyzed that performance success is related to other categorical variables in this study. So the hypotheses generated are as follows:

H3: There is no evidence of significant correlation between quality performance success and adoption, ISO and Size in electrical and electronic industries.

For this purpose, the Spearman value must be calculated to assess whether there is any correlation between performance

success and other independent variables. Since there are correlations in some extent between adoption and ISO. Landau, & Everitt (2004) stated that when there are correlations in some extents, it is helpful to run partial correlation coefficients. It measures the strength of individual linear relationship between quality performance and other variables individually. So the hypothesis is broken down into 2 sub-hypotheses.

H3a: There is no evidence of significant correlation between quality performance success and adoption in electrical and electronic industries.

H3b: There is no evidence of significant correlation between performance success and ISO in electrical and electronic industries.

After run of partial correlation between performance success and adoption, and sig. $< \alpha$, so the null hypothesis (*H3a* & *H3b*) is rejected. Therefore there is a significant correlation between performance success and adoption by strength of 0.463 and 0.429 respectively. The correlation increased from 0.435 to 0.463 and from 0.410 to 0.429 after run of partial correlation for *H3a* and *H3b* respectively. The reason could be that part of the relationship being attributed to ISO and Size variables.

Interaction of ISO and adoption on quality performance success

To extensively analyze the effects of ISO and adoption on quality conformance success, it is needed to run factorial design. For this purpose, the hypothesis was generated to find out how the length

of QM practices' adoption and ISO can affect the mean of performance success. To test the hypothesis, general linear model is performed. It is determined that length of adoption has been defined by 3 levels, while the ISO has been defined by 6 different levels.

H4: There is no evidence of interaction between adoption and ISO on performance success.

H5: The mean of quality performance success is equal between ISO certification levels.

H6: The mean of quality performance success is equal between years of adoption groups.

As shown in Table 1, since the Sig. = 0.854 > α , so the null hypothesis (H10) is accepted and there is no significant interaction between adoption and ISO through affecting performance success. Similarly, since Sig. < α , thus it implies that the mean of performance success differs between the levels of ISO certification. Likewise, since Sig. < α , thus it implies that the mean of performance success differs based on the length of QM practices' implementation. Therefore, the pairwise comparison is needed for variables of ISO and years of QM practices adoption to analyze how the mean of conformance success differs between individual levels.

Estimation of success rate through ISO certification

Even though p-value is important to identify major effects, it is generally advised to quantify the effects through constructing

confidence intervals (Landau, & Everitt, 2004). As the ISO has significant effects on conformance success and there is no interaction, it is sensible to estimate the differences in the mean of conformance success among ISO certification levels. It is noticeable that SPSS only offers comparison between levels where there is no interaction. In other words, only factors that do not have interaction with each other must be used (Landau, & Everitt, 2004).

Based on the estimates of success through ISO, the highest mean is obtained by the category of all ISO levels by the mean of 4. The lowest mean conformance success is obtained by non-ISO certification companies by the mean of 2.580. It is clear that, through attaining ISO certifications the mean of quality performance success improves from 2.580 to 4.

According to Pairwise Comparisons of success and ISO, as comparison of non-ISO certification level with other levels, it is clearly seen that the mean difference is negative. It means categories of certification companies have higher mean of performance success. As $\text{Sig.} < \alpha$, thus all these differences are significant. As comparison of ISO 9001 to other levels, as $\text{Sig.} < \alpha$, all the differences are significant. To compare the organizations which are certificated by ISO 9001 & 14001 with other levels, the difference is significant with non-ISO and ISO 9001 certification but there is no evidence of significant differences to organizations which additionally obtained ISO 27001 certificate.

Please See Table 1 in the PDF Version

Estimation of success rate through adoption years

Since the length of adoption has significant effects on conformance success and there is no interaction with ISO, it is sensible to estimate the differences in mean of performance success among adoption levels.

Please See Table 2 in the PDF Version

The mean of performance success increased from 2.405 to 3.461 through the increase in the length of implementation within levels. The organizations by implementation of quality tools and practices less than 5 years obtained the mean of 2.405. It is increased to 2.775 and 3.461 for organizations which

implemented quality management for 5 to 10 years and up to 10 years respectively.

Based on pairwise of success and adoption, for the category of less than 5 years QM adoption, the mean difference is significant (Sig. < α) and negative in comparison with other levels. For the category of 5 to 10 years, the Sig. < α . and the mean performance success for the organization with more than 10 years implementation is more.

Please See Table 3 in the PDF Version

Fig 2 demonstrated a visual result. Through considering the plot, there is significant differences of performance success mean between non-ISO and ISO 9001 certification. Through years of

QM practices implementation, performance success increased significantly for both ISO and Non-ISO certification groups. The lines are almost parallel through less than 5 years and 5 to 10 years of QM implementation. The lines get non-parallel through period of 5 to 10 years to up to 10 years. It seems that when QM adoption approaches up to 10 years, the difference of performance success reduces but the difference level is still significant.

Please See Figure 2 in the PDF Version

Comparison of QM implementation obstacles

According to Table 4, the most effective problems faced by electrical industry is culture of being reluctant to change, lack of

supervision skill and lack of communication. In electronic industry, the problem faced is indicated as culture, lack of knowledge about the tools, lack of supervision skill and lack of actual supports, commitment of top management.

Please See Table 4 in the PDF Version

Since the mean rank compares difference in both industries, it would be sensible to investigate whether there is any evidence of significant differences in the average mean of obstacles between electrical and electronic industries.

H7: There is no evidence of obstacles mean differences between electrical industry and electronic industry.

To assess this hypothesis, as the data distribution is not normal, the Wilcoxon signed rank test for non-parametric data analysis was performed to find out whether there is any significant evidence of differences for each individual obstacle between the two industries. For extensive analysis, H7 was examined through all 12 obstacles individually. Based on table 4, the Sig. > 2α for lack of knowledge about benefit of tools and lack of communication, thus for these 2 practices categories, the null hypothesis (H7) is rejected. Therefore, the mean differences for these 2 obstacles are significant from each other in electrical and electronic industries.

Conclusion

The data gathered from the sample of 187 SMEs out of 872 electrical and electronics companies in Malaysia which are active

in export were testified through several hypotheses and series of statistical analyses using SPSS 20 and summarized as follows. It was found that 52.4%, the majority of organizations implemented quality management practices up to 5 years maturity. While 53.5% of organizations have not been certificated by any type of ISO. The result showed, 61.5% of companies in Malaysia indicated themselves as successful and very successful in terms of quality performance. In this study it was extensively testified that independent factors such as ISO, size of organization and length of quality management practices' adoption predict performance success rate. It was found that ISO certification standards and levels of quality management implementations individually affect performance success rate. The result showed that there is no evidence of significant interaction between ISO certification standards and years of

quality management implementation on performance success rate. It was clearly demonstrated that through the increase in years of adoption in organizations of up to 10 years, performance success rate increased significantly. It was also clear that being certified by a type of ISO standards can lead to very successful quality performance level. Overall, it was found that there is a significant difference between non-ISO and ISO 9001 certificated organizations before 10 years of quality management practices implementation. Among obstacles, the result showed that there are significant differences between electrical industry and electronic industry in terms of lack of knowledge about benefit of tools and lack of communication. This study is unique due to the fact that it considered almost all variables contributing to success comprehensively.

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