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HARD QUALITY MANAGEMENT AND PERFORMANCE: THE MODERATING ROLE OF SOFT QUALITY MANAGEMENT

Abstract: *The main aim of this study is to examine the moderating role of soft quality management practices (management commitment, customer focus, employee involvement, training and education, reward and recognition and supplier relationship) between hard quality management and performance. The study uses data from 255 Electrical & Electronic organizations in Malaysia. A stepwise regression method was used. The results provided empirical support for the moderating role of soft quality management practices on the relationship between hard quality management and performance in a Malaysian context.*

Keywords: *quality management, soft quality management, hard quality management, Malaysia, moderating effects, performance*

1. Introduction

Quality management (QM) is a management philosophy including a set of soft and hard practices for improving performance (Ahire and Ravichandran, 2001; Anderson et al., 1995; Fotopoulos and Psomas, 2009; Singh and Dubey, 2013; Zimon, 2015, 2017). These studies have shown that soft QM practices facilitate QM success (Dow et al., 1999; Naor et al. 2008; Powell 1995). Similarly, while some studies find that some hard QM practices are not related to performance (Ho et al., 2001; Naor et al., 2008; Parast et al., 2011), others indicate the opposite (Kaynak 2003; Rahman and Bullock 2005). Although these research works show the positive effects of soft QM practices, the results regarding the hard QM part appear to be inconsistent.

In the field of QM some scholars have also questioned what issues contribute to QM success, examining the moderating factors in order to better explain this relationship (Douglas and Judge 2001; Zhang et al., 2012). In this context, empirical QM studies show that some factors such as organizational structure (Douglas and Judge 2001; Zhang et al., 2012), environmental uncertainty conditions (Sitkin et al., 1994; Zhang et al., 2012), cultural dimensions (Kull and Wacker 2010) and soft practices related to human factors (Allen and Kilmann 2001; Joiner 2007) enhance the effectiveness of QM practices. When considering the moderating influences, for example, of soft QM practices, it is assumed that the impact of hard QM on performance will vary depending on the level of implementation of soft QM practices. Although the direct and indirect relationships between QM practices and performance have been widely investigated, the moderating role of soft

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factors on the effectiveness of some QM practices has been under-investigated in QM literature. Few studies analyze the moderating influences of some soft practices, such as organization support and co-worker support (Joiner 2007), recruitment and selection processes (Ahmad and Schroeder 2002), and reward practices (Allen and Kilmann 2001) on QM implementation effectiveness.

To our knowledge, empirical studies have not been conducted on the moderating effects of other soft QM factors such as training, customer focus and supplier relations on hard QM implementation. In addition, future studies should consider the moderating role of soft practices like leadership commitment, human resource management, customer relationships and supplier relationships (Nair 2006). Moreover, although there are a number of research studies that investigate the implementation of QM in Malaysia (e.g., Eng Eng and Yusof 2003), little is known about the moderating effects of the soft part in a QM context, especially in a transitional economy such as Malaysia. Also, quality and performance should be improved among the Electrical & Electronics (E&E) organizations in Malaysia if it wishes to become a high-tech industrial nation by 2020 (Best and Rasiah, 2003; Idris et al., 1996).

The inconclusive findings on the link between hard QM and performance suggest the need for exploring into the moderating effects of soft QM practices in the Malaysian context. This study examines the moderating effects of the six soft QM practices (management commitment, customer focus, employee involvement, training and education, reward and recognition and supplier relationship) on the link between hard QM and performance in Malaysia. The present paper extends the previous studies by Flynn et al. (1995), Powell (1995), Dow et al. (1999), Samson and Terziovski (1999), Tarí et al. (2007), Kim et al. (2012) on the relationships between QM practices and performance and further contributes towards the understanding the moderating role of soft QM practices in a QM context in Malaysian organizations.

The literature pertaining to the moderating effects of soft QM practices and the hypotheses proposed are presented in the following section. The following section describes the methodology used and then the paper presents the findings of the study. Finally, a discussion is offered and conclusions are put forward.

2. Quality Improvement Approaches

Management and people aspects such as leadership, people management, customer and supplier relationships are related to soft aspects of QM, while tools and systems necessary for the implementation of QM principles, such as quality tools and techniques, process management, measurement, and product/service design are related to the hard aspects of QM (Fotopoulos and Psomas 2009; Gadenne and Shama 2009; Naor et al. 2008; Rahman and Bullock 2005; Singh and Dubey, 2013).

2.1. Hard QM and performance

The results are rather mixed in the literature regarding the impact of hard QM practices (e.g. practices related to feedback, process control and management, design) on performance. While some studies conclude that some hard QM practices are not related to performance (Ho et al., 2001; Naor et al. 2008; Parast et al., 2011), others show the opposite (Ahire and Dreyfus 2000; Kaynak 2003; Rahman and Bullock 2005; Aba et al., 2016).

These results provide justifications for the possible impact of QM on performance. For example, the use of quality tools provides feedback to make better decisions (Flynn et al., 1995; René et al., 2005) because this information makes it possible to determine the root cause of quality problems, in order

to solve them or to identify opportunities for improvement, leading to improved performance.

Managing and controlling processes leads to improved performance by reducing process variation (Kaynak 2003; Lee et al., 2003; Tarí et al., 2007). For example, when a company manages its processes (e.g by reducing process variation), this will have positive impacts on rework, returns, scrap (Laohavichien et al., 2011) and people results (Sila and Ebrahimpour 2005). Likewise, design management efforts have positive effects on performance (e.g. scrap, rework, defects, complaints, warranty, market share) (Ahire and Dreyfus 2000; Kaynak 2003).

Thus, hard QM practices (e.g. feedback, process control and process management, design) have positive effects on performance. The following hypothesis can therefore be suggested:

H1. The hard QM part has positive effects on performance.

2.2. Management commitment

Contingency theory in management has suggested high organizational performance is a function of the alignment and adjustment between an organization's system/processes and various contextual or environment factors (Joiner, 2007). For example, management commitment, customer focus, employee involvement, training, rewards and supplier relationships could be some of these contextual variables. Regarding management commitment, the effectiveness of QM is dependent on management commitment because it facilitates the development of the other practices (Albacete-Sáez et al., 2011; Kaynak 2003; Tarí et al., 2007). For example, full management commitment is a critical issue because it facilitates training for the right people at the right time to improve quality, for example, regarding quality techniques and tools (Bunney and Dale 1997; McQuater et al. 1995).

In this context, leaders play a moderating role when they communicate the values of quality to the whole organization and create an environment to collect and analyse information from customers, and include this feedback in the processes as a way to reach continuous improvement and customer satisfaction (Perez-Arostegui et al., 2012).

Management commitment also facilitates employee involvement and recognition, which leads to more satisfied employees. If employees are more satisfied they perform the processes better. Therefore, management commitment is important to implement process management and control (Kaynak 2003; Tarí et al., 2007). Kim et al. (2012) have suggested that management can use quality values and principles to motivate the employees and ultimately involve them in work design. In addition, Naor et al. (2008) have also indicated that product and process design in the organization can be improved by allocating the necessary resources, for example, by facilitating customer feedback for employees in product development or improving processes and/or promoting collaboration between areas/employees in process design.

Accordingly, management commitment is a key to reinforce the effectiveness of hard QM practices (e.g. feedback, process control and process management, design). Thus, the following hypothesis can be proposed:

H2. The hard QM part will be more strongly and positively related to performance in organizations with a greater focus on management commitment.

2.3. Management commitment

This practice leads organizations to meet customer requirements in order to include them in their processes. A firm's process and operations can be modified and adjusted accordingly based on customer suggestions (Flynn et al., 1994). Several empirical studies have found this link between customer focus and practices such as quality data and process

management and control (Kim et al., 2012; Lee et al., 2003). Similarly, when customers' expectations are incorporated into new product development, this will reinforce manufacturability and product features (Baird et al., 2011), thereby impacting on product design and process management and control. Consequently, customer focus improves process management and design because employees receive information about products and processes and include it in design and use it to avoid errors (Naor et al. 2008).

Thus, customer focus facilitates a greater development of QM practices such as feedback, process control and management, and design. This leads to the following hypothesis:

H3. The hard QM part will be more strongly and positively related to performance in organizations with a greater focus on customer focus.

2.4. Employee involvement

Employee involvement is necessary for continuous improvement in a QM context (Fotopoulos and Psomas 2009; Laohavichien et al., 2011). When employees trust that their efforts toward continuous improvement are recognized, this facilitates employee involvement. The positive link between QM and performance is reinforced by the perceived organizational support of employees (Joiner 2007). Thus, when organizations support improvement activities, employees provide more improvement ideas in order to improve performance.

For example, organizations that provide employees access to key information and empower them, use QM in a better way for improving performance (Douglas and Judge 2001). They can collect effectively information to be analysed; therefore they play a key role in identifying opportunities for improvement (Kim et al., 2012). In addition, when employees are involved they understand better the ways the product/service are designed and improved and can suggest other ways to improve product/services (Kim et al., 2012) and processes. This idea indicates that employee commitment moderates the relationship between quality practices and performance (Bou and Beltrán 2005).

Thus, employee involvement facilitates a collaboration culture and the participation in improvement activities and process design. Employee involvement reinforces the successful development of other QM practices, such as hard practices. As such, we hypothesize:

H4. The hard QM part will be more strongly and positively related to performance in organizations with a greater focus on employee involvement.

2.5. Training

When employees are trained in quality-related issues they can introduce or support improvements in their activities. Thus, training ensures that the employees have the necessary skills required for the implementation of other QM practices (Snell et al. 2000).

For example, co-worker support facilitates that employees share their knowledge and expertise, and therefore they may acquire task-relevant knowledge and expertise. In this sense, co-worker support in organizations plays a moderating role in the relationship between some QM practices and performance (Joiner 2007). When employees have higher levels of training and collaboration, it is easier for them to perform better their task and implement hard QM practices.

Training allows people to know how to perform better their activities, to identify and solve problems, to improve work methods, and to take responsibility for quality facilitating the participation in improvement activities. In a QM context, employees need to

be trained QM processes and procedures and quality methods (e.g. to identify areas for improvement and introduce improvements), and have access to data to act on problems (e.g. to improve product quality). This indicates the importance of training for process management and control, and product quality. In addition, training facilitates a better use of information (e.g. feedback from customers) and the participation in other activities such as design. Training can also have positive effects on design (Kaynak 2003) and an increased level of training strengthens the relationship between design and performance (Malhotra et al., 2001).

Thus, training generates an increased awareness of quality-related issues playing a critical role in the successful implementation of process control and management, design and feedback. The above arguments lead to the following hypothesis:

H5. The hard QM part will be more strongly and positively related to performance in organizations with a greater focus on training and education.

2.6. Rewards

QM literature shows that rewards have an impact on the effectiveness of QM because they can be used by organizations to promote continuous improvement. Allen and Kilmann (2001) analyse the moderating effects of reward systems for QM. They find that the use of extrinsic reward practices, including profit sharing, gainsharing, employment security and pay-for-performance, moderates the relationship between some QM practices and performance. If employees are rewarded for their quality improvement efforts they can be more motivated in quality initiatives, for example, in using feedback to improve products and processes, and participate in process design.

Escrig-Tena and Bou-Llusar (2012) do not support the results of Allen and Kilmann (2001) and find that only the use of developmental performance appraisal has a moderating effect on the relationship between QM practices and people results.

This evidence indicates that rewards can facilitate the participation in a QM context, by enhancing the effects of design on quality and flexibility (Malhotra et al., 2001) and other hard QM practices on performance.

Accordingly, the use of appropriate reward practices by organizations helps QM practices such as hard factors to have a greater effect on performance. In the light of the above reasoning, the following hypothesis is developed:

H6. The hard QM part will be more strongly and positively related to performance in organizations with a greater focus on reward and recognition.

2.7. Supplier relationships

Organizations must ensure quality at all stages of manufacturing. According to Ahire et al. (1996), the basis for procuring quality parts is derived from effective supplier management. Improving supplier relations enhances the performance of both suppliers and buyers. For this purpose, the materials from suppliers must meet the buyer's specifications and standards for quality, which may have a positive effect on process variability and, as a result on process management. This idea indicates that supplier relationships are related to process management and design (Flynn et al., 1995; Kaynak 2003). For example, supplier management facilitates cooperative relationships with suppliers to obtain quality materials as a basis to improve products by enhancing supplier commitment to product design. These supplier relationships enhance product design (Kim et al., 2012). Supplier relationships also provide material and parts facilitating the reduction of waste, thereby improving process management (Baird et al., 2011). In addition, good relationships with suppliers increase their involvement in the design of products/services and give them opportunities to offer suggestions to improve processes and products (Naor et al. 2008).

Similarly, if suppliers fulfil the specifications it is easier to achieve and improve product quality, and even good relations with them facilitate the use of feedback to improve the organization's activities.

Thus, with good supplier relations, the probability to successfully develop hard QM practices is higher. Therefore, we propose the following hypothesis:

H7. The hard QM part will be more strongly and positively related to performance in organizations with a greater focus on supplier relationships.

All the above possible relationships between the independent and dependent variable are shown in Figure 1.

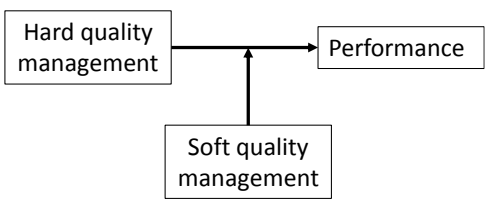

Figure 1. Research model

3. Methodology

3.1. Population and Sample

The population for this study is made up of all 683 E&E firms from Malaysia. The simple random sampling method was used to select the sample survey firms from the list obtained from the Federal Malaysian Manufacturers (FMM) (FMM-MATRADE, 2003). These firms are involved in manufacturing electrical and electronic products and deliver them to either the local or the international market.

First, a pre-test was developed using 15 organizations. Second, a total of 350 sets of closed-ended questionnaires were distributed via mail to the selected firms. Out of 350 sets of questionnaires, 275 were returned but 20 of them were discarded due to incomplete answers. Thus, the research is based on data from 255 respondents about their perceptions. The managing directors or quality managers of the firms were the respondents because they are very familiar with the quality related matters. Of these 255 E&E organisations, 80 were classified as small firms, 86 firms as medium and 89 as large enterprises.

Non-response bias was tested by splitting the collected data into two different groups in which the data collected late (90) was considered as late respondents, compared to those received early (185). Then t-tests were conducted on the two groups' mean responses to ten randomly selected questions, and the results showed that the two groups were identical. With regard to demographic variables such as number of employees, multinational company registration and ISO registration, the two groups were also found not significantly different. In addition, a multiple group analysis was conducted, which showed that the proposed model was equivalent across the two groups.

3.2. Measurement instrument

To measure the six soft QM factors (management commitment, customer focus, employee involvement, training and education, reward and recognition, and supplier relationship), the study used the items in Zhang et al. (2000). In order to measure hard QM, the study used the items from Flynn et al. (1994): feedback, inter-functional design, new product quality, process control, and process management.

The performance indicators which specifically described productivity performance indicators for manufacturing industries in Malaysia were adopted from the study by the Malaysian National Productivity Corporation (NPC) (2005). It was decided to use the performance measures from the NPC of Malaysian manufacturing companies because the study is focused on Malaysian organizations and it

was considered that it would be easier to understand for managers because the managers in these companies, especially in Malaysian manufacturing including E&E firms, are familiar with this kind of measures of performance. The scale has nine dimensions and mainly uses information relating to the productivity and performance of firms. The original wordings of the items were maintained for ease of understanding and interpretation. Added value per employee, total output per employee, added value content, process efficiency, fixed assets per employee, added value per fixed assets, added value per labour cost, unit labour cost, and labour cost per employee were the 9 items for measuring performance.

Based on the feedback from 15 managers and quality experts, this study tested and refined the measurement instrument. The structure and content of the questionnaire was improved with the pre-test. In its final version, the instrument contains the following: six soft quality management factors with 38 items, five hard quality management dimensions with 20 items and the performance construct with 9 items. In total there are 67 items used in this study. A ten-point Likert scale continuum was used to measure the six soft factors and hard quality management, in which 1 is strongly disagree and 10 is strongly agree. A rating scale on a continuum of 1 to 10 was used to measure the performance items, in which 1 represents nothing and 10 high, to indicate the level of firm growth.

3.3. Analytic Methods

Statistical techniques such as correlation, and regression analysis were deemed appropriate and suitable to test the seven hypotheses. The statistics employed were determined to a great extent by the design of the study and also the types of measurement scale characterizing the dependent variable. First, a descriptive analysis was used to investigate the overall level of perception on the six soft QM factors, hard QM, and performance. Second, in order to determine the best set of predictor variables in predicting performance, a stepwise regression method was used. All the inferential statistics used in the study were evaluated using one-tailed tests. The significance level or probability level (p-value) of 0.05 was used as the standard acceptance level.

A principal component factor analysis with varimax rotation was employed to validate the construct validity of the six soft QM factors, hard QM and performance. The results are presented in Table 1.

The factor analysis results justified that there was no cross loading of items. Moreover, all the eight constructs in the study were found to be uni-factorial based on the factor analysis matrices. The minimum and maximum eigen values recorded were 3.02 and 4.54 respectively. The minimum factor loading was 0.61 and the rest were rather high. Almost 57% to 62% of the variance observed in the respective data was captured by these factors. The Cronbach's alpha (α) varies from 0.81 to 0.89 and is considered to be good. First, the data was confirmed with multivariate normality and secondly, Bartlett's tests for sphericity (BTS) results indicate that data do not produce an identity matrix. In this sense, the data are acceptable for factor analysis and other multivariate statistical tests. Moreover, the Kaiser-Meyer-Olkin (KMO) values for all the variables are well above 0.70, indicating that the distribution of values is adequate for running factor analysis.

Table 2 provides the descriptive analysis (means, standard deviations) and the correlation matrix for all the variables incorporated in the study.

Table 1. Summary of factor matrix

Constructs	Item Loading	Eigen value	% of Variation Explained	Cronbach Alpha	BTS	KMO	p-value
Management Commitment	0.68-0.85	4.06	57.96	0.88	905.80	0.89	0.0005
Employee Involvement	0.61-0.85	3.09	61.77	0.83	598.57	0.82	0.0005
Training and Education	0.70-0.82	3.53	58.75	0.86	768.57	0.86	0.0005
Reward and Recognition	0.74-0.83	3.02	60.31	0.83	565.46	0.82	0.0005
Customer Focus	0.72-0.84	3.48	59.56	0.81	567.89	0.84	0.0005
Supplier Relationship	0.72-0.85	3.78	58.45	0.82	564.67	0.85	0.0005
Hard QM	0.70-0.80	4.54	56.70	0.89	102.35	0.87	0.0005
Performance	0.71-0.83	3.87	57.97	0.85	456.72	0.85	0.0005

Notes: KMO- Kaiser-Meyer-Olkin; BTS- Bartlett's tests for sphericity

Table 2. Descriptive statistics and Pearson correlations between soft QM factors, hard QM and performance

Variables	Mean	S.D	1	2	3	4	5	6	7
1 Hard QM (HQM)	**6.41**	**0.89**							
2 Performance (PERF)	**4.80**	**0.76**	0.488						
3 Management commitment (MC)	**8.25**	**0.79**	0.425	0.381					
4 Customer focus (CF)	**7.05**	**0.64**	0.511	0.491	0.442				
5 Employee involvement (EI)	**6.28**	**0.84**	0.529	0.337	0.459	0.411			
6 Training and education (T&ED)	**6.97**	**0.73**	0.459	0.212	0.460	0.469	0.444		
7 Reward and recognition (R&R)	**6.37**	**0.82**	0.473	0.416	0.464	0.319	0.468	0.329	
8 Supplier relationship (SR)	**6.72**	**0.72**	0.357	0.291	0.441	0.437	0.392	0.302	0.402

Notes**:** Zero-order coefficients p <0.05, Benforroni adjusted alpha=0.008 (0.05/6)

The strength of the association between the variables is measured by the correlation coefficients (r). If the p-value is less than 0.05, a coefficient is considered to be significant. From the results, it was found that there were significant correlations between all the independent variables. For all of the 28 correlations, the coefficients are larger than 0.40. There are no correlations of 0.90 or above. Hence, collinearity and multicollinearity do not present data problems in this research.

The assumptions of multivariate analysis including normality, linearity, multicollinearity, and singularity were tested for the constructs used in the study. The results showed that there were no statistically significant violations of these assumptions. Thus, the available data could be used to run a multivariate statistical analysis such as regression.

4. Results

Table 2 shows that there are significant positive correlations between each of the independent variables and performance, providing support for the research model. The correlation between hard QM and performance ($r=0.49$, $p < 0.05$) indicated there was a moderately quite high positive correlation between these two variables. In order to test the hypotheses, moderated multiple regression (MMR) analysis using ordinary least squares (OLS) was performed. Cohen and Cohen (1983) have suggested that MMR is an appropriate method for detecting the effects of moderating variables and Aguins (1995) has stated MMR seems to be the preferred statistical method to detect moderating effects especially in dealing with continuous predictor variables. All the regression results are shown in Table 3 with the appropriate regression coefficients (β).

Table 3. Results of hierarchical regression analysis

Variable	M1	M2	M3	M4	M5	M6	M7
Constant	12.9*	-21.45	0.59	12.24	11.78	10.45	-1.65
MC	0.21*	0.08*	0.35*	0.05	0.21	0.67*	0.34*
CF	0.42*	0.10*	0.23*	0.21*	0.37*	-0.45	0.16
EI	0.25*	0.16*	0.42	0.32	0.45	0.23	0.35*
T&ED	0.15*	0.06*	0.15*	0.41*	0.56*	0.21*	0.17
R&R	0.45*	0.14*	0.34	0.12	0.08	0.14	0.36*
SR	0.20*	0.06*	0.17*	0.32*	0.19	0.48*	0.32
HQM		0.35*	0.31*	0.21*	0.11	0.34*	0.27
HQM X MC				0.51*			
HQM X CF						0.31*	
HQM X EI							
HQM X T&ED							
HQM X R&R							
HQM X SR							
R^2	0.49	0.57	0.61	0.64	0.65	0.67	0.68
F	25.67	23.52	18.56	17.89	18.74	23.21	26.71
Change R^2		0.08		0.03		0.02	

Notes:
*$p < 0.05$
M1: Model 1, M2: Model 2 etc.
HQM: Hard QM; MC: Management commitment; CF: Customer focus; EI: Employee involvement; T&ED: Training and education; R&R: Reward and recognition; SR: Supplier relationship

Table 3. Results of hierarchical regression analysis (continued)

Variable	M8	M9	M10	M11	M12	M13	M14
Constant	8.56	-6.34	7.21	7.11	-2.13	7.15	-3.40
MC	0.23*	0.12*	0.34*	0.31*	0.18*	0.08*	0.36*
CF	0.41*	0.36	0.05	0.32	0.28	0.28	0.08
EI	0.34	0.17*	0.32*	0.27*	0.47*	0.32*	0.24*
T&ED	0.21*	0.25*	0.17*	0.37	0.12	0.43	0.32
R&R	0.47	0.42	0.43	0.15*	0.27*	0.38*	0.45*
SR	0.56	0.35*	0.25*	0.19*	0.49*	0.18*	0.31*
HQM	0.45*	0.25*	0.14	0.18*	0.13	0.38*	0.19*
HQM X MC							
HQM X CF							
HQM X EI	0.29*						
HQM X T&ED			0.20*				
HQM X R&R					0.21*		
HQM X SR							0.32*
R^2	0.69	0.70	0.72	0.73	0.74	0.75	0.77
F	15.45	26.78	21.67	34.21	25.91	15.45	17.89
Change R^2	0.01		0.02		0.01		0.02

Notes:
*$p < 0.05$
M1: Model 1, M2: Model 2 etc.
HQM: Hard QM; MC: Management commitment; CF: Customer focus; EI: Employee involvement; T&ED: Training and education; R&R: Reward and recognition; SR: Supplier relationship

Hypothesis 1 was tested by comparing the increase in variance (R^2) explained from model 1 (M1) to model 2 (M2). Model 1 represents the regression of the soft QM variables on the performance variable, and model 2 adds hard QM to the regression. In this sense, the hard QM part has positive effects on performance ($p < 0.05$), and indeed the addition of the hard QM variable increases the R^2 by 0.08 (8%). Therefore, H1 is well supported by our data.

In this study, H2, H3, H4, H5, H6, H7, and models 3 through 14 were created to examine the moderating effects of six soft QM factors (management commitment, customer focus, employee involvement, training and education, reward and recognition, and supplier relationship) on performance. The moderating effect of management commitment (H2) was tested with Models 2 and 3 by showing the increase in explained variance after adding the first-order interaction between management commitment and hard QM. The results in Table 3 show that the interaction term/product term (HQM X MC) was statistically significant ($p < 0.05$) and adds 0.03 (3%) to the explanatory power of the model. In this sense, management commitment moderates the relationship between the hard QM part and performance and this supports H2.

Models 5 and 6 are used to test H3 by showing the increase in explained variance after adding the first-order interaction between customer focus and hard QM. The results indicate that the interaction/product term (HQM x CF) is statistically significant ($p < 0.05$) and further this term adds 0.02 (2%) to the explanatory power of the model. This result provides empirical support for the moderating effect of customer focus on the relationship between hard QM and performance. Therefore, H3 is supported.

Similarly, Models 7 and 8 are used to test H4 by showing the increase in explained variance after adding the first-order interaction between employee involvement and hard QM. The results indicate that the interaction/product term (HQM x EI) is statistically significant ($p < 0.05$) and further this term adds 0.01 (1%) to the explanatory power of the model. This result provides empirical support for the moderating effect of employee involvement on the relationship between hard QM and performance. Therefore, H4 is supported.

Models 9 and 10 are used to test H5 by showing the increase in explained variance after adding the first-order interaction between training and education, and hard QM. The results indicate that the interaction/product term (HQM x T&ED) is statistically significant ($p < 0.05$) and further this term adds 0.02 (2%) to the explanatory power of the model. In this sense, training and education moderates the relationship between hard QM and performance and this supports H5.

Models 11 and 12 are used to test H6 by showing the increase in explained variance after adding the first-order interaction between reward and recognition, and hard QM. The results indicate that the interaction/product term (HQM x R&R) is statistically significant ($p < 0.05$) and further this term adds 0.01 (1%) to the explanatory power of the model. In this sense, reward and recognition moderates the relationship between hard QM and performance and this supports H5. Therefore, H6 is supported.

Finally, Models 13 and 14 are used to test H7. This is done by showing the increase in explained variance after adding the first-order interaction between supplier relationship and hard QM. The results indicate that the interaction/product term (HQM x SR) is statistically significant ($p < 0.05$) and further this term adds 0.02 (2%) to the explanatory power of the model. This result provides empirical support for the moderating effect of supplier relationship on the relationship between hard QM and performance. Therefore, H7 is well supported by our data.

In sum, the study has found that the relationship between hard QM and performance in Malaysian E&E organizations was moderated positively by all the six soft QM practices.

After examining closely the coefficients for the interaction terms, it was found that management commitment (MC) has been shown to have the highest moderating influence on the relationship between hard QM and performance since the regression value, β for the interaction term (Hard QM x MC) is 0.51. It also clearly indicates that management commitment is the most important moderating factor in the hard QM-performance relationship. Supplier relationship (SR) was found to have the second highest moderating influence (Hard QM x SR) with a regression value of 0.32. The third important moderating factor is customer focus (CF) with an interaction regression value of 0.31.

Employee involvement (EI) was found to be the fourth most important moderating factor since the interaction (Hard QM x EI) regression value is 0.29, followed by reward and recognition (R&R) with an interaction (Hard QM x R&R) value of 0.21. The least important moderating factor is training and education (T& Ed), which has an interaction (Hard QM x T&Ed) value of 0.20.

The results show that management commitment is the most important moderating factor. This shows that, the higher the management commitment, the higher the performance of the firms via hard QM. Stronger management commitment with the support of hard QM practices would greatly enhance the firm performance.

5. Discussion and conclusions

Evidence from this empirical study supports a positive and significant relationship between the extent of implementation of

hard QM and performance in Malaysian E&E firms. This result supports those scholars suggesting that hard QM has positive effects on performance (Ahire and Dreyfus 2000; Eng Eng and Yusof 2003; Kaynak 2003; Rahman and Bullock 2005).

This study also finds that an environment of support from soft QM enhances the effectiveness of hard QM implementation, supporting the appropriateness of a contingency approach to the successful implementation of hard QM practices. The study provides empirical evidence that the relationship between hard QM implementation and performance is moderated by soft QM practices such as management commitment, customer focus, employee involvement, training and education, reward and recognition, and supplier relationship.

First, the results extend the previous studies on the mediating effects between QM practices and performance (Fotopoulos and Psomas 2009; Sila and Ebrahimpour 2005), and hard QM as a mediator (Ho et al., 2001; Rahman and Bullock 2005). Second, the study also supplements those studies analyzing the moderating role of some soft practices. For example, it shows the importance of management commitment and customer focus to reinforce hard QM practices, supplementing previous studies (Naor et al., 2008). Similarly, it finds that employee involvement, training and rewards are also important contingency issues that can reinforce the effects of QM hard issues on performance, as previous studies have found regarding human issues (Bou and Beltrán, 2005; Escrig-Tena and Bou-Llosar 2012; Joiner 2007). These ideas clarify the interplay between soft and hard QM practices, and performance. As a consequence, the paper supports the idea that soft QM practices may also play a moderating influence.

5.1. Analytic Methods

The study contributes to the QM literature because the results emphasize the importance of integrating soft QM practices into hard QM practices for effective and successful implementation of QM programs to enhance performance. QM literature has suggested that both the soft and hard QM part have direct and indirect effects on performance. This study supplements this point of view expanding the interplay between soft and hard QM practices showing also that a moderating role of the soft QM practices exists.

The study provides some implications for managers. First, it helps Malaysian managers to have a clearer understanding of how to reinforce the benefits of soft QM and hard QM parts on performance, by understanding and focusing the firm's resources on the important elements. The managers are motivated to implement the hard QM part by investing more time and resources. For example, the use of information on quality performance, the involvement of employees from a variety of areas (e.g. manufacturing, marketing, etc.) in process design and in the introduction of new products, the use of quality tools to control processes, the management and improvement of the processes, amongst others, are actions that may have positive effects on performance.

Second, for the effective implementation of the hard QM part, this study justifies the critical nature of the soft QM part. Managers need to consider the soft issues when creating a quality culture. The success of hard QM will be higher with an effective implementation of practices such as customer focus (e.g. practices related to collect and analyse data from customer and other stakeholders), employee involvement (e.g. practices to empower employees), training and education (e.g. practices to increase the level of training to acquire appropriate skills for continuous improvement), reward and recognition (e.g. appropriate rewards to motivate employees for continuous improvement), and good relationships with suppliers. In this context, in addition, commitment from managers is a

critical issue to facilitate an easier implementation of practices related to hard factors.

5.2. Limitations and future research

The conclusions drawn from this study should consider the following limitations. First, this study uses a cross-sectional design. Therefore, a future study could apply longitudinal research. Second, the sample data for this study were taken from one single industry (electrical and electronic manufacturing), which limits the ability to generalize the results of this study to industry in general. Future research should therefore examine other industries. Finally, the paper selects the most commonly studied soft QM practices and there are other factors (e.g. teamwork, trust, communication and culture) which could be considered in future studies. These studies could complement previous research about the role of culture in a QM context.

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