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The Influence of Soft and Hard Quality Management Practices on Performance

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Abstract

The aim of this study is to examine the relationship between the practices of soft quality management and hard quality management, and to investigate the direct and indirect effects of soft and hard quality management on firm performance. The paper proposes several hypotheses relating to the relationship between soft quality management factors, hard quality management and performance. To test these hypotheses, the paper uses a sample of 255 electrical and electronics firms from Malaysia as the data source, and structural equation modeling (SEM) as the statistical tool. The findings show that soft quality management factors have a positive influence on hard quality management; hard quality management has a direct effect on performance and soft quality management factors have direct and indirect effects on performance. Consequently, hard quality management acts as a mediating variable between soft quality management factors and performance.

Keywords: Soft quality management, hard quality management, performance, electrical and electronics firms, Malaysia

1. Introduction

Quality gurus suggest that quality management is the key to the improvement of performance (Deming, 1982; Juran, 1988). Several empirical studies in developed and developing countries support this conclusion, finding a positive relationship between quality management and performance (Flynn et al., 1995; Powell, 1995; Leppert, 1997; Easton and Jarrell, 1998; Kaynak, 2003; Prajogo and Sohal, 2006; Sila, 2007; Chung et al., 2008; Tseng and Lin, 2008).

To investigate this relationship, the studies in different countries use various quality management and performance measures and different statistical methods (e.g. correlations, *t*-tests, regressions, and structural equations). In terms of the analysis of quality management as a variable, some studies focus on total quality management (TQM) (Powell, 1995; Prajogo and Sohal, 2006; Sila, 2007), some use the ISO 9001 standard (Naveh and Marcus, 2004; Dick et al., 2008), and others focus on quality awards (Hendricks and Singhal, 1996; Easton and Jarrell, 1998; York and Mire, 2004). Among those studies that focus on TQM, a distinction can be drawn between those that treat TQM as a single construct, and those that describe TQM as a disaggregated set of practices. These practices may be divided into soft and hard practices (Flynn et al., 1995; Rahman, 2004).

Details of this classification are given below (Table 1), but in general hard quality management practices are technical tools and techniques used in quality management, while

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soft quality management practices deal with the management of people, relationships and leadership. Even in studies that do not explicitly use the terms "hard" and "soft" it is possible to differentiate between the impacts of the two groups of practices on performance. In this context, empirical studies have examined both the direct effects (Powell, 1995; Terziovski et al., 2003) and the indirect effects (Lai and Cheng, 2005; Sila, 2007) of quality management on performance. According to some of these works, the success of quality management critically depends on practices associated to soft factors such as leadership and people management (Powell, 1995; Samson and Terziovski, 1999; Terziovski et al., 2003). Similarly, several studies have shown that hard quality management practices are unrelated or weakly related to performance (Powell, 1995; Dow et al., 1999), although other studies show that hard quality management has an impact on performance (Forza and Filippini, 1998; Tarí and Sabater, 2004).

Studies that focus explicitly on the impacts of hard and soft quality management practices find mixed results (Flynn et al., 1995; Ho et al., 2001; Rahman and Bullock, 2005). For example, some scholars find that the relationship between the hard practices and performance is not significant (Ho et al., 2001), while others show that some soft and hard quality management practices are either directly or indirectly related to performance (Rahman and Bullock, 2005). Some of these studies also conclude that soft factors may impact on performance in an indirect manner via hard factors. This suggests that hard quality management factors may have a role as a mediator.

Overall, this literature shows that although soft aspects are important for the success of quality management, the results regarding the effects of hard aspects are inconclusive. Therefore, it is of interest to analyse these relationships in order to clarify the relationships that have been the subject of previous, inconclusive studies.

In relation to the statistical methods used to study the relationships, data analyses are based on a series of multiple regressions (Samson and Terziovski, 1999; Terziovski et al., 2003), correlations (Powell, 1995; Curkovic et al., 2000) and other analytical frameworks. However, few empirical studies identify the direct and indirect effects of quality management practices on performance using structural equation models (SEM) and considering quality management as a multidimensional construct (e.g. Anderson et al., 1995 ; Flynn et al., 1995; Kaynak, 2003; Lee et al., 2003; Sila and Ebrahimpour, 2005). The few studies that use these more sophisticated approaches have been conducted in the USA and Korea. In this context, several studies use SEM as the statistical tool to analyse the impact of other factors (e.g. brand contribution, innovation) on the performance of firms (Quintana et al., 2003; Kuo and Wu, 2007).

An area of interest is, therefore, the examination of whether the results of these previous studies, regarding direct and indirect effects of specific aspects of quality management on performance using structural equations models, can be extended to other countries. Such replication studies could be based on analyses carried out in countries other than the USA and Korea. Research into quality practices has been extended beyond developed countries to other countries around the world (Zakuan et al., 2010). Thus, replications may improve our understanding and facilitate theory development (Easley et al., 2000; Singh et al., 2003).

Few studies investigate these relationships in Asian countries (Zakuan et al., 2010). In many developing countries in Asia, the idea of quality management is still quite new, and it will take time to develop a complete understanding of it (Onitsuka, 1999). Developed and developing countries are at the different stages of quality management (Zakuan et al., 2010) and there is even considerable variation in the level of quality management development in the different countries of the Asian region. Among Asian countries, Malaysia may be considered to be a middle-ranking developing nation in relation to quality management.

Few studies of aspects of quality management have been conducted in Malaysia and even fewer have used structural equations as a statistical tool to investigate the direct and indirect effects of soft and hard quality management practices on performance. Hence, it is important to extend the studies on the direct and indirect effects of soft and hard quality management practices to the context of Malaysian firms.

The aim of this paper is thus to investigate the relationships between soft quality management factors, the direct relationship between soft quality management and hard quality management, the direct relationship between hard quality management and performance, and the direct and indirect relationships between soft quality management and performance. With this objective, the paper proposes several hypotheses in relation to soft and hard quality management and performance. To test these hypotheses, the paper uses a sample of 255 electrical and electronics firms from Malaysia. Few studies have analysed quality management in a specific manufacturing industry such as organizations in electrical and electronic manufacturing (Ismail et al., 1998; Agus, 2001; Eng Eng and Yusof, 2003). This approach is developed from the point of view of replication research, and uses structural equations to examine the relationships between quality management practices and performance in electrical and electronic firms that operate in Malaysia. The intention is to test the generalizability of existing theory. Accordingly, the contribution of the paper is to extend the results of previous studies that analyse direct and indirect effects of aspects of quality management using structural equations to transitional economies such as Malaysia.

The following parts of this paper are organized as follows. The next section reviews the relevant literature in order to articulate the hypotheses. Next, the paper describes the measurement instrument, the sample, the data collection and the reliability and validity analysis. The paper then presents the empirical results, and the last section presents the conclusions, managerial implications, limitations and suggestions for future research.

2. Literature review and hypotheses

2.1 Soft and hard quality management practices

Quality management (QM) practices can be classified into two groups: the management system – leadership, planning, human resources, etc. – and the technical system (Evans and Lindsay, 1999), or into the "soft" and "hard" parts (Wilkinson et al., 1998).

The technical system, as defined by Evans and Lindsay (1999), consists of a set of tools and techniques (run charts, control charts, Pareto diagrams, brainstorming, stratification, tree diagrams, histograms, scatter diagrams, force-field analysis, flow charts, etc.), while the hard part, according to Wilkinson et al. (1998), includes production and work process control techniques which ensure the correct functioning of such processes, including, amongst other things, process design, just-in-time philosophy, the ISO 9000 standard and the seven basic quality control tools. The management system or the soft part is the behavioural aspects of management or the human aspects, such as leadership and people management. These two dimensions reflect all the issues which a manager must bear in mind for the successful implementation of quality management.

Although there is some disagreement about what constitutes the soft and hard elements of quality management, there is a measure of consensus about common soft and hard elements in the studies that explicitly classify quality management practices as soft and hard (Table 1). The soft quality management factors are generally relate to people aspects, while the hard quality management factors represent the quality tools and techniques, design activities, process control and management, and process measurement.

Table 1. Soft and hard QM practices according to literature

Study	Soft factors	Hard factors
Theoretical studies		
Rahman (2004)	Leadership, people management (employee involvement, employee empowerment, employee training, teamwork and communication), customer focus, quality planning	Use of advanced manufacturing systems, usage of Just-in-time principles, quality data and reporting, design quality management, statistical process control, benchmarking, zero defect mentality
Lewis et al. (2006)	Customer focus, people management (e.g. training, teamwork, employee involvement, communication, rewards and recognition, employee empowerment), top management commitment, supplier management, quality culture, social responsibility	Continuous improvement and innovation, information and performance measurement, process management, planning, process control, product and service design, benchmarking, quality systems
Empirical studies		
Flynn et al. (1995)	Customer relationship, supplier relationship, work attitudes, workforce management, top management support	Product design process, process flow management, statistical control and feedback
Ho et al. (2001)	Role of top management, role of quality department, employee relations, training	Product design, process management, quality data and reporting, supplier quality management
Chin et al. (2002)	Strategic planning, leadership, people management (e.g. education and training, employee involvement), organisational culture.	Tools and techniques, quality system, process analysis and improvement, supplier chain management, measurement
Rahman and Bullock (2005)	People management (e.g. workforce commitment, use of teams, personnel training), shared vision, customer focus, supplier relations	Computer based technologies, Just-in-time principles, technology utilisation, continuous improvement enablers
Fotopoulos and Psomas (2009)	Top management commitment, strategic quality planning, employee involvement, supplier management, customer focus, process orientation, continuous improvement, facts-based decision making, human resource development	Cause and effect diagram, scatter diagram, affinity diagram, relations diagram, force-field analysis, run chart, control chart, quality function deployment, failure mode and effect analysis
Gadenne and Sharma (2009)	Top management philosophy and supplier support, employee and customer involvement, employee training	Benchmarking and continuous measurement, continuous improvement, efficiency improvement

Based on this review of the literature, there is a general agreement on the need to measure practices related to senior management commitment, people management and customer focus as soft quality management factors. Similarly, there is agreement on the use of practices related to measurement, process management, design, tools and techniques as hard factors. In this context, planning and supplier management are practices that are normally classified as soft factors, although some scholars have considered them to be hard factors.

In summary, soft aspects of quality management relate to management and people aspects such as leadership, people management, customer and supplier relationships, and quality planning, while hard aspects of quality management relate to tools and systems necessary for the implementation of quality management principles such as quality tools and techniques, benchmarking, the ISO 9001 standard and process management, measurement, and product/service design. Soft practices facilitate the development of hard practices and both are important to successful implementation of quality management.

2.2 The relationship between soft and hard quality management and performance

In general terms, the empirical literature finds a connection between quality management practices and performance. To investigate these relationships, many studies that operationalize quality management practices use soft and hard practices, but only a few studies explicitly classify them as soft and hard.

Studies that analyse the effects of quality management practices but do not name them as soft versus hard, in general, find that quality management practices have positive effects on performance (Kaynak, 2003; Prajogo and Sohal, 2006; Sila, 2007). Some of these studies show significant positive relationships between performance and several practices that have been identified here as soft factors, such as management commitment, people management, and customer focus (Dow et al., 1999; Samson and Terziovski, 1999; Powell, 1995). Similarly, while some studies find that some hard quality management practices (e.g. statistical process control, benchmarking) are not related to performance (Powell, 1995; Samson and Terziovski, 1999), others indicate the opposite (Kaynak, 2003). In summary, these studies show that some soft quality management factors may have positive effects on performance and that the results are inconclusive for hard quality management factors.

In relation to empirical studies that explicitly classify quality management practices as soft and hard and then analyse the effects of soft and hard practices on performance, the following are their salient features. Flynn et al. (1995) examined the relationships between eight dimensions of quality management and performance using a path analysis. They show that some soft and hard quality management factors have a direct and indirect relationship with performance. Ho et al. (2001) hypothesized positive influences of soft quality management practices on hard quality management practices, which in turn affect performance. They examined these relationships using regression analysis. The results show a mediating effect of the hard quality management practices although the relationship between the hard issues and performance was not significant. Chin et al. (2002), using an analytic hierarchy process, showed that it was impossible for the hard factors to produce high quality on their own, as their effectiveness depends significantly on support from the soft quality management factors. Rahman and Bullock (2005), using regression analysis, found that soft quality management practices impact on performance directly and indirectly through hard quality management. Fotopoulos and Psomas (2009) show that soft and hard quality management elements have both a direct and indirect impact on the quality management results, although soft quality management elements play a major role. Gadenne and Sharma (2009) found that all soft and hard factors are significantly associated with improved overall performance. For example, employee and customer involvement, employee training and efficiency improvement are significantly related to customer satisfaction.

Although some results are inconclusive, these studies show that, in general terms, some soft and hard quality management factors may be related, that soft quality management factors may have direct and indirect effects on performance, that hard factors may be directly related to performance, and that hard quality management may act as a mediating variable between soft quality management and performance. Thus the following four hypotheses are proposed:

Hypothesis 1: *Soft quality management factors have positive direct effects on hard quality management.*

Hypothesis 2: *Hard quality management has a positive direct effect on performance.*

Hypothesis 3: *Soft quality management factors have positive direct effects on performance.*

Hypothesis 4: *Soft quality management factors indirectly have positive effects on performance via hard quality management.*

3. Method

3.1 Measurement instrument

The measurement instrument was created using an extensive review of the literature on the measurement of soft quality management factors, hard quality management and performance. Soft quality management was measured using six factors mentioned in the literature review in Subsection 2.1: management commitment, customer focus, employee involvement, training and education, reward and recognition, and supplier relationship. The measures of these six soft quality management factors, which were found valid and reliable in the study by Zhang et al. (2000), were adopted. In relation to hard quality management, the study used the items from Flynn et al. (1994): feedback, inter-functional design, new product quality, process control, and process management. Although performance has been a focus of researcher interest for centuries, there is no agreement as to what constitutes performance in the literature on organizational performance (Pham and Jordan, 2009). For this study, the dimensions relating to performance were adopted from the study by the Malaysian National Productivity Corporation (NPC) (2005) since this study specifically designed productivity performance indicators for manufacturing industries in Malaysia. 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. The nine items or indicators for performance are: 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.

All the eight main constructs (six soft factors, hard quality management and performance) used in this study are very broad and potentially quite complex in nature and, for the purpose of this study, the authors have used the overall composite mean scores for all the indicators for each construct, in order to create an index that indicates the subjective evaluation of these constructs based on the perceptions of managers.

This study tested and refined the measurement instrument based on the feedback from 15 managers and quality experts. This pre-test helped to improve the structure and content of the questionnaire. The final instrument has 38 items measuring the six soft quality management factors, 20 items measuring the five hard quality management dimensions and 9 items measuring the performance construct. In total there are 67 items used in this study. The measurement instrument uses a ten-point Likert's scale continuum for the items that measure the six soft factors and hard quality management, where 1 is strongly disagree and 10 is

strongly agree. All nine measures of performance require the respondents to indicate the level of growth and all the items are also constructed using rating scales on a continuum of 1 to 10, in which 1 represents nothing and 10 a high level.

3.2 Sample

The population of this study is made up of all 683 electrical and electronics firms from West Malaysia. The sample survey firms were drawn through simple random sampling from the list obtained from the Federal Malaysian Manufacturers (FMM) (FMM-MATRADE, 2003). Therefore, the company list in the directory represents the sampling frame for the present study. These firms are mainly involved in manufacturing electrical and electronic products for the local or international market. Thus, the sample is the group of organisations selected at random from the list of 683 electrical and electronic organisations. The instrument was distributed to 350 firms. One key informant from each firm was identified. These informants were managing directors and quality directors/managers, since they are directly involved in the process and have first-hand knowledge of quality management implementation activities in their firms.

A total of 275 managers responded, a response rate of 72.8 percent, although 20 of the questionnaires received had incomplete responses and were therefore removed from the analysis. Thus, the research is based on data from 255 respondents. Of these 255 electrical and electronic manufacturers, 80 were classified as small firms, 86 as medium and 89 as large enterprises.

To test for non-response bias, the data were split into two groups, where the surveys received late (90) were expected to be more like the non-respondents than those received early (185). Then *t*-tests were conducted on the two groups' mean responses to ten randomly selected questions (Armstrong and Overton, 1977), and the results showed that the two groups were identical. The two groups were also not significantly different in terms of demographic variables such as number of employees, multinational company registration and ISO registration. In addition, a multiple group analysis was conducted, which showed that the proposed model was equivalent across the two groups.

3.3 Scale reliability and validity

Before considering the importance of constructs in SEM analysis, their validity and reliability were first tested. The validity, tested by the confirmatory factor analysis (CFA), determined whether the items/indicators of each construct can represent the construct well. In this study there are altogether eight main constructs. Goodness-of-fit Index (GFI) is used as an indicator for the validity of these constructs whereas the reliability of the constructs was tested with Cronbach's alpha (α). As suggested by Hair et al. (1998), the cut off point for GFI and Cronbach's α were set to 0.90 and 0.70, respectively. The mean value was used to test the SEM model given that it is simple, yet accurate (Hair et al., 1998). All the items had statistically significant factor loadings on their assigned soft quality management factors, hard quality management, and performance. All were therefore retained in the model (Table 2). In this sense, the indicators selected for each of the eight constructs are reliable and valid.

Table 2 indicates that the CFI values ranged from 0.92 to 0.96 (all over 0.90) and the RMSEA values ranged from 0.019 to 0.058 (smaller than 0.08), suggesting that all the eight constructs were unidimensional.

Table 2. Summary of goodness-of-fit statistics for CFA of model constructs

Model constructs and their indicators	χ^2	*d.f*	$\chi^2/d.f$	*p*-value	CFI	RMSEA	Factor loading	Cronbach's α
Soft QM factors	54.23	12	4.52	0.0025	0.94	0.032		0.97
Management commitment							0.82	0.95
Customer focus							0.87	0.93
Employee involvement							0.88	0.89
Training and education							0.82	0.90
Reward and recognition							0.78	0.89
Supplier relationship							0.79	0.93
Hard QM	15.30	5	3.06	0.0200	0.92	0.058		0.93
Feedback							0.76	0.89
Interfunctional design							0.87	0.96
New product quality							0.89	0.87
Process control							0.82	0.91
Process management							0.78	0.92
Performance	85.45	24	3.56	0.2377	0.96	0.019		0.90
Added value per employee							0.86	
Total output per employee							0.79	
Added value content							0.90	
Process efficiency							0.88	
Fixed asset per employee							0.89	
Added value per fixed assets							0.83	
Added value per labor cost							0.80	
Unit labor Cost							0.79	
Labor cost per employee							0.78	

All the factor loadings were significant at $p < 0.001$.

The reliability of the constructs was assessed using Cronbach's alpha. The overall alpha values for all the eight constructs ranged from 0.89 to 0.97 (see Table 2), yielding an overall reliability coefficient of 0.97 for the six soft quality management factors construct, 0.93 for the hard quality management construct and 0.90 for the performance construct. These results suggest satisfactory reliability of the eight constructs used in the study.

Table 2 also shows that the factor loadings ranged from 0.76 to 0.90 and were all statistically significant, indicating strong convergent validity. The χ^2 for the constrained and unconstrained models shows that the χ^2 difference tests between all pairs of constructs are significant, suggesting strong discriminant validity. Similarly, the overall bivariate correlations between the overall soft quality management factors, overall hard quality management and overall firm performance were 0.49, 0.61, and 0.50, respectively. These correlations were statistically significant at $p < 0.001$, indicating strong criterion-related validity.

The assumptions of multivariate analysis including normality, linearity, multicollinearity, and singularity were tested for the constructs used in the proposed model. 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 SEM.

3.4 Analytic methods

First, descriptive analysis was used (see Table 3). For this purpose, the overall single composite mean scores for each of the eight constructs was measured by adding the total scores for each variable and then dividing it by the total number of items.

Table 3. Descriptive statistics and correlation matrix

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

Notes: Zero-order coefficients $p < 0.01$, Benforroni adjusted alpha = 0.008 (0.05/6)

Second, the data and the research model were analyzed with the AMOS 6.0 program (Arbuckle, 1999). The maximum likelihood estimation method was used. Hypothesis testing was accomplished using SEM paths. Although other multivariate techniques are known to be powerful in testing single relationships between the dependent and independent variables, human and behavioural issues in management are more complicated, so that a dependent variable may be an independent variable in other dependence relationships. Most techniques cannot take into account the interaction effects among the posited variables (both dependent and independent). SEM combines several techniques including factor, path, and regression analyses. It uses observable indicators to investigate the relationship among latent constructs along a specified causal path. A method, such as SEM, that can examine a series of dependence relationships simultaneously, helps to address complicated managerial and behavioural issues (Cheng, 2001). Consequently, SEM can expand the explanatory ability and statistical efficiency of model testing with a single comprehensive method (Hair et al., 1998).

4. Analysis and results

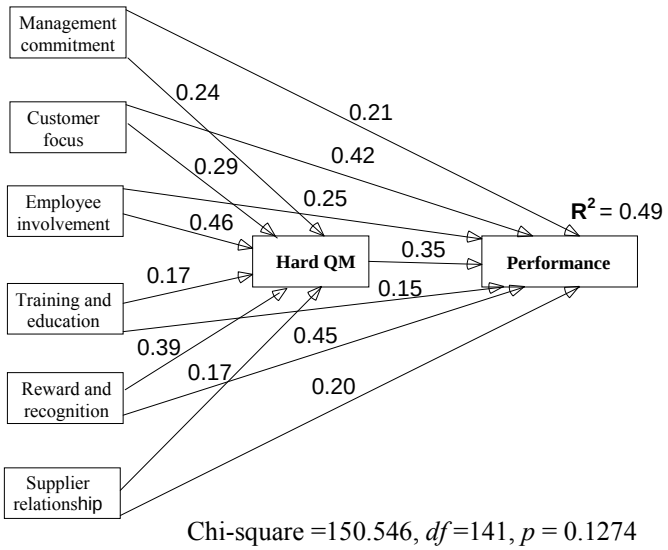
4.1 Analysis of the structural model

Table 4 shows the goodness-of-fit indices for the research model. The GFI value is 0.92 and indicates an adequate model fit. The RMSEA value is 0.056 and also suggests a well-fitting model. The overall fit statistics in Table 4 reveal that the proposed model fits the data from the quality or firm managers reasonably well. First, the Chi-square statistic, $\chi 2$ associated with the null hypothesis that the proposed model can effectively reproduce the

observed covariance is 150.546 with 141 degrees of freedom, resulting in a ratio of 1.068 and a *p*-value of 0.1274 (not significant). Good-fitting models have ratios of 2.00 or less (Wheaton et al., 1977). Second, Table 4 shows that the various measures of relative and absolute fit index (ranging from 0 to 1, with 0 implying poor fit and 1 indicating perfect fit), including the GFI, the comparative fit (CFI), and the normed fit (NFI) indices, exceed 0.90 without any exceptions. Third, Table 4 also shows that the difference between reproduced and observed covariances are small as indicated by the root mean square residual (RMSR) of 0.049 and the RMSEA of 0.056. Thus, the proposed model is an acceptable portrayal of the data and serves as a sound basis for interpreting the specific hypotheses and influence pathways in the study. All the hypothesized paths are significant as Figure 1 shows.

Table 4. Results of the overall structural model fit

Fit Measures	Recommended Value	Research Model
χ^2		150.546
$\chi^2/d.f$	less or equal to 2.00	1.068
GFI	more or equal to 0.90	0.920
AGFI	more or equal to 0.90	0.910
NFI	more or equal to 0.90	0.912
CFI	more or equal to 0.90	0.916
RMSR	less or equal to 0.10	0.049
RMSEA	less or equal to 0.08	0.056



Note: All the standardized parameter estimates are significant at $p < 0.001$

Figure 1. A model of the relationships between soft QM factors, hard QM and performance

The final model (Figure 1) captures only about 49 percent of the total variance ($R^2 = 0.49$) associated with the performance construct. This is not unusual, however, because a myriad of exogenous environmental and other factors affect the performance. In this sense, the structural equation model presented in Figure 1 also suggests that the mediating model (final model) accounted for nearly half (49%) of the variation in performance. The remaining variance (51%) must be attributed to other factors, such as competitive forces, management procedures, and other environmental considerations that were not included in the present study. All the standardized parameter estimates in the model have significant *t*-values ($t > 1.96$), giving statistical evidence that their contributions towards the other constructs are significant.

4.2 Hypothesis testing

First, Table 3 shows that the correlation coefficients between the six soft quality management factors (management commitment, customer focus, employee involvement, training and education, reward and recognition and supplier relationship) are positive and significant. Therefore, soft quality management factors relate positively to each other.

Second, to test Hypotheses 1, 2, 3 and 4, this paper uses the standardized parameter estimates from the structural model, direct effects, indirect effects and total effects (Table 5 and Figure 1). The following subsections give the results for the four hypotheses.

Table 5. Direct, indirect and total effect of latent exogenous variables on performance

Exogenous Variables	Direct Effect (DE)	Indirect Effect (IE)	Total Effect (TE) = (DE) + (IE)
Hard QM	0.350	0.000	0.350 + 0.000 = 0.350
Management commitment	0.210	0.240 X 0.350 = 0.084	0.210 + 0.084 = 0.394
Customer focus	0.420	0.290 X 0.350 = 0.102	0.420 + 0.102 = 0.522
Employee involvement	0.250	0.460 X 0.350 = 0.161	0.250 + 0.161 = 0.411
Training and education	0.150	0.170 X 0.350 = 0.059	0.150 + 0.059 = 0.209
Reward and recognition	0.450	0.390 X 0.350 = 0.137	0.450 + 0.137 = 0.587
Supplier relationship	0.200	0.170 X 0.350 = 0.059	0.200 + 0.059 = 0.259

All the parameters are significant at $p < 0.001$.

Soft quality management factors have positive direct effects on hard quality management. Figure 1 shows the final model and the path coefficients for the overall direct effects of the six soft quality management factors on hard quality management. These standardized parameter estimates indicate the significant positive direct effect of all the six soft quality management factors on hard quality management, supporting Hypothesis 1. This result shows that effective implementation of the soft quality management factors positively affects hard quality management.

Hard quality management has positive direct effect on performance. Figure 1 and Table 5 show that hard quality management has a positive direct effect on performance, supporting Hypothesis 2. This result shows that effective implementation of hard quality management (e.g. feedback, interfunctional design, new product quality, process control, and process management) improves firm performance.

Soft quality management factors have direct positive effects on performance. Figure 1 and Table 5 show that the six soft quality management factors have a positive direct effect on performance and this result supports Hypothesis 3. Therefore effective implementation of the six soft quality management factors directly improves performance.

Soft quality management factors indirectly have positive effects on performance, mediated by hard quality management. Table 5 shows that all the six soft quality management factors have significant positive indirect effects on performance, via hard quality management. This result supports Hypothesis 4.

Based on these results, the four hypotheses are supported and among the six soft factors and the hard quality management, the three factors that have highest impacts on performance are reward and recognition, customer focus and employee involvement.

5. Discussion and conclusions

The results show that the sample data is a good fit to the proposed model and thus provide support for the relationships between six soft quality management factors, hard quality management and performance. The paper empirically tests the structural model using SEM on the data gathered from a sample of 255 electrical and electronic companies. The R-square value of 0.49 means 49 percent of the variance in organizational performance is significantly explained by the model with six soft quality management factors and hard quality management. The results support the four hypotheses and also substantiate the relationships that had been anticipated between soft quality management factors, hard quality management and performance in electrical and electronic manufacturing companies in Malaysia.

Several previous studies have found similar relationships between soft quality management factors. For example, studies show that top management provides resources to facilitate quality efforts, such as investment in people, and can improve the relationships with both customer and suppliers (Black and Porter, 1995; Flynn et al., 1995; Kaynak, 2003). These studies show that the soft quality management factors relate to each other. The results here support this relationship within the context of Malaysian electrical and electronic organisations.

Previous studies also provide evidence that several soft factors have positive effects on hard issues. For example, several scholars show a positive correlation between people management and process control and management (Samson and Terziovski, 1999). Similarly, senior management provides training for employees in the use of quality techniques and tools, and people may use quality data to improve quality. In addition, several authors recognize the strategic importance of integrating internal processes with external suppliers and customers in unique supply chains. Accordingly, senior management, people management, and supplier and customer relationships relate positively to process control and management, product quality, design and feedback (Flynn et al., 1994; Kaynak, 2003; Rahman and Bullock, 2005). This idea is supported by the findings of this study.

The results of this study clarify some of the mixed findings shown in the quality management literature regarding the effects of hard quality management on performance. For example, Flynn et al. (1995) and Samson and Terziovski (1999) do not find a positive and significant effect of process management on performance, although other scholars show that process management has an impact on performance (Kaynak, 2003). The results here support the idea of a direct positive contribution of hard quality management to performance found in some studies (Kaynak, 2003; Rahman and Bullock, 2005).

In addition, soft quality management factors have direct and indirect effects on performance, supporting a direct positive contribution of the soft quality management factors to performance (Samson and Terziovski, 1999; Curkovic et al., 2000) and the indirect effects

shown in some studies, mediated by hard quality management (Rahman and Bullock, 2005). Although some scholars find that the relationship between the hard issues and performance is not significant (Ho et al., 2001), the results of our study show that soft issues can also have an indirect impact on performance via hard quality management. This suggests that some quality management factors, such as hard quality management, may be mediators, and that, therefore, their effectiveness will depend significantly on the support of soft quality management factors. In this context, recognising people and focusing on customers are key issues in Malaysian electrical and electronic firms if they are to improve performance and competitiveness.

Accordingly, both soft and hard practices are necessary for the implementation of quality management, and soft factors facilitate the development of hard factors. As Fotopoulos and Psomas (2009) show, hard quality management elements are only the vehicle to quality improvement because they alone cannot lead an organisation to continuous improvement, customer satisfaction and consolidation of market position, without the proper guidance from senior management, and employee and supplier support.

Consequently, although some scholars find no significant relationships between hard quality management and performance, and few studies analyze the direct and indirect effects of soft and hard quality management, the contribution of the present study to the discipline of quality management can be seen in the evidence for the importance of soft quality management factors, in both their direct and indirect relationships, with performance. This extends the empirical evidence about the direct and indirect effects of soft quality management and hard quality management on performance to electrical and electronic firms in Malaysia.

The practice of quality management at the national level is also influenced by international developments, as companies struggle to compete internationally and gain a competitive edge in the global market (Zakuan et al., 2010). Therefore, electrical and electronic organizations in Malaysia should develop these soft quality management factors to create conditions that allow effective utilization of hard quality management, which in turn affects performance as a way to gain competitive edge, and so support the export of local electrical and electronic products to regional and global markets.

5.1 Managerial implications

This study has shown that the three main factors that have greatest impact on performance are reward and recognition, customer focus and employee involvement. This is really important in helping management to focus their firm's resources on the right priorities. From a practical point of view, this study can be expected to help managers of firms to have a clearer sense of how to enhance the benefits of soft factors and hard quality management on performance, by understanding and focusing the firm's resources on the important elements. The results of this study show that soft issues are a most important resource, which has strong effects on organizational performance. Thus, managers should consider that improvement in soft quality management factors would support the successful implementation of hard quality management. That is, the success of hard quality management depends on the effective implementation of the soft quality management factors such as management commitment, customer focus, employee involvement, training and education, reward and recognition, and supplier relationship. Both soft and hard practices should be planted into everybody's mind and operate in every department's day-to-day work for successful implementation of quality management. Managers in Malaysian organisations should understand that the implementation of soft and hard quality management practices will improve performance (e.g. improve productivity and quality). This may support the export of local electrical and electronic products to regional and global markets.

Therefore, managers and decision makers in organizations need to upgrade their quality practices by increasing the resources and attention devoted to them. All quality management factors are necessary and managers should provide resources to support ongoing training, full involvement of employees, recognition and reward of employees' efforts in quality improvement, and improvements in customer and supplier relationships (e.g. by requesting detailed information about customer needs and specifications, and assessing supplier quality levels). Efforts relating to people aspects, such as achieving employee involvement, and rewarding and recognising good work by employees, as well as focusing on customers, are particularly key issues in this kind of firm if they are to improve performance and compete in a global market.

5.2 Limitations and future research

This study has a number of limitations. The first limitation of this study is that it is a cross-sectional study. For this reason, it is recommended that future studies should embark on longitudinal research that provides more valuable information for theory development and refinement in the fields of quality management. Second, data on single industry (electrical and electronic manufacturing) limit the ability to generalize the results of this study to industry in general. Future research should therefore examine other industries. Third, the paper selects the most commonly studied soft quality management practices and there are other factors which could be considered in future studies. These include communication, teamwork and culture.

Finally, the eight main constructs (six soft factors, hard quality management and performance) used in the study were very broad and potentially quite complex in nature, and, for the purpose of this study, the authors have used only the overall composite mean scores for all the items of each construct to create an index that indicates the subjective evaluation of these constructs based on the perceptions of managers. In other words, this study only examines the relationships between the eight latent variables and the conclusions drawn in this study do not specify the relationship between specific indicators for the independent variables (six soft quality management factors), mediating variable (hard quality management) and dependent variable (performance). In this sense, future research would need to unpack these constructs into their specific dimensions in order to make real sense of them.

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