

# QUALITY MANAGEMENT AND PROFITABILITY LINKAGE: DOES THE LENGTH OF QM ADOPTION ACT AS THE MODERATING VARIABLE?

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## ABSTRACT

*Manufacturing companies in Malaysia have never had it so tough. They are now confronting increasing prices of oil and raw materials, high advancement in innovation and technology, as well as high customer expectation on the quality of products and services. In addition, managers of these companies are well aware of the increasing competitive pressures in the world market. It is clear today that these pressures are due largely to the increased performance of those firms that have successfully implemented quality improvement. This paper presents the findings from an empirical study examining the relationship between quality management (QM) practices and profitability in the electronics and electrical industry in Malaysia. It is said that QM has the potential to not only enhance production efficiency and effectiveness, but also improves bottom-line results. Much has been written about the relationship between QM and performance. However, the link of QM practices to profitability in the electronics and electrical industry in Malaysia has not been fully addressed in empirical studies. To address this issue, this paper investigates the impact of QM practices on profitability in the Malaysian electronics and electrical industry using correlation, multiple regression, and hierarchical regression analyses. The findings revealed that quality measurement, supplier relations, and benchmarking in particular, appear to be of primary importance and exhibit significant impact on profitability. Findings of the study provided a striking demonstration of the importance of implementing effective QM practices for the electronics and electrical industry in Malaysia in enhancing its profitability. However, the study failed to provide the statistical evidence of the existence of the moderating effect of the length of QM adoption on the QM and profitability linkage.*

**Keywords:** *Quality management; profitability; electronics and electrical industry; correlation, and multiple regression analysis.*

## ABSTRAK

Syarikat perkilangan di Malaysia berhadapan dengan keadaan yang mencabar. Mereka berhadapan dengan kenaikan harga minyak dan bahan mentah, kemajuan tinggi dalam teknologi dan inovasi, di samping jangkaan tinggi pelanggan terhadap kualiti produk dan perkhidmatan. Di samping itu, pengurus syarikat perkilangan ini sedar akan tekanan persaingan yang meningkat dalam pasaran dunia masa kini. Adalah jelas bahawa tekanan ini sebahagian besarnya disebabkan peningkatan prestasi firma-firma yang berjaya mengimplimentasikan pembaharuan kualiti. Artikel ini mempersembahkan penemuan daripada satu kajian empirikal yang meneliti perhubungan di antara amalan pengurusan kualiti (QM) dan keuntungan dalam industri elektrik dan elektronik di Malaysia. Pengurusan kualiti dikatakan mempunyai potensi bukan sahaja untuk mempertingkatkan kecekapan dan keberkesanan pengeluaran tetapi juga memperbaiki pulangan asas. Banyak yang diperkatakan mengenai perhubungan antara QM dan prestasi. Walau bagaimanapun, pertalian di antara amalan pengurusan kualiti dengan keuntungan dalam syarikat-syarikat elektrik dan elektronik di Malaysia tidak banyak dikupas dalam kajian empirikal. Untuk mengupas isu ini, artikel ini menyiasat impak amalan pengurusan kualiti ke atas keuntungan dalam industri elektrik dan elektronik di Malaysia menggunakan analisis korelasi, regresi berganda dan regresi berhierarki. Penemuan menunjukkan bahawa pengukuran kualiti, perhubungan pembekal dan ukur tara khasnya menunjukkan kepentingan dan mempamerkan impak signifikan terhadap keuntungan. Keputusan kajian mendemonstrasikan kepentingan pelaksanaan amalan pengurusan kualiti yang efektif bagi syarikat elektrik dan elektronik di Malaysia dalam mempertingkatkan keuntungan. Walau bagaimanapun, kajian ini gagal menyediakan bukti statistik mengenai kewujudan kesan moderat jangka masa amalan QM dalam pertalian perhubungan di antara QM dan keuntungan.

**Kata kunci:** Pengurusan kualiti; keuntungan; industri elektrik dan elektronik; korelasi, dan analisis regresi berganda.

## INTRODUCTION

Many manufacturing companies have fought the global pressures of competition by becoming increasingly technologically advanced, moving up-market to produce more value-added products, and upgrading the skills of their domestic work force (Enright, Scott, & Dodwell, 1997; Pun & Lee, 1997). Everyone, everywhere is in pursuit of higher quality. The impact of quality is so enormous that it can affect a company's competitiveness, both locally and globally. Quality

is not something that happens by chance, it is the result of deliberate action. Quality of a product or service is the degree to which the product or service meets specifications and needs of customers. This quality consciousness has alerted management of organisations that, in order for an organisation to survive as a competitive one in the market, quality should be treated as a primary organisational goal.

A manufacturing company achieves world-class status when it has successfully developed operational capabilities (through quality management) to support the entire company in gaining a sustained overall quality over its competitors. However, quality management (QM) would only be successfully implemented in an organisation if employees were committed to a life-long learning process of improving continuously. This paper explores the possibility of adopting QM as the basis for enhancing profitability in the electronics and electrical industry in Malaysia.

Empirically, the purpose of this study was to present an explicit result on the relationship between QM and profitability where other researchers have perhaps known or describe them only implicitly. There are studies which suggested that QM improves performance but, with a few exceptions, rarely support it with statistical evidence. This study was one of few attempts to estimate the effects of implementing QM programmes. It fills a gap that exists in the literature on QM in the electronics and electrical industry in Malaysia.

Since the purpose of this paper is to enhance managerial understanding of quality management practices and profitability in relation to QM implementations, the main objectives of this paper are:

- (1) to empirically investigate relationships between quality management (qm) practices and profitability, and
- (2) to empirically assess whether length of QM adoption moderates the linkage between QM and profitability.

## **LITERATURE REVIEW**

Quality management (QM) is a concept based on continuous improvement in the performance of processes in an organisation and in the quality of the products and services that are the outputs of those processes. It is a team activity that demands a new culture, a new philosophy, and a new emphasis, and it calls for discipline and profound knowledge. Quality advocates had identified several critical principles for successful QM practices which among others are

top management commitment, customer focus, supplier relationship, benchmarking, quality-oriented training, employee focus, zero-defects, process improvement, and quality measurement (Saraph, Benson, & Schroeder, 1989). Top management acts as the main driver for QM implementation, creating values, goals, and systems to satisfy customer expectations and to improve an organisation's performance (Ahire, Golhar, & Waller, 1996). Top management should actively participate in quality transformation. The management has to outline the quality goals, quality policies, and quality plans so that employees are constantly reminded that the customer is the top priority (Besterfield, Bester-Michna, Besterfield, & Besterfield-Sacre, 1995). Also, it cannot be denied that customer expectations have increased and they want and demand tailored or customised services (customer focus). A customer focus keeps the business aware of the changes taking place in its environment and provides the knowledge needed to change the product. All product attributes that contribute to value which lead to customer satisfaction and affect customer purchase preferences must be addressed appropriately in a quality-oriented system. This also includes the trust and confidence in products and services that leads to customer preference and loyalty.

On the other hand, benchmarking is another process in which an organisation continuously compares and measures itself against business leaders anywhere in the world to gain information and provide a guideline for rational performance goals (Boone & Wilkins, 1995). In addition, people in the organisation should be continually trained and be given adequate training and education on prescriptions, methods, and the concept of quality, which usually includes QM principles, team skills, and problem solving (quality related training). It is often said that the most valuable resource within a company is the people that work within it (employee focus). A study carried out by Guzzo, Jette, and Katzell, (1985) showed that training has a positive impact on individual worker productivity. They added that broad-based improvements in individual productivity should result in improved organisational performance. In addition, Dahlgaard, Hartz & Edgeman (1998) suggested that employee's satisfaction, motivation, and ability to act as a constructive part in the process of continuous improvement depend very much on education and training. Finally, quality management, process improvement, and zero defects should also be emphasised.

As mentioned earlier, this paper aims at investigating relationships between QM and profitability. It is said that QM has the potential to not only increase competitiveness and organisational effectiveness, but also improve product quality and organisational performance

(Ahire *et. al.*, 1996). Many studies had investigated the notion that QM practices provide an approach to improve the economic position of organisations in manufacturing and also in service sectors. Specifically, Powell (1995) suggested that there are significant relationships between QM, competitive advantage, and business performance. In addition, several studies have succeeded in providing evidence that QM has a positive impact on financial performance and/or overall performance (Schaffer & Thompson, 1992; Opara, 1996; Cherkasky, 1992; Arawati & Za'faran, 2000). A study by Simmons and White (1999) involving 126 electronics companies concluded that ISO 9000 registered companies are more profitable than non-ISO 9000 companies. Arawati (2001) found that training and top management commitment play very important roles in QM implementations in public listed manufacturing companies. The overall results point to the significant and positive impact of QM on competitive advantage and customer satisfaction, which, in turn, significantly improves the performance of these companies. Other proponents of QM claimed that well implemented QM can offer many benefits including improved products and services, reduced costs, more satisfied customer and employees, and improved bottom line financial performance (Powell, 1995). Hence, quality has been seen as a fundamental capability for firms to develop. In addition, this study assessed whether the length of QM adoption moderates the linkage between QM and profitability. Several studies have suggested that the length of QM adoption has an important relationship with performance (Powell 1995; Samson & Terziovski, 1999; Dow, Samson, & Ford 1999; Arawati & Za'faran, 2000). Arawati and Za'faran (2000) explored the relationship between the length of QM adoption and financial performance, and suggested moderate association between them. However none has empirically and objectively investigated whether the length of QM adoption would help in enhancing performances after the quality management programme implementation in Malaysian manufacturing companies. Therefore, in addition to investigating the relationship between QM and profitability, it would be interesting to assess the moderating effect of the length of QM adoption in the linkage between quality management implementation and profitability.

## RESEARCH METHODOLOGY

The sample chosen for this study were manufacturing companies in the electronics and electrical industry in Malaysia. Sample companies were chosen from a list of electronics and electrical companies in Klang Valley, Malaysia (obtained from Federation of Malaysian

Manufacturing companies directory). Companies in Klang Valley were chosen because the majority of electronics and electrical companies were situated in Klang Valley (mostly in Kuala Lumpur and Selangor). The reasons for focusing on this sector are twofold. Firstly, the electronics and electrical industry has emerged as a leading sector in Malaysia in terms of adopting new manufacturing and quality practices, and these practices are driven primarily by competitive rather than regulatory forces. Secondly, the industry is heterogeneous in terms of sub-sectors and product/process complexity. A total of 200 manufacturing companies were chosen to be included in the study but only 110 useable responses were analysed using the SPSS package. The primary objective of the research was to measure senior quality managers' or production manager's perception of quality management practices and level of profitability in the industry. Empirical data were obtained through a survey of 110 managers, most of whom were senior managers who were responsible and capable of responding to questions on quality practices and profitability. Face-to-face interviews with quality managers or production managers were carried out for checking the information accuracy, validating the outcome of analysis, and developing an understanding of practical aspects of quality management principle adoption.

The instrument used in this study was a structured survey questionnaire. The instrument developed in this study consisted of two major parts. The first part comprised several constructs measuring QM practices, and the second part comprised performance measurements. To enable respondents to indicate their answers, a seven-point interval scale was used for the questionnaire regarding the level of QM practices in the companies. The respondents were asked to indicate the current practice of the QM practices based on the scale of 1 (very low degree of current practice) to 7 (very high degree of current practice). A total of nine constructs of QM, which have been widely referred, were extracted. Due to confidentiality matters and standardisation of measurements, the profitability measure also used a seven-point interval scale, representing a range of agreement on statement whether over the past three years the profitability was high relative to competitors after implementing QM practices. However, a ratio or exact measurement was used to measure the length of QM adoption where the respondent was asked to state exactly how many years has the QM programme been adopted.

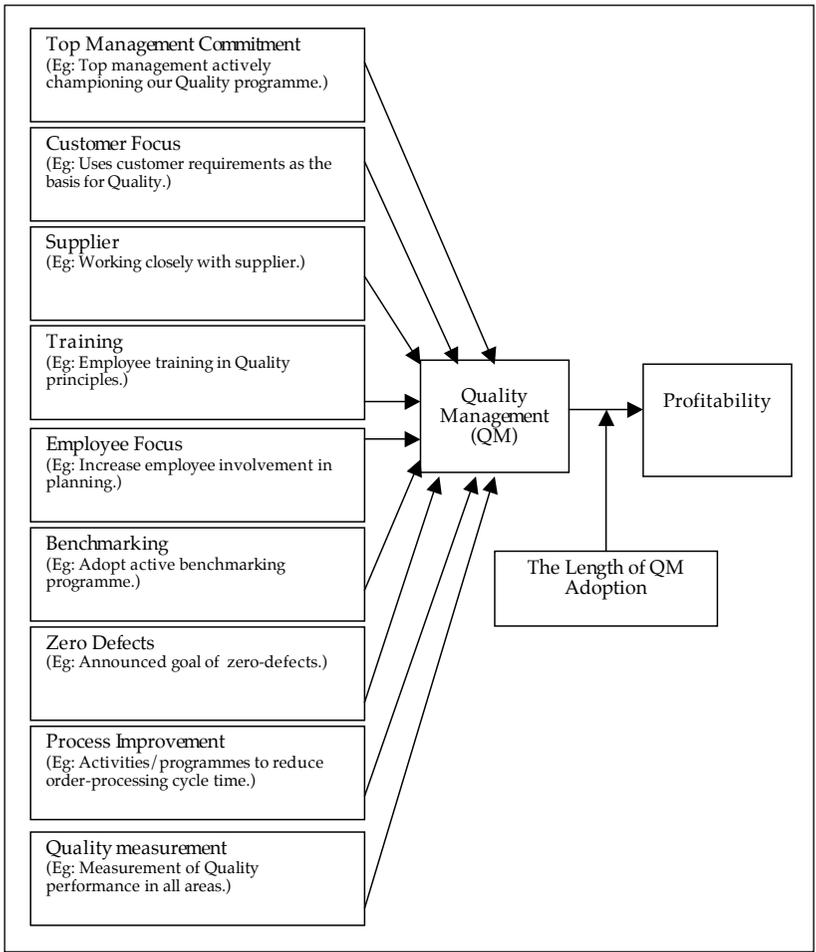
Confirmatory factor analysis and Cronbach's reliability were used to select and assess the final items that would be used for hypothesis testing. The critical variables of quality management in this study

had content validity because an extensive review of the literature was conducted in selecting the measurement items and the critical factors, and all the items and factors were evaluated and validated by professionals in quality areas. The QM variables in this study were adopted from prominent studies or sources (Powell, 1995; Saraph *et al.*, 1989; Deming, 1986; Juran, 1992; Crosby, 1979; Baldrige, 1992). From the initial data analysis, the nine constructs were subjected to validity and reliability tests before a single score can be calculated to represent each construct. Confirmatory factor analysis (CFA) or a measurement model using AMOS 4 was employed for examining construct validity of each scale by assessing how well the individual item measured the scale (Ahire *et al.*, 1996). Specifically, confirmatory factor analysis was used to detect the unidimensionality of each construct. Unidimensionality is evidence that a single trait or construct underlies a set of measures (Anderson & Gerbing, 1988). The measurement model for each construct was treated as a single factor congeneric model with error variances and estimated regression weights. The goodness of fit (GFI) indices of the nine constructs exceeded the 0.90 criterion suggested by Hair, Anderson, Tatham, & Black, 1998, hence, establishing the construct validity (see Table 1).

**Table 1:** Descriptive Statistics of Critical Variables of Quality Management Practices

Variable	Original items	Final items	Mean	Std. Dev.	Cronbach's Alpha	GFI
Management Commitment	4	4	6.021	1.191	0.877	0.971
Customer Focus	5	4	5.777	1.188	0.854	0.926
Suppliers Relationships	5	4	5.783	1.107	0.844	0.913
Training (Quality Related)	5	4	5.471	1.272	0.901	0.972
Employee Focus	8	8	4.908	1.401	0.953	0.994
Benchmarking	4	4	4.912	1.739	0.963	0.909
Zero Defects	3	3	5.279	1.688	0.849	0.924
Process Improvement	3	3	5.043	1.812	0.914	0.977
Quality Measurement	3	3	5.348	1.589	0.922	0.985

In order to obtain reliable measures, a reliability test was conducted to determine the internal consistency and stability of the measurements (Churchill, 1979). The reliability analysis was conducted by calculating the Cronbach's alpha for each construct. Items that did not significantly contribute to the reliability were eliminated for parsimony purposes. The result showed that the Cronbach's alpha measures for the nine constructs exceeded the threshold point of 0.70 suggested by Nunnally (1978). Alpha coefficients for QM scales ranged between 0.844 and 0.963 after the alpha maximisation process were carried out (Table 1). As a result, 37 items were retained for the nine constructs.



**Figure 1:** The conceptual framework on the relationship between quality management (QM) and profitability and the moderating effect of the length of QM adoption.

## **Research Hypotheses**

The main purpose of the study was to investigate the relationship between QM and profitability. On the basis of the literature, this study hypothesised directional relationships between QM and profitability. In addition, it also investigated whether the length of QM adoption moderates the linkage between QM and profitability. The relational paths among the constructs are summarised in Figure 1.

The alternative hypotheses for this study can be stated as follows:

Hypothesis 1: QM practices are positively correlated with profitability

Hypothesis 2: The length of QM Adoption moderates the linkage between QM and profitability

## **PRELIMINARY RESULTS: CORRELATIONS**

### **Correlations between Quality Management Practices and Profitability**

Table 2 exhibits Pearson's correlations between QM practices and profitability. Profitability had significant correlations with top management commitment (0.342), customer focus (0.315), supplier relations (0.319), training (0.319), employee focus (0.365), benchmarking (0.605), zero defects (0.356), process improvement (0.380) and quality measurement (0.613). These findings are consistent with several previous studies that proclaimed better organisational transformations as a result of QM initiatives (Nakajo & Kono, 1989; Snell & Dean, 1992; Ebrahimpour & Withers, 1992; Bowen & Lawler, 1992). Fundamentally, to improve profitability, an electronics or electrical company should obtain the support of top management, focus on customer needs, secure high quality supplies, train employees in quality related activities, implement benchmarking, ensure zero defects, enhance process improvement, and standardise quality measurement.

### **Determining the Relationship between Quality Management (QM) and Profitability: A Multiple Linear Regression Analysis**

In this study, a regression model was developed to represent an attempt to account for the contributions of critical determinants of QM on profitability. Several diagnostic procedures had been proposed in the literature for detecting the presence of approximate linear

relationships among the QM variables. In this study, VIF (variance inflation factor) associated with each QM variable were determined. If one or more of these variance inflation factors are large, we can conclude that nearly linear relationships exist among the QM variables. It has been suggested, as a rule of thumb, that values of VIF greater than 10.00 may be considered large enough for us to suspect serious multicollinearity (Graybill & Iyer, 1994). Since none of the QM variables exhibited values of VIF greater than 3.00 (Table 2), it was concluded that the presence of multicollinearity in this study is not severe and therefore regression analysis was conducted.

**Table 2:** Correlations between Quality Management Practices and Profitability

Quality management practices	Profitability	VIF
1 Top Management Commitment	0.342(**)	2.727
2 Customer Focus	0.315(**)	1.509
3 Supplier Relations	0.319(**)	2.407
4 Training	0.319(**)	2.578
5 Employee Focus	0.365(**)	1.999
6 Benchmarking	0.605(**)	2.170
7 Zero Defects	0.356(**)	2.085
8 Process Improvement	0.380(**)	1.642
9 Quality Measurement	0.613(**)	2.170

1. \* $P \leq 0.05$ , \*\* $P \leq 0.01$  2. All t-tests are one-tailed

### Testing the Overall Regression Model

A regression forecasting model was generated as follows:

$$Y = Y_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \dots + \beta_i X_i + e,$$

where:

$x_1, x_2, \dots, x_i$  = independent variables

$\beta_1, \beta_2, \dots, \beta_i$  = regression coefficients for the independent variables,  $x_1, x_2, \dots, x_i$

The overall significance of the multiple regression models were tested with the following hypothesis.

$$H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_i = 0$$

$H_0 =$  At least one of the regression coefficients is  $\neq 0$ .

A rejection of the null hypothesis indicated that at least one of the predictor variables is adding significant predictability for the dependent variable.

A stepwise multiple regression analysis instead of standard regression analysis was conducted to specifically identify significant regression coefficients of QM and to have a model with relatively good fit. The multiple regression result using stepwise method indicated that a strong relationship existed for the model. The model which highlighted the relationship between quality management practices and profitability has a good fit and has high values of R (0.686) and  $R^2$  (0.471) with standard error of 1.179, and a significant F-value of 31.148. The model also suggested that three quality management practices (quality measurements, benchmarking, and supplier relations) are able to explain almost 50% of the variance in the dependent variable (profitability). This value is considered quite high, given that a multitude of factors affecting profitability.

**Table 3:** Regression Models Summaries

Model	Dependent Variable	R	$R^2$	Adjusted $R^2$	Std Error (SE)	F	Sig
Regression Model	Profitability	0.686	0.471	0.456	1.179	31.148	0.000

### Significance Tests of the Individual Regression Coefficients

The significance of beta coefficients provided support for the alternate hypotheses in the regression model. The values of standardised beta coefficients of the quality management practices provided some indication as to their comparative influences of quality management practices on profitability. Individual significance tests for each regression coefficient were carried out by using a t-test (Hair *et al.*,

1998). The hypothesis for testing the regression coefficient of each independent variable took the following form:

$$H_0 : \beta_i = 0$$

$$H_a : \beta_i \neq 0$$

Testing the regression coefficients not only gives researchers some insight into the fit of the regression model, but it also helps in assessing the strength of individual predictor variables in estimating of the dependent variable (Black, 2001). The result (Table 4) indicated that regression coefficients or slopes of quality measurement (p-value = 0.000), benchmarking (p-value = 0.000) and supplier relations (p-value = 0.043), have significant impact on profitability. These findings further support the alternate hypotheses that these regression coefficients or slopes are significant and have predictive powers in estimating profitability.

**Table 4:** The Relationship between Quality Management Practices and Profitability: A Stepwise Regression Analysis

Quality Management practices	Unstandardized Coefficient		Std. Coef.	t	Sig.
	Beta	S. Error			
Constant	1.521	0.656		2.319	0.022
Quality measurement	0.527	0.117	0.440	4.504	0.000
Benchmarking	0.446	0.104	0.433	4.305	0.000
Supplier Relations	0.286	0.140	0.190	2.046	0.043

• *Dependent variable = Profitability.*

**Testing the Relationship between Quality Management and Profitability, and the Moderating Effect of the Length of QM Adoption**

Having found that there are significant relationships between QM and profitability, the question is now directed at examining whether

the length of QM adoption moderates the relationship between QM and profitability. In testing the moderating effects, the three significant QM scales were substituted by a single variable, obtained from the mean of these scores. Since all variables were continuous, the relationship between quality management and profitability, and the moderating effect of the length of QM adoption was tested using hierarchical regression analysis. In Hypothesis 2, it was hypothesised that the relationship between QM and profitability is moderated by another variable, the length of QM adoption. It was expected that the effect of QM on profitability will be enhanced with longer length of QM adoption. Baron and Kenny (1986) suggested that the statistical analysis for testing the moderation effect depends on the level of measurement of the independent variable and the moderator variable. Hierarchical regression analysis was carried out to test the moderation effect of the length of QM adoption on the relationship between QM and profitability, a method commonly used when the moderating variable is treated as a continuous variable. In this analysis, the dependent variable was regressed on the independent, moderator, and the cross products of both variables (Snell & Dean, 1992). In the first step, the independent variable was entered into the regression equation. In the second step, the particular moderator variable was entered into the equation. In the final step, the cross-product of the independent variable and the moderating variable was entered as a set. According to Snell and Dean (1992), evidence of moderation exists when the interaction terms account for significant incremental variance in independent variable, either individually, signified by the values of betas, or collectively, signified by the values of the incremental F-statistic. If the moderating variable improves the relationship between QM and profitability, then the subsequent betas, F-values, and change in  $R^2$  after the addition of the moderator into the regression equation all were expected to be significantly higher.

In this paper, hierarchical regression analyses were conducted separately to test the moderating effect of the length of QM adoption on the QM and profitability linkage. As presented in Table 5, the first regression analysis indicated that QM has a significant predictive power against profitability. The second regression analysis also signified that the length of QM adoption has significant predictive power against profitability but at a very much lesser explained variation. The third analysis indicated that the inclusion of QM and QM  $\times$  (L) provides slight change on the predictive power as indicated by R square value and change statistics, but unfortunately at a lower rate. In addition, the values of the subsequent beta of the cross product between QM and the length of adoption on profitability was not significant (p-

value = 0.633) and therefore failed to provide the statistical evidence of the existence of the moderating effect of the length of QM adoption on the QM and profitability linkage (Table 6).

**Table 5:** The Moderating Effect of the Length of QM Adoption on QM and Profitability Linkage: Hierarchical Regression Analyses

Dependent	Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Change Statistics		
					R <sup>2</sup> Change	F Change	Sig. F Change
Profitability	(Constant), QM	0.607	0.369	0.363	0.369	62.513	0.000
Profitability	(Constant), L	0.202	0.041	0.032	0.041	4.350	0.039
Profitability	(Constant), QM, QMxL	0.588	0.346	0.333	0.346	26.752	0.000

Notes: QM = Quality management practices, L = Length of QM adoption  
 QMxL = Quality management x Length of QM adoption (interaction term between QM and L)

**Table 6:** Coefficients of Regression Analysis between QM and Profitability Linkage: Hierarchical Regression Analyses

Dependent	Model	Unstd. Coefficients		Std. Coef	t	Sig
		B	Std. Error	Beta		
Profitability	(Constant)	0.538	0.589		0.914	0.363
	QM	0.830	0.105	0.607	7.907	0.000
Profitability	(Constant)	4.648	0.308		15.107	0.000
	L	0.061	0.029	0.202	2.086	0.039
Profitability	(Constant)	.803	0.641		1.252	0.213
	QM	0.775	0.130	0.563	5.964	0.000
	QMxL	0.002	0.004	0.045	0.479	0.633

The findings suggested that within the main effects model, QM practices have a statistical positive effect on profitability. Profitability was higher for those companies with high implementation of QM practices ( $H_1$ ). In addition, we can also suggest that the length of QM adoption has significant effect on profitability but at a relatively lesser rate. However, the result of the moderating effect of the length of QM adoption did not fully satisfy all the statistical requirements to support the hypothesis ( $H_2$ ). An interaction or moderation effect exists only if the interaction term gives a significant contribution over and above the main effects (Cohen & Cohen, 1986). As displayed in Table 5, the addition of the interaction term does not exhibit an explanatory contribution over and above that of the main effects. Explained variance decreased by 0.023 or 7% to 0.346 from 0.369. This result failed to support the proposition that moderation effect of the length of QM adoption exists between the QM and profitability linkage. In addition, the subsequent beta of the cross product between QM and the length of QM adoption on profitability (Table 6) did not have a significant t-value (p-value = 0.633). The moderating effect of the length of QM adoption on the link between QM and profitability was not statistically proven and therefore Hypothesis 2 was not supported.

**Table 7:** Partial Correlations between the Length of QM Adoption and QM Practices

Partial Correlations between the length of QM Adoption and the four QM practices	Correlations (p-value)	Controlling for
Quality measurement (Qmeasure)	0.327 (0.000)	Benchmarking & Supplier Relations
Benchmarking (Bench)	-0.093 (0.175)	Quality measurement & Supplier Relations
Supplier Relations (SuppRel)	-0.036 (0.358)	Quality measurement & Benchmarking

To further investigate this issue, the author conducted a more stringent test using partial correlation to check the link between the length of QM adoption and each of the three QM practices controlling for the other two practices. Among the three elements of QM practices, only quality measurement was significantly correlated with the length of QM Adoption. The other two practices (benchmarking and supplier

relations) although not significant, showed a negative direction of correlation. The results of partial correlation indicated that the length of QM adoption does not have significant effect on the *people* aspects of QM (for example, supplier relations). However, the result of partial correlation reinforced that the length of QM adoption has a significant and positive effect on the *mechanistic* elements of QM (for example, quality measurement). Therefore, the findings can only suggest that the longer the length of QM adoption, the better the quality control and measurement of the electronic and electrical companies. However, the findings did not give enough evidence to support the proposition that the length of QM adoption mediates the link between QM and profitability.

## CONCLUSION AND IMPLICATIONS

Many manufacturing companies are embracing quality management to have a company-wide drive toward excellence in all aspects of the products and services that are important to the customer. The dramatic changes of recent decades in Malaysian business scenario arising in part from international competition, increasing oil and raw material prices, as well as rapid changes in technology have exerted pressure on electronics and electrical companies as well as other manufacturing companies to adopt quality management practices. QM provides a vision that focuses everyone in an organisation on quality improvement. The pursuit of quality improvement is not only requested by the market but also driven by the need to survive. Manufacturers must make quality products better, faster, and cheaper than those of their competitors. Adoption of effective quality management strategies would be one of the most crucial factors for success in the electronics and electrical industry. This paper has attempted to investigate the impact of quality management practices on profitability in the Malaysian electronics and electrical industry. On the whole, we can suggest that quality management has positive and significant impact on profitability. The findings lead to several main conclusions and evidences suggested as follows:

- (1) Quality measurements, benchmarking, and supplier relations have significant association with profitability.
- (2) The study failed to provide the statistical evidence of the existence of the moderating effect of the length of QM adoption on the QM and profitability linkage.
- (3) The length of QM adoption has a significant and positive effect on the mechanistic elements of QM.

Therefore, to ensure effective QM practices, a manufacturing company in Malaysia needs joint effort and collaboration from everyone in the organisation. In this study, it was found that manufacturing companies in Malaysia can benefit from QM practices. Emphasis should be given to critical factors such as quality measurements, benchmarking, and supplier relations. The implementation of QM requires total management commitment to ensure workers indulge in quality work culture and responsible for the quality of their work (Goodstadt & Marti, 1990). The company's mission, vision, and values need to be deployed in such a way that all employees understand what the company is trying to achieve and their roles in achieving it. Employees who believe they are important will be motivated to ensure that their efforts are consistent with the organisational goals. Setting a goal of zero defects, and continuing to renew one's commitment to moving ever closer toward that goal, will lead to improvements that continue to approach absolute perfection over time (Richman & Zachary, 1993). Simultaneously, process improvement requires everyone in an organisation to work toward doing things right the first time, every time. This requires process ownership, process documentation, defined customer and supplier requirements, indicators and measurement criteria, an improvement methodology, and the necessary statistical methods (Anonymous, 1995). Lastly, quality measurement is a goal-orientation with constant performance measurement, often with the use of statistical analysis. The analysis process ensures that all deviations are appropriately considered, measured, and responded to consistently (Shores, 1992).

The study found that quality management practice is positively related to profitability. However, the moderating effect of the length of QM adoption on the link between QM and profitability appears more complex than stated. Even though the length of QM adoption has a slight predictive power against profitability, however it fails as a moderating variable between QM and profitability. A further investigation on this issue using partial correlation revealed that the length of QM adoption only has significant correlations with the *hard* aspects or *mechanistic* elements of QM practices and not on the *soft* aspects or *people* elements of QM practices. The *soft* aspects of QM are related to human factors and the *hard* aspects of QM are concerned with tools, techniques, or system (Powell, 1995; Samson & Terziovski, 1999; Dow *et al.*, 1999). This finding may imply that human aspects are more difficult to change through the length of QM adoption because they involve more complex matters such as culture and ways of life. Even though organisational performance can come

from human aspects, not many companies perform well on these dimensions (Pfeffer & Veiga, 1999; Prajogo & Brown, 2004).

Even though this study failed to provide the statistical evidence of the existence of the moderating effect of the length of QM adoption on the QM and profitability linkage, it revealed human aspects that are beyond the elements of process, tools, and system. One thing that can be suggested from this result is that new adopters of QM can also gain from QM practices because the study suggested that the length of QM adoption is not a significant requirement for the enhancement of bottom-line performances. In addition, new adopters of QM practices can stand to benefit from the results of this work which would provide them with ideas of what quality practice is all about and benefits that may be realised from its implementation. Nonetheless, both new and old adopters can benefit from the strategy of strengthening the process and tools of QM implementation. Probably due to cultural matter, people are more difficult to change in accordance to new QM programme and implementations in comparison to mechanistic process and procedures, but management may reduce the impact of resistance regarding quality ideas by sending employees to quality related training or quality problem solving training. Employees may be more willing to accept new ideas if they understand the objectives and goals of those ideas. Employee involvement is another important quality aspect that can contribute positively toward the success of the QM implementation, provided it is well nurtured and not left unattended. Employee involvement groups have been found to significantly impact employee commitment to quality (Ahire *et al.*, 1996) because employees are the key to consistent quality. Therefore, it is crucial that an organisation has a people-oriented philosophy in order to instil the sense of responsibility toward producing quality products. If it is well nurtured, employee involvement can promote greater participation from employees in the decision-making process and elevate the sense of responsibility, accountability, and ownership on a shared and willing basis. In the long run, the organisation will eventually benefit because employees are the people who are directly involved in the overall process of the organisation. Given the chance, employees can give great contribution toward the success of the organisation. In contrast, poorly managed people convey their disdain for quality and service when they work. Therefore, it is important to pay special attention to employee recruitment, selection, and socialisation, and to reinforce the socialisation and quality process with continuous training and education. Effective communication throughout the department, between departments, and throughout the organisation is required to reinforce the deep commitment of

management and creates an awareness and understanding of the role of quality programme. All company activities as a whole have the potential impact that may improve product quality; therefore teamwork is vital. Quality improvement requires close cooperation between managers and employees and among departments (Shetty, 1987). Future research can investigate further on the human aspect of the quality management in manufacturing companies and other types of companies. However, the findings of this study permits managers to obtain a better understanding of quality management practices and identify those areas of quality management where improvements should be made to enhance profitability.

This paper will be of particular interest to practising managers as it suggests what factors should be emphasised to stimulate the adoption of quality management concepts in the Malaysian electronics and electrical industry. With many organisations in Malaysia embracing the QM ideology, there is a need to assess whether QM does indeed provide a unique approach to improving performance or is it just an organisational performance improvement activity. Many practitioners, especially in Malaysia, are still awaiting a clearer concept and more realistic framework to guide them in the QM implementation. This study also identifies QM practices that may be of interest, in seeking to improve profitability. Even though this study failed to suggest the significant moderation effect of length of adoption, the message is clear, and suggests two things. Firstly, we can say that quality measurement, supplier relations, and benchmarking have strong contributions toward QM implementations. Secondly, there is significant impact of QM on profitability of the Malaysian electronics and electrical industry.

The conclusion emerging from this study is that QM will ultimately result in positive gains. The results validated some of the key linkages and supported beliefs and evidence by researchers of the relationships between QM and profitability. QM is explained most often in terms of eliminating defects, but defects are just one form of waste. By using QM techniques such as process control, Pareto Charts, and fish-bone diagrams, a company can locate waste, identify its cause, and eliminate it. QM can lead to decreased waste, and rework, and ultimately to a variety of related improvements. In addition, it aims at improving processes, eliminating mistakes, and satisfying customers (customer focus). However, continuous improvement in quality must be matched by sales. Continuous improvement for total customer satisfaction should be an integral part of the way a manufacturing company conducts its business.

Customer requirements are constantly changing, and electronics and electrical industry faces tighter markets, varying demands, changing technologies, and increased competition. It is very important that a company determines what the customers want and need because they determine the sales and ultimately profitability. Success depends on customer needs driving every business decision (Blanchard, 1994). In addition, involving employees, empowering them, and bringing them into the decision-making process provide the opportunity for continuous process improvement. The untapped ideas, innovations, and creative thoughts of employees can make the difference between success and failure (Besterfield *et al.*, 1995). However to enhance their knowledge and skill requires training. Finally, another approach to quality improvement is to engage in benchmarking. This involves studying and attempting to emulate, the strategies and practices of organisations already known to generate world-class products and services (Weiers, 2005).

It is also important to note that this study attempted to enrich the literature and make a contribution in quality-related studies. In addition, its purpose has been to make explicit what other researchers have perhaps known implicitly. The empirical results supported long-standing beliefs and anecdotal evidence by researchers about the relationships between QM and profitability, and lend credibility to causal hypotheses that improving quality in processes and practices leads to improvements in external performance results. By strengthening QM practices, improved performance will likely to occur. This result provides evidence that improving internal quality practices will positively impact the most important external performance measures.

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