

Examining The Association Between Benchmarking In TQM And Performance: An Empirical Research For Change

Arawati Agus*, Za'faran Hassan** and Mohd Shukri Hajinoor***

This paper presents the findings from an empirical study examining the relationship between benchmarking, product quality performance and business performance in Malaysian electronics and electrical industry. It is said that benchmarking has the potential to not only enhance production efficiency and effectiveness but also improves bottom-line results. Few have attempted to investigate the relationship between benchmarking and performance and the link of benchmarking to performance in the electronics and electrical industry in Malaysia has not been fully addressed in empirical studies. Thus this paper investigates the impact of benchmarking on performance in the Malaysian electronics and electrical industry using correlation, Friedman's rank test and structural equation modeling. The result of the study reveals that benchmarking in particular appears to be of primary importance and exhibit significant impact on product quality performance and business performance. Findings of the study provide a striking demonstration of the importance of implementing effective benchmarking for Malaysian electronics and electrical industry in enhancing its performance.

Field of Research: Total Quality Management

1.0 Introduction

In today's highly competitive, rapidly changing global economy organizations have been forced to consider, and in many cases adopt or implement, a wide variety of innovative management program and techniques. One such program that has been used extensively is a holistic management philosophy known as Total Quality Management (TQM). A manufacturing company achieves world-class status when it has successfully developed operational capabilities (through Total Quality Management) to support the

* Arawati Agus, Graduate School of Business, Universiti Kebangsaan Malaysia, 43600, Bangi, Selangor Malaysia, email: araa@ukm.my

** Za'faran Hassan, Faculty of Business Management, Universiti Teknologi MARA, 40450, Shah Alam, Selangor, Malaysia, email: zafaran@salam.uitm.edu.my

*** Mohd Shukri Hajinoor: Faculty of Economics & Business, Universiti Kebangsaan Malaysia, 43600, Bangi, Selangor Malaysia, email: shukri@ukm.my

entire company in gaining a sustained overall quality over its competitors. However, Total Quality Management (TQM) would only be successfully implemented in an organization if management are committed and supported a life-long process of improving continuously in comparison with competitors by constantly benchmarking against the best in the industry.

This paper explores the role of benchmarking in association with product quality performance and business performance in the Malaysian electronics and electrical industry. Since the link of benchmarking to performance in the electronics and electrical industry in Malaysia has not been fully addressed in empirical studies, the result of the study would fill a gap that exists in the literature on TQM regarding the importance of benchmarking in Malaysia. The main objectives of this paper are:

- (1) To empirically determine whether benchmarking in TQM has significant association or impact on product quality performance.
- (2) To empirically discover whether benchmarking in TQM has significant association or impact on business performance.
- (3) To empirically assess the importance of each benchmarking practices.

2.0 Literature Review

Total Quality Management (TQM) is a concept based on continuous improvement in the performance of processes in an organization and in the quality of the products and services that are the outputs of those processes. It is said that TQM has the potential to not only increase competitiveness and organizational effectiveness but also improve product quality and organizational performance (Ahire, 1996). Powell (1995) suggests that there are significant relationships between TQM, competitive advantage and business performance. In addition, several studies have succeeded in providing evidence that TQM has a positive impact on financial performance and/or overall performance (Schaffer and Thompson, 1992; Opara, 1996; Cherkasky, 1992; Arawati Agus & Za'faran Hassan, 2000). Well implemented TQM can offer many benefits including improved products and services, reduced costs, more satisfied customer and employees, and improved bottom line financial performance (Powell, 1995). Quality advocates have identified several critical principles for successful TQM practices which among others are: benchmarking, customer focus, supplier relationship, benchmarking, quality-oriented training, employee focus, zero-defects, process improvement and quality measurement (Saraph et al, 1989).

TQM is fast becoming a condition for survival in business and will impact economic development of organizations dramatically by forcing increasing levels of sophistication and increased performance (Spiker 1991; Canada 1993). According to Murray (1997), benchmarking is a process used by companies to target key areas for improvement within their operations so they can increase their productivity, competitiveness, and quality. It involves comparing their financial and operating performances against a competitor's performance or comparing the performance of various internal departments against each other. Since quality results have to be measured against a target,

benchmarking is very important for companies to gauge their performances to stay competitive. Firms must therefore engage in efforts to increase the understanding of its competitors thoroughly (Mabert, 1992). By comparing themselves with the best-performing competitors in every aspect of business endeavor, companies thus develop both high-quality targets and various possible sources of information concerning how to perform each aspect better (Richman & Zachary 1993).

According to Zairi (1998:35), benchmarking is used in the following ways:

- As an enabler for achieving and maintaining high levels of competitiveness.
- As a measurement of business performance against the best of the best through a continuous effort of constantly reviewing processes, practices and methods.
- As a process which can be characterized by a standard and variables (expectations, performance and measurements).
- As a continuous process of measuring our products, services and business practices against the toughest competitors and those companies recognized as industry leaders (Xerox definition).
- To emulate the best by continuously implementing change and measuring performance.

Companies can also increase their knowledge by conducting primary marketing research with customers, suppliers, and dealers (Kotler, 1994). The organisation must establish benchmarks for use in the determination and subsequent assessment of their efforts (Tillery & Rutledge 1991). As a result, productivity, performance, and effectiveness can be enhanced.

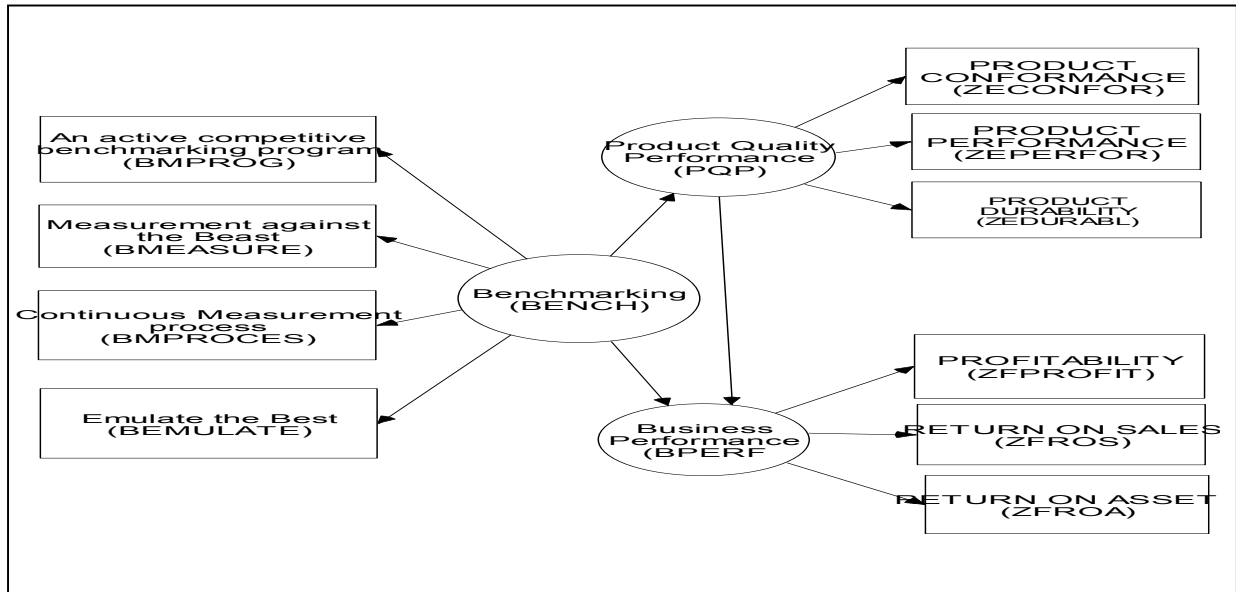
3.0 Theoretical and Conceptual Framework

This paper explores the relationship among benchmarking in TQM, product quality performance and business performance within the context of the Malaysian electronics and electrical industry. The proposed conceptual model, as depicted in Figure 1, is based on three main constructs—(i) benchmarking in TQM (BENCH); (ii) product quality performance (PQP); and (iii) business performance (BPERF). Essentially, benchmarking in TQM represents a manager's assessment of the overall level of benchmarking in quality initiatives. In addition to improving levels of internal performance, TQM has also been shown to provide benefits in terms of external performance such as market share and profitability (Shetty, 1987).

The conceptual model proposed here utilized benchmarking dimensions derived from studies and documented references (Zairi, 1998; Murray, 1997; Mabert, 1992; Richman & Zachary, 1993). Four dimensions of benchmarking in TQM identified from several sources (Zairi, 1998; Murray, 1997; Mabert, 1992; Richman & Zachary, 1993) were considered to relate to distinctive features of benchmarking in TQM and are therefore incorporated in the present conceptual model (Figure 1). These benchmarking dimensions include: 'Active benchmarking program' - (BMPROG), 'Measurement against the best' - (BMEASURE), 'Continuous Measurement process' - (BMPROCES) and 'Emulate the best' - (BEMULATE). Meanwhile, product quality performance is based on

three pertinent dimensions namely product conformance (ZECONFOR), product performance (ZEPERFOR) and product durability (ZEDURABL) (Kotler 1994). Lastly business performance in this study is derived from three important business performance variables comprise of profitability (ZFPROFIT), return on sale (ZFROS) and return on assets (ZFROA).

Figure 1. The conceptual model linking Benchmarking, Product quality performance and Business Performance



4.0 Hypotheses

A structural model is used in this study to analyze the structural effect of benchmarking in TQM on performance results and the following hypotheses are put forward:

- H_1 : Benchmarking in TQM has a positive structural effect on product quality performance.
- H_2 : Benchmarking in TQM has a positive structural effect on business performance.
- H_3 : Product quality performance has a positive structural effect on business performance.

In investigating the structural effect of benchmarking in TQM on overall results such as product quality performance and business performance, it is also pertinent to determine the structural loadings of each benchmarking determinant. Therefore, this study also attempts to test the following hypotheses:

- H_{1A} : 'Active benchmarking program' has a positive structural loading on benchmarking in TQM.

H_{1B} : 'Measurement against the best' has positive structural loading on benchmarking in TQM.

H_{1C} : 'Continuous measurement process' has a positive structural loading on benchmarking in TQM.

H_{1D} : 'Emulate the best' has a positive structural loading on benchmarking in TQM.

More importantly, this study aims to test the overall model fit based on the main null hypothesis:

H_0 : The overall hypothesized model has a good fit.

For structural modeling, accepting this main hypothesis indicates that the model presented adequately reproduce the observed covariance matrix (Bollen, 1989; Joreskog, 1989; Mueller, 1996) and suggest that the data fit the proposed model.

5.0 Research Methodology

The units of analysis chosen for this study were Malaysian manufacturing companies in the electronics and electrical industry. Sample companies were selected from Federation of Malaysian Manufacturers directory, as the sampling frame. The reasons for focusing on the electronics and electrical sector are twofold. First, 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. Second, the industry is heterogeneous in terms of sub-sectors and product/process complexity. Empirical data were obtained through survey of one hundred and twenty managers as the respondents, most of whom were senior managers who were responsible and capable of responding to questions on total quality management including benchmarking, product quality performance and business performance. Face to face interviews were carried out for checking the information accuracy, validating the outcome of analysis and developing an understanding of practical aspects of benchmarking adoption.

This paper is part of a larger research on TQM and its impact on performances in Malaysian electronics and electrical companies and is conducted from early 2006 until end of year 2007. The instrument utilized was a structured survey questionnaire, consisting of two major parts. The first part comprises several constructs measuring TQM practices including benchmarking, and the second part comprises performance measurement. The respondents were asked to indicate the current practice of the TQM practices including benchmarking based on the scale of 1 (very low degree of current practice) to 7 (very high degree of current practice). In order to capture the multi-dimensional nature of performance measures, this study divided the performances into two types: 1) Product quality performance and 2) Business performance. Due to confidentiality matters and standardization of measurements, the operational and business performance measures also used a seven-point interval scale, representing a

range of agreement on statement whether over the past three years a particular performance is high relative to competitors after implementing benchmarking practices.

Table 1- Descriptive Statistics of Critical Variables.

Benchmarking:	Mean	Std. Dev.	Exploratory Factor Analysis – EFA(Varimax Rotation)		
			Factor Loadings1 (Lean)	Factor Loadings2 (PQP)	Factor Loadings3 (BP)
Active benchmarking program	4.8150	1.58812	.841	.205	.254
Measurement against the best	5.0550	1.55924	.909	.198	.201
Continuous measurement process	5.1050	1.56784	.906	.140	.235
Emulate the best	5.1167	1.57674	.897	.213	.237
<u>Product Quality Performance:</u>					
Product Conformance	5.8592	1.07699	.250	.899	.274
Product Performance	6.0092	.98476	.177	.913	.247
Product Durability	5.9758	1.00561	.192	.899	.238
<u>Business Performance:</u>					
Profitability (PROFIT)	5.0525	1.43386	.285	.257	.887
Return on Sales (ROS)	4.8892	1.48425	.242	.249	.896
Return on Assets (ROA)	4.9458	1.43356	.293	.309	.868

Exploratory factor analysis, confirmatory factor analysis and Cronbach's reliability analysis were used to select and assess the final items that would be used for hypothesis testing. The critical variables of benchmarking in this study had content validity because an extensive review of the literature was conducted in selecting the measurement items. The benchmarking determinants in this study were adopted from prominent studies or sources (Zairi, 1998; Murray, 1997; Mabert, 1992; Richman & Zachary, 1993). The four determinants of benchmarking were subjected to validity and reliability tests. Exploratory factor analysis was conducted to investigate whether the constructs as described in the literature fits the factors derived from the factor analysis. Factor analysis indicates that the KMO (Kaiser-Meyer-Olkin) measure is 0.887 with significant chi-square value (Barlett's Test of Sphericity). The KMO value in this analysis surpasses the threshold value of 0.50 as recommended by Hair et. al (1998). All variables or determinants exhibit high factor loadings and fall into the designated factors. This result provides evidence to support the theoretical conceptualization of each construct. Confirmatory factor analysis (CFA) or a measurement model using AMOS 5 was employed for examining construct validity of each scale by assessing how well the individual item measured the scale (Ahire et al., 1996). The goodness of fit indices (GFI) and comparative fit index (CFI) of the exogenous determinants exceeded the 0.90 criterion suggested by Hair et al. (1998), hence, establishing the construct validity (see Table 2). The reliability analysis shows that the Cronbach's alpha measures for the main constructs exceeds the threshold point of 0.70 suggested by Nunnally (1978). Alpha coefficients for benchmarking scales and performance scales ranged between 0.954 and 0.962 after the alpha maximization processes were carried out (Table 2).

Table 2- Factor Analysis and Reliability Test

CONSTRUCT	Exploratory Factor Analysis –EFA (Varimax Rotation)			Confirmatory Factor Analysis - CFA		Reliability Test
	Eigen value	% of Variance Explained	Cummulative Variance Explained	GFI	CFI	Cronbach's Alpha
Benchmarking	3.515	35.147	35.147	0.902	0.905	0.954
Product Quality Performance	2.817	28.174	63.321	0.984	0.995	0.957
Business Performance	2.752	27.520	90.841	0.998	0.999	0.962

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization (KMO= 0.887)

6.0 Preliminary Results

(a) Correlations between benchmarking in TQM, product quality performance and business performance

As a preliminary analysis, Table 3 exhibits correlation among the benchmarking practices as well as the multicollinearity statistics. The result indicates that the benchmarking practices have significant correlations with one another. In addition, it suggests that those practices complement each other and need to be implemented in a holistic manner. The collinearity test did not indicate any multicollinearity problem.

Table 4 and Table 5 exhibit Pearson's correlations between benchmarking in TQM and product quality performance as well as business performance. Specifically, product conformance, product performance and product quality performance have significant correlations with all the four benchmarking determinants. On the other hand, business performance measures such as profitability, return on sales and market share have significant correlations with 'Emulate the best' and 'Active benchmarking program'. These findings are consistent with several previous studies that proclaimed better organizational transformations as a result of benchmarking initiatives (Zairi, 1998; Murray, 1997; Mabert, 1992; Richman & Zachary, 1993).

Table 3. Pearson's correlation among benchmarking practices

Benchmarking Variables		1	2	3	4	Collinearity Statistics	
						Tolerance	VIF
1	Active benchmarking program	1				.296	3.382
2	Measurement against the best	.822(**)	1			.173	5.786
3	Continuous measurement process	.778(**)	.864(**)	1		.173	5.774
4	Emulate the best	.797(**)	.874(**)	.891(**)	1	.158	6.348
1. *P<0.05, **P<0.01 2. All t-tests are two-tailed							

Table 4. Pearson correlation between benchmarking in TQM and product quality performance

Benchmarking		Product Conformance	Product Performance	Product Durability
1	Active benchmarking program	.452(**)	.416(**)	.393(**)
2	Measurement against the best	.465(**)	.390(**)	.396(**)
3	Continuous Measurement process	.415(**)	.337(**)	.375(**)
4	Emulate the best	.485(**)	.409(**)	.417(**)

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

Table 5- Pearson correlation between benchmarking in TQM and business performance

Benchmarking		Profitability	Return on Sales	Return on asset
1	Active benchmarking program	.510(**)	.488(**)	.524(**)
2	Measurement against the best	.486(**)	.458(**)	.501(**)
3	Continuous Measurement process	.509(**)	.459(**)	.513(**)
4	Emulate the best	.522(**)	.479(**)	.539(**)

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

(b) Cluster Analysis and Friedman's Test

This study also tries to highlight which of benchmarking determinants are more prioritized by successful companies. Since product quality performance and business performance are very importance bottom-line outcomes, the classifications are based on average product quality performance and business performance clustering. Two cluster analyses were carried out to further explore the segmentation of manufacturing companies in this study. Table 6 and Table 7 highlight the cluster analysis result. The first cluster analysis categorized companies into one of two groups: (1)“Excellent” product quality producers and (2)“Average” product quality producers. Since business performance is also a very important bottom-line outcome, the second classification is thus based on average business performance clustering. This second cluster analysis categorized manufacturing companies into two groups: (1)“High” business performance achievers and (2)“Average” business performance achievers. It can

be inferred that the higher level of benchmarking is linked to “Excellent” product quality producers and “High” business performance achievers”.

Table 6. Rankings of benchmarking determinants based on product quality performance clustering using Friedman’s rank test

Benchmarking	High product quality producers (n=81, chi-square = 9.105, significant=0.028, overall cluster's mean = 5.492)				Low product quality producers (n=39, chi-square = 8.429, significant=0.038, overall cluster's mean = 3.991)			
	Friedman's Test	Rank	Mean	Std Dev	Friedman's Test	Rank	Mean	Std Dev
Active benchmarking program	2.27	4	5.2926	1.42388	2.17	4	3.7171	1.28921
Measurement against the best	2.52	3	5.5321	1.37766	2.54	3	3.9857	1.32735
Continuous measurement process	2.57	2	5.5358	1.45862	2.74	1	4.1771	1.31375
Emulate the best	2.64	1	5.6062	1.29435	2.55	2	4.0829	1.60193

Table. 7 Rankings of benchmarking determinants based on business performance clustering using Friedman’s rank test

Benchmarking	High business performance companies (n=82, chi-square = 11.267, significant=0.010, overall cluster's mean = 5.510)				Low business performance companies (n=38, chi-square = 6.896, significant=0.075, overall cluster's mean = 3.971)			
	Friedman's Test	Rank	Mean	Std Dev	Friedman's Test	Rank	Mean	Std Dev
Active benchmarking program	2.23	4	5.2768	1.42874	2.24	4	3.8184	1.46635
Measurement against the best	2.51	3	5.5232	1.33456	2.58	2	4.0447	1.54477
Continuous measurement process	2.60	2	5.6037	1.33956	2.70	1	4.0289	1.49574
Emulate the best	2.66	1	5.6378	1.25291	2.49	3	3.9921	1.63052

7.0 The Result Of The Structural Equation Modeling

The relationship between benchmarking, product quality performance and business performance is depicted in the structural equation modeling (SEM). The findings of SEM model indicate a Chi-square value of 26.056 with 32 degrees of freedom and p-value of 0.761 (Figure 2). This result supports the null hypothesis that the SEM model has a good fit (H_0). The p-value is considerably substantial (p-value > 0.05), in supporting the main null hypothesis that the overall model fits the data. In addition, other statistical

structural indices such as Bentler comparative fit index CFI (0.999), Normed fit index NFI (0.982) and Goodness of fit index GFI (0.957) further suggest that the model has a satisfactory fit (Table 8). Since the probability value and structural modeling indices are well above the recommended level, the model is considered to be a reasonable representation of the data (Hair et al., 1998). The direct structural effect of benchmarking on product quality performance (0.487), the direct structural effect of benchmarking on business performance (0.369) and the indirect effect of benchmarking on business performance through product quality performance (0.419) are considered high given the complex causal linkages, suggesting the importance of benchmarking practices especially ‘Emulate the best’, ‘Measurement against the best’, ‘Active benchmarking program’ and ‘Continuous Measurement process’ in improving operational and ultimately business performance in the Malaysian the electronic and electrical industry. Therefore, we have enough evidence to accept the proposition that benchmarking in TQM has positive and significant structural effect on product quality performance (H_1). In addition, benchmarking has significant direct effect on business performance (H_2) and finally product quality performance has significant direct effect on business performance (H_3). The SEM result also suggests that benchmarking in TQM has positive effects on product quality performance and ultimately improve business performance.

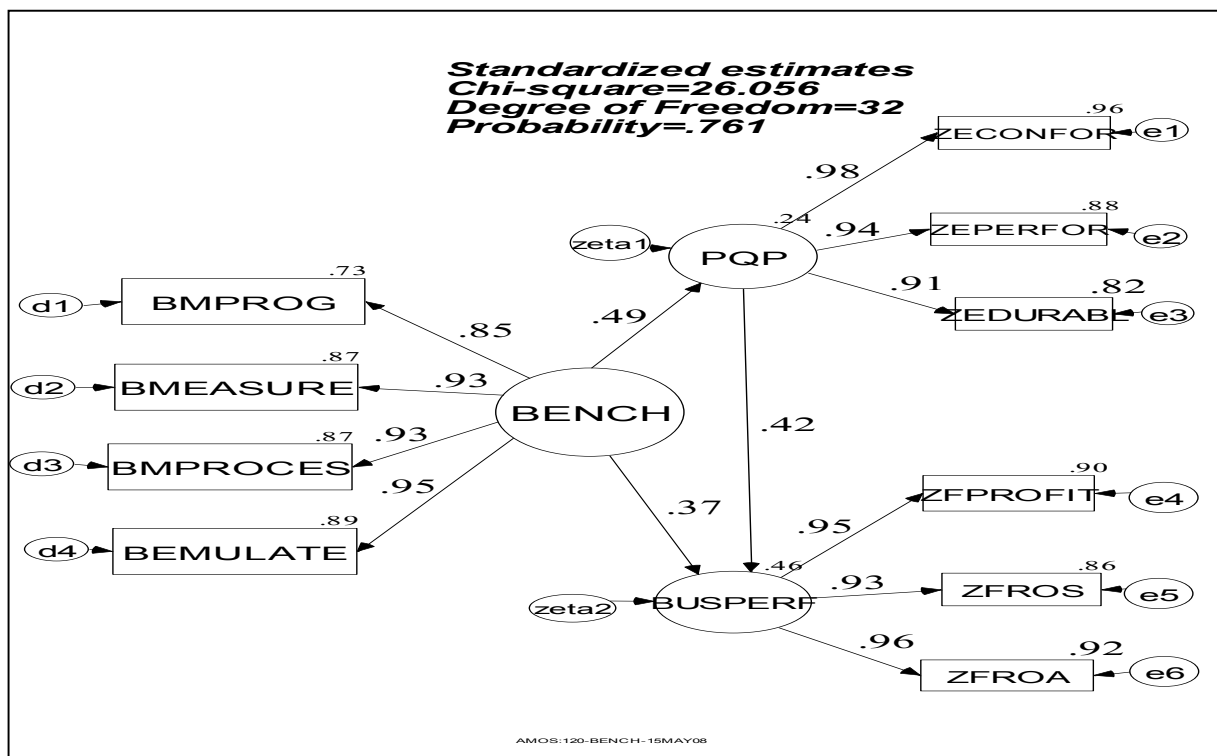


Figure 2: The structural model showing the structural linkage between benchmarking, product quality performance and business performance.

Table 8. Measurement results of SEM model

Statistics	Model Values	Recommended * values for good fit
Chi square	26.056	-
Probability Level	0.761	≥ 0.05
Degree of Freedom	32	-
χ^2 /df	0.8142	≤ 3.00
Bollen (1989) Incremental Fit Index (IFI)	0.999	≥ 0.90
Tucker & Lewis (1973) TLI	0.999	≥ 0.90
Bentler (1988) comparative fit model (CFI)	0.999	≥ 0.90
Normed fit index (NFI)	0.982	≥ 0.90
Goodness of fit index (GFI)	0.957	≥ 0.90

*Chau (1997)

Table 9. Measurement results of the SEM model

(i)Constructs and indicators	Std. Loadings	Std. errors	Critical Ratio	Probability (significant)
a. BENCHMARKING IN TQM (BENCH)				
Active benchmarking program	0.855	0.064	14.636	0.000
Measurement against the best	0.931	0.049	19.932	0.000
Continuous measurement process	0.931	0.049	18.884	0.000
Emulate the best	0.946	0.052	19.932	0.000
b. Product Quality Performance (PQP)				
Product Conformance	0.978	0.050	23.058	0.000
Product Performance	0.935	0.038	23.058	0.000
Product Durability	0.905	0.056	17.710	0.000
c. Business Performance (BPERF)				
Profitability (PROFIT)	0.950	0.049	20.080	0.000
Return on Sales (ROS)	0.926	0.050	20.082	0.000
Return on Assets (ROA)	0.961	0.043	23.317	0.000
(ii) Exogenous/endogenous Path				
a. BENCH → PQP [H_1 is supported]	0.487	0.055	5.615	0.000
C. BENCH → BPERF [H_2 is supported]	0.369	0.079	4.381	0.000
b. PQP → BPERF [H_3 is supported]	0.419	0.124	4.984	0.000

Looking at the loadings of the benchmarking determinants (Table 9) on the main construct, we can see that 'Emulate the best' (structural loading = 0.946, std. error = 0.052 and critical ratio = 19.932) has the highest contribution towards benchmarking in TQM and it is followed by 'Measurement against the best' (loading = 0.931, std. error = 0.049 and probability value = 0.000), 'Continuous Measurement process' (structural loading = 0.931, std. error = 0.053 and critical ratio = 18.884), and 'Active benchmarking program' (structural loading = 0.855, std. error = 0.064 and critical ratio = 14.636). All of these indicators have significant probability values (critical values ≥ 2.00), giving statistical evidence that their contributions towards benchmarking main construct are significant and positive. Therefore in the long run, benchmarking in TQM may ultimately enhance business performance of the electronics and electrical firms in Malaysia. The

examination of residuals also reveals that variances among variables of the construct are perfectly explained by the respective constructs.

9.0 Conclusion And Implications

Benchmarking in TQM provides a vision that focuses everyone in an organization on quality and performance improvement. This paper tries to investigate the structural relationship between benchmarking in TQM, product quality performance and business performance in the Malaysian electronics and electrical industry. It is important to note that by using SEM, the author is focused on examining the strength of the relationships between benchmarking, product quality performance and business performance as a whole, and not on the individual effect of the five benchmarking practices (similar to beta in the regression analysis). The results of the study assist in understandings on how benchmarking in TQM may influence product quality performance and business performance. This study leads to several main conclusions:

- (1) Benchmarking determinants namely 'Emulate the best', 'Measurement against the best', 'Active benchmarking program' and 'Continuous Measurement process' have **positive** and **direct** effects on product quality performance.
- (2) Benchmarking in TQM has **positive** and **direct** effects on business performance through product quality performance.
- (3) Product quality performance (especially product conformance, product performance and product durability) has **positive** and **direct** effects on business performance (namely profitability, return on sales and return on assets).
- (4) The Malaysian Benchmarking Index (MBI = 67.30) for the electronic and electrical industry is considered average indicating moderate benchmarking involvement in TQM initiatives.

The conclusion emerging from this study is that benchmarking in TQM will ultimately results in positive gains. The results validate some of the key linkages and support beliefs and evidence by other researchers of the relationships between benchmarking in TQM and performance. It is also important to note that this study attempts to enrich the literature review and make a contribution in benchmarking and quality-related studies. In addition, its purpose has been to make explicit what other researchers have perhaps known implicitly but without solid measurements. The empirical results support long-standing beliefs and anecdotal evidence by researchers about the relationships between the exogenous (benchmarking in TQM) and endogenous results (performances), and lend credibility to causal hypotheses that improving internal process leads to improvements in external performance results. This study to some extent helps in resolving controversy about the magnitude and measurements of performance gains from benchmarking in TQM. By strengthening benchmarking in TQM, improved performance will likely to occur.

The paper will be of particular interest to practicing production managers or top level managers as it suggests the importance benchmarking in the Malaysian electronics and electrical industry. Results indicate that electronics and electrical companies should

emphasize greater attention to the degree of benchmarking in TQM programs in enhancing bottom-line performance.

10. Reference

- Ahire, S.L., Golhar, D. Y. & Waller, M. A. 1996. "Development and validation of TQM implementation constructs", *Decision Sciences.*, 27(1), pg 23-55.
- Anonymous. 1995, ISO and Total Quality, *International Journal of Health Care Quality Assurance*, 8(4), 34-35.
- Arawati Agus & Za'faran Hassan. 2000. "Exploring the relationship between the length of TQM adoption and financial performance: An empirical study in Malaysia", *International Journal of Management*, September, 17(3), 323-333.
- Arawati Agus. 2001. "A linear structural modelling of total quality management practices in manufacturing companies in Malaysia", *Total Quality Management*, 12(5), 561-573.
- Bollen, Kenneth A. 1989. *Structural equations with latent variables*. John Wiley and Sons, New York:
- Boone, E. Louis & Wilkins, Dianne. 1995. "The Role of benchmarking in total quality management". *International Journal of Management*. March, 12(1), 123-131.
- Canada, P. 1993."TQM benchmarking for economic development programs: Good is not Good, Where Better is Expected", *Economic Development Review*. 11(3): 34-38.
- Chau, P.Y.K., 1997 "Reexamining a Model for Evaluating Information Center Success Using a Structural Equation Modeling Approach", *Decision Sciences*, Vol. 28, No. 2: 309-334,.
- Cherkasky M., Stanley. 1992. "Total quality for a sustainable competitive advantage", *Quality*, 4-7.
- Cronbach, L.J. 1951. "Coefficient alpha and the internal structure of tests",. *Psychometrika*. 16, 297-334.
- Drew, S.A.W. 1997, "From knowledge to action: the impact of benchmarking on organizational performance", *Long Range Planning*, Vol. 30 No.3, pp.427-41.
- Elmuti, D., Kathawala, Y. 1997, "An overview of benchmarking process: a tool for continuous improvement and competitive advantage", *Benchmarking for Quality Management & Technology*, Vol. 4 No.4, pp.229-43.
- Fornell C., Johnson M. D., Anderson, E. W., Cha J. & Bryant, B. E. 1996. "The American Customer Satisfaction Index: Nature, Purpose and findings", *Journal of Marketing*. Vol. 60 (October 1996), 7-18.
- Hair, J.F., Anderson, R.E., Tatham, R.L. & Black, W.C. 1998. *Multivariate data analysis*. Prentice-Hall, Englewood Cliffs, NJ
- Hesham A.E. 2008. "Understanding benchmarking in Egyptian organizations: an empirical analysis", *Benchmarking: An International Journal* 15 (6): 742-764.
- Jarrar, F.Y., Zairi, M. 2001, "Future trends in benchmarking for competitive advantage: a global survey", *Total Quality Management*, Vol. 12 No.7-8, pp.906-12.
- Joreskog, K. & Sorbom D. 1989. *LISREL 7: A guide to the Program and Applications*. 2nd ed. Statistical Package for the Social Sciences, Chicago:
- Kotler, P. & Armstrong, G. 1994, *Principles of marketing*. Prentice-Hall, New Jersey

- Kumar, S., Chandra, C. 2001, "Enhancing the effectiveness of benchmarking in manufacturing organizations", *Industrial Management and Data Systems*, Vol. 101 No.2, pp.80-9.
- Mabert, Vincent A. 1992. "Operations in the American economy: Liability or asset". *Business Horizons*. July-August. **35**(4): 3-5.
- Malcom Baldrige 1992. *National quality award application guidelines*. Gaithersburg, USA: National Institute of Standards and Technology.
- Mueller, Ralph O. 1996. *Basic principles structural equation modeling: An introduction to LISREL and EQS*. Springer, New York:
- Murray, Mary Ann. 1997. "Can benchmarking give you a competitive edge?" *Management Accounting*. **79**(2): 46-50.
- Nunnally, J. 1978. *Psychometric Theory*. Mc Graw Hill Book Co., New York
- Opara, Emmanuel Uzoma. 1996. "The Empirical Test of Total Quality Management: An Application of TQM at Chevron and Its Impact on Productivity", *Quality Management Journal*. October 1996, 4(1), 10-11.
- Powell, Thomas C. 1995. Total Quality Management As competitive advantage: A Review and Empirical Study, *Strategic Management Journal*, 16, 15-37.
- Prajogo, D. I. & Brown, Alan 2004. "The Relationship Between TQM practices and quality performance and the role of formal TQM programs: An Australian empirical study", *Quality Management Journal*, Vol. 11(4), 31-41.
- Richman, E. & Zachary, W. 1993. "Quality and reliability management: review and update", *Quality Management*, July/August.
- Samson, D. & Terziovski. 1999. "The relationship between total quality management practices and operational performance", *Journal of Operations Management*. Vol.17(4), pg 393-409.
- Saraph, Jayant V., Benson, George P., & Schroeder, Roger G. 1989. "An instrument for measuring the critical factors of quality management", *Decision Sciences*. Fall. 20, 810-829.
- Schaffer, R H & Thompson H. 1992. "Successful change programs begin with results" *Harvard Business Review*. September/October, 80-89.
- Shetty, Y.K. 1987. "Product quality and competitive strategy." *Business Horizon*. May/June: 46-52.
- Spiker, B. K. 1991. "Total quality management: The mind-set for competitiveness in the 1990s". *Manufacturing Systems*. September: 40-45.
- Tillery, K.R. & Rutledge, A.L. 1991. "Quality-strategy and quality-management connections", *International Journal of Quality & Reliability Management (IJQ)*. 8(1): 71-77.
- Voss, C.A., Blackmon, K. 1997, "Benchmarking and operational performance: some empirical results", *Benchmarking for Quality Management & Technology*, Vol. 4 No.4, pp.273-85.
- Weiss, Carol H. 1998. *Evaluation: Methods for Studying Programs and Policies*. 2nd ed. Upper Saddle River, N.J.: Prentice-Hall.
- Wong, W.P., Wong, K.Y 2008. "A review on benchmarking of supply chain performance measures", *Benchmarking: An International Journal* 15 (1): 25-51.
- Zairi, Mohamed. 1998. *Benchmarking for best practice: Continuous learning through sustainable innovation*. Butterworth-Heinemann, Oxford: