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Can Benchmarking Through TQM Implementation Improve Performance? : Some Empirical Evidence

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It is said that benchmarking has the potential to not only enhance production efficiency and effectiveness,, but also improve bottom-line results. Benchmarking is the global search for industry's best practices for improving an organization's products and processes. The growing use of this process within TQM programs has highlighted the need for capturing and analyzing benchmarking data. This paper investigates the impact of benchmarking on performance in the Malaysian electronics and electrical industry using correlation analysis, Friedman's rank test and structural equation modeling. The findings indicate that benchmarking has positive and direct impact on product quality performance. Its impact on business performance, although positive, is rather indirect. Structural loadings in the Structural Equation Model indicate that 'emulating the best' is the most important benchmarking determinant while product conformance and return on assets are also vital. Findings of the study provide a striking demonstration of the importance of implementing effective benchmarking in enhancing performance.

Field of Research: Total Quality Management, Benchmarking

1. 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). 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. Benchmarking in essence is a crucial component of the TQM process by which a company evaluates and compares its strategies, products, and processes with that of the strongest competitors or the best. within and/or outside the industry. The purpose is to learn how they achieve excellence,

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and then setting out to match and even surpass them. Benchmarking is a systematic and continuous measurement process; a process of continuously measuring and comparing an organization's business processes against business process leaders anywhere in the world to gain information which will help the organization take action to improve its performance (Watson, 1993, p. 3). Spendolini (1992) argues that the initiation in 1988 of the Baldrige Award has also positively influenced the proliferation of benchmarking in the U.S. According to Czuchry et al. (1995) the Baldrige Award's influence is two-fold: first, companies that receive the award are required to share information regarding quality and business process improvements with other organizations, thus creating a readily available source of benchmarking data; second, the award criteria require that organizations implement and maintain trend data and conduct competitive comparisons. Today, benchmarking has become a management buzzword. As this management tool continues to evolve, innovative adaptations and extensions of the original intent, scope, and methodology continue to appear in the literature. Therefore, organizations utilizing the differing facets of benchmarking stand to gain both operationally and strategically, which has positive implications for customer service and satisfaction (Yasin, 2002).

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 has not been fully addressed in the industry that has been so important to the export-oriented Malaysian economy (according to the Ninth Malaysia Plan 2006-2010, electronics and electrical products constitute 65.8% of manufactured goods exports), the result of this study will fill the gap existing in the TQM literature on 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. Literature Review

Total Quality Management (TQM)

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, 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).

The bulk of the total quality management literature is based on personal experiences and anecdotal evidence (Black & Porter, 1996; Rao *et al*., 1999). The lack of empirical research can be attributed to the fact that the existing theoretical base of TQM to support research on total quality is not sufficient. The growing interest in quality has reached, due to globalization, several developing countries (Ali, 1997). It is appropriate, therefore, for studies in TQM implementation to be conducted for the benefit of the managers in these developing countries, where the need is confounded by a dire lack of total quality management information (Thiagarajan *et al*., 2001; Ali, 1997). Generally, there seems to be acknowledged limitations of the findings of some of the earlier studies in their applicability across national boundaries (Dawson, 1994; Rao *et al*., 1999). Therefore, the findings of such systematic studies will generate a new way of thinking concerning contexts. This research addresses a major gap in the literature by empirically investigating benchmarking in TQM implementation in a developing country, namely, Malaysia.

Benchmarking

Effective quality management requires judicious use of benchmarking. Since quality results have to be measured against a target, benchmarking is crucial for companies to gauge their performance in order to stay competitive. Benchmarking has been viewed as an important management tool of TQM (Kumar and Chandra, 2001; Fong, Cheng and Ho, 1998; Kouzmin, Loffler, Klages, and Korac-Kakabadse, 1999). 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. 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). Benchmarking can and should be utilized as an essential element of a comprehensive TQM strategy.

Zairi and Leonard (1996) postulate that organizations implementing benchmarking tend to achieve various tangible and intangible benefits. Zairi (1998) notes that through effective implementation of benchmarking, companies gain significant improvements in customer satisfaction, reduced overheads and improved communication while establishing the importance of the internal customer. Benchmarking goes beyond just competitively analyzing the competition; it focuses on analyzing organizational processes and methods to assess how competitors achieved their positions (Mathaisel et al., 2004). At the same time, companies can learn about their competitors' strengths and weaknesses through secondary data and personnel experience. Zairi (2003) highlighted that the benefit of benchmarking can be categorized into operational, financial and strategic benefits. Benchmarking is an essential cornerstone for companies to remain at the forefront of excellence in a level playing field market (Wong and Wong, 2008). The results of benchmarking clearly show that it translates into higher profitability (Zairi and Youssef, 1995; 1996). Voss and Blackmon (1997) have noted that benchmarking is also associated with better financial results, operational performance, and business performance. It also leads to "strategic thinking and action" (Drew, 1997). 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.

Even though the benefit derived from benchmarking might be different for each company, however the common benefits centers towards "improvement" and "value creation" (Wong and Wong, 2008). Effective implementation of benchmarking practices can lead to financial gains and these financial gains are always in the areas of cost saving, investment avoidance and revenue generation" (Hesham, 2008). Furthermore, Heaphy and Gruska (1995) suggest the potential benefits of benchmarking include increased customer satisfaction through maximum value products and services and benchmarking can assist the change efforts by securing acceptance and compliance to new goals and strategies. Kumar and Chandra (2001), Voss, Ahlstrom and Blackmon (1996, 1997) and Voss and Blackmon (1994) suggest further that the benefits identified from benchmarking are better understanding of strengths and weaknesses of processes, improved suppliers management, improved cycle time and enhanced learning of other organizations work practices. Sweeney (1994) stressed that companies tend to increase productivity and achieve organizational performance through the effective implementation of benchmarking. Camp (1989) and Mittelstaedt (1992) find that effective benchmarking lead to defining customer requirements, establishing effective goals and objectives, develop true measure of productivity, and become more competitive. Jarrar and Zairi (2001) examine the benefits gained from the implementation of benchmarking in organizations in the U.K. They find that the most important benefits are process improvement, setting internal standards and quality improvement. Hesham (2008) noted that benchmarking helps organizations to sustain superior performance. According to Booth (1995) and Fong et al. (1998), this would involve change and improvement in products, services and processes.

The benchmarking process, according to Murray (1997), usually consists of 4 steps: (i) analyzing the company's practices, procedures, and performances, (ii) selecting benchmarks, (iii) collecting data on the benchmarks' practices, and (iv) analyzing data. Also, internal benchmarking is compared with external benchmarking. The types of benchmarking, according to Camp (1995), are based on who counterparts are. They are as follows:

- *Internal benchmarking*: A comparison among similar operations within one's own organization. Internal benchmarking establishes operating standards within organizations (Spendolini, 1992). It is aimed at identifying the best internal procedures and used as a baseline for external benchmarking.
- *Competitive benchmarking*: A comparison with the best of the direct. It follows internal benchmarking since internal information must be gathered and analyzed before they can be compared to externally (Fink, 1988; Yasin and Zimmerer, 1995; Camp, 1989). The process involves comparing companies in the same markets that have competing products, services, or work processes.
- *Functional benchmarking*: A comparison of methods with that of companies with similar processes in the same function outside one's industry.
- *Generic benchmarking*: A comparison of work processes with that of others who have innovative, exemplar work processes. It can be used across dissimilar organizations. It is thought to be extremely effective but difficult to implement. It requires a broad conceptualization of the entire process and careful understanding of the procedures (Elmuti and Kathawala, 1997).

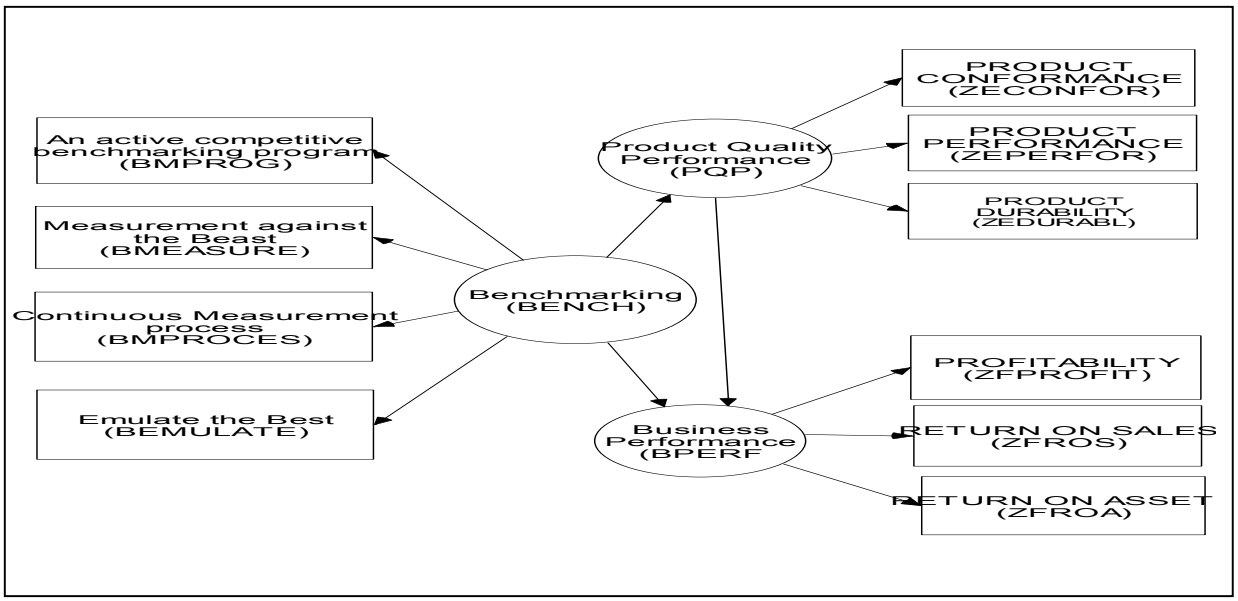
3. Theoretical and Conceptual framework

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. 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. Methodology and Research Design

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
Product Quality Performance:					
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
Business Performance:					
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) Extraction Method: Principal Component Analysis. Kaiser Normalization (KMO= 0.887)			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. Findings and Discussions

(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)"Low" product quality producers. Since business performance is also a very important bottom-line outcome, the second classification is thus based on business performance clustering. This second cluster analysis categorized manufacturing companies into two groups: (1)"High" business performance achievers and (2)"Low" 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

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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	2.51	3	5.52	1.3345	2.58	2	4.044	1.54477

against the best			32	6			7	
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

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.

Table 8. Measurement results of SEM model

Statistics	Model Values	Recommended * values for good fit (*Chau (1997)
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)

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

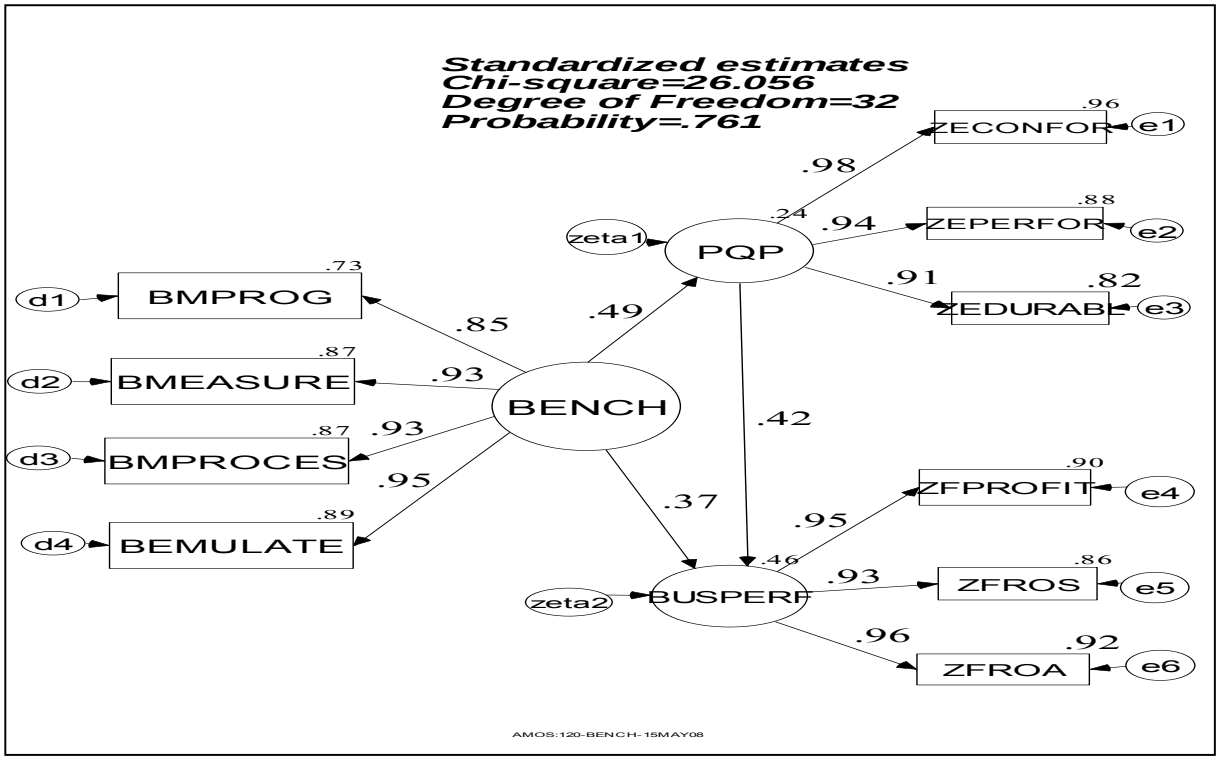

Table 9. Measurement results of the SEM model

(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.

The Malaysian Benchmarking Index (MBI) for the Electronics and Electrical Industry

This paper also seeks to calculate what we term the Malaysian Benchmarking Index (MBI) in the context of product quality performance and business performance for the Malaysian electronics and electrical industry. The index is calculated by utilizing unstandardized weights from structural equation modeling output. The purpose is to determine the level or extent of benchmarking in the electronics and electrical industry in Malaysia. The calculation follows that of Fornell et al. (1996). This paper proposes the following formula:

$$MBI = \frac{\sum_{i=1}^{4} w_i \bar{x}_j - \sum_{i=1}^{4} w_i}{6 \sum_{i=1}^{4} w_i} X\ 100$$

where,
MBI = Malaysian Benchmarking Index
w_i's = the unstandardized weights
x_j = the measurements variables

The result: MBI = 67.30

A score of 67.30 on the MBI can be considered moderate. It is instructive that more should be done by the electronics and electrical companies in Malaysia to institute and implement within their organizations effective benchmarking programs in order to improve product quality performance and business performance.

8. Summary and Conclusion

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, this study 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 understanding 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.

From the main findings above, we can say that while we find benchmarking has positive and direct impact on Product Quality Performance (PQP), its impact on Business

Performance (BPERF), although positive, is rather indirect through PQP. Looking at the structural loadings in the SEM we find 'emulate the best' (BEMULATE) as the most important benchmarking determinant whereas product conformance (ZECONFOR) and return on assets (ZFROA) are most vital variables for PQP and BPERF, respectively. This study demonstrates evidence of the widespread use of benchmarking amongst firms in the Malaysian electronics and electrical industry. The high uptake of benchmarking is probably due, in part, to the turbulent nature of the industry itself. This places significant economic pressures on managers, who have frequently turned to benchmarking as a means of improving the performance of their organizations. Whilst not all the experiences were equally successful, the tendency was for them to be considered as beneficial. Although benchmarking is widely used in Malaysian electronics and electrical industry, the nature of these activities is variable in terms of how and what information is collected and the use(s) made of it.

Research Limitations

The research limitations identified in this study, imply that there are several opportunities for additional research in the field of benchmarking and TQM which would assist practitioners in knowing what strategies to invest in. Additional research in benchmarking and TQM is warranted for several reasons. First, while this study indicated relationships between variables, it did not establish causality. As a next step in benchmarking and TQM research, a path model is intuitively appealing because the behavioral and attitudinal phenomenon measured and tested in this study are complex and may interact in less straightforward ways than described in TQM doctrine itself. Further empirical examination of alternative relationships among benchmarking and TQM elements will advance the strength and understanding of TQM precepts. Second, the findings may be contingent upon the context and environment in which benchmarking is implemented, and, therefore, may not be generalize to environments significantly different from those in the study units. Finally, the findings of the study are based on perceptions rather than direct measurement or observation of events.

Future Research Direction

The ideas presented in this paper have a number of implications for research. First, by using this study's findings as an interpretive lens, it offers researchers a new perspective on TQM as a dynamic endeavor. This study has shown several examples that can clarify fuzzy areas in the TQM literature with the potential to generate new understanding for TQM scholars. Although this paper represents only an initial step, it can provide a spring board for other researchers. We encourage them to use this lens to elucidate other issues and problem areas within TQM beyond those addressed here. Examples may include understanding the role that TQM practices have on firm performance, or considering the role of top managers' perceptions on the knotty issue of TQM implementation. In addition, scholars may find as a fruitful avenue for future research, the exploration of TQM through a comprehensive, theoretical integration. The

findings of this study offers greater structure and precision than exists in the extant strategy and organization literature, and may provide useful guidance to organizational scholars wishing to employ this perspective whether their interests lie in the area of TQM or otherwise.

Practical Implications

Our findings also have a number of implications for practicing managers. The paper will be of particular interest to practicing production managers or top level managers as it suggests the importance of 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. Managers would be well advised to follow the teachings of TQM, but they must exercise caution before blindly following other TQM prescriptions. Contrary to some TQM proponents, monetary incentives that reward individual performance should play an essential role in fostering entrepreneurial behavior leading to increased emphasis on benchmarking. And while a fact and science-based approach has benefits, a single-minded focus on such an approach may cause managers to miss unobservable and unmeasurable factors critical to business success. Finally, managers must be careful not to overlook the long-term implications inherent in many benchmarking activities.

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