

A survey of TQM practices in the Malaysian electrical and electronic industry

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ABSTRACT *Total quality management (TQM) is one of the key approaches towards realizing the goal of meeting customer satisfaction. Besides efforts for quality improvement by large companies, many small and medium-sized enterprises (SMEs) have also pursued their quality improvement effort, but mostly through the ISO 9000 certification route. Few of these SMEs have actually implemented a total approach using the TQM philosophy. This paper relates to a survey conducted to investigate the level of practice on TQM elements and to find the most critical factors perceived by the SMEs. A questionnaire was sent to 248 companies in the electrical and electronics sector in Malaysia, which resulted in a response rate of 24.2%. Attempts at finding significant differences between small and large companies' quality practices were made and revealed that there was a significant difference between the TQM practices of large and small companies. Management leadership, continuous improvement system and education and training proved to be rated among top priorities for successful implementation by large companies, compared with SMEs. However, supplier quality management was found to be the least implemented criteria by both large and small companies. This indicates that a much greater emphasis must be given on supplier management in future quality improvement programmes. The study has highlighted the importance of TQM adoption in SMEs to meet future challenges in realizing the vision, of world-class organizations. Engineering innovation must not be limited to 'hard technology' alone but should incorporate advanced manufacturing management techniques to sustain the improvement efforts and in meeting the long-term needs of the nation. Further studies can be made focusing on other types of industry in Malaysia, such as automotive, metal-based, and food processing, etc, to allow for a more comprehensive TQM framework to be built upon to meet the needs of SMEs in their drive towards a total quality organization.*

Introduction

Quality management has been recognized and as an important area by organizations, as shown by the diverse publications found in the literature. Quality holds the key to competitiveness in today's global market, regardless of the size of the company. Total quality management (TQM) programmes and practices are primarily embraced in large multinational organizations. Little has been written on how TQM has been applied in Malaysian small and medium sized enterprises (SMEs). Only a small number of Malaysian SMEs have reached a stage of development where they are able to apply quality management (QM) effectively (Idris *et al.*,

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1996). A better understanding is therefore required to investigate the current status of TQM implementation. The current work has focused on the electrical and electronics sector and attempts to gauge how far this sector has moved towards implementing TQM. It is significant in attempting to discover the primary needs of local SMEs trying to adopt a quality philosophy in their business. With a better understanding of the process, it can be the basis for the development of an appropriate TQM framework for future practical implementation by the SMEs.

Following a brief literature review, this paper has a description of the methodology employed in the study and this is followed by the results from the survey. A general description of the survey respondents is presented, followed by the level of practices in the companies. Having analysed the first section of the questionnaire, the results of two tests of significance are described. Some of the factors found lacking in practice are highlighted, and the SMEs' perceptions to successful TQM implementation are identified. The paper concludes with a summary highlighting the important findings from this study and future research directions.

Literature review

Total quality management is an established field of study where academics, consultants, engineers and quality practitioners have contributed their ideas towards its advancement. Numerous definitions with regards to TQM have been given by this group of people (Besterfield, 1995). TQM has been defined as both a philosophy and a set of guiding principles that represents the foundation of a continuously improving organization. It integrates fundamental management techniques, existing improvement efforts and technical tools in a disciplined approach. Berry (1991) defined the TQM process as a total corporate focus on meeting and exceeding customer's expectations and significantly reducing costs resulting from poor quality by adopting a new management system and corporate culture. In short, emphasis must be given towards achieving excellence in organizations. However, there is no standard method as to how TQM should be implemented in a company. As Kanji (1996) pointed out, the way of life of an organization committed to customer satisfaction through continuous improvement varies from organization to organization and from one country to another, but has certain principles that can be implemented to secure market share, increase profits and reduce costs.

The TQM philosophy provides the overall concept that fosters continuous improvement in an organization. Continuous improvements can be achieved through internal and external quality improvements (Dahlgaard *et al.*, 1998). TQM calls for a cultural transformation that requires employee involvement at all levels and a spirit of teamwork among customers, suppliers, employees and managers. Employee involvement, participation and empowerment form the cornerstones of TQM (Saylor, 1992). In general, TQM can be classified based on these six areas:

- management leadership and commitment
- continuous improvement
- total customer satisfaction
- employee involvement
- training and education
- reward and recognition

Some principles and practices of TQM may differ among firms and industries, but there is unanimous agreement as to the importance of leadership by top management when implementing TQM. This requires management actively to participate in quality transforma-

tion. Management has to outline the quality goals, quality policies and quality plans so that employees are constantly reminded that the customer, not the product, is the top priority (Besterfield, 1995). A continuous improvement system gears the organization towards attainment of the vision (Richardson, 1997). The improvement system must not only be applied continuously, but consistently, throughout the organization. This requires a disciplined continuous improvement system based on trust, with everyone in the organization striving to improve the system (Crosby, 1979). Increasingly, manufacturing and service organizations are using customer satisfaction as the measure of quality. This fact is reflected in the Malcolm Baldrige National Quality Award, wherein customer satisfaction accounts for 300 out of the total 1000 points.

An organization must give its customers a quality product or service that meets their needs, at reasonable price, with on-time delivery and outstanding service. Listening to the 'customers' and responding quickly to their changing needs, expectations and perceptions is one of the basic TQM approaches. By keeping close to their customers, companies can establish customer needs, gather information on customer trends and benchmark them with their competitors. This can be a winning strategy towards winning new customers and retaining customer loyalty.

Total customer satisfaction also means having an unwavering focus on the internal customers. Before external customers can be satisfied, obstacles faced by internal customers have to be eliminated. This is because employees are the asset and form an important part of the firm's processes. It is crucial that good working conditions created for employees to produce and deliver quality outputs and that they are provided with the proper training, tools, information and empowerment required for quality excellence. Only then can the entire workforce truly be utilized through active involvement from committed and satisfied employees. Deming's 14 points for management are worth remembering. The basis of his philosophy is contained in the following principles: (1) institute training on the job; (2) breakdown barriers between departments to build teamwork; (3) drive out fear in the workplace; (4) eliminate quotas on the shop floor; (5) create conditions that allow employees to have pride in their workmanship; and (6) institute a programme of education and self-improvement (Saunders, 1995).

In the past, the focus on achieving such improvements was frequently based on a 'system' approach—techniques and methods of quality control. Such a focus may overlook the fact that operating a system depends very much on people, and no system will function effectively with disinterested or poorly trained employees. There must be full coordination between the designed management system and employees.

Employee involvement is a process for empowering members of an organization to make decisions and to solve problems appropriate to their levels in the organization (Richardson, 1997). This can be achieved by making the employee part of the organization, which is essential to the success of the organization. Employees who believe they are important will be motivated to ensure that their efforts are consistent to the organizational goals.

Training and education provide the necessary skills and knowledge— the ability to make it happen (Saylor, 1992). It is an investment that must be made. According to Dahlgaard *et al.* (1998), Japan, Estonia and India are reported to allocate between 65 and 80 hours per year in training and education activities for every employee. They believe that worker's satisfaction, motivation and ability to act as a constructive part in the process of continuous improvement depend very much on education and training.

In the TQM environment, everyone is required to gain additional capabilities to improve the process. Hence, a comprehensive training programme is necessary and must be institutionalized within the entire organization. Training in TQM philosophy, guiding prin-

principles and tools and techniques is never ending. Personal and team interaction skills must be continually refined. This training should be given, only as it is needed, to the people who will use it immediately. It should start with specific training for management. Once management has the skills to lead the TQM process, the rest of the organization should be trained to ensure a systematic, integrated, consistent organization-wide effort (Richardson, 1997).

Specific job skills training must be provided and constantly updated to reflect the improved processes. All too often management exhorts employees to do things right the first time, to be actively involved in improvement teams, and to participate in the never-ending search for excellence. Yet, at the same time, management fails to provide the necessary training, knowledge, quality tools, and empowerment for effective self-management. Hence, all training should be geared to specific, clearly defined objectives, must be performed as close as possible to the time it is required and is reinforced to ensure the desired results.

Rewards are generally considered to be something given for quality work, such as money or other tangible things of financial value. Recognition is an act of acknowledgement that is directed at an individual's self-esteem and social needs (Richardson, 1997). Most quality gurus, including Crosby and Juran, have indicated that reward and recognition be instituted to support TQM. They feel that recognition, praise, coaching and a show of concern are all vital forms of reward that must not be omitted. Rewards and recognition should be given according to the different situations encountered and should probably be ranked—the higher the achievement, the higher the reward. This can be in the form of a bonus, salary increase, promotion, theatre tickets, or perhaps simply a pat on the back (Besterfield, 1995).

In a TQM environment, there must be a change in the usual recognition system. One must give recognition for efforts, not just for goal attainment. This recognition of effort provides a powerful incentive for everyone to become involved in quality improvement. It helps illustrate the commitment from management. It is also essential that employee involvement be used in planning and executing any recognition or reward system. Programmes that are developed with employee involvement will most likely succeed.

Most of the quality gurus believe that management and the system, rather than the workers, are the cause of a lack in quality. These and others have synthesized each other's ideas, and have developed two general views covering: (1) those who focus on technical processes and tools and (2) those who focus on management dimensions (Ross, 1994). Tang & Bauer (1995) proposed two fundamental quality approaches that companies should practice. They are:

- (1) conformance to specifications and standards (systems approach), and
- (2) theories and practices of quality experts (humanistic approach).

The first approach covers all business methods, practices, and procedures that should conform to a specific set of documented standards or specifications. These quality practices are governed by audits, inspections, and tests to ensure conformance. The focus is on products and services, and are typically internal, with little extension to suppliers. Quality in this context is applied to physical things—parts, equipment and so on. Military specification, American National Standards Institute (ANSI), and ISO 9000 (International Organization for Standardization) Standards are typical examples of this approach.

The second approach more broadly addresses the company and organizational aspects of quality implementation. This approach complements standards and specifications with the additional focus on the role of management, planning, people contributions, customer focus, teamwork and business process. The elements tend to be less physical and more of the 'soft' technologies, such as building and maintaining relationships and understanding the nature

and flow of work. This approach is also 'less' audit and inspection oriented and more prevention based.

Lau & Idris (2000) investigated the critical soft factors needed to ensure the success of TQM implementation in Malaysia. They found that the major influences that bring changes in TQM tangible effect (growth, profitability, quality, market competitiveness) came from the soft elements, such as culture and trust (12.5%) and teamwork (11.25%).

Consequently, the philosophy and key elements form the reference points for most discussions on TQM today. However, when one talks about quality today, ISO 9000 will always be part of the conversation. It is a set of standards established for the management of quality assurance. Unlike product standards, these standards are for a quality management system. Each country, which has adopted the standard, has its own set of standards technically equivalent to the ISO series.

For instance, in Malaysia, SIRIM (Standards and Industrial Research Institute Malaysia) is responsible for providing certification for both the management systems and products for Malaysian industries. It also aims to improve the quality of Malaysian industrial products, thereby contributing to the industrial development and export promotion by upgrading the capabilities of testing and inspection. Even though the ISO 9000 family of quality standards was introduced in Malaysia in 1987, the involvement of Malaysian industries is still low, compared with more developed countries such as the United Kingdom, France and Germany (Idris *et al.*, 1996).

Methodology

The objective of this study was to investigate the level of implementation of TQM in Malaysian electrical and electronics SMEs. To that end, a survey instrument from Yusof (2000) was developed and modified. A total of eight constructs were proposed, which were felt to be important for TQM implementation. For scoring purposes, a five-point Likert scale was employed with a score of 1 relating to 'strongly disagree' and 5 meaning 'strongly agree'. In addition, a zero was included in the scale as an option to indicate 'no opinion' or 'not applicable'.

Having validated the questionnaire through expert validation and pilot testing, a sample of 248 electrical and electronics companies were randomly selected from the Directory of the Federation of Malaysian Manufacturers (FMM) and the directory of the Malaysian Small and Medium Industry Development Corporation (SMIDEC) 2000. The full survey, through the mailed questionnaire, was carried out within two months. Although the response rate was initially not encouraging, various techniques were used to improve the response rate including providing a stamped self-addressed envelope, and personalization (a hand-written note) on the covering letter in the follow-up stage. As a result, the final response rate was 24.2%, which the authors felt to be reasonable for this kind of study. The responses were analysed using the SPSS Version 10 statistical package.

Survey results

General profiles of respondent

The first aspect analysed was the general profile of the respondents. The breakdown of the respondents based on the size of the companies is shown in Table 1. A large proportion (37.3%) of the respondents were medium-sized industries employing between 50 to 250 employees. 32.2% of the organization were large industries having more than 200 employees,

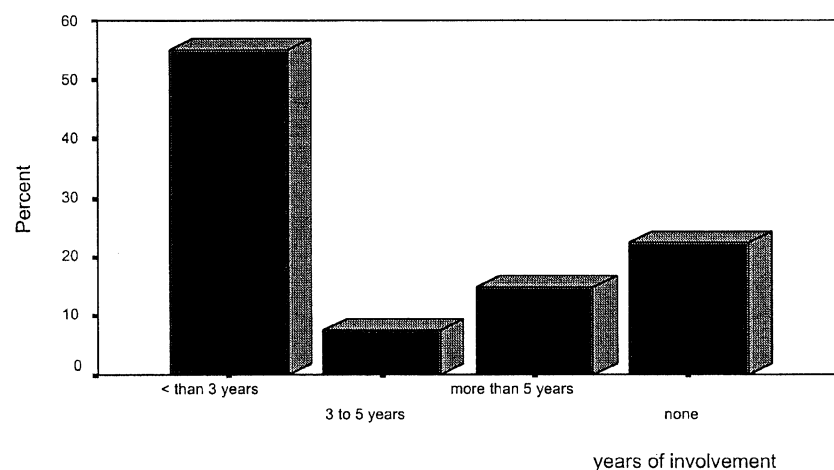
Table 1. Breakdown of the respondents regarding to their size of industry

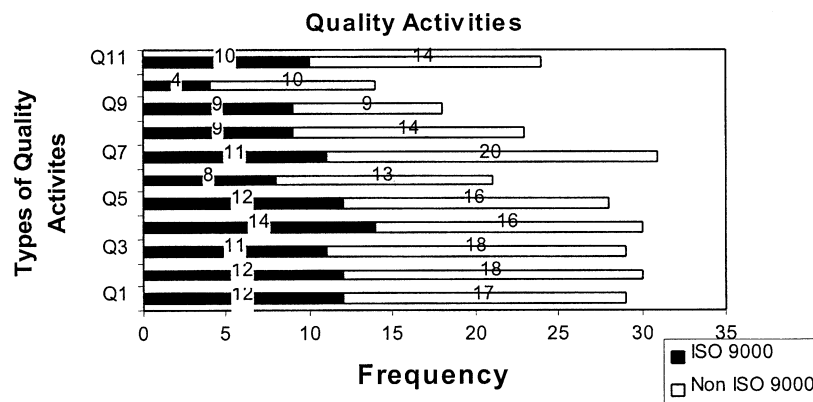
Size of company	No. of respondent	Percent (%)
Small (<50 employees)	18	30.5
Medium (50–200 employees)	22	37.3
Large (>200 employees)	19	32.2
Total	59	100

while the small industries, those having less than 50 employees, constituted 30.5% of the total. In short, SMEs represented 67.8% of the total percentage of respondents with the remainder being large companies.

As it was the purpose of this study to find out where the Malaysian companies, especially SMEs, are in the quality race, the companies were asked whether they have been implementing TQM. It was quite surprising that 62.5% of the respondent do not have any ISO 9000 certification. Perhaps most of them (55%) are still in their infancy stage of getting used to the idea of TQM or to having ISO 9000 certification in their companies. This is reflected in the number of years of TQM involvement, with many of the companies having less than 3 years' experience. In fact, 23% of the companies have never been involved in any quality programmes (as shown in Fig. 1).

After an initial understanding of the status of SMEs' qualification and involvement, it was felt important to identify whether these SMEs had actually been implementing TQM. According to Struebing & Klaus (1997), using quality control tools is very important for small businesses, since these firms may be competing with large companies and would require a method to differentiate their products. In relation to this, a list of quality initiatives was presented to the respondents, who were required to indicate which ones they had already implemented. A summary of the major initiatives implemented by the companies is shown in Fig. 2, and these are categorized according to whether the companies are certified to ISO 9000 or not. A majority of the respondents (77.5%) were found to have adopted Production planning and control in their daily manufacturing operation. This means that the companies are trying to produce quality products in line with maximizing their resources to

**Figure 1.** No. of years of TQM involvement—SMEs.



- | | |
|----------------------------------|--------------------------------------|
| Q1 – Internal quality audit | Q6 – Supplier improvement activities |
| Q2 – Quality awareness program | Q7 – Production planning and control |
| Q3 – Problem solving techniques | Q8 – Quality costing |
| Q4 – Statistical sampling | Q9 – Quality Circle |
| Q5 – Statistical process control | Q10 – Total Productive Maintenance |
| | Q11 – 5-S Housekeeping |

Figure 2. Results of quality activities adopted by ISO 9000 and non-ISO 9000 companies.

maintain a high margin of profit. Another point worth mentioning here is that the non-ISO 9000 companies have a higher implementation percentage as compared with certified companies. The reason could not be ascertained. The second highest degree of practice is split between Statistical Sampling (75%) and Quality Awareness Programme (75%), which were mainly conducted by the non-ISO 9000 companies.

However, the three least implemented quality activities were Total Productive Maintenance (TPM) (35%), Quality Circles (45%) and 52.5% for initiating supplier improvement activities. This finding concurs with other survey findings, such as Siti, (2000), Idris *et al.* (1996), Beskese & Cebeci (2001) and Gulbro *et al.* (2000). Idris *et al.* (1996), for example, found that TPM was as the least preferred quality activity. While a study conducted by Yusof & Aspinwall (2000) among the UK companies also reported 'supplier involvement programme' being placed last in the list of implemented quality initiatives. One can see that there was quality awareness among the companies where most of them are using the shorter and most cost-effective route to maintain their product quality, e.g. usage of production planning and statistical sampling techniques. Nothing extraordinary was said about the setting up of Quality Circles for a continuous approach to TQM.

To illustrate better SMEs' perception on the extent of usefulness for the various quality activities that have been implemented, a summary of the mean degree of usefulness was made. Table 2 shows the comparison of both ISO 9000 certified and non-certified companies with respect to the companies' perception on the degree of usefulness of the quality activities implemented.

5-S (Seiri, Seiton, Seiso, Seiketsu and Shitsuke) housekeeping was found to be the most useful (4.25) even though it was not found to be highly practised. Production and planning control (3.97) was ranked second, followed by problem solving techniques (3.93) and internal quality audit (3.86). It was quite surprising that statistical sampling (3.53) was found to be

Table 2. *Perception on usefulness of quality activities among SMEs companies*

Quality activities	μ_{SME} ISO 9000	μ_{SME} non-ISO 9000	Overall μ_{SME} degree of usefulness	Rank
1 Internal quality audit	4.17	3.65	3.86	4
2 Quality awareness programme	4.08	3.56	3.77	6
3 Problem solving techniques	3.82	4.0	3.93	3
4 Statistical sampling	3.43	3.63	3.53	11
5 Statistical process control	3.92	3.56	3.71	8
6 Supplier improvement activities	4.25	3.46	3.76	7
7 Production and planning control	3.82	4.05	3.97	2
8 Quality costing	3.67	3.86	3.78	5
9 Quality circle	4.11	3.11	3.61	10
10 Total Productive Maintenance (TPM)	4.00	3.50	3.64	9
11 5-S Housekeeping	4.10	4.36	4.25	1

the most 'useless' among all the quality activities, even though it was the second most popularly practised in the first place. It is the authors' opinion that these companies may feel that statistical sampling is nothing more than just routine inspection in manufacturing. It is believed that another contributing factor to this perception could be the lack of understanding and knowledge of the proper use of statistical tools.

The level of implementation for quality management principles

Having described the quality activities, the next part of the analysis involved the implementation of quality management practices: which is the focus of this survey. Table 3 shows a summary of the mean score of each item in the questionnaire. As can be seen, the mean score ranges from 3.17 to 4.08, which is slightly lower than the level of quality management practices by Singaporean SMEs, which gave a score of between 3.32 to 4.49 (Quazi & Padibjo, 1998). Nevertheless, it can be argued that the quality management practices, as highlighted by Quazi & Padibjo (1998), were slightly different from those proposed in this study, although there were some similar ones, such as stressing the importance of leadership, customer satisfaction, human resource utilization and improvement tools and techniques.

Of these eight critical factors in Table 3, management leadership gave the highest overall mean rating of 3.65, and supplier quality management (3.07) the lowest. One observation was that many of the respondents have rated 'the degree of practice' at the lower end of the scale, between 'moderate' to 'agree'. This could indicate that the companies could be still struggling to implement TQM successfully.

Further to this, an analysis on the reliability of the result of the eight proposed constructs was performed and is described in the next section. A further comparative study was also carried out to achieve a better understanding of the level of TQM implementation among SMEs and will be presented in the following sections.

Internal consistency analysis

Internal consistency was used to assess the reliability of the measurements (eight constructs) depicting the degree to which they indicate a common latent (unobserved) construct. It relates to the extent to which an experiment, test or any measuring procedure yields the same results on repeated trials (Cramer, 1998). Cronbach's Alpha is commonly used for this

Table 3. *The mean of main factors for implementation*

Factor	Item no.	Mean	Overall mean
Management leadership	F11	3.87	3.654
	F12	3.66	
	F13	3.82	
	F14	3.79	
	F15	3.71	
	F16	3.73	
Continuous improvement system	F21	4.08	3.608
	F22	3.88	
	F23	4.03	
	F24	3.18	
	F25	3.74	
	F26	3.68	
Customer satisfaction and feedback	F31	3.68	3.510
	F32	3.59	
	F33	3.17	
	F34	4.07	
	F35	4.11	
Improvement tools and techniques	F41	3.21	3.323
	F42	3.26	
	F43	3.54	
	F44	3.44	
	F45	3.59	
Supplier quality management	F51	3.43	3.067
	F52	3.18	
	F53	3.19	
	F54	3.53	
	F55	3.00	
Employee participation	F61	3.71	3.442
	F62	3.90	
	F63	3.56	
	F64	3.60	
	F65	3.64	
	F66	3.81	
Education and training	F71	3.55	3.569
	F72	3.72	
	F73	3.77	
	F74	3.69	
Work environment and culture	F81	3.39	3.430
	F82	3.58	
	F83	3.82	
	F84	3.63	
	F85	3.92	

purpose. Values of alpha range from between 0 and 1.0, with higher values indicating higher reliability. The value of each variable, as measured by each statement on the scale of 1 to 5, is computed using the reliability analysis procedure shown in Table 4.

The alpha values range from 0.7066 to 0.917, which indicates an internal consistency with the alpha value of more than 0.70, so no items were dropped from each variable. These

Table 4. *Internal consistency results*

Factor	Quality management practices	No. of items	Alpha value	Items for deletion	Alpha if item deleted
F1	Management leadership	6	0.8458	None	0.8458
F2	Continuous improvement system	6	0.7066	F2.2	0.7125
F3	Customer satisfaction and feedback	5	0.7838	None	0.7838
F4	Improvement tools and techniques	5	0.9017	None	0.9017
F5	Supplier quality management	5	0.8434	F5.5	0.8653
F6	Employee participation	6	0.7721	F6.4	0.7863
F7	Education and training	4	0.7924	F7.4	0.8533
F8	Work environment and culture	5	0.7358	F8.1	0.7739
	Total	42			

results are therefore acceptable and are a reliable measure of the constructs. However, some of the alpha values could be further improved if items such as 'Our company always incorporates quality factors in our product or service design' (F2.2), 'Our company regularly conducts a supplier quality audit' (F5.5), 'An appraisal system based on quality performance is established' (F6.4) and 'Our employees are fully informed of the company's operational performance and business results' (F8.1) are removed from the related construct. Overall, the instrument has been proven to be an acceptable instrument through this test.

Test of significance on the difference of means

Having analysed the first two sections of the survey, it was found that some statistical tests will be helpful to justify further the level of TQM implementation among the SMEs. Two significance tests were carried out to investigate whether there are any significant differences between SMEs and large companies on the extent of quality practices. In order to conduct the tests, the following hypotheses were set up.

- (i) To test for a significant difference in the extent of practice between SMEs and large companies.

H_0 : $\mu_1 - \mu_2 = 0$; i.e. there is no significant difference between SME practices (on each of the TQM factors) and those of large companies.

H_1 : $\mu_1 - \mu_2 \neq 0$; i.e. there is a significant difference between SME practices (on each of TQM factors) and those of large companies.

- (ii) To test for a significant difference in the extent of practice between SME ISO 9000 and non-ISO 9000 companies.

H_0 : $\mu_1 - \mu_2 = 0$; i.e. there is no significant difference between the practices of ISO 9000 (on each of the TQM factors) and non-ISO 9000 companies.

H_1 : $\mu_1 - \mu_2 \neq 0$; i.e. there is a significant difference between the practices (on each of TQM factors) for ISO 9000 and non-ISO 9000 companies.

These two tests were analysed using an ordinary comparison *t*-test. The result of the first *t*-test is given in Table 5.

It was expected that quality management practices among the large companies would be higher and better established than among the SMEs, and the results prove this to be true. Statistical results indicate that there were significant differences between the SMEs and large companies' mean of practices at the 0.05 significant level. This indicates that the mean of

Table 5. T-test results of quality management practices between large and small companies

Quality management practices	μ_{SME}	μ_{LARGE}	p-value	t_{cal}	Result
F1 Management leadership	3.654	4.368	0.001	-3.448	Sig.
F2 Continuous improvement system	3.608	4.342	0.001	-3.558	Sig.
F3 Customer satisfaction and feedback	3.510	4.074	0.002	-3.192	Sig.
F4 Improvement tools and techniques	3.323	3.916	0.021	-2.379	Sig.
P5 Supplier quality management	3.067	3.768	0.020	-2.388	Sig.
F6 Employee participation	3.442	4.140	0.004	-2.865	Sig.
F7 Education and training	3.569	4.184	0.011	-2.613	Sig.
F8 Work environment and culture	3.430	3.979	0.046	-2.043	Sig.
Grand mean	3.450	4.096	—	—	

practices of large companies are, on average, better than the mean of practices among SMEs. Management leadership (4.368), continuous improvement system (4.342) and education and training (4.184) were rated among the top priorities by large companies as compared with SMEs. The lowest degree of quality management practices by large companies was found to be supplier quality management (3.768). As such, this helps to explain the findings in this survey that large companies are better at adopting TQM. For example, the grand mean of practices from the high and large companies (4.096) is between 'high' and 'very highly practiced', which is probably an indication that these companies have embarked on this TQM journey for quite some time. However, there will always be room for improvement towards achieving business excellence.

In contrast, the SMEs' mean practice of 3.45 indicate that their quality practices are only moderate. This result concurs with Idris *et al.* (1996) findings on Malaysian SMEs, which still have the 'wait and see' attitude. Based on this evidence, the results indicate that the SMEs may face problems in competing with large companies in employing continuous improvement as a tool towards achieving total quality. One possible reason is that perhaps the local SMEs have been slow to implement the concepts compared with large companies, which have been more aggressive in embracing the TQM philosophy. This is quite obvious since most of the large companies in the electronics sector are subsidiaries and overseas plants of multinational companies that practised TQM.

The result of a second test of significance is shown in Table 6. It gives the mean of

Table 6. Results of quality management practices—comparison between ISO 9000 certified against non-ISO 9000 certified SMEs

Quality management practices	μ_{SME} ISO 9000	μ_{SME} non- ISO 9000	p-value	t_{cal}	Result
F1 Management leadership	3.689	3.633	0.837	0.207	Not sig.
F2 Continuous improvement system	3.556	3.640	0.742	-0.331	Not sig.
F3 Customer satisfaction and feedback	3.533	3.496	0.869	0.165	Not sig.
F4 Improvement tools and techniques	3.480	3.225	0.423	0.810	Not sig.
F5 Supplier quality management	3.627	2.717	0.008	2.791	Sig.
P6 Employee participation	3.611	3.340	0.366	0.916	Not sig.
F7 Education and training	3.533	3.590	0.838	-0.205	Not sig.
P8 Work environment and culture	3.587	3.336	0.468	0.753	Not sig.
Grand mean	3.577	3.372	—	—	

practice between ISO 9000 certified SMEs and non-ISO 9000 certified SMEs. It gives no statistical significant difference. As the result is not significant for all the quality management factors, except for supplier quality management, there is not sufficient evidence to reject the null hypothesis. This shows that there is almost no difference between the quality management practice among the SMEs, even though 37.5% of the respondents have had a certified quality system in their organization, e.g. ISO 9002. SMEs in Malaysia must put in more effort in advocating TQM; merely implementing ISO 9000, through getting the 'certificate', cannot guarantee success in the long term for the business.

In addition, it was observed that the mean of practice for supplier quality management (2.717) for non-ISO 9000 certified companies was the lowest among all the factors presented. This finding on supplier quality management has to be considered seriously. Not only were the SMEs found lacking in implementing supplier quality, but this can also be a potential hindrance for large companies. It was ranked as the least practised by large companies, with a 3.77 mean practice compared with the other factors.

Obviously, steps have to be taken in future quality improvement programme to build awareness among the Malaysian electrical sector on the importance of having supplier quality management. If companies do not manage their suppliers properly, the chances of getting a high reject rate will be higher and can result in monetary loss. The companies should insist that their suppliers be selected on the basis of quality aspects as against the low price of the product. By doing so, SMEs and large companies will be able to compete more effectively. Insisting on quality in the supplier chain will assist efforts towards advancing the quality of goods and services in the organization.

Having discovered these findings, the researchers hope that the outcome will prove beneficial for those trying to build a framework to implement quality programmes in Malaysian SMEs. The following sections present a short discussion and conclusions drawn from this survey.

Discussions

Having described the survey results, this section attempts to present a broad evaluation of the current status of TQM amongst the Malaysian electrical and electronics companies. The findings are anticipated to satisfy the following questions.

- (a) What have been the most accepted quality activities implemented so far?
- (b) Which of the eight constructs have the highest degree of practice?
- (c) How do the findings on the level of practice compare with results from other countries?

The findings of this study are examined by comparing these results with those from other countries to the closest possible criteria presented in questionnaire. It was the main purpose of this study to find out where Malaysian companies are in the quality race, compared with other countries such as Turkey, Australia, Ireland and European countries.

Based on the survey results, it appear that 37.5% of the SMEs studied had obtained a certified quality assurance system, while 77% of the total respondents admitted having been involved in implementing TQM in their organizations. A study conducted by Beskese & Cebeci (2001) in Turkey revealed that almost 75% of organizations there have ISO 9000 certification. Nevertheless, those which were found to be actively implementing TQM constituted 30.3%, and the corresponding figure was 60% in Australian manufacturing companies (Mandal *et al.*, 1999). A study of the Irish manufacturing industry reported 66%

of its respondents having ISO 9000 certification but only 19% of that have implemented TQM (Ismail & Hashmi, 1999).

Malaysian SMEs have shown a very keen interest in implementing TQM but the rate of registration for a quality system is still quite low compared with the studies mentioned earlier. Most probably, these SMEs faced similar obstacles to their foreign counterparts (Wilkinson *et al.*, 1994; Lee & Oakes, 1995; Ismail & Hashmi, 1999; Gulbro *et al.*, 2000) such as lack of resources (e.g. financial, technical, human) while applying for certification. Another reason could be that the number years of TQM involvement is generally lower. This can be seen from the results of the survey, where 55% of the SMEs have been involved in TQM for three years while 23% have never been involved in TQM.

It is quite apparent nowadays that the implementation of the various quality initiatives can produce significant improvements in productivity and competitiveness in various organizations (Mandal *et al.*, 1999). In this case, a large portion of Malaysian SMEs (75%) are actively involved in production and planning control activities, as the mean practice found was 3.97. This activity has also emerged as an important activity from Idris *et al.*'s (1996) survey amongst Malaysian SMEs, with a 60% rate of implementation from the companies.

Statistical sampling and the quality awareness programme were also found to be the top five most popular quality activities in Idris *et al.*'s (1996) survey. However, both of these activities were found to be less useful for the SMEs in this study, although both were rated the second most implemented among SMEs companies. Thus, the researchers feel that these findings ought to be highlighted to ensure that measures are taken so that SMEs will benefit from implementing these activities. Total Productive Maintenance (TPM) has always been the least favoured quality activities adopted in Malaysian manufacturing companies (Siti, 2000; Idris *et al.*, 1996). TPM is a system of maintenance covering the entire life of the equipment in every division, including planning, manufacturing, maintenance and all other divisions (Hamzah & Ho, 1994). It is important for SMEs and should not be ignored, and SMEs must be given more exposure to TPM.

In terms of the implementation of quality management practices, the authors have investigated the level of adoption. This study has proposed eight constructs modelled from the extant literature. It is not surprising that many of the Malaysian SMEs surveyed understand the importance of top management involvement and commitment and they actively practised it (3.65). These figures, however, reflect a lower degree of practice as compared with a similar study on Singaporean SMEs, which produced an overall mean rating of 4.36 (Quazi & Padibjo, 1998), and the UK SMEs of 3.75 (Yusof & Aspinwall, 2000). In Australia, 82% of the companies have also identified the active involvement of top management as the most important factor in implementing quality concepts in their organizations (Mandal *et al.*, 1999). This findings indicate to some extent that Malaysian SMEs still have a long way to go in their journey towards TQM.

Subsequently, in this study continuous improvement system appeared to be the second highly practised (3.61), a figure that is a little higher than for UK companies (3.35). However, this is well behind SMEs in the US where the figure appears to be as high as 4.01. Many research results have revealed that education and training are the most important elements in a successful implementation of TQM (Mann & Kehoe, 1994; Zhang *et al.*, 2000). 79% of the Australian manufacturing companies stated that they have an on-going quality-training programme, which suggests that they consider quality as an important business strategy (Mandal *et al.*, 1999). Findings from a European survey in the UK, Portugal and Finland also indicate that adequate training determines the likely effectiveness of the quality initiatives undertaken. Among the three countries surveyed, UK companies were found to provide the most training, followed by Portugal, and Finland the least training (Matthews *et al.*, 2001).

However, as direct comparisons cannot be made from these findings, it can be said that Malaysian SMEs are not behind in this initiative based on a mean practice of 3.57.

Finally, there is evidence that should raise some concerns on supplier quality management, since many studies have found a low practice level. In the case of this work, supply quality management gave the lowest practice (3.07) from the eight constructs. Similar survey results were obtained in Australian and UK manufacturing companies. In Australia, only 47% of the respondents have conducted supplier evaluation, while UK companies recorded a mean of 3.26 on the five-point Likert scale. These findings suggest that some immediate measures should be taken to increase awareness amongst organizations. Supplier quality management is an important aspect of TQM since materials and purchased parts are often a major source of quality problems (Zhang *et al.*, 2000). Therefore, organizations that pursue good supplier quality management will be able to reduce total quality costs and improve product quality in the long run.

Conclusions

This paper has presented the results of a survey conducted on Malaysian electronics and electrical SMEs, which had the prime purpose of investigating the level of quality management practices in these companies. From the results presented and discussed, the level of TQM implementation among these Malaysian SMEs has been outlined. Although some of these results may not be directly comparable, they have undoubtedly provided some indications on the extent of achievements for Malaysian SMEs in their journey towards excellence. The paper has also indicated and identified crucial issues for organizations to consider, especially in areas found to be lacking in implementation. Future research should concentrate on identifying a systematic approach towards TQM so that SMEs can sustain the changes in the new era of the global business environment. A survey is currently underway to extend the work to include manufacturing SMEs in Malaysia so as to make a comparison between the different manufacturing sectors. This would hopefully pave the way towards creating a better understanding of TQM implementation issues and help to improve success rates of TQM implementation in the Malaysian context.

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