

## COMPARATIVE STUDY OF QUALITY PRACTICES BETWEEN JAPANESE AND NON-JAPANESE BASED ELECTRICAL AND ELECTRONICS COMPANIES IN MALAYSIA: A SURVEY

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**Abstract.** This paper presents the results of a study on the comparison of quality practices between Japanese and non-Japanese companies in Malaysia. The main objective is to investigate the differences that may exist between them in implementing quality management. Towards that end, a questionnaire was developed, validated and sent out to 370 companies in the electrical and electronics sector and the survey gave a response rate of 21.9 per cent. The results show that Japanese companies have higher levels of quality activities when compared to non-Japanese companies. The top five quality activities with big gap against non-Japanese companies are; quality control circle, supplier improvement, application of Failure Mode and Effect Analysis (FMEA), conducting Value Engineering (VE) and implementing quality costing. ISO 9001 was found to be the most useful practice in all the companies surveyed. The results also showed that in-process inspection, 5S (Seiri, Seiton, Seiso, Seiketsu, Shitsuke) activities, internal quality audit and conducting production planning and control have high practice level in all companies. The findings of this research points to the need for much greater emphasis on quality practices found lacking by non-Japanese companies in their future quality improvement efforts.

*Keywords:* Quality practices, Japanese, non-Japanese, electrical and electronics

**Abstrak.** Kertas kerja ini membentangkan keputusan kajian perbandingan amalan kualiti antara syarikat Jepun dengan bukan Jepun di Malaysia. Objektif utama kajian adalah untuk menyelidik perbezaan yang mungkin wujud antara kedua-dua jenis syarikat dalam melaksanakan pengurusan kualiti. Untuk mencapai tujuan tersebut, satu soal selidik telah dibangunkan, disahkan dan dihantar kepada 370 syarikat dalam sektor industri elektrik dan elektronik, dan kadar respon ialah 21.9 peratus. Keputusan kajian menunjuk bahawa syarikat Jepun memiliki tahap amalan kualiti lebih tinggi dibandingkan dengan syarikat bukan Jepun. Lima amalan kualiti yang tertinggi dengan perbezaan besar berbanding syarikat bukan Jepun ialah; kumpulan meningkat kualiti (KMK), penambahbaikan pembekal, penggunaan Analisis Mod Kegagalan dan Kesan (FMEA), pelaksanaan Kejuruteraan Nilai (VE) dan pelaksanaan pengesanan kualiti. Amalan ISO 9001 didapati tertinggi nilai kegunaan dalam semua syarikat yang dikaji. Hasil kajian juga menunjukkan bahawa pemeriksaan dalam proses, aktiviti 5S (*Seiri, Seiton, Seiso, Seiketsu, Shitsuke*), audit kualiti dalaman dan pelaksanaan perancangan dan kawalan pengeluaran pada tahap tinggi dalam semua syarikat. Hasil penyelidikan ini mengarah kepada perlunya penekanan yang lebih dalam amalan kualiti terkurang oleh syarikat bukan Jepun dalam usaha peningkatan kualiti masa depan.

*Kata kunci:* Amalan kualiti, Jepun, bukan Jepun, elektrik dan elektronik

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## 1.0 INTRODUCTION

Quality is a crucial element in ensuring a company survive in this continuously growing competition in a globalize market. Continuous efforts to improve quality, productivity, cost and delivery can enhance competitiveness. Japanese companies are very successful in producing quality products due to their commitment for TQM and quality practices adoption, as expounded by quality gurus such as Deming, Juran, Taguchi and others.

The electrical and electronics sector is one of the most important industrial sector in Malaysia where it is the largest export earner, netting receipts amounting to RM256 billion or 47.8% of the country's total exports revenue in 2006 [1]. In Malaysia, the electrical and electronics industrial sector consists of multi-national companies and small and medium sized enterprises (SMEs). Besides local-based companies, many investors from Japan, Hong Kong, Singapore, United States of America and Taiwan have also invested in this sector.

Malaysia has long realized the importance of adopting and learning from Japan and South Korea in terms of their work-culture, technology, etc., in its effort to become an industrialized country. The Look East Policy, for example, was adopted in 1980 with the main purpose of learning from these countries in developing local Malaysian industries. The Japanese government have also contributed through the Japan/ASEAN TQM project which was established in 1995, mainly to facilitate the implementation and promotion of TQM activities in ASEAN countries including Malaysia in order to develop their industries and promote international trade [2]. It is therefore important to know what kind and level of quality practices that differ between Japanese and non-Japanese companies in the Malaysian context. Thus, the objective of this study is to compare quality practices and importance between Japanese and non-Japanese companies. To achieve this objective, the authors have selected the Malaysian electrical and electronic sector as the focus of study.

TQM practices has been studied by various authors [3]. Some of major quality practices proposed and used include management leadership, employee involvement, supplier management, quality tools and techniques, product design, and process management.

## 2.0 METHODOLOGY

The survey methodology was employed in this study, and a survey instrument was developed and modified from Eng and Yusof [3]. A total of thirty-four quality activities which was felt important for TQM implementation were proposed. For rating the level of quality practice and usefulness, a five-point Likert scale was employed with a scale of 1 relating to 'very low' and a scale of 5 meaning 'very high'.

Having validated the questionnaire by quality experts, it was pilot tested and finalized. A population of 370 electrical and electronic companies of Japanese and non-Japanese companies were selected from the directories of Federation of Malaysian

Manufacturer (FMM) and Foreign Companies directory list in Malaysia. A total of 370 questionnaires were mailed to these companies in the middle of January 2007. At the end of February 2007, a total 83 questionnaires were returned which represented about 22.4% response rate. The number of returned questionnaires that were found to be usable in this study was 81, which represented about 21.9% response rate. Since the response rate is high compared to some previous studies, it shows that the respondents were interested to this research and some of them request feedback on the survey results. The response was later analyzed using the SPSS Version 11.5 statistical package.

### 3.0 SURVEY RESULTS

#### 3.1 General Profiles of Respondent

The first aspect analysed was the general profile of the respondents. With regards to the job position of the respondents, 86.4% of respondents hold the position of QA/QC Manager or QA/QC Engineer and about 1.2% is engineering manager. This indicates that appropriate person in the company, as intended in this study, has answered the questionnaire. It means the data have high degree of reliability and validity because the answers have been obtained from people, who have direct responsibility for quality in the company. The summary is shown in Table 1.

**Table 1** Current positions of the respondents in the company

	Frequency	Percent	Cumulative percent
Engineering Manager	1	1.2	1.2
Quality Assurance/ Control Manager	70	86.4	87.6
Others	10	12.3	100.0
Total	81	100.0	

The length of time in the current position indicates the understanding of the respondents about the implementation of TQM in the companies. Table 2 shows 70% of the respondents has been in the current position for more than 3 years, 24.7% between 1 to 3 years, and 4.9% for less than 1 year. It indicates that this data have a high degree of confidence since most of the respondents have been involved in quality for more than 3 years.

The breakdown of the respondents based on the size of the companies is shown in Table 3. Number of employees is used to categorize the size of the companies. In this study, small and medium sized enterprises (SMEs) are those with the number of employees between 50 to 300 employees. The companies with the number of employees above 300 are categorized as large companies. As summarized in Table 3, the company size is quite diverse between the respondents. About 23.5% of the respondents are

**Table 2** The length of time in current position

	<b>Frequency</b>	<b>Percent</b>	<b>Cumulative percent</b>
<1 years	4	4.9	4.9
1-3 years	20	24.7	29.6
3-6 years	14	17.3	46.9
>6 years	43	53.1	100.0
Total	81	100.0	

**Table 3** Number of employee

<b>Size of company</b>	<b>No. of respondent</b>	<b>Percent</b>	<b>Cumulative percent</b>
51-150	19	23.5	23.5
151-300	7	8.6	32.1
>300	55	67.9	100
(Total)	81	100	

from the companies that employ between 50 to 150 employees, 8.6% have employees between 151 to 300, and 67.9% from the companies employing more than 300 employees. This shows that 32.1% of the respondents can be categorized as SMEs and remaining 67.9% being large companies. Meanwhile, there are no companies that can be categorized as small industries (employing less than 50 employees).

The next question concerning majority shareholder in the company is to find-out the ownership of the companies. Table 4 shows that 46.9% of the respondents are non-Japanese and 53.1% are Japanese companies. It means the data have high degree of reliability and validity because the response feedbacks have been obtained from enough frequency that is more than  $n = 30$  companies.

After an initial understanding of the owner and the company size, it was felt important to identify whether they have certifications in the company. In terms of quality certification, almost 91.4% of the respondents have MS ISO 9001:2000 as shown in Table 5. This is followed by 55.6% having ISO 14000 certification, 35.8% for TS 16949 and 17.3% for OHSAS. Some companies are in the process of certifying to MS ISO 14001 and TS 16949. There are also companies with more than one certification. The

**Table 4** Major share in the company (Japanese and non-Japanese)

<b>Major share</b>	<b>Frequency</b>	<b>Percent</b>	<b>Cumulative %</b>
Non-Japanese	38	46.9	46.9
Japanese	43	53.1	100
(Total)	81	100	

survey result shows that Japanese companies have higher certification achievement ratio than non-Japanese companies particularly in ISO 9001 and ISO 14000 as shown in Table 5. This indicates that Japanese companies emphasize in quality and environment system in their operation as a “license” to compete in global market.

**Table 5** Quality certification by owner

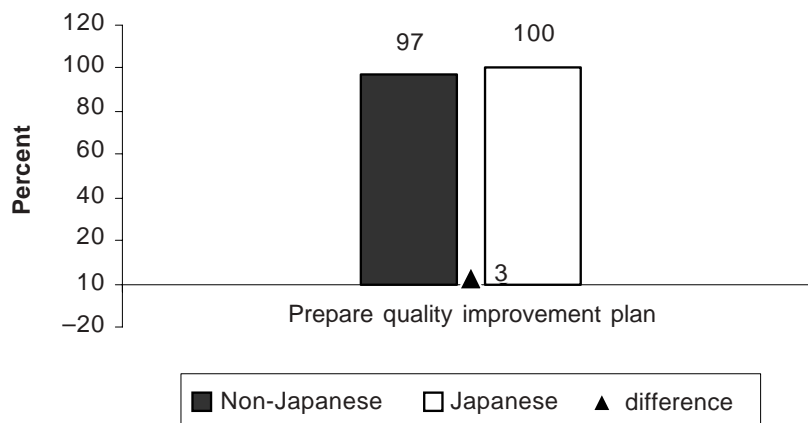
Owner	ISO 9001	TS 16949	OHSAS	ISO14000	Others
Japanese	42 (97.6 %)	16 (37.2 %)	8 (18.6 %)	36 (83.7 %)	1 (2.3 %)
Non-Japanese	32 (84.2 %)	13 (34.2 %)	61 (5.8 %)	92 (3.6 %)	1 (2.6 %)
Total	74 (91.4 %)	29 (35.8 %)	14 (17.3 %)	45 (55.6 %)	2 (2.5 %)

### 3.2 Quality Practices Result

It was expected that quality practices such as management leadership, employee involvement, supplier management, and design management, amongst Japanese companies to be higher and well established than non-Japanese companies and the results proved true. The survey result and findings which starts from quality planning until customer feedback will be presented from here onwards.

#### 3.2.1 Quality Planning

Quality planning is typically used to plan the quality improvement of the company. The result, as in Figure 1, shows that Japanese companies have slightly higher quality planning practices against non-Japanese companies but no huge difference exist between both categories.



**Figure 1** Comparative application ratio of quality planning between Japanese and non-Japanese

The total application ratio (percentage applying the quality practice) for both types of companies is 99% as shown in Table 6. This indicates that quality improvement plan is one of the important activities in TQM implementation. The results on the degree of usefulness showed the perception of the companies on the usefulness of the activities after it had been implemented. The survey results indicate that the mean value for usefulness of the activities to be 3.56 (average value out of 5 in Likert scale) is close to useful level. Management have to outline goals, quality policies and quality plan so that employee are constantly reminded that customer satisfaction is the top priority.

**Table 6** Total application ratios for both category

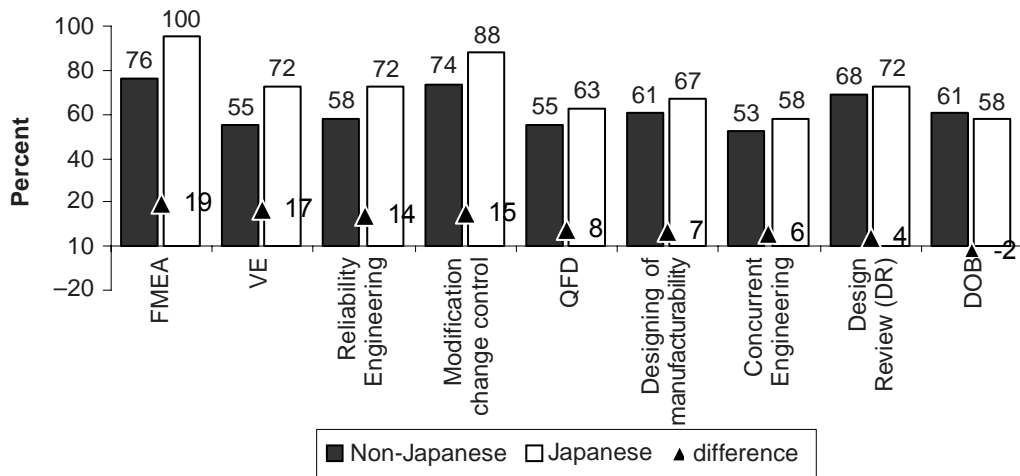
No	Quality activities	Applied (%)	Practices	Usefulness
1.	Prepare Quality Improvement Plan	99	3.51	3.56

### 3.2.2 Design Development

Design development is very important to translate customer requirements into product specification. The result, as in Figure 2, shows that Japanese companies have higher design development practice against non-Japanese companies. FMEA (failure mode effect analysis), VE (value engineering) and modification change control shows huge gap of application ratio, and thus indicate the strength of Japanese companies against non-Japanese companies. VE is the second highest gap between both categories of companies, in which non-Japanese companies could give some emphasis for improvement to better compete in the market.

Table 7 shows the application of design practices, its mean practice and usefulness level (from a Likert scale of 5). Most of the design activities have low application level (less than 70%) except for conducting FMEA, modification change control and design review. The reasons may be due to lack of understanding and expertise by the companies about the application of the quality activities. The least implemented activity for design development is concurrent engineering. It indicates that the early involvement of marketing, production, quality, procurement and customer is still at a very low level for design improvement during the early stage of product development.

The highest usefulness level in design quality activities is modification change control (3.30). It is believed that any modification for changing parts, circuit design or process will affect the stability of the design and quality, and therefore, must be controlled properly before any problems occur. The result also shows that FMEA is the second highest level of usefulness (3.14). The implementation of these tools is actually important to ensure preventive action be made before proceeding to mass production.



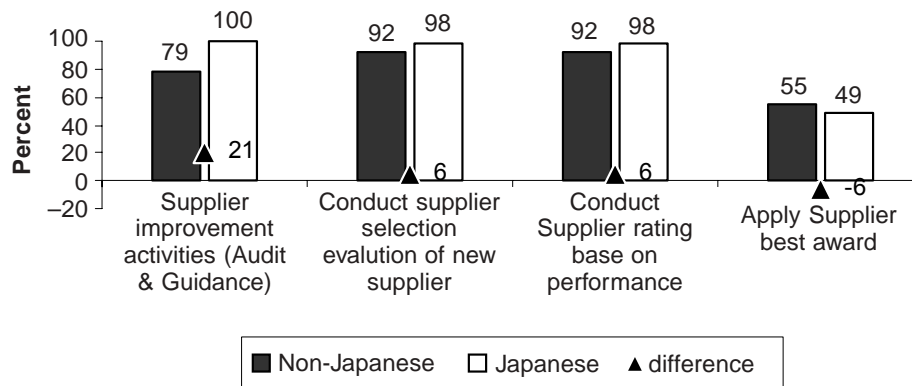
**Figure 2** Comparative application ratio of quality development between Japanese and non-Japanese

**Table 7** Total application ratios of both category

No	Design activities	Applied (%)	Practices	Usefulness
1	Conduct FMEA	86	3.05	3.14
2	Conduct Modification Change Control	81	3.21	3.30
3	Conduct Design Review (DR)	70	2.65	2.70
4	Apply Reliability Engineering	65	2.37	2.41
5	Designing for manufacturability	64	2.37	2.46
6	Conduct Value Engineering (VE)	64	2.25	2.36
7	Apply Quality Function Deployment	59	2.01	2.02
8	Apply DOE	59	1.93	2.14
9	Apply Concurrent Engineering	56	1.85	1.85

### 3.2.3 Supplier Management

Quality activities of supplier management are important to ensure parts are conforming to part specification and standard. Figure 3 shows a huge gap of application ratio on supplier improvement activities between Japanese companies and non-Japanese companies. This indicates that Japanese companies are seriously managing their suppliers for improving their quality. One of the strong points about Japanese product is the level of quality control maintained by its supplier (Ishikawa [4]). This Japanese approach of supplier management and ensuring quality evolved directly from the Japanese practice of *keiretsu*. Damanpour [5] defined *keiretsu* as large conglomerates of financially linked groups of companies. In the US, individualism has taken over and corporation operate independently of one another.



**Figure 3** Comparative application ratio of supplier management between Japanese and non-Japanese

Mean values of usefulness level also shows value above 3.5 in Table 8, except for supplier best award (1.86). The most useful activities is supplier selection evaluation as shown in table. This result indicates that the new supplier selection evaluation is very useful as a preventive action to ensure that supplier has the ability to supply parts right from the start.

**Table 8** Total application ratios of both category

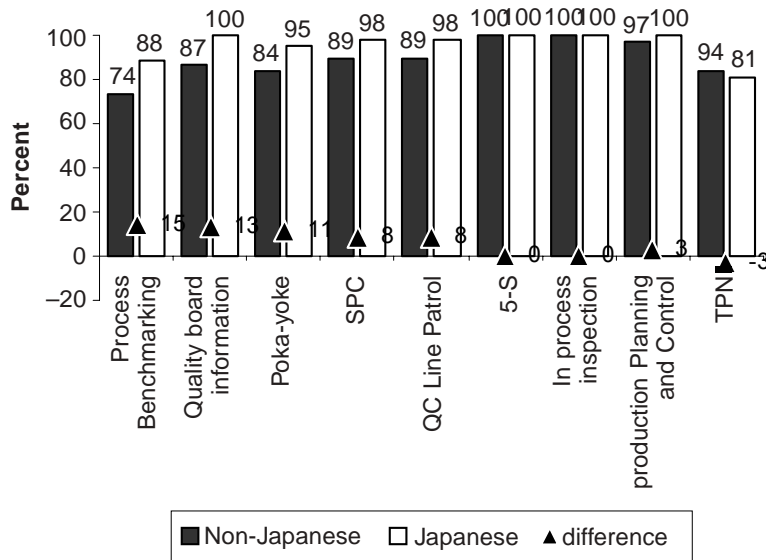
No	Quality activities	Applied (%)	Practices	Usefulness
1	Supplier rating base on performance	95	3.93	3.96
2	Supplier selection evaluation of new supplier	95	3.95	3.98
3	Supplier Improvement Activities (Audit & Guidance)	90	3.58	3.69
4	Supplier best award	52	1.86	1.86

### 3.2.4 Production Process

Production relates to a process where products are produced as per design requirements utilizing man, machine, method and material. The Japanese calls production process as “gemba” and Japanese believe that improvement starts here. The results, as in Figure 4, shows that Japanese companies have higher production process quality practices against non-Japanese companies. Process benchmarking, quality information board and mistake-proof system shows the huge gap of application ratio, which shows the strength of Japanese companies against non-Japanese companies. It is also noticed that non-Japanese companies performed well in 5S, in-process inspection and production Planning and Control (PPC).

Table 9 shows that the implementation of production process is at a high level (more than 80%) in the companies. The highest practice level activities are in-process





**Figure 4** Comparative application ratio of production process between Japanese and non-Japanese

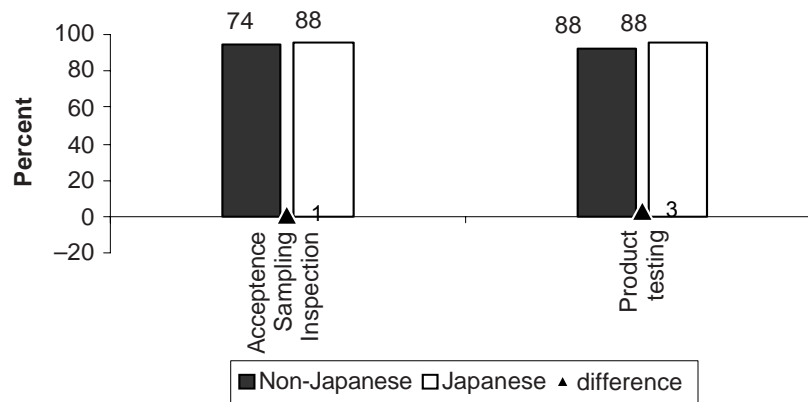
**Table 9** Total application ratios of both category

No	Quality activities	Applied (%)	Practices	Usefulness
1	In process Inspection	100	4.35	4.36
2	5S housekeeping	100	4.28	4.36
3	Production Planning and Control	99	4.25	4.30
4	Use Quality board information	94	3.91	3.89
5	QC Line Patrol	94	3.84	3.89
6	Statistical Process control (SPC)	94	3.69	3.80
7	Poka-yoke (Mistake-proofing)	90	3.42	3.57
8	Total Productive Maintenance (TPM)	83	3.20	3.40
9	Process Benchmarking	81	3.04	3.14

inspection and 5S. The mean value of companies' perception in practices and usefulness of the production process quality activities are above 3.0. The rank of practices and usefulness is similar to the implementation rank as mentioned above. The low practice and usefulness level activities for production process are TPM and process benchmarking.

### 3.2.5 Sampling Inspection

Sampling inspection is a method to decide whether to accept or reject the product before releasing to the market. Figure 5 shows that implementation of sampling

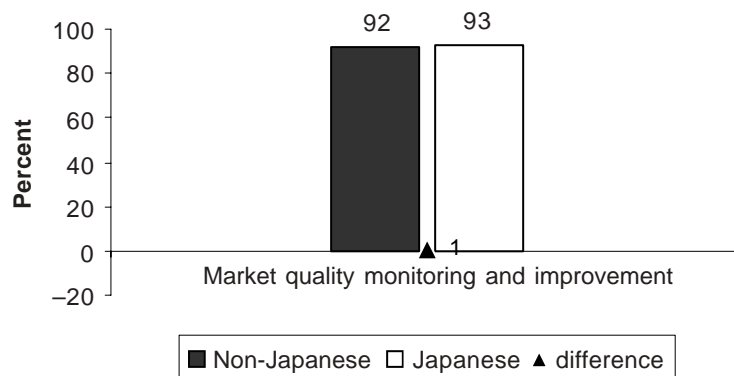


**Figure 5** Comparative application ratio of sampling inspection between Japanese and non-Japanese

inspection of quality activities is at a high level (more than 90%). The survey result shows no huge gap of practice between both categories.

### 3.2.6 Customer Feedback

Customer feedback is a very important process to improve current process and standard to fulfill the customer requirement. One method is by monitoring market quality and improvement must be made to every customer's claim or comments. Customer's voice must be reviewed and it must be incorporated in the process, design and system. The result in Figure 6 shows that implementation of market quality monitoring and improvement is high (more than 90%). It also show no huge gap of practice between both the categories.

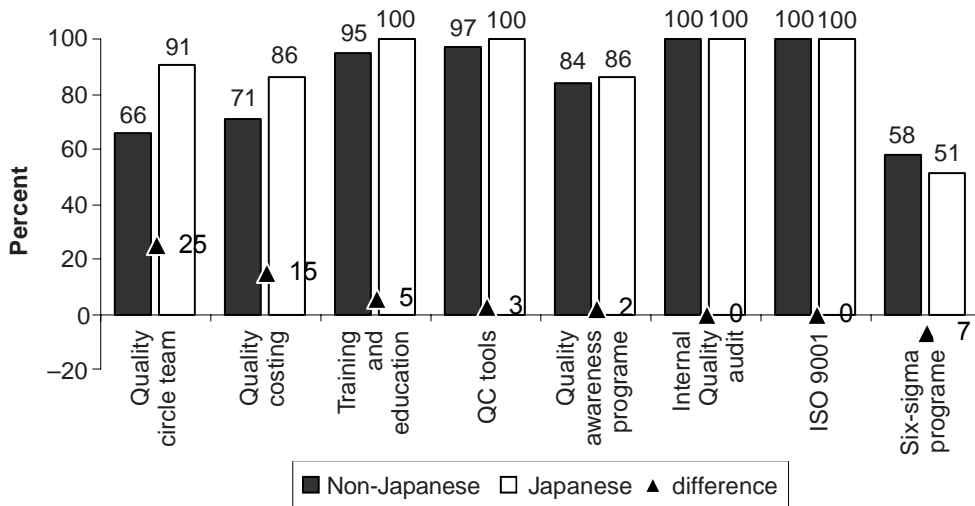


**Figure 6** Comparative application ratio of market monitoring between Japanese and non-Japanese

### 3.2.7 All Stages

Besides supplier management, production process, design development, sampling inspection and customer feedback, there are also quality activities applicable to all the stages of process such as QC tools, ISO 9001 standard and etc.

The overall result, as in Figure 7, shows that Japanese companies have higher quality practices against non-Japanese companies. The survey results also indicates that quality circle is widely implemented in Japanese companies compared to non-Japanese companies. Quality circles can be used at all levels of an organization involving people is an effective technique to improve quality [6]. It can be observed that non-Japanese companies have high practice levels for ISO 9000, internal audit, application of QC tools, and training and education



**Figure 7** Comparative application ratio of all stage between Japanese and non-Japanese

The results in Table 10 shows that implementation for all stage activities is high at 80%, except for quality circle teams (79%), quality costing (79%) and six-sigma program (54%). When activities are ranked based on the degree of implementation, they are; ISO 9001 (100%), internal quality audit (100%), use of QC tools (99%), training and education (98%), quality awareness program (85%), quality circle teams (79%), quality costing (79%) and six-sigma program (54%). The results show that the most important and useful practice is ISO 9001. This indicates that ISO 9001 is a very important element for maintaining quality. The least implemented activity is six-sigma program. Probably, one reason is this program require high investment when compared to other quality activities, which are more of a low-cost approach.

**Table 10** Total application ratios of both category

No	Quality activities	Applied (%)	Practices	Usefulness
1	ISO 9001 standard	100	4.41	4.52
2	Internal Quality Audit	100	4.36	4.41
3	Use QC tools	99	3.85	3.95
4	Conduct training and education	98	4.20	4.20
5	Conduct Quality Awareness program	85	3.27	3.44
6	Conduct Quality Circle Team	79	2.98	3.02
7	Conduct Quality Costing	79	2.88	2.81
8	Six-sigma program	54	1.86	2.28

#### 4.0 DISCUSSIONS

Some main findings have emerged from this study and are discussed here. One of them is on certification. Japanese companies have higher certification achievement ratio of ISO 9001 and ISO 14000 than non-Japanese companies. This indicates that non-Japanese companies should probably have certifications for their quality and environment system as a “license” to compete in the global market. Naser *et al.* [7] found that there is association between ISO 9000 certification and the financial performances in Malaysian companies. The experience in Singapore shows that ISO 9000 certification has provided significant benefits to companies, and many organizations trying to adopt TQM have chosen ISO 9000 certification as a stepping-stone towards TQM [8]. The survey result shows that ISO 9001 is the most practiced and useful amongst both companies in pursuing towards TQM practices and it is proven true based on the survey result.

The analysis in this study found that the extent of quality practices for overall stage are still lower than the extent of usefulness and there is a gap, where further action could be taken for improvement by both Japanese and non-Japanese companies.

It was expected that quality practices among Japanese companies to be higher compared to non-Japanese companies based on the previous authors such as Garvin [9] and Dahlgard *et al.* [10] and this proved to be true. Design development, supplier management and production process stage particularly showed the strength of Japanese companies with huge practice gap. The survey results show that Japanese companies not only focused on shop floor process but also on product design to built-up high quality product. Non-Japanese companies must move forward from a focus of shop floor to encompass all functions from product design through manufacturing until after sales and service. Garvin [9], who examined the quality of air conditioners manufactured by companies in Japan and United States, showed that a huge gap exist between Japanese companies and the Western companies in their TQM practices. Garvin [9] also highlighted that a combination of TQM practices

such as reliability engineering, statistical quality control, training and education, preventive maintenance and supplier management are all widely practiced in Japanese companies.

The results in this study show that the top five quality activities, which gave the strength of Japanese companies with huge gap of practices against non-Japanese companies, are; quality control circle (QCC), supplier improvement, FMEA, VE and quality costing. This points to the need for a greater emphasis to be made in the future quality program in non-Japanese companies. It was expected that QCC is one of the most important activities compared to non-Japanese companies and this was proven true. Takagi [11] found that QCC is a significantly effective activity for improving organizational capacity by spreading into every corner of the organization. This survey also shows that supplier quality improvement, new model development and cost reduction are very important activities, which need to be given emphasis in the future for non-Japanese companies. In the others words, non-Japanese companies should produce products to meet the twin objectives of high quality and low cost. In this study, the authors define cost as a component of quality because this factor is one of the element of customer satisfaction.

The survey result indicates that there is still a gap for improvement effort. Many non-Japanese companies in Malaysia are still in TQM journey and they need some guidance to compete with other long-term established companies. Based on the survey results, the differences are identified as weak points of non-Japanese companies and as opportunities for improvement. In order to reduce this gap further the following recommendations are proposed;

- (1) **Employee involvement:** Employee involvement in quality control circle should be established and practiced. Top management should also promote employees involvement in quality activities such as quality control circle and awareness programs, which will lead to continuous improvement. A top level “champion” must drive the quality initiative throughout the organization and provide the necessary leadership, resource and recognitions to employees.
- (2) **Cost reduction activities:** The organization should continue to examine quality costing and improve product costing with VE activities to produce good quality product with the lower cost to meet the customer satisfaction.
- (3) **New product development:** Non-Japanese companies should change their perception and practices of product design, which shows that practices are at a low level compared to Japanese companies. Quality should start from product design development to ensure manufacturability, reliability and quality of the products. Non-Japanese companies are still lacking in FMEA, VE and modification change control against Japanese companies and these points need to be emphasized in the future improvement.

- (4) **Supplier management:** Continuous improvement on supplier quality improvement must be emphasized because modern complex product depends heavily on quality and reliability of component and parts. The findings show those non-Japanese companies are still weak on supplier quality improvement and vendor selection evaluation.

The overall result of quality practices shows that ISO 9001 is the most useful and widely practiced amongst both categories in pursuing TQM and should be implemented in all companies as the basic foundation of TQM. The results of the survey also showed that in-process inspection, 5S, internal quality audit and conduct production planning and control are highly practiced and useful in all companies and must be given priority.

## 5.0 CONCLUSIONS

This paper has presented the results of a survey conducted on the Malaysian electronic and electrical companies with the main purpose of comparing the quality activities level between Japanese and non-Japanese companies in Malaysia. The results show that Japanese companies have a higher implementation level of quality practices. From all the findings presented and discussed, the level of quality practice and importance between Japanese companies non-Japanese companies have been compared. Non-Japanese companies should emphasize on QCC, supplier improvement, FMEA, VE and quality costing in their future quality improvement efforts. ISO 9001 is the most useful and highly practiced amongst both categories of companies in pursuing towards TQM.

This paper has also indicated and identified crucial issues for organization to consider especially on areas found lacking in implementation. Further studies can be made focusing on the other types of industry in Malaysia, such as automotive, metal-based and food processing, to develop a comprehensive quality implementation framework to meet the needs of Malaysian industries in their drive towards TQM. This would hopefully pave the way towards creating a much better understanding of TQM implementation issues and help improve the success rates of TQM implementation.

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