Comparison of Quality Engineering Practices in Malaysian and Indonesian Automotive Related Companies

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Abstract. The main motivating factor driving this research is to find differences between the automotive related companies in Malaysia and Indonesia with regard to quality engineering (QE) implementation. A comparative study between Malaysia and Indonesia provides the opportunity to gain perspective and thorough understanding of the similarities and differences on the critical factors for successful QE practices in the context of both these countries. Face to face interviews are used to compare the QE practices in two automotive companies in Malaysia and Indonesia, respectively. The findings of study showed that both countries have clear quality objectives to achieving zero defects in processes and products and total customer satisfaction. Top and middle management in both countries were found to be directly involved in quality improvement on the shop floor to provide On-The-Job training and actively encourage team members to perform quality problem solving through the formation of quality control circles (QCC) particularly in Indonesia automotive industry. In Malaysia automotive industry, the implementation was not fully effective, but they have started to cultivate those values in the daily execution. Based on the case study results and analysis, the researcher has provided suggestions for both countries as an improvement plan for successful QE implementation. These recommendations will allow management to implement appropriate strategies for better QE implementation which hopefully can improve company’s performance and ultimately the making the automotive industry in both countries to reach world class quality. It is strongly believed that the findings of this study can help Malaysia and Indonesia automotive industries in their efforts to become more effective and competitive.

Keywords: Quality engineering, Critical factors, automotive industry, Malaysia, Indonesia

1. Introduction
Quality engineering (QE) has been used in quality literature to denote many things. [1] believes that QE is the series of operational, managerial and technical process used by an organization to ensure that the quality of a goods and services produced are at the supposed or required levels. QE concentrates not only on the hard aspects of TQM but also the specialized technical factors of quality

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management. Krishnamoorthi [2], on the other hand, defines QE as the field that comprises technical methods, management and financing approaches, tools and techniques for problem solving, training and motivation methods, and computer-based information system and other fields required for planning, producing, and distributing goods and services to meet the consumer needs.

QE is focused on product/process design and production for meeting customer requirements, one can also define QE as the approach which consists of operational, managerial and engineering activities that a company uses for quality control (QC), quality improvement (QI) and quality assurance (QA) to achieve successful implementation of TQM [3]. This study is an attempt to provide insights into how the implementation of these quality management concepts focused on critical success factors (CSFs) for QE implementation in the automotive industry.

This paper provides an explanation and analysis of results of case studies conducted in two Indonesia automotive industries and two Malaysia automotive companies. The case studies were carried out during the period starting from January 2010 until June 2010. The purpose of the case study was to evaluate the existing QE implementation in terms of CSFs amongst automotive industries in Malaysia and Indonesia. It begins with a description of the methodology employed in eliciting relevant information concerning the case studied companies from the case study protocol. A summary of the current QE practices in both countries in terms of CSFs are presented. The paper culminates with a proposed suggestion, conclusions and some future research directions.

2. Methodology

2.1 Introduction
Case study research is one of the techniques that are frequently used in collecting data, building theories, or validating theories. The main benefits of case study methodology are its ability to deal with contextual conditions and reality of many social phenomena and allow the researcher to start an investigation without knowing precisely the case boundaries [4]. In addition, case studies have the likelihood to be valid and consistent with empirical observation, which closely mirror reality [5].

Various issues concerning quality management have been carried out by previous researchers using a case study approach. Through the case study approach, various theories have been proposed, tested, and explained. The number of cases in the case study research varied from two to ten cases. Some previous researches using case study approach in quality management conducted by previous researchers (see for example, Galperin and Lituchy [6], Ritchie and Dale [7], Yusof and Aspinwall [8], Vouzas [9], Benavent et al. [10], Irianto [11], and Qui and Tannock [12]). Case study approach is used in this research to evaluate and to obtain in-depth analysis associated with the actual implementation of QE among automotive industries in Malaysia and Indonesia in term of critical factors.

2.2 Case Study Methodology
In collecting empirical information and data for this study, the authors consulted the relevant experts in the field of quality engineering implementation and automotive industry. In the experts consultant step, the Delphi method used to obtain the experts judgments in terms of CSFs model for QE implementation. The results from Delphi method relating to CSFs for successful QE implementation has been described in an earlier publication by Putri and Yusof [13] as shown in Table 1. The CSFs for successful QE practices consist of nine factors and thirty-one sub factors.
Table 1. The CSFs for successful QE implementation based on result from Delphi method [13]

| Major factors (criteria)            | Sub-factors (sub-criteria)                                                                 |
|-------------------------------------|-------------------------------------------------------------------------------------------|
| Management responsibility           | Strategic quality planning/quality policy; the role of divisional top management; top management commitment/support; internal stakeholders’ involvement. |
| Resource management                 | Technology-and production related resources; financial-related resources; information and communication-related resources |
| People management                   | Employee involvement; education and training; teamwork and cooperation; work environment culture |
| Quality in design and process       | Process management/operating procedures; role of quality department; product design; process analysis and improvement; applied quality tools and techniques |
| Measurement, analysis and feedback  | Quality measurement, feedback and benchmarking; continuous improvement; performance measurement: external and internal; quality data and reporting; communication to improve quality; recognition and rewards; quality systems |
| Supplier management                 | Supplier quality management; contact with supplier and professional associates             |
| Customer focus                      | Customer involvement; customer driven processes                                           |
| Quality technical material          | Standardization quality standard; quality control (QC) technical management              |
| jiritsuka/independent                | Develop QC management; Independence without support from mother company                    |

In this research, the data collection has combined several methods. They are face to face interviews, direct observation, organization documents, and feedback from experts in case study company. Face to face interviews were conducted with the person responsible for quality initiatives implementation as well as with the general manager taking approximately one and a half hours each time, and continuing for a few days after that because they had other activities they need to attend to. Therefore, the interview has to continue the following day or other days depending on the appointment set by the researcher and the person in the case company. Telephone calls were made to arrange the date for next visit for interview followed up by e-mail. The interview protocol was sent to the expert before face to face interview. Development of case study protocol is essential in order to facilitate data collection. In this study interview protocol was developed in the form of semi-structured interviews. The interview protocol comprises all the questions in terms of critical factors and their sub factors for successful QE implementation. It is a major tool for increasing the reliability and validity of case study research. The semi-structured interview was developed based on literature review of CSFs in QE. The main questions asked are “how” and “why” a particular approach or practice was adopted. Some of the questions are based on informal conversation with top management and/or quality engineering/quality assurance managers from selected companies. Apart from the face to face interview, relevant documents were also referred to for clarification purposes and when possible copies provided by the case companies. Certain issues were obtained through observation by the researcher.

The interview is centred on questions about CSF for QE implementation. Only those questions relevant to the implementation of QE in the case companies were further investigated. In addition, clarification was sought, if necessary, through telephone calls, e-mail, or follow up visits to related companies. The purpose was to clarify the answers given by the expert in related companies so that it is consistent with the intended question. In Indonesia, interviews were conducted in Indonesian language. As for Malaysia, it was conducted in English and Malay, which means that the interview protocol uses two languages, that is, English and Indonesian.

The first section in the semi-structured interview provides the explanation on the objective and the scope of research, general information about the company, such as statement of vision and mission;
The number of employees; type of product made; and other relevant information. The next section in the semi-structured interview contains questions relating to how the existing implementation of the critical factors to achieve successful implementation of the QE which includes nine criteria and 31 sub criteria in the case study companies.

2.3 Overview of the Companies Studied

According to Malaysian Industrial Development Authority (MIDA), there are four automobile manufacturers, nine assemblers, three composite body sports car makers, 23 franchise holders which have the rights to assemble various makes and models of passenger and commercial vehicles, nine motor cycles manufacturers or assemblers, and 350 component manufacturers in the country [14]. In Indonesia, according to data from the Association of Indonesia Automotive Industries or known as Gaikindo, until 2006, there are 16 assemblers, 21 sales agents, 7 parts manufacturer, and 4 major components companies. Perusahaan Otomobil Nasional Sendirian Berhad (PONSB), which manufactures the Proton brand, is one of the largest car manufacturers in Malaysia. Similarly, Toyota Motor Manufacturing Indonesia (TMMIN) and Astra Daihatsu Motor (ADM) are the two largest car assembling companies in Indonesia that produces Toyota and Daihatsu brand respectively. Meanwhile, automotive industry Sendirian Berhad (AISB) is one of the largest original equipment manufacturer (OEM) in Malaysia which produces exhaust systems for national and non-national car companies. These four companies were selected as the case study companies to observe on the implementation of QE relating to the critical success factors. Case study was conducted in four companies, where PONSB and AISB represent Malaysia automotive industry and TMMIN and ADM representing Indonesia automotive industry. The selection of four cases indicates that this study meets the guidelines given by Eisenhardt [5] who indicated that a single investigator will have difficulty if handling more than four cases. In addition, time and resources constraints are also important consideration. Table 2 shows a summary of all case study companies which consist of three car manufacturers and one original equipment manufacturer (OEM).

Table 2: The overview of the studied companies

| Characteristics                        | AISB          | PONSB          | TMMIN           | ADM             |
|----------------------------------------|---------------|----------------|-----------------|-----------------|
| Ownership                              | Malaysian     | Malaysian      | Indonesian and Japanese | Indonesian and Japanese |
| Product                                | Exhaust system| Passenger car  | Passenger car   | Passenger car (5/7 seats MPV and SUV) |
| Main production facility               | Computerized manufacturing facility | Integrated manufacturing facility | Integrated manufacturing facility | Flexible assembly line (semi-automatic and partially robotic) |
| Type of foreign cooperation (main country) | Original equipment manufacturer (Malaysia) | Product (automobile manufacturer, Malaysia) | Product co-manufacturer (Japan) | Product co-manufacturer (Japan) |
| Major market                           | Local and Foreign (ASEAN, China, India and subcontinent, Middle East-North Africa, UK & Western Europe, Australia and South Africa) | Local and Foreign (Asia Pacific, East Timor, Venezuela, Brazil, Pakistan, South Africa, Argentina) | Local and Foreign (South East Asia, Japan, Middle East, General Africa, South Africa, Mexico and Venezuela) |
| Yearly production                      | 200,000 units (Shah Alam) and 150,000 units (Tanjung Malim) | 100,000 units | 270,000 units |
| Number of employees                    | 488           | 11,500         | 5,271           | 7,000           |
3. QE Implementation at Selected Companies: Case Study Results
This section describes the QE practices at case study companies based on the interview and direct observation of the researcher. The results are used to evaluate the current implementation of QE in Malaysia and Indonesia automotive industries and to determine the uniqueness amongst the case study companies.

The findings show that top and middle management in all four companies have a high level of commitment to quality improvement efforts in their respective companies. All of them have a clear vision and mission in achieving customer satisfaction and they always put customer satisfaction both internal and external customers in every process and adopted the Toyota way principles in improving quality and productivity. Some initiatives implemented include just in time, building in quality, and every day Kaizen. They believed that the Toyota way philosophies are relevant to their businesses and when practiced can improve the effectiveness of their QE implementation.

However, it was observed that those companies with shares dominated by the Japanese such as TMMIN and ADM, applied Toyota Way culture more when compared to the other two case study companies. Both companies believe that the right process will produce the right result. Everyone in the company continues to identify the root causes and prevent similar problems do not occur. This is the focus of continuous learning system at both companies. The evidence is there are many QCC in companies that actively conduct continuous improvement (every day Kaizen) in the company and participated in various competitions held within the company itself and held in the Astra group.
In AISB, as the largest OEM in Malaysia believe that by adopting the Toyota Way culture at the company targets can be achieved. While PONSB formerly worked with Mitsubishi, Japan, adopted the principles taught by MMC. PONSB is attempting to develop their production system called Proton production system by adopting the Toyota production system (TPS). However, there is not much effort yet in PONSB to fully adopt Toyota way philosophies in a formal manner throughout the organizations.

With the implementation of every day Kaizen, all the companies are trying to become learning organizations. Top and middle management always encourages low level management (team member) to solve problems related to Quality (Q), Cost (C), Delivery (D), Safety (S), and Morale (M). In addition, with the QCC, all companies encourage their employees to solve the problems in their workplace by team work approach. All the companies are also continuously teaching employees on how to work together as a team to achieve company’s quality goals.

In problem solving associated with QCDSM, the companies are implementing systematic approach known as PDCA cycle and feedback system. All companies also apply genchi genbutsu i.e. solve the problem by looking directly what is actually happening in the workplace (shop floor). For TMMIN and ADM, genchi genbutsu is routinely performed by top management; even the vice president participates in giving OTJ training to team members. Top management at TMMIN and ADM do not believe in only looking at the report on shop floor problems given by subordinates, but they directly observe the problems and together seek the root causes. In PONSB, genchi genbutsu activities are less routinely performed by top management. Genchi genbutsu are more often performed by middle management who then report to top management about problems that occur on the shop floor associated with QCDSM.

In TMMIN and ADM, product planning and design stages are the responsibility of TMC and DMC, Japan, respectively as the mother companies. Sometimes product engineers from TMMIN and ADM are also included in new product development process. In PONSB, new product development process conducted by the directorate of product planning and development. In AISB as an OEM manufacturer
receive technical drawing of product from car manufacturer such as PONSB, Toyota and Perodua. At times, AISB are also asked to propose its own design with the help of technical assistance from outside parties designated by the car manufacturer.

In the product design and planning stages, Malaysia automotive industries have applied more tools and techniques compared to Indonesia automotive industries. As for the tools and techniques used in process design stage, both Malaysia and Indonesia automotive industries are implementing similar tools and techniques. However, Indonesia automotive industries implement many tools and techniques in production quality control including 7 basic tools; 7 new tools, process capability studies, and Just in time.

The manufacturing processes are well documented in the form of standard operating procedure (SOP) in all companies and are periodically reviewed. Changes on the process are made based on the result of process evaluation and their employees are actively involved in process change implementation. All companies used the concept of defects investigation. TPM is implemented for production maintenance and all the companies have a quality department that continues to monitor quality performance. This department has autonomy regarding quality in all companies.

For introducing and using the tools and techniques, training is provided starting from top management right down to the lower management in all the companies studied, through OTJ training, knowledge of the tools and techniques are transferred to their subordinates. However for fundamental skills, training is provided directly to the team members in all companies, especially training about tools and techniques used for quality problem solving. TMMIN, ADM, and PONSB are certified ISO 9001 companies, whereas AISB is certified by ISO/TS 16949. All companies conduct quality measurement, supplier quality level monitoring, and benchmarking with other company. TMMIN, ADM, and PONSB also work in partnership and long term relationships with their suppliers to develop supplier capabilities. The three companies provide assistance to improve the quality and responsiveness of suppliers including advice; dispatched engineers to suppliers; financial assistance; etc. Cross case comparisons among the four companies are shown in Table 3.

4. Discussions
According to the case study results, both Indonesia and Malaysia automotive industries use TPS. The culture adopted from the mother company has a direct influence on the culture of the Indonesia automotive industry in such a way that middle and top managers are ready and willing to launch a cultural shift. This culture continues to support the success of sustainable quality improvement. As for the Malaysian automotive industries, they are local companies and have also adopted the Toyota Way culture but its implementation has not been that effective.

In achieving successful implementation of QE the automotive industry must take into consideration two important factors. They are management responsibility and people management. Indonesia automotive industry is highly influenced by Japanese culture showed that the top and middle managers in both studied companies in Indonesia encourage teams to conduct Kaizen in the workplace. QCC is also actively promoted for continuous quality improvement. It can be seen that the Indonesia automotive industries have a clear direction in their philosophy and production system i.e. Toyota way philosophy and TPS.

However, due to strong influence from the mother company, the case companies in Indonesia have no full authority in relation to their production systems such as in the case of new product development process. They only participate in a minor portion or perhaps to a less significant number of components in a unit of the car. Since the Indonesia automotive industries are less involved in the product design stage, it resulted in a lack of understanding and implementation of employee-related
tools and techniques used in this phase. In the case of process design and planning, they are given full authority by the mother company, although under supervision and assistance from the mother company.

In relation to individual creativity and innovation, team members in Indonesia automotive industries have high creativity and innovation through QCC. Team members are given full authority to stop line production if they find any quality problems and then work as a team in solving quality problem. Communication to improve quality also exists between top and middle managers and team members. Even the Vice president also participates and performs gemba Kaizen and provides OTJ training.

In the case of Malaysia, the findings indicate that both the companies have also adopted the philosophy of the Toyota Way and TPS. However, the Kaizen initiative has not been effectively implemented in both companies. This is evident from the lack of active role of the QCC in continuous quality improvement. Team members are not encouraged to solve problems in teamwork approach. The lack of number in QCC resulted in lower individual creativity and innovation in both companies. In addition, top management is not encouraging individual development in relation to continuous quality improvement. At the same time, top management does not give full authority to team in making decisions relating to quality related problems. Team members must first report to middle management if they find problems, then middle management report to top management. Top management is less active in conducting direct observations in shop floor and provides OTJ training. Direct observation activities are only done by middle management. Top management is only waiting for a report from middle management.
Table 3. Cross case comparison of QE practices

| Evidence |
|----------|
| 1. Management responsibility |
| Strategic quality planning (SQP) communicated throughout the company | Yes | Yes | Yes | Yes |
| SQP always evaluated regularly by leaders | Yes | Yes | Yes | Yes |
| Company has vision and mission related to quality improvement | Yes | Yes | Yes | Yes |
| Company implements Toyota way principles and adopt TPS | Yes | Yes | Yes | Yes |
| Support the belief “built in quality” | Yes | Yes | Yes | Yes |
| Apply quality gate to support “built in quality” belief | Yes | Yes | Yes | Yes |
| Each division has clear and measurable KPI | Yes | Yes | Yes | Yes |
| Develop PDCA cycle and feedback system | Yes | Yes | Yes | Yes |
| Leaders conduct direct observation to shop floor and actively involve in problem solving | Yes | Yes | Yes | Sometimes |
| Leaders committed to continuous quality improvement as ultimate goal | Yes | Yes | Yes | Yes |
| Leaders support long term quality improvement process | Yes | Yes | Yes | Yes |
| Leaders always communicate and dialogue with team members | Yes | Yes | Yes | Sometimes |
| Leaders committed in providing resources and guidance as well as improving working conditions | Yes | Yes | Yes | Yes |
| Leaders always encourage individual development and continuous improvement through involvement | Yes | Yes | Yes | Sometimes |
| Leaders take responsibility for quality performance by giving guideline through OTJ training | Yes | Yes | Yes | Sometimes |
| 2. Resource management |
| Technology development support by leaders | Yes | Yes | Yes | Yes |
| The current technology meet customer demand | Yes | Yes | Yes | Yes |
| Funding was allocated for quality improvement efforts | Yes | Yes | Yes | Yes |
| Financial performance was evaluated periodically | Yes | Yes | Yes | Yes |
| Availability of information and communication for company system improvement | Yes | Yes | Yes | Yes |
| The current information system can supply the needs of both internal and external company | Yes | Yes | Yes | Yes |
| 3. People management |
| Foster a culture that enhances continuous improvement (Kaizen) through individual creativity and team work | Yes | Yes | Yes | Not effective |
| Implement QCC program | Yes | Yes | Yes | Not effective |
| Activity                                                                 | Yes | Yes | Yes | Sometimes | Not effective | Yes | Yes | Yes | Slight difference |
|-------------------------------------------------------------------------|-----|-----|-----|-----------|---------------|-----|-----|-----|------------------|
| Encourage team member to make decisions relating to their work for quality improvement through QCC |     |     |     |           |               |     |     |     |                  |
| Implement suggestion and feedback systems                                |     |     |     |           |               |     |     |     |                  |
| Implement learning by doing fashion (OTJ development)                    |     |     |     |           |               |     |     |     |                  |
| Company provides resources for employees’ training                        |     |     |     |           |               |     |     |     |                  |
| Company provides employee with training and education to increase their capabilities and skill |     |     |     |           |               |     |     |     |                  |
| Team members have the authority to take direct action or to stop line production if they find any problem |     |     |     |           |               |     |     |     |                  |
| No differences in “status” between leaders and team members               |     |     |     |           |               |     |     |     |                  |
| Company has management training system                                   |     |     |     |           |               |     |     |     |                  |
| Problem solving approach applied to solve quality problems                |     |     |     |           |               |     |     |     |                  |
| Every job is structured to support the work team approach through standardized work |     |     |     |           |               |     |     |     |                  |
| Team members involve in the formulation of policy and company strategy    |     |     |     |           |               |     |     |     |                  |
| **4. Quality in design and process**                                      |     |     |     |           |               |     |     |     |                  |
| Company used the concept of finding the defects                           |     |     |     |           |               |     |     |     |                  |
| Company systematically manage its processes                               |     |     |     |           |               |     |     |     |                  |
| Company implements total productive maintenance                            |     |     |     |           |               |     |     |     |                  |
| Company conducts product design                                           |     |     |     |           |               |     |     |     |                  |
| Coordination among affected department in the product development process |     |     |     |           |               |     |     |     |                  |
| Company implements process change                                         |     |     |     |           |               |     |     |     |                  |
| Team members are actively involved in process change implementation        |     |     |     |           |               |     |     |     |                  |
| Results from process evaluation are used to make changes about the process |     |     |     |           |               |     |     |     |                  |
| Company has well documented SOP for the entire process                    |     |     |     |           |               |     |     |     |                  |
| Quality department has an autonomy regarding quality in company            |     |     |     |           |               |     |     |     |                  |
| Quality department served as the coordinator and representative of leaders in running the rule of quality |     |     |     |           |               |     |     |     |                  |
| Use quality tools and techniques to improve quality                       |     |     |     |           |               |     |     |     |                  |
| **5. Measurement, analysis, and feedback**                                |     |     |     |           |               |     |     |     |                  |
| Company conducts quality measurement, supplier quality level monitoring, and benchmarking |     |     |     |           |               |     |     |     |                  |
| Company assesses internal and external quality issues                     |     |     |     |           |               |     |     |     |                  |
| Quality data is available for team members and leaders                    |     |     |     |           |               |     |     |     |                  |
Quality data is used to manage quality and to evaluate supervisor and managerial performance | Yes | Yes | Yes | Yes
---|---|---|---|---
Top-down and bottom-up communication is conducted between management and team member in improving quality | Yes | Yes | Yes | Yes
Company provides the reward to ideas and suggestions for quality improvement | Yes | Yes | Yes | Yes
Company certified ISO 9001 quality management system and/or ISO/TS 16949 | Yes | Yes | Yes | Yes

### 6. Supplier management

| Item                                                                 | Yes | Yes | Yes | Yes |
|----------------------------------------------------------------------|-----|-----|-----|-----|
| Company has built up strong and close relationships with supplier    |     |     |     |     |
| Company works in partnership with suppliers                          |     |     |     |     |
| Company provides technical assistance to improve the quality and responsiveness of suppliers |     |     |     |     |
| Supplier involves in the design process and in the product development process | Sometimes | Sometimes | No | Sometimes |
| Company provides clarity of specifications to suppliers              | Yes | Yes | Yes | Yes |
| Supplier receives assistance in terms of financial assistance        | Yes | Yes | Not available | Yes |

### 7. Customer focus

| Item                                                                 | Yes | Yes | Yes | Yes |
|----------------------------------------------------------------------|-----|-----|-----|-----|
| Customer involvement is helpful in the product design                |     |     |     |     |
| Company conducts analysis and review of customer information         | Yes | Yes | Yes | Yes |
| Customer works as “partner” throughout the new product development process | Yes | Yes | Yes | Yes |
| Need to get final design approval from the customer                  | Sometimes | Sometimes | Yes | Sometimes |
| Use JD Power Initial Quality Study to collect customer information    | Yes | Yes | NA | Yes |
| Quality of technical material and Quality Jiritsuka/independent      |     |     |     |     |
| Company conducts standardization of quality standards and develops QC management | Yes | Yes | NA | Yes |
Case study results indicate that the study is in line with research conducted by Fauzi et al. [15]. They conducted a comparative study to investigate the application of quality between Japanese and non-Japanese electronic and electrical companies. The results show that the QCC is more widely adopted in Japanese firms compared to non-Japanese companies. QCC is used at every level of an organization that involves people. QCC is an effective activity to improve quality. Fauzi et al., (2007) also proves that the QCC is one of the activities undertaken by Japanese firms compared to non-Japanese companies.

The results of this research also reinforce the study by Ebrahimpour and Withers [16]. They also conducted a comparative study between Japanese and non-Japanese companies. The results showed that employees at Japanese companies have work participation and high responsibility towards the quality compared to non-Japanese companies. They also stated that the involvement of production employees of non-Japanese companies in quality control efforts is very low compared with Japanese companies. Every employee in Japanese companies do their own maintenance on their equipment on a daily basis, while non-Japanese companies do not perform their own maintenance on their equipment in which maintenance activities are only submitted to the maintenance department.

Therefore, both the companies studied in Malaysia are largest local OEM and largest local car manufacturer in Malaysia, so it is profitable for them to have full authority in all stages of their production systems. Use of tools and techniques in every stage of QE at Malaysia automotive industry is also more diverse than the Indonesia automotive industry. Malaysia automotive industries have conducted their own new product development process. It can be concluded that the Malaysia automotive industry is more independent than Indonesia automotive industry. Malaysia automotive industry is not a shadow of the mother company as in the case of Indonesia automotive industry.

Top management in Indonesia automotive companies always encourage their employees to participate in the QCC and provide financial and non-financial rewards to employees. While top management in Malaysia automotive industries provide less encouragement to their employees to participate in QCC. They do provide financial reward to its employees for suggestions proposed by the employee. There is a more active contribution from team members on the activities and conventions between the QCC in Indonesia than the companies studied in Malaysia. Results from case studies also indicate that Indonesian companies are better on several critical factors such as the support and commitment from top management, a high response from employees and behaviours of team members in continuous improvement. Therefore it can be said that the QCC provides a positive impact on increasing employee involvement in continuous quality improvement.

5. Conclusions and Further Research Directions
This paper has described and discussed the QE practices in two automotive industries in Malaysia and Indonesia in relation to the nine factors for successful implementation of QE. An overview of the case companies is first described followed by further descriptions of individual companies. QE practices in each case companies were then explained followed by cross case analysis through comparison of current practice in each company. Cross case comparisons include nine critical factors for successful of QE implementation i.e. management responsibility; resource management; people management; quality in design and process; measurement, analysis, and feedback; supplier management; customer focus; quality of technical material; and quality jiritsuka/independent. Finally, the overview of QE practices from both countries are discussed and presented.

Based on case studies, recommendations were made on both countries as an improvement plan to achieve a successful application of QE. They include 1) Employee involvement in QCC must continue to be built and applied. Top management should always encourage employees to engage in quality improvement activities, such as QCC and direct observation at the source of the problem. At the end, it
will head towards a sustainable quality improvement; 2) Top and middle management actively build a culture of continuous quality improvement by gradually changing the behaviour of employees to constantly alert the quality of processes and products; 3) Both countries always conduct a survey of customer and employee satisfactions to obtain feedback from customers and employees; 4) Both countries should continuously develop strong relationships and partnerships with suppliers and provide assistance for improving suppliers’ quality and embed continuous quality improvement culture to suppliers.

Finally, the sample used in this study only represents the automotive industry in Malaysia and Indonesia. One way to strengthen this research is to repeat the same methodology in other countries in the ASEAN region such as Thailand, Philippines, or even other countries in the world. Thus, it is expected to obtain new insights about the critical factors for achieving success in the automotive industry QE. Future research should replicate the study using the instrument that was developed and possibly look into conducting a longitudinal study. However, it is hoped that this work has contributed to the comparative analysis of quality implementation between countries and will have useful application in the near future.

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