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A study of quality management practices in TQM and non-TQM firms

Findings from the ASEAN automotive industry

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Abstract

Purpose – The primary objective of this research is to explore whether total quality management (TQM) firms execute various quality management practices significantly differently from non-TQM firms in the Association of South East Asian Nations (ASEAN) automotive supply chain. The study also aims to analyze differences between different tiers of this supply chain and to examine the relationship between the implementation of quality management systems and adoption of TQM.

Design/methodology/approach – A total of 165 datasets collected from ASEAN automotive Original Equipment Manufacturers (OEMs) and their tier 1 and 2 suppliers in five ASEAN countries were tested by using cross-tabulation analysis and ANOVA with *post hoc* test.

Findings – The results show that firms that have successfully implemented the concept of work standardization or process-approach through quality management systems (QMS) certification have tended to pursue TQM as the subsequent stage in their quality journey. In addition, the study found that all seven TQM practices – leadership; strategy and planning; customer focus; information and analysis; people management; process management; and supplier involvement – were significantly higher in TQM firms than in non-TQM firms. Finally, the study found that tier 3 suppliers were less likely to implement TQM practices compared with higher tiers (1 and 2), except in supplier involvement.

Originality/value – The study presents an insight into TQM constructs evolution in the ASEAN region, which has gained increased prominence and world impact as a result of international outsourcing. It therefore addresses a significant gap in the literature about how quality management is deployed in this important region of the world.

Keywords Automotive industry, Quality management, Total quality management, ISO 9000 series, Organizational restructuring, South East Asia

Paper type Research paper

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Introduction

This study presents findings on the current state of Total Quality Management (TQM) in the automotive sector in the Association of South East Asia Nations (ASEAN) region. The necessity to maintain competitiveness has led to many firms outsourcing manufacturing abroad to take advantage of lower labor costs, proximity to raw materials, and new markets (Phusavat and Kanchana, 2008). Besides China and India, the ASEAN region has been an important beneficiary of this trend. This has led to the region being recognized as one of the most dynamic economic regions in the world and the one with the most potential for growth and development (Karki *et al.*, 2005). The ASEAN was established in 1967 in Bangkok to accelerate economic growth, social progress and cultural development, and to promote peace and stability in the region. The ten members of ASEAN are Indonesia, Malaysia, Philippines, Singapore, Thailand, Brunei, Lao PDR, Myanmar, Cambodia, and Vietnam. It is important to note that the ASEAN region had a combined gross domestic product in excess of US$1,281 billion in 2007, and a total trade of about US$1,405 billion in 2006.

According to a study by Ferdows (1997), firms that outsource manufacturing aim to provide high quality products at comparatively low prices. This factor combined with increased consumer awareness of quality has forced manufacturers in emerging economy countries to place more emphasis on developing technological capabilities, establishing supply networks, and enhancing quality management systems (Lee and Zhou, 2000). Quality management has long been recognized as a source of competitive advantage and one of the most important drivers of global competition (Prajogo and Sohal, 2003). Quality therefore, is critical if manufacturers are to achieve world class manufacturing and it has been identified as a crucial factor for sustainable development of ASEAN manufacturers (Phusavat and Kanchana, 2008). However, Huang and Lin (2002) found that eastern countries, except Japan, lagged almost a decade behind western countries in implementing quality management.

The positioning of manufacturers in the ASEAN region as suppliers to firms and, ultimately, consumers worldwide implies that their quality management practices have worldwide impact. It is crucial to understand the development of quality in this very important region of the world. Furthermore, it has been suggested that quality management practices may not easily be transferred from one culture to another (Young and Wilkinson, 2001). There is agreement among several researchers that while there is a lot of literature in international journals examining quality practices in UK, USA, Japan, and Western Europe, only a few have examined quality practices in developing countries and, in particular, ASEAN countries (Young and Wilkinson, 2001; Arumugam *et al.*, 2008).

Hence, this study based on the ASEAN automobile manufacturing sector investigates differences among tier suppliers in terms of implementing quality management practices. In addition, the study also examines differences between organizations that have formally implemented a TQM program and those that have not done so. Therefore, it contributes to a growing body of research into differences between TQM and non-TQM organizations by presenting an ASEAN perspective comprising multi-tier organizations in the automobile industry. Such a study has not been the subject of other published TQM versus non-TQM research including studies by Ahire *et al.* (1996), Adebanjo and Kehoe (1999) and Lee and Zhou (2000).

The following section reviews the literature. Subsequent section presents the research methodology including the survey instrument development, respondents'

characteristics, and reliability and validity of the survey instrument. It is followed by research finding from statistical analysis. The managerial implications and conclusions are described in the last section.

Literature review

The literature presented in this section examines the concept of TQM implementation as a facilitator of organizational innovation. An analysis and comparison of literature on TQM implementation in firms from different perspectives (i.e. national-level, regional-level, and global-level) are summarized. Then, a review of literature on the relationship between TQM and international standards for quality management systems (QMS) is discussed.

TQM: an organizational innovation/intervention

Previous studies suggested that TQM was conceptualized as an organizational innovation or organizational development intervention that leads firms to achieve sustainable competitive advantages (Ravichandran, 2000; Ahire and Ravichandran, 2001, Arumugam *et al.*, 2009). In order to adopt this intervention, Ahire and Ravichandran (2001) proposed a four-stage innovation diffusion framework consisting of adoption, adaptation, acceptance, and use stages. Given that innovation or intervention includes technical innovation and administrative innovation, Ravichandran (2000) stated that TQM should be viewed as an administrative innovation as it comprised of a set of practices oriented toward the development of a quality-focused organizational system. Recently, Santos-Vijande and Alvarez-Gonzalez's (2007) study emphasized that TQM is an appropriate resource to promote organizational innovation and to increase firm's competitiveness.

TQM implementation

TQM has been recognized as one of the sources of a firms' competitive advantage. Prabhu *et al.* (2000), Prajogo and Sohal (2003) and Sousa and Voss (2002) provided summaries of literature on TQM practices and firm performances. Although TQM has been implemented in organizations in all parts of the world, the literature does not provide a breakdown of TQM implementation in a regional context.

Table I provides a summary of studies conducted in emerging economy countries including China, Hong Kong, Malaysia, Taiwan, Thailand, Turkey, and Vietnam. Recent literature on emerging economy countries such as China, Malaysia, and Taiwan has focused on reporting the current status and issues of implementing TQM in their countries (Huang and Lin, 2002; Lau *et al.*, 2004; Arumugam *et al.*, 2009). These studies suggest that TQM firms in emerging economy countries demonstrated higher level of customer focus, process management, leadership, strategic planning, and human resource development than non-TQM firms. However, recent studies do not examine the same issues for industrialized countries. This may be because industrialized countries that have introduced TQM for a longer period of time may have reached maturity level of TQM implementation – the "use" (stage 4) in the innovation diffusion framework for TQM implementation proposed by Ahire and Ravichandran (2001).

However, the relationship between TQM implementation and QMS deployment has been the subject of research in both emerging economy and industrialized countries (Prabhu *et al.*, 2000; Rahman, 2001; Martinez-Lorente and Martinez-Costa, 2004; Arumugam *et al.*, 2008). Furthermore, other studies have attempted to identify the

Table I.
Summary of literature review on TQM practices and their implementation

National studies		Regional and global studies	
Emerging economy countries		*Regional*	
China	Lee and Zhou (2000); Lau *et al.* (2004)	Australia-New Zealand	M. Terziovski *et al.* (1997); Samson and Terziovski (1999)
Hong Kong	Liu and Kleiner (2001)	North America	Parast *et al.* (2006); Ahire and Ravichandran (2001)
Malaysia	Rahman and Tannock (2005); Arumugam *et al.* (2008); Arumugam *et al.* (2009)	*Global*	Raghunathan *et al.* (1997); Liu and Kleiner (2001); Rungtusanatham *et al.* (2005)
Taiwan	Huang and Lin (2002)		
Thailand	Krasachol *et al.* (1998), Nagswasdi and O'Brien (1999), Das *et al.* (2006)		
Turkey	Bayazit and Karpak (2007)		
Vietnam	Hoang *et al.* (2006)		

Note: Countries' names are alphabetically sorted

impact of TQM implementation on firms' performances in both developed (Ahire *et al.*, 1996; Prabhu *et al.*, 2000; Prajogo and Sohal, 2003), and emerging economy countries (Das *et al.*, 2006; Arumugam *et al.*, 2008). The majority of these studies concluded that TQM positively impacts firm performances depending on the degree of implementation.

Besides the national-level studies, many studies have focused on the impact of quality management implementation in different regions, such as Australia-New Zealand (Terziovski *et al.*, 1997; Samson and Terziovski, 1999), US-Mexico (Parast *et al.*, 2006), and US-Canada (Ahire and Ravichandran, 2001). Comparative studies between firms with and without TQM implementation, with regard to certain aspects of quality management strategies in American and Japanese firms in the United States can be found in various studies (Ebrahimpour and Withers, 1992; Schroeder *et al.*, 1992). However, the results from these studies cannot be taken to apply globally. Quality management practices in an international context were compared (Raghunathan *et al.*, 1997; Parast *et al.*, 2006) and the findings reported statistically significant differences in certain practices in different parts of the world. It is therefore important to understand the specific issues that relate to different regions and cultures. From Table I, we believe that more research is required on TQM implementation in Asia on a regional basis in line with the earlier findings by Young and Wilkinson (2001) and Arumugam *et al.* (2008).

TQM and international standards for quality management systems

The ISO 9000 (International Organization for Standardization) series of international standards were first introduced in 1987 with the objective of standardizing quality management systems. A number of studies have been conducted to examine the relationship between TQM implementation and Quality Management Systems (QMS). A common argument of many of these studies is that ISO 9001 series should be the first step and then sequentially followed by TQM implementation (Gotzamani and Tsiotras, 2001; Magd and Curry, 2003). TQM and ISO 9001 have some common elements such as process management, information and analysis, and the use of statistical tools (Lee *et al.*, 1999). Therefore, as the firms are certified to ISO 9001, some elements on the way

to TQM are also achieved (Martinez-Lorente and Martinez-Costa, 2004). Moreover, consistency and stability of the organization's work are first introduced by ISO 9001 certification, then TQM implementation is pursued later to increase operational efficiency and organizational performance (Magd and Curry, 2003). Companies that start with adopting ISO 9001 and continue with TQM achieved significantly higher performance levels (Prabhu *et al.*, 2000).

Sun (2000) argued that ISO 9001 certification and TQM should be systematically implemented together since integrated implementation would make the quality system become more effective. However, other studies present a contradictory viewpoint. Martinez-Lorente and Martinez-Costa (2004) wrote that simultaneously implementing ISO 9001 and TQM philosophy provided less benefit to the companies than when applied separately. Other studies suggested that there are philosophical and focal differences between TQM implementation and ISO 9001 including emphasis placed on continual improvement, customer focus, and workforce development and participation (Lee and Zhou, 2000; Gotzamani and Tsiotras, 2001). Some elements of ISO 9001 are opposite to TQM philosophy, such as excessive bureaucracy and lack of flexibility, which can prohibit firms from pursuing continual improvement. Terziovski *et al.* (1997) compared the joint effects of TQM and ISO 9001 and concluded that TQM implementation leads to better results than ISO 9001 certification while Martinez-Lorente and Martinez-Costa (2004) suggested that firms should implement TQM but not ISO 9001. Rahman (2001) found no relationship between ISO 9001 certification and TQM implementation in small and medium enterprises (SMEs) in Australia. In addition Taylor and Wright (2003) also reported that there was no significant effect on TQM outcomes from ISO 9000 series certification in UK firms. In view of the lack of consensus about the relationship between TQM and ISO 9001 certification, it is important from a regional developmental perspective, to understand the context in which organizations in the ASEAN region have managed the implementation of both.

After reviewing literature on TQM implementation presented earlier, three research questions were established and examined:

RQ1. Do ASEAN OEM firms that have been implementing the international standard of quality management system (QMS) such as ISO 9001:2000 and ISO/TS 16949:2002 tend to adopt TQM?

RQ2. Is there any significant difference between TQM and non-TQM firms in terms of embedding the strategic change of TQM practices?

RQ3. Is there any significant difference among tiered automotive suppliers in implementing TQM practices?

ASEAN automotive industry: structure and policy

Recognizing the opportunities for competitive vehicle and automotive component production and exports, ASEAN is committed to the development of an ASEAN automotive industry integrated with the global automotive industry. The automotive sector is a priority sector under the "ASEAN Framework Agreement for the Integration of Priority Sectors 2015", and specific policies are set out in the "Roadmap for Integration of the Automotive Products Sector" (Karki *et al.*, 2005).

According to McLean *et al.* (2008), it is important to note that the growth of an ASEAN vehicle and automotive component market is attracting additional foreign investment in component, system and module production. Some international OEM assemblers and component suppliers are also seeking cooperation and collaboration, through joint ventures and alliances, with established local firms or suppliers. These changes are creating substantial opportunities for existing ASEAN parts and component firms and vehicle producers to expand their production and exports, particularly through global supply chains. In order to capture this opportunity, ASEAN automotive suppliers need to improve their operational capabilities. Hence, adoption and adaptation of organizational innovation including lean production, supply chain management, and TQM are important for local suppliers to move from economy of scale to economy of scope production strategy.

In the global context, automakers' strategies are a major factor in shaping the development of the automotive sector in an economy, but automakers' response to national and regional policies will be strongly influenced by each automaker's global strategy. Many international assemblers – especially American and Japanese automakers – set high entry requirements for their suppliers. This includes all basic competitive priorities (order-qualifiers) of cost, product quality, delivery, safety, and manufacturing flexibility. These requirements cascade through the supply chain, raising the benchmark for all suppliers. The global automakers expect their tier 1 suppliers to participate actively in the improvement of operational capability as well as the design of new automotive technology, systems and modules. They also expect the higher tier suppliers to transfer all adopted improvement activities (TQM, lean production, logistics and supply chain management, "*kaizen*") to the lower tiers efficiently and effectively.

Research methodology

Survey instrument and data collection

Based on the literature review addressed in the previous section, measures of TQM constructs were determined by using the Malcolm Baldrige National Quality Award (MBNQA) model. The main reason is that this model has been used in the study of industrialized countries including Australia, New Zealand, USA, and UK. The final version of survey instrument was modified from the study of Prajogo and Sohal (2003). However, a new construct of suppliers' relationship (Chen and Paulraj, 2004) was added because suppliers' relationship/involvement is important in the automotive industry. Consequently, the survey instrument consisted of 30 items that were classified into seven constructs: leadership; strategy and planning; customer focus; information and analysis; people management; process management; and supplier relationship.

Two academics and four practitioners from the ASEAN automotive industry helped to modify the survey instrument for this study. Some questions were modified from the previous study because they were not clearly explained. In addition, the original questionnaire was designed to survey a multitude of industries in industrialized countries, whereas this study targeted specifically the ASEAN automotive industry. A five-point Likert scale was used to ask respondents to indicate the implementation status of each TQM practice (items) ranging from 1 = strongly disagree to 5 = strongly agree. Two dummy questions were also inserted into the final version in order to ensure better reliability of returned questionnaires.

As a part of Enhancing ASEAN Automotive Capabilities Project 2007-2008, the research team asked the ASEAN Secretariat to invite senior operations managers in the automotive industry and OEM suppliers to attend a series of one-day executive workshops in the five countries (Indonesia, Malaysia, Philippines, Vietnam, and Thailand). These five countries were considered to be the major hub of ASEAN automobile industry by the ASEAN secretariat. The survey questionnaire was administered to participants in the workshops. Out of 180 returned survey questionnaires, 15 responses were unusable due to contradiction of the answers to the "dummy questions". This meant that the final sample was 165 completed usable surveys. The overall response rate is 51.2 percent.

Respondents' profile

Table II shows the respondents' characteristics. Approximately one-third (34.6 percent) of our respondents came from Vietnam, whereas Indonesia contributed less than ten percent of the sample. The relatively low numbers from Indonesia was because many potential participants could not attend the workshops due to distance from Jakarta. The automotive-tiered suppliers can be classified into:

(1) *Tier 1*: In Toyota Japan, this means tied or co-owned suppliers of major components or vehicles. In other industrial countries, they provide parts, modules, systems and components directly to the assemblers.

(2) *Tier 2*: Provide sub-assemblies and parts to Tier 1.

(3) *Tier 3*: Provide transformed raw material such as aluminum tubing, electronics, and steel.

According to Table II, the majority of the respondents (67.3 percent) are Tier 1 OEM suppliers that supply directly to the automotive manufacturers (assemblers). Approximately 25 percent are Tier 2 OEM suppliers. Slightly more than one-half (51.5 percent) of the responding firms employ more than 200 employees and could be defined as large firms (Bank of Thailand, 2000). Of the responding firms, 70 percent have experience in implementing QMS by gaining international certifications, such as the ISO 9001:2000 series and/or ISOTS16949:2002 (ISOTS-16949:2002 is a technical specification of quality system requirements for the design/development, production, installation and servicing of automotive-related products. It includes the ISO 9001:2000 requirements.). Approximately 48 percent of responding firms have been implementing TQM whereas approximately 16 percent of responding firms had no such programs other than "Corrective and Preventive Action". The relatively low adoption of TQM could indicate that some ASEAN automotive-tiered suppliers still consider it as an organizational innovation and beyond their capabilities.

Reliability and validity of the survey instrument

To test the research questions as described earlier, this study-collected data from a single respondent from each target firm. Financial constraints prohibited cross-validating survey data using multiple respondents from each firm. Hence, to minimize random measurement error, only senior managers in operations functions (i.e. production planning and control, engineering, and quality assurance department) were invited to participate in a one-day workshop sponsored by AusAID (Australian Foreign Aid), the ASEAN Secretariat, respective ASEAN Automotive Federations and

Characteristics of respondents ($n = 165$)	Response rate	Frequency	Percent
Country			
Vietnam	57/85 = 67.1%	57	34.6
Thailand	45/120 = 37.5%	45	27.3
Philippines	37/50 = 74.0%	37	22.4
Malaysia	18/42 = 42.9%	18	10.9
Indonesia	8/25 = 32.0%	8	4.8
Position in the supply chain			
Tier 1 Supplier		111	67.3
Tier 2 Supplier		42	25.4
Tier 3 Supplier		11	6.7
Number of employees			
200 or more		85	51.5
Fewer than 200		67	40.6
Quality management system certification (ISO 9001:2000 and ISO TS-16949:2002)			
Yes		116	70.3
No		39	23.6
Total quality management (TQM) program implementation			
Yes		79	47.9
No		59	35.8

Table II.
Respondents' characteristics

Supplier institutions in each country. The reason for focusing on this group is the expectation that they are more knowledgeable and familiar with organizational development interventions and innovations (Ahire and Ravichandran, 2001), and particularly, within a formal TQM context. The internal consistency of measures used in this study was verified by considering Cronbach alpha (a value greater than 0.6 is generally deemed acceptable for exploratory study). The composited mean of each TQM construct was generated and tested by calculating Cronbach alpha. The result shows that the reliability coefficients were acceptable ranging from 0.781-0.891.

Research findings

TQM programs versus ISO 9001: 2000 implementation

This study investigated whether ASEAN Automotive OEM supplier firms that have been implementing international standards of QMS such as ISO 9001:2000 and ISOTS 16949 tend to adopt TQM. This study also examined whether there is a significant difference in implementing the identified seven TQM constructs between TQM and non-TQM firms; and level of tier (1-2-3) in the automotive supply chain.

In order to answer the first research question, cross-tabulation analysis was conducted and Pearson Chi-square was generated. The results, presented in Table III, show that among ISO 9001: 2000 and ISO TS16949 certified firms, 65.7 percent have implemented TQM, whereas, for non-ISO 9001 firms, 73.7 percent have not implemented TQM. These results are consistent with other previous studies (Ho, 1999; Rahman, 2001) showing that relatively higher proportion of firms with ISO 9001 also implemented higher TQM categories compared to firms without ISO 9001. However, the Rahman study is with respect to SMEs in Australia. In this study, the implications are:

Cross-tabulation analysis	Quality system certifications ISO cert.	Non-ISO cert.	Total
Non-TQM firms [a]			
Count	37	22	59
% within TQM firms	62.7	37.3	100.0
% within QMS cert.	34.3	73.3	42.8
TQM firms [a]			
Count	71	8	79
% within TQM firms	89.9	10.1	100.0
% within QMS cert.	65.7	26.7	57.2
Total			
Count	108	30	138
% within TQM	78.3	21.7	100.0

Note: [a]Pearson Chi-Square significant level = 0.000

Table III.
TQM program and QMS certification (*RQ1*)

- Firms that adopted ISO 9001:2000 and ISO TS16949:2002 certification, tend to implement TQM as the next step in the quality management journey.
- Non-ISO 9001 certified firms did not adopt TQM. It could be suggested that firms that do not understand QMS, are less likely to comprehend or even envision the need to adopt TQM;
- However, continual improvement is one of the ISO 9001: 2000 and ISO/TS 16949: 2002 requirements. Therefore, firms with ISO 9001 certification can consider some TQM constructs as an effective organization development intervention, but not necessarily the full set of practices within TQM strategies. This implies that to deploy TQM strategies, firms can assess which practices they can adopt from ISO series requirements and adapt to their organizational or business environment, and model to then build a continuous improvement culture (Ahire and Ravichandran, 2001).

TQM practices between TQM and non-TQM firms

As illustrated in Table IV, the results of a *t*-test shows that firms with a TQM program indicated a higher level of TQM practices implementation than non-TQM firms. Supplier involvement and customer focus show the smallest gap between TQM and non-TQM firms (0.268 and 0.286 respectively). For customer focus, this implies that ASEAN tier suppliers, whether or not practicing TQM, have familiarity with and have been able to embed this practice, because of their experiences in dealing with major assemblers in terms of the entry requirements (cost, quality, delivery, safety, and flexibility). Both TQM and non-TQM firms consider this practice as vital to their business strategy.

For supplier involvement, this study showed that there is not much difference between TQM and non-TQM firms, due to the nature of automotive supply chain. The requirements from downstream customers are likely to have led to the realization that the performance of upstream suppliers impacts the overall efficiency of all players in the supply chain. Leadership and people management, on the other hand, show the biggest gap between TQM and non-TQM firms (0.402). The reason for this is that leadership and people management have been shown to be core components of a quality culture

TQM practices	TQM program	n	Mean	SD	t	Sig. (two-tailed)	Mean difference (Gap)	Std error difference
Leadership*	TQM	74	4.130	0.689	2.958	0.004	0.402	0.136
	Non-TQM	55	3.727	0.854				
Strategy and planning process*	TQM	73	4.024	0.736	2.239	0.027	0.339	0.151
	Non-TQM	54	3.685	0.969				
Customer focus*	TQM	74	4.076	0.623	2.252	0.026	0.286	0.127
	Non-TQM	54	3.790	0.811				
Information and analysis*	TQM	74	3.703	0.721	2.213	0.029	0.323	0.146
	Non-TQM	54	3.380	0.930				
People management*	TQM	74	3.747	0.764	2.670	0.009	0.402	0.151
	Non-TQM	53	3.345	0.929				
Process management*	TQM	73	3.816	0.707	2.128	0.035	0.308	0.145
	Non-TQM	53	3.508	0.919				
Suppliers involvement**	TQM	73	3.636	0.663	1.900	0.060	0.268	0.141
	Non-TQM	53	3.368	0.921				

Note: *Significant predictor variable at $\alpha = 0.0$; **Significant predictor variable at $\alpha = 0.10$

Table IV.
TQM practices between TQM and non-TQM firms (t-test) (*RQ2*)

(Adebanjo and Kehoe, 1999). Furthermore, according to Rahman (2001), "soft" TQM (employee commitment, shared vision, and customer focus) was considered as the driver of organizational transformation. Hence, firms adopting TQM are likely to be able to deploy these two practices more efficiently and effectively than non-TQM firms.

TQM practices implementation among tier suppliers

In order to answer the last research question on whether there is a significant difference in implementing TQM practices, among suppliers at different tiers in the automotive supply chain, ANOVA with *post hoc* test (LSD) was conducted. Table V presents this result and shows that for six out of seven TQM practices, differences between tier 1 and tier 2 suppliers were not significant. This study also found that lower tier suppliers in the ASEAN automotive supply chain did indicate significantly lower levels of implementation for TQM practices. People management, and information and analysis showed the biggest gaps between tier 1 and tier 3 (1.242, and 1.201), and tier 2 and tier 3 (1.002, and 0.973) respectively. Only supplier involvement was not significantly different between tier 2 and tier 3.

The key implication here, is that the expectation of automotive OEMs that TQM strategy and practices are cascaded upstream in the supply chain has only been partially successful. The findings from this study suggest that beyond tier 1 and tier 2 suppliers, a widespread adoption of TQM practices is lacking in the ASEAN automotive industry. It is our suggestion that tier 1 and 2 suppliers are within relatively easy view of the OEMs and therefore, have little choice but to adopt the required qualifying practices, which include QMS certification. Tier 3 suppliers, on the other hand, are further away from the OEMs and may not feel the same pressure from either OEMs or tier 1 and 2 suppliers to implement TQM practices as a standard way of working as well as the entry requirements of global automotive manufacturing industry (McLean *et al.*, 2008).

Implications and conclusions

This study has examined TQM in the ASEAN automotive sector. Three research questions were explored by using 165 survey responses obtained from five ASEAN countries in the automotive manufacturing industry. The result shows that firms that have been certified to ISO series standards are significantly more likely to go further and implement TQM program. The differences and similarities in implementation of TQM practices indicated similarities between TQM and non-TQM firms with respect to customer focus and supplier involvement. While a similar effect with respect to customer focus was found in a UK-based study (Adebanjo and Kehoe, 1999), no such similarity was found in respect of supplier involvement. This suggests an increasing realization that customers and suppliers are equally important to all organizations and that organizations, in general, are more aware of their impact on the supply chain. It also suggests that participants in the ASEAN automotive supply chain clearly view having a sustainable relationship with both upstream and downstream partners as being crucial for commercial success, even when they do not intend to implement TQM practices. In addition, the study found that tier 3 suppliers are less likely to implement TQM practices when compared with higher tier firms within the automotive supply chain.

This study has a number of implications for both industry and research. First, for the ASEAN automotive industry, it suggests that beyond tier 1 and 2 suppliers, there may be opportunities for improvement in the supply chain within the context of quality

TQM practices	(I)	ANOVA with *post hoc* test (LSD) (J)	Mean difference (I − J) (Gap)	Std error	Sig.	95% confidence interval Lower bound	Upper bound
Leadership	Tier 1*	Tier 2	0.165	0.150	0.274	−0.132	0.462
		Tier 3*	0.776	0.256	0.003	0.270	1.282
	Tier 2*	Tier 3*	0.611	0.275	0.028	0.067	1.154
Strategy and planning process	Tier 1*	Tier 2*	0.313	0.153	0.042	0.012	0.615
		Tier 3*	0.901	0.272	0.001	0.364	1.437
	Tier 2*	Tier 3*	0.588	0.290	0.044	0.015	1.160
Customer focus	Tier 1*	Tier 2	0.090	0.132	0.495	−0.170	0.350
		Tier 3*	0.703	0.234	0.003	0.240	1.165
	Tier 2*	Tier 3*	0.612	0.250	0.015	0.119	1.106
Information and analysis	Tier 1*	Tier 2	0.228	0.146	0.121	−0.061	0.517
		Tier 3*	1.201	0.260	0.000	0.687	1.715
	Tier 2*	Tier 3*	0.973	0.278	0.001	0.424	1.522
People management	Tier 1*	Tier 2	0.239	0.152	0.118	−0.061	0.540
		Tier 3*	1.242	0.268	0.000	0.712	1.772
	Tier 2*	Tier 3*	1.002	0.287	0.001	0.435	1.570
Process management	Tier 1*	Tier 2	0.106	0.148	0.478	−0.188	0.399
		Tier 3*	0.847	0.277	0.003	0.300	1.394
	Tier 2*	Tier 3*	0.741	0.294	0.013	0.161	1.322
Supplier involvement	Tier 1*	Tier 2	0.131	0.146	0.372	−0.158	0.420
		Tier 3*	0.634	0.273	0.022	0.095	1.173
	Tier 2	Tier 3	0.503	0.290	0.085	−0.070	1.075

Note: *The mean difference is significant at the 0.05 level

Table V.
TQM practices among ASEAN automotive tier suppliers (*RQ3*)

management and its practices. It is important, therefore, that higher-tiered suppliers and OEMs encourage tier 3 and lower suppliers to improve their focus on QMS or TQM constructs as tools of organizational development intervention. In effect, a supply chain view to managing quality should be considered in these countries.

Second, it may be beneficial to encourage the implementation of ISO series standards as the starting point for current non-adopters as these firms are then likely to progress to TQM strategy. Third, firms in the ASEAN automotive industry who have failed to adopt TQM need to be aware of its effects on performance and should not consider relationships with suppliers and customers as sufficient for commercial success. With respect to research implications, this study has shown that less than half of the respondents have implemented a TQM strategy. This diffusion rate is less than would be found in industrialized countries. It is, therefore, important to understand the impact that this level of diffusion has had on product quality and supply chain performance. In addition, research needs to focus on the impact, if any, that TQM practices, or lack of, in this region has had on the attractiveness of the region to OEMs as a destination for future investment or "offshore manufacturing hub".

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