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## Article

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## MANAGEMENT | RESEARCH ARTICLE

# The relationship between TQM and project performance: Empirical evidence from Malaysian construction industry

Cherng-Yee Jong<sup>1</sup>, Adriel K. S. Sim<sup>1\*</sup> and Tek Yew Lew<sup>1</sup>

**Abstract:** Many studies have suggested the adaptation and implementation of Total Quality Management (TQM) is likely to improve an organization's performance. A considerable amount of literature has examined the relationship between TQM and other elements like business performance, organizational performance, and marketing performance in different industries. However, little is known of the influence of TQM in project performance in the context of Malaysian construction organizations. The objective of the study is to examine the relationship between TQM and project performance in Malaysian construction organizations. Data were collected from member list of companies from the Construction Industry Development Board (CIDB) Malaysia. A total of 161 valid responses has been returned for data analysis. The findings revealed that TQM practices were partially correlated with project performance of Malaysian construction organizations. Specifically, operation focus and workforce focus were perceived as dominant TQM practices on project performance. This study contributes to the knowledge on TQM and project performance by providing empirical evidence on their ability to improve Malaysian construction industry. Besides, this study provides further insight for

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### PUBLIC INTEREST STATEMENT

Construction organizations would be interested to examine the critical success factors of project performance to avoid cost overruns, delays in projects' completion and not meeting clients' quality expectations. Hence, this study was conducted to examine the impact of Total Quality Management (TQM) practices (leadership, strategic planning, customer focus, workforce focus, operation focus, and measurement, analysis & knowledge management) on project performance. Data was collected from established Malaysian construction organizations registered with the Construction Industry Development Board. The findings revealed that operation focus and workforce focus impacted project performance. This study provides insights for contractors on the critical TQM success factors of project performance.

industrial practitioners to understand the roles of TQM and its ability in enhancing project performance.

**Subjects:** Construction Business Management; Project Management; Quality Management

**Keywords:** total quality management; project performance; construction industry; TQM practices; quality improvement; business excellence

## 1. Introduction

TQM originated in the manufacturing industry and there is a considerable body of TQM literature that has examined TQM implementation in this industry all over the world. Studies were conducted to investigate TQM in various performance dimensions, including firm performance, operational performance, quality performance, financial and market performance, innovation performance, and customer satisfaction (Ebrahimi & Sadeghi, 2013). In Malaysia, there has been a number of research studies conducted on TQM in manufacturing (Arumugam, Ooi, & Fong, 2008; Rahman & Tannock, 2005; Talib, Rahman, & Qureshi, 2013) and services industries (Ooi, Lin, Tan, & Chong, 2011; Samat, Ramayah, & Mat Saad, 2006). However, research that specifically focuses on TQM and project environments is still lacking (Bryde & Robinson, 2007), especially in Malaysia. Leong has indicated that limited studies have been conducted in the construction industry but one of the areas worth further exploration include, what types of quality practices (i.e. TQM) are recommended for improved project performance.

There have been a few TQM studies conducted in the construction industry. Altayeb and Alhasanat (2014) studied the TQM implementation in the Palestinian construction industry. Meanwhile, Harrington, Voehl, Wiggin, and Sinha (2012) examined the TQM implementation of in the construction industry in general. Bakar, Ali, and Onyeizu (2011) examined the TQM practices in Oman construction companies, while Mir and Pinnington (2014) determined the relationship between project management performance and project success in UAE project-based organizations. T. H. Kuo and Kuo (2010) investigated the relationship of corporate culture, TQM, and project performance in Taiwan. However, all these studies are limited to different regions in which the characteristics and practices in these developed countries are very different from Malaysia, which is a developing country. Notably, none of the studies focused exclusively on the link between TQM and project performance of the construction organizations.

A few Malaysian studies have been conducted on the construction industry. Abdul Aziz (2002) completed a study on the realities of applying TQM in the construction industry. Din et al. (2011) studied the elements of performance between certified and non-certified construction organizations. Leong et al. (2014) reviewed on the quality management system research in the construction industry. There is no evidence to suggest there has been any empirical and statistical research examining the relationship between project performance and TQM in Malaysia. There is also a lack of studies, which have examined the association of quality management and project management in Malaysia. As mentioned by Thiagaragan, Zairi, and Dale (2001), the development of empirical research on TQM still lags far behind, especially in the construction industry (Leong et al., 2014).

Hence, there is a gap detected in the existing TQM literature in the context of the Malaysian construction industry. Therefore, this study focuses on explaining the empirical evidence for the relationship between TQM and project performance in the Malaysian project environment. Coupled with the current pressure to improve the level of quality in the construction industry in Malaysia, there is indeed a need and urgency for research to determine if TQM implementation can improve project performance. This research not only focuses on investigating if a link exists, but also providing a more refined and detailed examination on how any links may provide a possible contribution to the construction organizations in terms of improving their project performance through TQM implementation.

## 2. Literature review and hypotheses development

### 2.1. TQM

Many researchers have defined TQM in various ways although they are generally complementary to each other. The number and significance of TQM elements vary from one author to another. This leads to disagreement regarding the design of TQM from the literature (Dahlgard-Park, 2011). Problems appeared when a diversity of TQM dimensions occurred. Many researchers have preferred to develop their own model instead of using a proven constructed model, which has been tested by preceding authors. As a result, agreement on a set of common TQM practices defining the wide range of TQM frameworks is problematic (Prajogo & McDermott, 2005; Psomas, Vouzas, & Kafetzopoulos, 2014).

Quality awards have been adopted as the TQM framework in many studies conducted in other countries. There are more than a hundred quality awards existing in various countries. All these quality awards have been derived from earlier prestigious awards: the Malcolm Baldrige National Quality Award (MBNQA), the European Quality Award, and the Deming Prize (Jaeger, Adair, & Al-Qudah, 2013). Taking into consideration the widespread acceptance of the MBNQA quality criteria, these criteria best represent TQM and were chosen for the analysis of construction organizations in Malaysia. The rationale for adopting MBNQA in this study is that it is widely recognized as one of the benchmarks of TQM and many scholars have validated this system of TQM practices (Ooi et al., 2011; Prajogo & McDermott, 2005; Sabella, Kashou, & Omran, 2014; Terziovski, 2006). This framework is also relevant and appropriate to both manufacturing (Ooi, Lee, Chong, & Lin, 2013) and non-manufacturing sectors (Bouranta, Psomas, & Pantouvakis, 2017). MBNQA's framework incorporates seven independent quality criteria: leadership, strategic planning, customer/market focus, operation focus, workforce focus, measurement/analysis and knowledge management, and results.

In this study, TQM practices based on the MBNQA model were adopted for the following reasons:

- (1) It contains both soft and hard elements of TQM (Lee & Ooi, 2015; Lee, Ooi, & Choong, 2013; Talib et al., 2013)
- (2) It has been adopted by many researchers in their empirical research (Lee & Ooi, 2015; Lee et al., 2013; Talib et al., 2013)
- (3) It has been implemented in both developing and developed countries (Lee & Ooi, 2015; Lee et al., 2013)
- (4) It has been applied in construction projects (Jaeger et al., 2013; K. C. Lam, Lam, & Wang, 2008).

### 2.2. Project performance

The Project Management Institute (1996) defines a project as “a temporary endeavour undertaken to create a unique product or services”. Projects are unique, novel, specifically aimed at a certain goal, and have a clear finishing date. The complex and unpredictable nature of projects generates serious challenges to the project-based organizations and fundamentally differed project-based organizations from standard organizations. With the complexity of construction projects, defining project success itself is a complex issue (Alzahrani & Emsley, 2013).

Within the context of a construction project, the success of a project may be judged differently by the construction organizations depending on their own objectives (Neyestani, 2016). What is viewed as a measure of success on one project may be perceived as an indication of project failure on another project. In fact, it is difficult to measure whether the performance of a project is a success or a failure due to the fact that the concept of success remains vague among project participants (Alzahrani & Emsley, 2013).

In addition, there is no commonly agreed framework for performance measurements on projects (Toor & Ogunlana, 2010). Research on project success shows that it is impossible to generate a universal checklist of project success criteria that are suitable for all projects as the projects differ from each other in terms of size, location, uniqueness, and complexity (Westerveld, 2003). Time, cost, and quality or the so-called iron triangles are the commonly accepted performance indicator to measure the success of construction projects (Mane & Patil, 2015; Meredith & Mantel, 2011). Over the years, the “iron triangle” criteria (time, cost, and quality) have been criticized because they seemed to be inadequate. Toor and Ogunlana (2010) reported that the same old-fashioned performance criteria are no longer the sole dominant of project success due to the evolving project environments. The measurement of customer satisfaction and the overall satisfaction of stakeholders should be considered in performance evaluation criteria (Neyestani, 2016; Proust, 2011).

Due to the complexity of the process success concept and the lack of consensus among authors in the field, the traditional dimensions of the iron triangle, albeit criticized, are still considered central to the measurement of project success (Neyestani, 2016; Papke-Shields, Beise, & Quan, 2010). This research uses the basic dimensions, denoted as project efficiency by Shenhar, Dvir, Levy, and Maltz (2001). Project performance will be evaluated according to the planned budget, schedule, technical specifications (product/service requirements), and the ability to meet customer service requirements. So, in this research we will measure the project performance in terms of project efficiency (time, cost, and quality).

### 2.3. TQM and project performance

Table 1 illustrates a summary of studies on the link between TQM and the elements of performance. These studies were identified through the Scopus search engine from 2010 onwards with the main key words of TQM and performance. From the table, it is clear the TQM studies from the literature were not from one single area but were conducted all across the world, from Taiwan, Malaysia, India, and Pakistan, to the United Arab Emirates, Turkey, the United States, and Iran. The industries involved also varied, such as construction, manufacturing, and services. The TQM framework adopted in each study was diverse as well as the measurements of performance being investigated. TQM framework and dimensions of performance in each study are summarized in Table 2.

A few studies have conducted TQM research in the construction industry, such as T. H. Kuo and Kuo (2010); Ali and Rahmat (2010), Din et al. (2011), Mir and Pinnington (2014) and Leong et al. (2014). T. H. Kuo and Kuo (2010) considered the link between TQM and project performance in Taiwan using structural equation modelling (SEM). The study confirmed that TQM had a positive and direct influence on project performance. A study conducted by Ali and Rahmat (2010) investigated the performance measurements of construction projects managed by ISO-certified contractors in Malaysia. The study concluded that functionality and clients’ satisfaction are the most important criteria for measuring construction project performance whereas time and cost were the least important. In this study, mean statistics were used to rank the importance of project performance measurements as perceived by the contractors in the ISO-certified companies. There was no analysis conducted of an association between TQM and project performance.

Din et al. (2011) measured the difference between Malaysian ISO 9000 certified companies and non-certified companies in project management practices, financial management practices, and project success. The study indicated that certified companies outperformed non-certified companies in project management practices and financial management practices and ISO 9000 certification showed a positive moderating effect on the casual relationship between TQM practices and project success. The casual relationship between project management practices and project success were explained by comparing the project management practices between certified and non-certified companies. Furthermore, any links between project management practices and project success were not identified.

**Table 1. Studies of TQM and elements of performance (2010 onwards)**

Author	Elements of performance	Analysis procedure	TQM framework adopted	Sample Size	Region	Industry specific
T. H. Kuo and Kuo (2010)	Project performance	Structural equation modelling	TQM	N = 371	Taiwan	Construction
Ali and Rahmat (2010)	Project performance	Mean	TQM	N = 30	Malaysia	Construction
Bakar et al. (2011)	Quality performance	Chi square	TQM	N = 67	Oman	Construction
Din, Abd-Hamid, and Bryde (2011)	Project management practices Financial management practices Project success	MANOVA	ISO 9000	N = 336	Malaysia	Construction
Agus (2011)	Product performance & customer-related performance	Pearson's correlation & Structural equation modelling	TQM	Not mentioned	Malaysia	Manufacturing
Teh, Tritos, and Datun (2012)	Technology management	Structural equation modelling	TQM	N = 115	ASEAN (Thailand, Malaysia, Philippines, Indonesia, and Vietnam)	Automotive manufacturing
Harrington et al. (2012)	In general	Not mentioned	TQM	Not mentioned	USA	Construction
Talib et al. (2013)	Quality performance	Pearson's correlation & Multiple regression	TQM	N = 172	India	Service
Irfan and Kee (2013)	Service quality	Structural equation modelling	TQM	N-255	Pakistan	Service
Ooi et al. (2013)	Innovation performance	Multiple regression	MBNQA	N = 206	Malaysia	Manufacturing
Altayeb and Alhasanat (2014)	Project success	Factor and Pareto analysis	TQM	N = 98	Palestine	Construction
Mir and Pinnington (2014)	Project success	Bi-variate correlation & Multiple Regression	PMPA	N = 154	United Arab Emirates	Construction
Sadikoglu and Olcay (2014)	Firm performance	Multiple regression	TQM	N = 242	Turkey	Not mentioned
Leong et al. (2014)	Project performance	Correlation & regression analysis	TQM	N = 1030	Malaysia	Construction
Banna, Ahmad, and Koh (2018)	Bank loan quality	FAMA-MacBeth regression	TQM	N = 581	United State	Bank
Shafiq, Lasrado, and Hafeez (2017)	Organizational performance	Structural equation modelling	EFQM	N = 210	Pakistan	Textile
Mehralian, Nazari, Nooriparto, and Rasekh (2017)	Organizational performance	Structural equation modelling	TQM	N = 933	Iran	Pharmaceutical

**Table 2. TQM practices and elements of performance adopted**

Author	TQM adopted		Dimensions of performance	
T. H. Kuo and Kuo (2010)	(1) Leadership ability (2) Human research management (3) Process management	(1) Continuous quality improvement & information (2) Cooperation firms' management	<i>Project performance</i> (1) Technology innovation (2) Successful ratio (3) Product quality	(1) Cost/benefit analysis (2) Process improvement
Ali and Rahmat (2010)	ISO 9000 certification		<i>Project performance</i> (1) Cost performance (2) Time performance (3) Quality performance	(1) Client's satisfaction (2) Health and safety (3) Functionality
Din et al. (2011)	ISO 9000 certification		(1) Project management practices (2) Financial management practices	(1) Project success
Agus (2011)	(1) Supplier relations (2) Benchmarking	(1) Quality measurement (2) Continuous process improvement	(1) Product performance (2) Customer-related performance	
Teh et al. (2012)	<i>Hard TQM elements</i> (1) Customer focus (2) Information & analysis	(1) Process management	<i>Technology management</i>	
Talib et al. (2013)	(1) Top management commitment (2) Customer focus (3) Training and education (4) Continuous improvement and innovation (5) Supplier management (6) Employee involvement (7) Information & analysis (8) Process management	(1) Quality system (2) Benchmarking (3) Quality culture (4) Human resource management (5) Strategic planning (6) Employee encouragement (7) Teamwork (8) Communication (9) Product & service design	<i>Quality performance</i> (1) Product quality (2) Service quality (3) Process quality (4) Employee service quality	(1) Employee satisfaction (2) Customer satisfaction (3) Supplier performance

(Continued)



**Table 2. (Continued)**

Author	TQM adopted			Dimensions of performance	
Irfan and Kee (2013)	(1) Top management commitment & visionary leadership (2) Customer focused (3) Information, analysis & system	(1) Service culture (2) Human resource management (3) Social responsibility	Service quality (1) Customer satisfaction (2) Employee satisfaction		
Ooi, Lin, Teh, and Chong (2012)	(1) Leadership (2) Strategic planning (3) Customer focus	(1) Information analysis (2) People management (3) Process management	Innovation performance		
Mir and Pinnington (2014)	(1) PM leadership (2) PM staff (3) PM policy & strategy	(1) PM partnership & resources (2) PM KPI's	Project success (1) Project efficiency (2) Impact on customer	(1) Impact on the team (2) Business success (3) Preparing for the future	
Sadikoglu and Olcay (2014)	(1) Leadership (2) Knowledge and process management (3) Training	(1) Supplier quality management (2) Customer focus (3) Strategic quality planning	Firm performance (1) Operational performance (2) Inventory management performance (3) Employee performance	(1) Innovation performance (2) Social responsibility (3) Customer results (4) Market and financial performance	
Leong et al. (2014)	ISO 9000 certification		Project performance (1) Cost performance (2) Time performance (3) Time performance	(1) Quality performance (2) Safety and health (3) Clients' satisfaction	
Banna et al. (2018)	(1) Bank efficiency (2) Income-to-cost ratio		Bank loan quality (1) Non-performing loans		
Shafiq et al. (2017)	EFQM (1) Leadership (2) Strategy	(1) Partnership & resources (2) Process (3) People	Organizational performance (1) Financial results (2) Non-financial results		

(Continued)



Table 2. (Continued)				
Author	TQM adopted		Dimensions of performance	
Mehralian et al. (2017)	(1) Top management commitment (2) Strategic planning process (3) Quality information and usage (4) Employee training	(1) Process design (2) Supplier quality (3) Benchmarking (4) Customer focus	Organizational performance (Balanced Scorecard Approach) (1) Financial perspective (2) Customer perspective	(1) Internal process perspective (2) Learning and growth perspective

Mir and Pinnington (2014) investigated the relationship between TQM and project success in the United Arab Emirates. A PMPA framework of TQM was adopted and tested against project success. The outcome of this study showed that PMPA and its contributing variables were found to have positively influenced project success. The association between each of the individual PMPA variables was tested and cross-checked using two methods, linear regression and Pearson's correlation. Both analyses come to the same conclusion KPIs, staff, leadership, and lifecycle management processes were the most contributing variables to project success. Partnership and resources, and PM policy and strategy were ranked the lowest in association with project success. A multiple regression analysis concluded the best-fit model which would explain the greatest variance in project success were life-cycle management processes, policy, and strategy.

Lastly, Leong et al. (2014) measured the effectiveness of ISO 9000 certification in Malaysia companies using project performance indicators. The results showed customer satisfaction and time variance were positively significant with ISO 9000 certification. However, in this study, there were no standards of ISO 9000 certification investigated as project performance indicators. The study merely investigated which project performance indicators had an impact on ISO 9000 certification. All the TQM studies conducted for the construction industry discussed above differed in the region, analysis procedure, TQM framework adopted, and in performance measurements. The TQM framework adopted in each of the studies is illustrated in Table 2 with their performance measurements. The MBNQA framework of TQM has not been explored in the construction industry and its relationship with project performance.

From the literature review conducted it becomes evident that very few studies have exclusively focused on the relationship between project performance and TQM in Malaysia. Therefore, this study focuses on analyzing empirical evidence for any relationship between TQM and project performance in the Malaysian construction industry. Coupled with the current pressure to improve the level of quality in the construction industry in Malaysia, there is indeed a need and urgency for a research study on whether the implementation of TQM can improve project performance. This research will not only focus on investigating whether a link exists, but also examine whether there may be any practical contributions for the construction organizations in improving their project performance through the implementation of TQM.

### *2.3.1. Leadership and project performance*

The importance of leadership has been noted throughout the project management literature, as a requirement of project excellence (Kerzner, 2013), a determinant of overall project culture (Shore, 2008), and as a vehicle for mobilizing people for change (Patterson, 2010). Today, there are many leadership style theories that have emerged such as emotional intelligence, contingency, competency, traits, and behaviour (Dulewicz & Higgs, 2004) and all of them claim that an appropriate leadership style can benefit project success and enhance project performance.

A study by Turner (2014) revealed that effective leadership is viewed as a critical factor for success in the management of organizations and it has also been shown an appropriate leadership style can lead to better performance. However, there is some contradiction in the literature where the leadership of a project manager is not regarded as a success factor of projects. In agreement with Anantatmula (2010) and Fung and Ramasamy (2015), this current study argues that though leadership style and competence are not directly related to project success, the leadership role is crucial to facilitate various project success factors that contribute to project performance. A project manager's leadership roles and responsibilities towards the project team and stakeholders influence the project outcomes (Fung & Ramasamy, 2015).

Jiang (2014) also made similar claims as he suggested leadership could directly benefit project success with corresponding competencies or indirectly through improving teamwork to help achieve a successful project. A model was developed where Jiang (2014) proposed an appropriate leadership style can reduce the negative effect of the project type on teamwork and

project success. However, this is just a conceptual model with further empirical testing needed. The findings of the above literature review provide an opportunity to explore further project manager leadership in promoting project performance. Consequently,

*H1: There is a positive relationship between leadership and project performance.*

### *2.3.2. Strategic planning and project performance*

Planning has been considered one of the critical factors for project success in the strategic management literature (Meredith & Mantel, 2011) and project management literature (Turner, 2014). Zwikael and Globerson (2004) recognized the importance of project planning and in their opinion, high quality planning increases the chances the project will be properly executed and completed. Adding to their previous study, Zwikael and Globerson (2004) asserted high-quality project planning in construction and engineering organizations has resulted in projects completed at half the cost and schedule overruns, compared to organizations in other industries such as information technology and communications, services, and manufacturing. In another recent study (Zwikael, Pathak, Singh, & Ahmed, 2014), found increasing the quality of planning improves project efficiency in high-risk projects and improves project effectiveness in low-risk projects. However, one of their hypotheses results showed that project planning was not significantly correlated with project efficiency or effectiveness. Evidence was found showing the results of Zwikael and Globerson (2006) contradicted the findings of Zwikael et al. (2014). The earlier study indicated high-quality project planning would reduce cost and schedule overruns, however, in the study by Zwikael et al. (2014) they mentioned project planning was found not to be correlated with either project efficiency or effectiveness.

Some results from the literature have challenged the importance of planning. For example, one of the very first milestones of Mintzberg (1994) book *The Rise and Fall of Strategic Planning*. Additional doubts are expressed in project management literature by Bart (1993) regarding the importance of formal planning. He indicated the traditional planning approach contains excessive formal control restrictions, which curtails opportunities for creativity and thus may eventually lead to project failure.

Although some claim that too much planning curtails the creativity of the project team, there is no argument stating at least a minimum level of planning is required. The rationale behind project planning is planning reduces uncertainty and increases the likelihood of project success. Planning does not guarantee project success, but a lack of planning will probably lead to failure according to the Project Management Body of Knowledge (PMBOK). Based on the assumptions presented above, there appears to be a relationship between strategic planning and project performance. As a result, the following hypothesis is generated

*H2: There is a positive relationship between strategic planning and project performance.*

### *2.3.3. Customer focus and project performance*

A customer-centred approach has long been recognized as an important strategy for improving business performance. The concepts of knowing customer requirements and being responsive to customer demands, and measuring customer satisfaction have led to an increase in cash flow, revenue growth, profitability, market share, and stock price (Anderson, Fornell, & Mazvanchery, 2004; Gruca & Rego, 2005; Homburg, Koschate, & Hoyer, 2005; Williams & Naumann, 2011). This customer focus concept is also supported in a study by Zou, Kumaraswamy, Chung, and Wong (2014) where they found an active customer relationship management strategy leads to better project performance as the relationship changed across project phases. Psomas et al. (2014) in their study revealed customer focus policy was the key TQM factor, which positively affected Spain's service sector. This suggests a customer focus approach leads to a better understanding of customers' needs, which in turn translates into internal actions being taken and eventually results in satisfied customers

and thus an organization's performance improves. However, some previous studies have showed contrasting results. Talib et al. (2013) investigating quality performance observed customer—oriented activities did not contribute positively to the Indian service sector.

Developing customer loyalty through customer satisfaction seems to generate a steady stream of sales in the long-term. Having reviewed the logic of a customer focus strategy, there is strong support for the statement increasing customer focus, will enhance the organization's performance in the project environment. Hence,

*H3: There is a positive relationship between customer focus and project performance.*

#### *2.3.4. Workforce focus and project performance*

The workforce is the most dynamic resource in an organization. It dominates the operation process to ensure that an organization performs its daily operations effectively and efficiently (Sabella et al., 2014) to maintaining a high level of quality can be achieved by bringing out the best talents and capabilities of a workforce (Lee & Ooi, 2014). These capacities can be further enhanced through a variety of organizational development practices such as employee training, involvement, empowerment, recognition, teamwork, etc. Where an organization has a high level of workforce focus, the requirements of employees are noticed (i.e. comfortable working environment, self-improvement opportunities, etc.), which in turn will generate greater work performance and increase morale and satisfaction. In the long run, this approach will enhance the organization's productivity and ultimately its performance (Valmohammadi & Roshanzamir, 2015).

Most of the studies reviewed indicate workforce focus has a significant relationship with performance. A study conducted in Spain showed an emphasis on workforce was one of the elements significantly affecting the service industry (Psomas et al., 2014). This has been supported by Valmohammadi and Roshanzamir (2015), where implementation of workforce-oriented activities increased organizational performance. However, the workforce-related activities did not show significance in the quality and innovation in performance at ASEAN manufacturing plants (Zeng, Phan, & Matsui, 2015). One of the ASEAN countries in the study was Malaysia.

This present study based on the literature reviewed, strongly suggests encouragement of workforce focus practices such as empowerment, involvement, training, and information sharing are the key factors of quality programmes. An organization needs to focus in this area if they want to succeed in improving performance. Hence, it is hypothesized that:

*H4: There is a positive relationship between workforce focus and project performance.*

#### *2.3.5. Operation focus and project performance*

Operation management is a systematic approach in which all the resources of an organization are used in the most efficient and effective manner to achieve the desired performance (Ooi, 2014). Operation focus emphasizes activities which includes preventive and proactive approaches to quality management (Lee & Ooi, 2014). The activities include designing fool-proof and stable production schedules and work distribution to reduce variation and improve the quality of the product during the production stage (Bouranta et al., 2017). Empirical studies such as Mehralian et al. (2017), have investigated the relationship between process management and performance which have showed a positive correlation between them. Valmohammadi and Roshanzamir (2015), Zeng et al. (2015); Irfan and Kee (2013) and Zehir, Ertosun, Zehir, and Muceldilli (2012) also showed similar results where all of the studies claimed that a positive significant relationship does exist between process management and performance.

However, there are some studies that showed contradictory findings. Shieh and Wu (2002) demonstrated process management did not have an association with project performance. A recent study (Talib et al., 2013) conducted on Indian service companies revealed similar findings. The results collected from 172 service companies showed process management had no significant effect on quality performance.

Following Deming's belief, where improving the process can improve productivity and quality (Shieh & Wu, 2002), this current study suggests that to achieve better performance, the key processes must be identified, evaluated, and continually improved. Based on the concept above, it is hypothesized that:

*H5: There is a positive relationship between operation focus and project performance.*

#### **2.3.6. Measurement, analysis, and knowledge management and project performance**

It is important for managers to make quality decisions for an organization based on the analysis of real and relevant data as emphasized by (Lee & Ooi, 2015). It is the duty of an organization to ensure the availability of reliable, adequate, high quality, and timely data and information for all key users to improve performance (Ooi, 2014). This concern about the reliability and validity of data and information using appropriate tools of measurement and/or analysis to support quality-based decision-making is necessary for the organization to improve its performance (Bouranta et al., 2017).

Mehralian et al. (2017) and Valmohammadi and Roshanzamir (2015) suggest the implementation of data collection and an analysis system will increase the performances of a firm. Zeng et al. (2015) in their study investigating 283 manufacturing plants observed quality information had a direct impact on quality performance in ASEAN countries. Other studies also showed quality information and analysis have had significant effects on performance such as Irfan and Kee (2013) and Agus (2011).

Based on the previous literature discussed, the process of obtaining adequate data and information to support quality-based decision-making seems to be an important part of every organization regardless of type of industry. Key decisions are then made by organizations on the information and analysis resulting from this process. Thus, the following hypothesis is proposed:

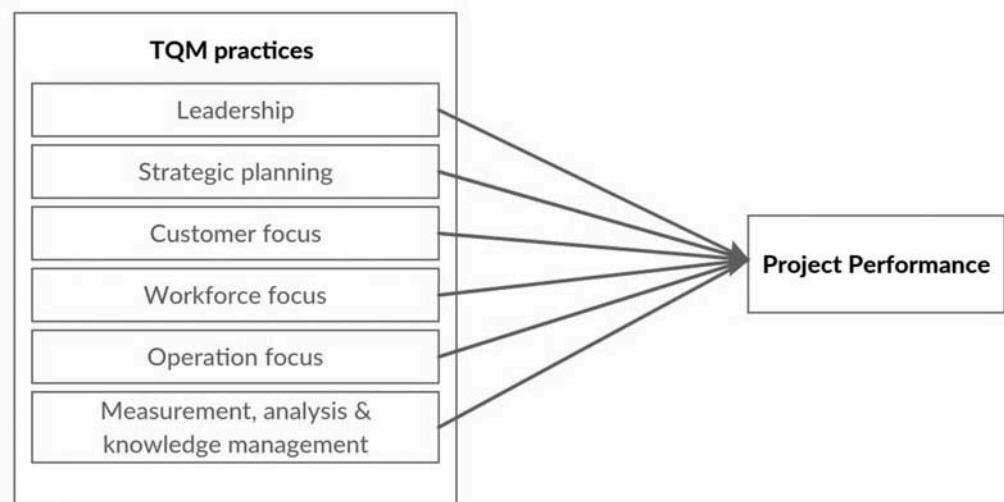
*H6: There is a positive relationship between measurement, analysis and knowledge management, and project performance.*

#### **2.4. Malaysian construction industry (MCI) as a focus of research**

Malaysia is one of the fastest growing developing countries. Furthermore, its construction industry plays a crucial role in enhancing the nation's social and economic development by providing essential developments for many other sectors to develop. The Malaysian construction industry generates one of the highest multiplier effects through its extensive backward and forward linkages with other sectors of the economy (Ibrahim, Roy, Ahmed, & Imtiaz, 2010). It stimulates raw, semi-processed, and processed materials manufacturing, such as steel and cement, in backward linkages and encourages the financial and professional services in forward-type linkages. The Malaysian government understands the importance of an efficient construction industry to the national economy and has created policies to support this industry.

With the launching of Vision 2020, the Malaysian government has proposed a fully industrialized country by the year 2020. However, with the current condition of the Malaysian construction industry, traditional ways of performing and managing construction processes will only exacerbate the existing problems. The construction organizations have to reconsider their construction practices. One strategy is to adopt Total Quality Management (TQM) more widely.

**Figure 1. Conceptual framework of the study.**



However, with the present research gap, clear guidelines for showing managers how to implement TQM is impossible and may result confusion. Managers, researchers, and quality management practitioners continuously show interest in TQM and its performance relationship and know which TQM practices to adopt to achieve successful implementations. Thus, one of the objectives of this study is to determine which TQM practices are essentially to a successful project performance in the Malaysian construction industry. Please see Figure 1.

### 2.5. Research objectives

The key objective of this research is to analyse the association between TQM practices and project performance in the Malaysian construction industry. More specifically, the study aims

- (1) To determine the dimensions of TQM practices and project performance applicable to the Malaysian construction industry;
- (2) To study if TQM practices have a significant impact on Malaysian construction project performance;
- (3) To investigate which TQM practices have a greater impact on Malaysian construction project performance.

## 3. Methodology

### 3.1. Population and sample

The target population of this study was the construction organizations in Malaysia. The sample size was derived from the listed members of the CIDB (Construction Industry Development Board), a statutory body representing the construction companies in Malaysia. The CIDB was established in 1994 and currently represents approximately 73,069 construction companies from every range of the CIDB categories (CIDB, 2016). The CIDB directory is frequently used to represent Malaysian construction organizations such as Din et al. (2011), Mir and Pinnington (2014), and Ali and Rahmat (2010). There were 73,069 companies registered as members of Construction Industry Development Board (CIDB). There were 6,331 companies belong to the category of Grade 7. Thus, the target population of this study was ISO 9001 certified construction companies from CIDB (Category Grade 7)

Due to research budget and other constraints, cross-sectional data collection method will be used. Convenience sampling was used as the sampling technique in this study. This sample group

**Table 3. Targeted respondents for each state**

States	G7 organizations	Percentage	Number of targeted respondents
Johor	450	7.11	129
Kedah	201	3.17	57
Kelantan	142	2.24	41
Labuan	1	0.02	1
Melaka	147	2.32	42
Negeri Sembilan	110	1.74	31
Pahang	145	2.29	41
Perak	189	2.99	54
Perlis	32	0.51	9
Pulau Pinang	410	6.48	117
Sabah	510	8.06	146
Sarawak	514	8.12	147
Selangor	1,567	24.75	448
Terengganu	206	3.25	59
Wilayah Persekutuan	1,707	26.96	488
<b>Total</b>	<b>6,331</b>	<b>100%</b>	<b>1,810</b>

was chosen as there is no certification for TQM in Malaysia (Sila, 2007) and no database available listing Malaysian organizations that had adopted TQM practices. Given that the ISO 9001 standard is based on quality management principles, which are in line with TQM philosophy, the criterion for selecting which organizations would participate in the study was their certification to ISO 9001. It was assumed that the ISO certified companies are TQM-oriented and compatible with the total quality philosophy (Goetsch & Davis, 2006; Wu & Liu, 2010).

A total of 1,810 questionnaires were sent out to achieve the targeted sample size with the assumed response rate of 20%. To ensure distribution equality in representing the whole of Malaysia, the 1,810 questionnaires were distributed among the 13 Malaysian states according to the ratio calculated in Table 3 below. Based on the density of the population, 488 questionnaires were sent to Wilayah Persekutuan, 448 to Selangor, 147 to Sarawak, 146 to Sabah, 129 to Johor, 117 to Pulau Pinang, 59 to Terengganu, 57 to Kedah, 54 to Perak, 42 to Melaka, 41 to Pahang and Kelantan, 31 to Pahang, 9 to Perlis and 1 to Labuan.

### 3.2. Research instrument

Based on an extensive literature review of TQM practices that influence the performance of projects conducted by the construction organizations, a questionnaire was developed. All of the variables identified were ensured to be ambiguous and captured the major theoretical construct of interests. The questionnaire consisted of 42 items, measuring six theoretical constructs: (1) leadership, (2) strategic planning, (3) customer focus, (4) measurement, analysis, and knowledge management, (5) workforce focus, (6) operation focus, and (7) project performance. The summary of questionnaire items are summarised in Table 4. below.

The measurement scales were adapted from previously validated research. Each of the questionnaire items was assessed on a 5-point Likert rating scale. Responses to TQM practices were assessed with a level of frequency value of (1) *very low*, (2) *low*, (3) *medium*, (4) *high*, and (5) *very high*. Responses for scales measuring the project performance of construction organizations that had adopted TQM practices were also recorded using the 5-point Likert rating scale with a level of agreement of, (1) *strongly disagree*, (2) *agree*, (3) *neutral*, (4) *agree*, and (5) *strongly agree*.



**Table 4. The summary of questionnaire items**

Section	Constructs	Dimensions	Sources	No. of Items	Rating Scale
1	Leadership	The commitment to quality practices by top management	Flynn, Schroeder, and Sakakibara (1995); Ahire, Golhar, and Waller (1996); Anderson, Jeraman, and Crum (1998); Lau, Zhao, and Xiao (2004); Saraph, Benson, and Schroeder (1989)	6	1 = very low, 5 = very high
2	Strategic planning	The propensity to develop and implement organizational strategic actions	Lau et al. (2004); Lee, Ooi, Sohal, and Chong (2012)	5	1 = very low, 5 = very high
3	Customer focus	The ability to assess and meet customer expectations	Flynn et al. (1995); Ahire, Golhar, and Waller (1996); Lau et al. (2004); Fotopoulos and Psomas (2010); Lee et al. (2012)	6	1 = very low, 5 = very high
4	Measurement, analysis and knowledge management	The effects to gather, measure, analyze work performance and improvements	Saraph et al. (1989); Anderson et al. (1998); Lau et al. (2004); Lee et al. (2012)	7	1 = very low, 5 = very high
5	Workforce focus	The assessment of employee capability and capacity needs	Saraph et al. (1989); Flynn et al. (1995); Lau et al. (2004); Fotopoulos and Psomas (2010)	7	1 = very low, 5 = very high
6	Operation focus	The efforts to improve product and work processes and achieve organizational success	Saraph et al. (1989); Flynn et al. (1995); Lau et al. (2004); Lee et al. (2012)	7	1 = very low, 5 = very high
7	Project performance	The objective of a construction project	Shenhar et al. (2001); Ling, Low, Wang, and Egbelakin (2008); Yeung, Chan, and Chan (2009)	4	1 = very low, 5 = very high
<b>Total number of measurement scale items</b>				<b>42</b>	

### 3.3. Validity and reliability

#### 3.3.1. Factor analysis

A principal component analysis (PCA) was run on a 38-question survey that measured TQM practices of 145 respondents. The suitability of a PCA was assessed before analysis. Inspection of the correlation matrix showed all of the variables had at least one correlation greater than 0.3. The overall Kaiser-Meyer-Olkin (KMO) measure was 0.928 with individual KMO measures all greater than 0.8, classification of *meritorious* to *marvelous* according to Kaiser (1974). Bartlett's test of sphericity was statistically significant ( $p < .0005$ ), indicating that the data was likely factorizable.

A PCA with forced factor 6 was applied with the rationale to retain as many of the components established as TQM factors. Five components had eigen-values greater than 1, and the 6th component had an eigen-value (0.98) of close to one as well. Thus, the decision was made to retain the six components. The 6-component solution explained 72.67% of the total variance.

The results of the PCA revealed all of the items loadings were above 0.4. A Promax oblique rotation was employed to aid interpretability. The rotated solution exhibited *simple structure* (Thurstone, 1947). The interpretation of the data was consistent with the TQM attributes, which the questionnaire was designed to measure. Measurement, analysis and knowledge management items were loaded on component 1, workforce focus items on component 2, leadership items on component 3, customer focus items on component 4, strategic planning items on component 5, and finally, operation focus items on component 6. The rotation output retained all six constructs of TQM according to the literature. Component loadings and communalities of the rotated solution are presented in Table 5 and structure matrix showing the correlations between variables and factors are shown in Table 6.

**Table 5. Rotated pattern matrix for PCA with promax rotation**

Items	Component						Communalities
	1	2	3	4	5	6	
<b>Eigenvalues</b>	20.17	2.46	1.54	1.38	1.08	0.99	-
<b>Var %</b>	53.07	59.55	63.61	67.23	70.08	72.67	-
<b>Factor 1: Measurement, analysis &amp; knowledge management</b>							
mm3	.903						.788
mm4	.888						.830
mm5	.875						.811
mm2	.830						.767
mm1	.756						.809
mm6	.593						.796
mm7	.570				.408		.687
of7	.570						.707
of2	.515						.643
of1	.465						.651
<b>Factor 2: Workforce management</b>							
wf2		.941					.744
wf5		.863					.732
wf6	.386	.847					.668
wf3		.752					.758
wf1		.726					.706

(Continued)

Items	Component						Communalities
	1	2	3	4	5	6	
wf7		.640					.707
wf4		.539					.679
of6	.475	.508					.695
<b>Factor 3: Leadership</b>							
ls4			.856				.782
ls5			.813				.699
ls2			.794				.712
ls3			.770				.632
ls6			.726				.624
ls1			.585				.643
<b>Factor 4: Customer focus</b>							
cf2				.804			.793
cf5		−3.00		.790			.714
cf3		.380		.777			.765
cf4		.414		.535	.302		.728
cf1				.486			.541
<b>Factor 5: Strategic planning</b>							
cf6	.439	−.442			.711		.596
sp4					.559		.704
sp3	.346				.439		.654
sp2					.411		.695
sp5			.346		.376		.714
sp1					.359		.643
<b>Factor 6: Operation focus</b>							
of3						.993	.440
of4						.611	.674
of5	.343					.511	.698

Rotation converged in 8 iterations.

**Table 6. Correlation**

Items	Rotated Component Coefficients					
	Component 1	Component 2	Component 3	Component 4	Component 5	Component 6
mm3	<b>.898</b>	.576	.524	.438	.486	.521
mm4	<b>.900</b>	.620	.466	.438	.550	.534
mm5	<b>.892</b>	.564	.502	.467	.541	.537
mm2	<b>.879</b>	.597	.495	.584	.485	.494
mm1	<b>.878</b>	.620	.550	.627	.550	.531
mm6	<b>.829</b>	.701	.556	.607	.643	.556
mm7	<b>.740</b>	.594	.383	.398	.631	.566
of7	<b>.798</b>	.662	.471	.468	.418	.655
of2	<b>.723</b>	.510	.407	.520	.219	.634
of1	<b>.741</b>	.640	.496	.538	.323	.618
wf2	.497	<b>.853</b>	.542	.501	.426	.491

(Continued)

**Table 6. (Continued)**

Items	Rotated Component Coefficients					
	Component 1	Component 2	Component 3	Component 4	Component 5	Component 6
wf5	.527	<b>.854</b>	.608	.484	.485	.463
wf6	.645	<b>.802</b>	.525	.370	.416	.412
wf3	.558	<b>.865</b>	.604	.530	.592	.525
wf1	.626	<b>.804</b>	.613	.539	.357	.521
wf7	.538	<b>.823</b>	.583	.526	.638	.508
wf4	.635	<b>.751</b>	.472	.333	.604	.558
of6	.751	<b>.754</b>	.506	.471	.484	.572
ls4	.362	.565	<b>.860</b>	.443	.544	.338
ls5	.559	.526	<b>.840</b>	.480	.395	.343
ls2	.442	.568	<b>.830</b>	.460	.381	.486
ls3	.459	.490	<b>.783</b>	.402	.400	.466
ls6	.358	.564	<b>.768</b>	.378	.478	.275
ls1	.473	.658	<b>.773</b>	.506	.488	.403
cf2	.520	.496	.568	<b>.875</b>	.450	.328
cf5	.553	.358	.426	<b>.800</b>	.306	.407
cf3	.402	.625	.428	<b>.835</b>	.472	.354
cf4	.430	.714	.432	<b>.743</b>	.657	.498
cf1	.451	.551	.490	<b>.681</b>	.557	.380
cf6	.538	.323	.361	.396	<b>.682</b>	.330
sp4	.529	.692	.640	.441	<b>.790</b>	.506
sp3	.667	.618	.577	.523	<b>.698</b>	.508
sp2	.631	.693	.622	.594	<b>.728</b>	.505
sp5	.506	.707	.717	.603	<b>.720</b>	.499
sp1	.616	.683	.580	.563	<b>.685</b>	.422
of3	.485	.425	.315	.333	.359	<b>.883</b>
of4	.654	.668	.587	.398	.490	<b>.829</b>
of5	.722	.604	.566	.413	.374	<b>.783</b>

Rotation converged in 8 iterations.

### 3.3.2. Reliability

The Cronbach's coefficient alpha was tested on both independent and dependent variables after factor analysis. Values range from 0 to 1, with higher values indicating greater reliability. The minimum acceptable level for the reliability coefficient is 0.7 (Nunnally, Bernstein, & Berge, 1967). Table 7 shows that each of the variable constructs exceeded the minimum alpha value of 0.7, which indicates good internal consistency and reliability. The reliability statistics for all of the variables can be found in Table 7

Table 3 shows that each of the variable constructs exceeded the minimum alpha value of 0.7, which indicates good internal consistency and reliability. The reliability statistics for all of the variables can be found in Table 7

## 4. Results

This study seeks to describe the association between TQM practices and project performance in Malaysian construction organizations by analyzing the 6 TQM constructs, specifically leadership,

**Table 7. Cronbach's alpha of the various constructs**

Variables	Number of items	Number of deleted items	Cronbach's alpha
Leadership	6	-	0.901
Strategic planning	6	-	0.897
Customer focus	5	-	0.869
Workforce focus	8	-	0.935
Operation focus	3	-	0.845
Measurement, analysis & knowledge management	10	-	0.957
Project performance	4	-	0.900

**Table 8. Summary of hypotheses**

Hypotheses	
H <sub>1</sub>	There is a significant positive relationship between leadership and project performance.
H <sub>2</sub>	There is a significant positive relationship between strategic planning and project performance.
H <sub>3</sub>	There is a significant positive relationship between customer focus and project performance.
H <sub>4</sub>	There is a significant positive relationship between workforce focus and project performance.
H <sub>5</sub>	There is a significant positive relationship between operation focus and project performance.
H <sub>6</sub>	There is a significant positive relationship between measurement, analysis and knowledge management and project performance.

strategic planning, customer focus, measurement, analysis and knowledge management, workforce focus and operation focus.

The research hypotheses were structured according to the research objectives, which were to identify the relationship between TQM and project performance and to determine which TQM practices have a greater association with project performance. This study used the regression analysis technique to test the regression model. Table 8 summarizes the hypotheses of the study.

The multiple regression model was statistically significant,  $F(6, 135) = 17.702$ ,  $p < .0005$ .

Table 9 shows the coefficient of determination ( $R^2$ ) for the overall model was 44% with an adjusted  $R^2$  of 41.5%, a large size effect according to (Cohen et al., 2013). The individual model variables revealed that workforce focus ( $\beta = 0.463$ ,  $p < 0.01$ ) and operation focus ( $\beta = 0.225$ ,  $p < 0.05$ ) were found to have a significant and positive effect on project performance. While, measurement, analysis, and knowledge management ( $\beta = -0.321$ ,  $p < 0.05$ ) was found to have a significant negative effect on project performance. Therefore, hypotheses H<sub>4</sub> and H<sub>5</sub> were supported. The results of multiple regression analysis indicated that measurement, analysis, and knowledge management ( $\beta = -.321$ ,  $p = .016$ ) had a significant but negative relationship with project performance. Therefore, hypothesis H<sub>6</sub> is not supported. Hence, H<sub>1</sub>, H<sub>2</sub>, H<sub>3</sub>, and H<sub>6</sub> were not supported.

## 5. Discussion

Six hypotheses were developed to examine whether the dimensions of TQM, i.e. leadership, strategic planning, customer focus, measurement, analysis, and knowledge management,

**Table 9. Regressions predicting project performance**

	<b>B</b>	<b>S.E.</b>	<b><math>\beta</math></b>	<b>p</b>
(Constant)	1.016	0.326		0.002
H1—Leadership	0.104	0.113	0.094	0.357
H2—Strategic planning	0.238	0.138	0.231	0.085
H3—Customer focus	0.013	0.100	0.013	0.894
H4—Workforce focus	0.465	0.124	0.463	0.000
H5—Operation focus	0.214	0.094	0.225	0.025
H6—Measurement, analysis & knowledge management	−0.276	0.113	−0.321	0.016
R <sup>2</sup>	0.440			
R <sup>2</sup> Change	0.440			
F Change	17.702			
	p < 0.001			
Adj. R <sup>2</sup>	0.415			
N	145			

workforce focus, and operation focus were significantly related to project performance within the construction organizations in Malaysia. The findings of each hypothesis are discussed in the following subsections.

### **5.1. Hypothesis 1—Relationship of leadership and project performance**

The initial conclusion that can be derived from this research is that leadership, one of the TQM practices, has demonstrated an insignificant impact on project performance. This indicates that the level of management leadership in the construction industry is still not intensive enough to influence project performance. The outcome of this study is consistent with but also contradicts other recent studies. A recent study by Shafiq et al. (2017) found leadership had a significant relationship with organizational performance both in financial and non-financial measurements. The study was conducted in the textile sector in Pakistan using a structural equation model (SEM), which is different in context of region, industry and analysis method from this study. This may explain the contradictory results derived from the study. A study by Talib et al. (2013) found top management commitment had no significant effect on quality performance. In their study, Sadikoglu and Olcay (2014) also concluded, leadership was not significant to all of the firm's performance measurements which included operational performance, inventory performance, employee performance, innovation performance, social responsibility, customer satisfaction, and market and financial performance. The insignificant relationship of leadership in project performance is explained in some of the literature. In project success literature, leadership is not regarded as one of the success factors in project management (Turner, 2014). In Yang, Huang, and Wu (2011) the researchers explained leadership is indirectly related to project performance through the relationship between team members. This is a similar conclusion to one of the studies conducted in Malaysia (Fung & Ramasamy, 2015), who also claimed, while the execution of leadership does not directly influence project performance, the team effectiveness resulting from leadership enhancement is likely to lead to better performance. This explains why leadership is not significant to project performance as the relationship is amplified by the factor of teamwork. One of the findings in Yang et al. (2011), stated that the higher the complexity level of the projects the more likely the projects are to be successful compared to those with lower complexity. The complexity of the project plays a moderating role in enhancing project performance and if applied to this study, project complexity could be an influencing factor that explains the relationship between leadership and project performance. In other words, the project conducted by the contractors in this study may consist of residential or shop lots with a lower level of complexity and where the role of leadership has not improved project performance. Fung and Ramasamy

(2015) explained that project performance is not directly dependent on leadership but on other factors. There are other factors that play a mediating role in the relationship between leadership and project performance (Lo, Ramayah, & De Run, 2010). It is understandable not all TQM practices have a significant relationship with project performance. It may be the case some TQM practices affect performance rather indirectly through the application of other, additional TQM practices or factors. In this study, it can be concluded leadership does not have a direct significant effect on project performance. There is a possibility the role of leadership on project performance is mediating through other factors and this may explain why leadership does not play a significant role in enhancing project performance as claimed in the general management literature.

### **5.2. Hypothesis 2—Relationship of strategic planning and project performance**

The results from this study demonstrate strategic planning does not have a significant relationship in improving project performance in the Malaysian companies. The assertion that planning is one of the critical success factors for project success, found in almost all strategic management and project management literature (Johnson, Boucher, Connors, & Robinson, 2001; Meredith & Mantel, 2011; Pinto & Slevin, 1988; Turner, 2014) does not apply in this study. Talib et al. (2013) in their study investigating TQM in Indian service companies found strategic planning was not significant to quality performance. A study conducted by Zwikael et al. (2014) in Fiji tried to determine the moderating effect of risk on the relationship between planning and success in project environment. The results of their regression analysis revealed project planning was not significantly correlated with project efficiency and effectiveness. Another study by Sadikoglu and Olcay (2014) also discovered that strategic planning was only partially correlated with organizational performance in Turkish firms. Out of seven measurements of organizational performance, strategic planning only positively related to employee performance and social responsibility. Despite the different regions, the results of these three studies show the same outcomes, where strategic planning is not significantly or only partially correlated with performances. This means that efforts in enhancing planning do not improve project performance. Zwikael et al. (2014) discovered risk factors play a moderating role in correlating project planning with success. They found the existence of a high-risk increases the quality of planning and improves project efficiency while a low-risk improves project effectiveness. This explains why strategic planning is found to have no significant association with project performance in this study, where the presence of risk factors plays a mediating role. In addition, construction practices such as engagement of multiple professionals, reliance on subcontractors, and constant changes to project descriptions and goals make planning even more challenging. Laird (2016) observed the increasing size and complexity of the project enhanced the correlation between project planning and project success. When size and complexity increases, more effective planning is necessary to coordinate the interrelated efforts of team members to success. This finding is parallel to the finding for leadership where the factor of size, complexity, and risk of a project impacts the performance indirectly. The outcome of this hypothesis implies strategic planning is still not intensive enough to improve project performance. The implication of strategic planning may exist through the existence of other factors, which need to be further explored.

### **5.3. Hypothesis 3—Relationship of customer focus and project performance**

The findings of this study show customer focus is not a vital determinant of project performance. This signifies understanding customer needs and the efforts of fulfilling customer satisfaction are not a priority in the construction industry and they do not affect project performance. Talib et al. (2013) discovered customer focus was one of the TQM factors not significant to quality performance for Indian service companies. In their study, customer focus had an indirect relationship with quality performance through continuous improvement. Another study by Sadikoglu and Olcay (2014) also revealed customer focus was partially correlated with organizational performance in Turkish manufacturing and service industries. In their study, customer focus only significantly related to two out of seven organizational measurements (i.e. operational performance and social responsibility). Although both Talib et al. (2013) and Sadikoglu and Olcay (2014) conducted studies in different countries and industries, they both showed similar outcomes to this study. According



to Talib et al. (2013) customer focus related indirectly to quality performance through other factors. This is supported by a previous study by Tari, Molina, and Castejon (2007) which demonstrated customer focus did not show a significant relationship with performance. However, the relationship is indirectly linked to performance through process management. Nair (2006) once again showed the impact of customer focus on performance measurements is influenced by moderating factors. The customer-oriented activities are designed to improve products and services with the goal of satisfying customers. The outcomes of customer-focused activities will then be transferred to process management to be implemented and eventually be reflected in the overall project performance. The relationship between customer focus and performance with the moderating effect of process management is applicable in the construction industry. As in this current study, customer focus is not being prioritised in the construction industry. The effect of customer focus on project performance could be a presence through process management, which requires further study.

#### **5.4. Hypothesis 4—Relationship of workforce focus and project performance**

The outcome of this research illustrates workforce focus is significantly linked to project performance in the Malaysian construction organizations. Workforce related practices include employee involvement, human resource management, and employee encouragement. In the studies of Naqvi, Bokhari, and Aziz (2011) and Zwikaël and Unger-Aviram (2010), human resource management has been regarded as one of the core elements of project management. Other than that, one of the elements of workforce focus, which is the performance management of employees, also has gained significance in project performance (Naqvi, Bokhari & Aziz 2011). In Sadikoglu and Olcay (2014) study, employee training was the only significant effect on operational management. Other organization measurements such as inventory performance, innovation performance, social responsibility, and market and financial performance were not related to employee training in the Turkish manufacturing and service industry (Sadikoglu & Olcay, 2014). Furthermore, a study in the automotive industry of Thailand by Popaitoon and Siengthai (2014) demonstrated human resource management practices had a positive association with project-related performance in the long term. However, Talib et al. (2013) in their study investigating TQM practices at Indian service companies showed workforce related practices have no significant effect on quality performance. This can be explained in which the repetitive work process in manufacturing and service industries disregards the needs of workforce focus, as shown in both Talib et al. (2013) and Sadikoglu and Olcay (2014). However, the construction industry, which depends greatly on its workforce in the building process, says that workforce focus is related to project performance. Overall, providing more intensive workforce focus practices could trigger a greater contribution by employees to achieving the desired project performance.

#### **5.5. Hypothesis 5—Relationship of operation focus and project performance**

Clear objectives and goals set by the organization with well-defined processes will lead workers towards a better performance. The finding in this study has confirmed this statement. ISO status certifies that Malaysian construction organizations under G7 have a standardized process management system for their business. Similarly, in other studies, process management has been confirmed as having a statistically significant relationship with performance (Sadikoglu & Zehir, 2010; Zehir et al., 2012). Mir and Pinnington (2014) studied United Arab Emirates (UAE) project based organizations and observed one of the process management practices, KPIs (Key performance indicators) was significantly correlated with project success. Similarly, in Sadikoglu and Olcay (2014), their study revealed that process management partially contributed to firm performance in the Turkish manufacturing and service industry, through inventory performance, innovation performance, and customer service. Zeng et al. (2015), looked at management practices and their impact on manufacturing performance in eight countries and discovered that process management was as one of the quality management practices that had a direct effect on quality performance. Process management has been shown to have a significant correlation in enhancing project performance not only in Malaysia but in other countries as well (Mir & Pinnington, 2014). Process performance has also shown significant contributions in the manufacturing and service

industry (Sadikoglu & Olcay, 2014; Zeng et al., 2015). Regardless of country or industry, process management has proven its importance in improving performance. The results of these findings have highlighted the importance of implementing the appropriate procedure throughout the project life cycle. A study by Tari, Molina, and Castejon (2007) asserted quality outcomes are achieved through the continuous improvement from process management activities. Process management activities such as developing key work processes at every project level, establishing Key Performance Indicators (KPIs), monitoring performance, approaches and tools to improve process performance, reducing variability, and preparing emergency plans will lead the organization to continuous improvement and ultimately have a positive impact on project performance. Their findings have also indicated process management activities must derive from suppliers and customers. Appropriate and effective work process activities can only be defined and implemented through the understanding of customer needs and a good relationship with suppliers. Particularly in a construction project, the uncertain nature of the industry requires work processes to be defined, managed, monitored, and controlled properly.

#### **5.6. Hypothesis 6—Relationship of measurement, analysis and knowledge management and project performance**

The current study's results show measurement, analysis, and knowledge management has a negative influence in improving the performance of the Malaysian construction organizations. This result is surprising as the more time and effort focused on measurement, analysis, and knowledge management, the less it will be in resulting the project performance. This result is also contradictory to the findings of other studies. In Mehralian et al. (2017), quality information availability and usage were found to be one of the TQM practices significantly affecting the performance of the pharmaceutical industry in Iran. Valmohammadi and Roshanzamir (2015) in their study investigating pharmaceutical manufacturing in Tehran showed measurement, analysis and knowledge management was one of the TQM practices associated with organizational performance. Zeng et al. (2015) in their study discovered quality information had a direct effect on the manufacturing industry's quality performance. In those studies, the importance of decision-making by managers based on real data analysis had been emphasized. Reliable and timely data information through appropriate tools or measurements is vital for upper management to decide the organization's direction and to drive excellence. On the other hand, some of the studies revealed contradictory outcomes. Ooi et al. (2012) in their study investigating Malaysian manufacturing revealed information analysis had a negative association with innovation performance. Likewise in Teh et al. (2012), information analysis had a negative relationship with the ASEAN (Thailand, Malaysia, Philippines, Indonesia and Vietnam) automotive industry. It is not surprising that measurement, analysis and knowledge management is not significant in improving project performance as there are other studies showing a similar relationship in their respective sector and country. The result of this hypothesis indicates the Malaysian construction industry still does not recognize the importance of using quality measurements and data in decision-making. Project managers in Malaysian construction organizations should look into reallocating their resources wisely to take advantage of adopting measurement, analysis, and knowledge management practices to improve their project performance. To accomplish this, the management of the organizations, especially the upper management decision-makers should rely more on statistical measurements, and reliable analysed data and encourage an information sharing culture in the organization to gain competitive advantage and maintain a leadership position in the industry.

#### **6. Conclusion**

The Malaysian construction industry has recognized the importance of continuous quality improvement of TQM in its practices. One TQM recommendation in the construction industry is the application for ISO 9000 certification. The ISO 9000 certification is only compulsory for those in the construction industry in Grade 7, according to the CIDB. Other smaller scale construction organizations are still lacking in TQM awareness and implementation. The continuous effort of

promoting and implementing quality management practices in Malaysia, especially in the construction sector, need to be encouraged.

The current management practices show the recognition of the importance of the workforce is essential to the Malaysian construction industry. The workforce is the core factor that sustains the overall operation of a construction project, where every stage of the project depends greatly on the workforce. This study suggests that by providing training, a good working environment, by encouraging teamwork, problem solving, a culture of “quality”, recognition, a rewards system, and fair compensation will increase workforce satisfaction. In addition, continuous monitoring and measuring of employee performance and job satisfaction are also essential to keep the workforce motivated and hence perform their jobs to their ability. They are the valuable assets that need great attention to improve the performance outcomes in the construction industry.

Furthermore, operation related functions are important in this unique, dynamic, and unpredictable industry. Developing key work processes, Key Performance Indicators (KPIs), a report system, new approaches and tools, improved communication with suppliers, and emergency plans are important to develop the operation process of the Malaysian construction organizations. Well-prepared operation functions enhance productivity. Project performance in the Malaysian construction industry depends directly on process management.

Another significance of this study is measurement, analysis and knowledge management has a negative influence in improving the performance of the Malaysian construction organizations. Similar implications are found in other sectors such as the manufacturing sector in Malaysia (Ooi et al., 2012) and the automotive industry of ASEAN (Teh et al., 2012). Measurements of performance, data collection and analysis, and knowledge management are the process of minimizing and reducing variability and changes; hence, a negative relationship exists between measurement, analysis and knowledge management and project performance. One other significance arising from this finding, there is a lack of knowledge in the use of measurement and analysis tools and a lack of support from management to instil a culture of information sharing in the construction organizations. The organizations have to reallocate their resources in this respect, as this is how reliable decision-making should be based.

Other TQM practices such as leadership, strategic planning and customer focus do not have a direct impact on project performance. However, other studies showed the possibility of other mediating factors influencing these features and ultimately performance (Fung & Ramasamy, 2015; Laird, 2016; Lo et al., 2010; Yang et al., 2011; Zwikael et al., 2014). Overall TQM has a significant impact on Malaysian construction project performance. The implication is that TQM is a holistic approach, which should be implemented collectively because each practice is inter-dependent with the other practices (Zwain, Lim, & Othman, 2017).

The findings of this study provide observations and insights to enable policy makers and regulators, such as the CIDB, to assess and consider any relevant revisions and amendments to current policies in Malaysia to improve quality performance in the Malaysian construction industry. For instance, one suggestion is for workforce focus and operation focus which have shown significant impact on project performance, be incorporated into current Malaysian construction industry policy. The workforce and operation focus related activities can be included as a source of reference to improve project performance and upgrade the status of the Malaysian construction industry globally.

## 7. Limitations and future research

The results of this research had to address some data weaknesses due to resource and time constraints. The first limitation was the study only focused on Malaysian organizations. It is suggested this study could be broadened to other countries including developed, developing, and underdeveloped countries. A comparison study between Malaysia, a developing country, and

another group of countries in the world is encouraged. Secondly, due to time constraints, a cross-sectional study was conducted in this research. In the future, a longitudinal study studying the link between TQM and project performance in the industry based on time sequence is suggested. The causality between variables can be tested through different points of time data for a clearer and more significant contribution.

This may further investigate the differences in the relationship between TQM and project performance across various nations. The findings of this study showed many of the TQM practices were not directly linked to project performance but the literature has shown there is a history of mediating factors effecting variables and outcomes. Therefore, future research could be expanded to investigate the role of mediating factors. A future study is suggested to increase the sample size for a better representation of the population and a better understanding of their organizations practices affecting Malaysian project performance. A comparison between a study with a larger sample size and the current study would be interesting in validating these results.

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## Appendix A. Questionnaire items

### TOTAL QUALITY MANAGEMENT (TQM) PRACTICES

#### PROJECT PERFORMANCE

Please circle one number per line to indicate the extent to which you agree or disagree with the following statement, where (1) = strongly agree; (2) = agree; (3) = neutral; (4) = disagree; and (5) = strongly disagree

#### Leadership

		1	2	3	4	5
LS1	Top management establishes and sustains clear and visible customer-focused quality vision, values and mission.					
LS2	Top management actively participates in quality management and improvement process					
LS3	Top management regularly held meetings discusses and reviews quality-related issues					
LS4	Top management encourages quality-related concepts and skills					
LS5	Top management allocate adequate resources for quality improvement					
LS6	Top management pursues long-term quality improvement process					



### Strategic Planning

SP1	Our organization has a mission statement which has been communicated throughout the company and is supported by our employees	1	2	3	4	5
SP2	Our organization has a comprehensive structured planning process which regularly sets and reviews short and long-term goals	1	2	3	4	5
SP3	Our organizations always incorporates supplier capabilities and needs of other stakeholders including the community when we develop our plans, policies, and objectives	1	2	3	4	5
SP4	Our organization strategic plans and tactical plan are linked to quality values	1	2	3	4	5
SP5	Our organization integrates continuous quality improvements into planning process	1	2	3	4	5

### Customer Focus

CF1	Our organization has been customer focused for a long time	1	2	3	4	5
CF2	Our organization provides mechanism for customer feedback	1	2	3	4	5
CF3	Our organization takes customer complaints as continuous improvement process	1	2	3	4	5
CF4	Our organization reviews customer complaints and take into consideration for product innovation	1	2	3	4	5
CF5	Our organization conducts a customer satisfaction survey every year					
CF6	Our organizations conducts market study regularly to collect suggestions for improving our product	1	2	3	4	5

### Measurement, Analysis and Knowledge Management

MM1	Our organization implements organizational performance measurement system	1	2	3	4	5
MM2	Our organization conducts organizational performance measure at a constant time interval period	1	2	3	4	5
MM3	Data and information collection at all levels and in all parts of our organization	1	2	3	4	5
MM4	Our organization regularly analyzes and reviews the data and information collected	1	2	3	4	5
MM5	Availability of key performance figures for analysis and decision making	1	2	3	4	5
MM6	Performance review findings for continuous improvement and innovation	1	2	3	4	5
MM7	Our organization has undertaken benchmarking of other firms' product quality and procedures	1	2	3	4	5

Workforce Focus						
WF1	Our organization provides training and development process for all our employees	1	2	3	4	5
WF2	Our organization encourage teamwork and problem solving among employees	1	2	3	4	5
WF3	Employee performance are regularly monitored and measured	1	2	3	4	5
WF4	Our organization regularly measures employee satisfaction	1	2	3	4	5
WF5	Our organization maintains a working environment that contributes to the health, safety and well-being of all employees	1	2	3	4	5
WF6	Our organization promotes compensation, recognition, and reward system among employees	1	2	3	4	5
WF7	Our organization instill quality culture on continuous improvement among employees	1	2	3	4	5
Operation Focus						
OF1	Our organization develops a set of key work processes	1	2	3	4	5
OF2	Our organization establishes Key Performance Indicators (KPIs) for monitoring purpose	1	2	3	4	5
OF3	Our organization practices daily operation work processes report system	1	2	3	4	5
OF4	Our organization regularly monitors and reviews on work processes performance	1	2	3	4	5
OF5	Our organization uses of approaches or tools to improve process performance and reduce variability	1	2	3	4	5
OF6	Our organization exercises two-way communication with suppliers	1	2	3	4	5
OF7	Our organization has a well-prepared disaster and emergency preparedness system to ensure the continuity of our operations	1	2	3	4	5

Please circle one number per line to indicate the extent to which you agree or disagree with the following statement, where (1) = strongly agree; (2) = agree; (3) = neutral; (4) = disagree; and (5) = strongly disagree

PP1	Generally our projects meet their time objectives	1	2	3	4	5
PP2	We are usually good at delivering projects within budget	1	2	3	4	5
PP3	Project specifications are usually met by the time of handover	1	2	3	4	5
PP4	Key stakeholders and end users are usually happy with the results from our projects	1	2	3	4	5



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