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Research Article

A Causal Model of the Quality Activities Process: Exploring the Links between Quality Capabilities, Competitiveness and Organizational Performance

Cheng-tao Yu and Bor-wen Cheng
Department of Industrial Engineering and Management, National Yunlin University of Science and Technology, Taiwan

Abstract: The purpose of this study is to examine the relationship between Total Quality Management (TQM) practices, quality capabilities, competitiveness and firm performance. In this study, TQM has been conceptualized as soft and hard practices. An empirical analysis based upon an extensive validation process was applied to refine the construct scales, respectively. The sample consists of 423 valid responses for applying Structural Equation Modeling (SEM). Results derived from this study show that soft TQM practices have a direct, positive and significant relationship between quality capabilities, competitive strategies and Organizational performance. In addition, an indirect, positive and significant relationship on organizational performance through quality capabilities and competitive strategies was observed. The findings of this research show that hypotheses H3b, H4b and H6b do not support, the rest are in line with the model inference. Particularly, from the results indicate that soft TQM are the most important resource, which has strong effects on organizational performance. Results derived from this study might help managers to implement TQM practices in order to effectively allocate resources and improve financial performance. Thus, managers should consider that improvement in soft TQM would support the successful implementation of quality capabilities, competitive advantage and organizational performance. Much efforts relating to social aspects in TQM activities are particularly key issues to improve performance.

Keywords: Competitiveness, organizational performance, quality activities, quality capabilities

INTRODUCTION

Organizations often seek ways to improve their competitive advantage within their respective industries. Many of them struggle to accomplish this goal with the use of a systematic approach to improve their organizational performance as it relates to quality products or services. Among those management approach, lots of researchers have indicated that the Total Quality Management (TQM) practices is a potentially useful tool for promoting business performance and increasing a company's competitive advantage (Hendricks and Singhal, 2001a; Martinez-Lorente *et al*., 2000; Terziovski and Samson, 2000). In general, TQM is a quality management approach that focuses on customer needs and process improvements. It views an organization as a collection of processes. Organizations must strive to continuously improve these processes for surviving in a competitive environment.

Actually, the concept of TQM has been developed over 50 years. It can be traced back as far as 1949, with the formation of the Union of Japanese Scientists and Engineers (JUSE) dedicated to improving postwar Japanese productivity (Powell, 1995). Since it was introduced to the world, the emergence of TQM has been one of the most significant quality management developments in the past half-century. Observed from the past literatures, TQM has been well accepted by managers as a change management quality approach (Arumugam *et al*., 2009). Many researchers claimed TQM as an improving approach to effectiveness, flexibility and competitiveness of a process to meet customer's needs (Oakland, 1993). It could be play an essential role in the development of management practices (Prajogo and Sohal, 2003; Hoang *et al*., 2006) and also a source of sustained competitive advantage for organizations (Terziovski, 2006).

Although many researchers believe that TQM is an important role for the efficiency and performance of the organization. Some authors find positive results between TQM and performance (Anderson *et al*., 1995; Choi and Eboch, 1998; Hendricks and Singhal, 1999, 1997, 2001a, b; Shenaway *et al*., 2007), some stressed that it produces better products and services, more satisfied customers and employees, reduce costs, enhance competitiveness and improve productivity (Zu, 2009; Kaynak, 2003; Deming, 1986), while others explore the importance of TQM to enhance competitive

Corresponding Author: Cheng-Tao Yu, Department of Industrial Engineering and Management, National Yunlin University of Science and Technology, Taiwan

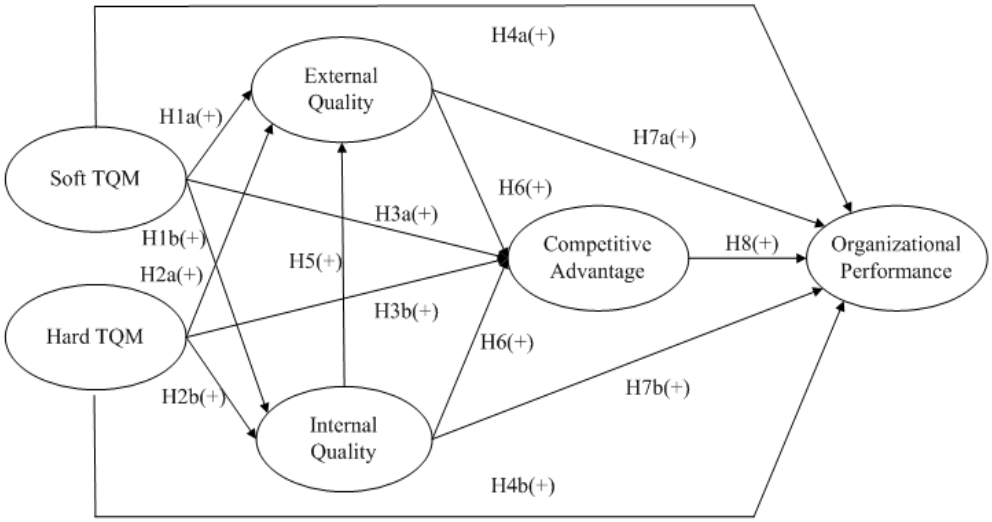

Fig. 1: Conceptual framework

advantage (Kuei *et al*., 2001; Eng and Yusof, 2003; Flynn *et al*., 1995; Powell, 1995).

In the past literature, on the relationship between TQM and performance contains many different perspectives. In 1981, Deming offers one important theoretical contribution, which was his Chain Reaction Model (Deming, 1981), it can clearly explain potential consequences of TQM activities and Deming's model has been certified by major corporations as having implemented effective TQM practices, which uses quality control of processes as well as products to achieve more consistent quality. In essence, rather than increasing costs, improving quality should actually reduce costs and therefore have a positive effect on financial performance (York and Miree, 2004). So, in his model, Deming postulated that effective TQM activities would get better quality improvement first and at the same time improving productivity and product effectiveness allows a company to benefit from the positive chain reaction.

As for the antecedents of the performance, from the perspective of competitive advantage, TQM has been regarded as one of effective ways for firms to improve their competitive advantage (Kuei *et al*., 2001). Generally, competitive advantage suggests that each organization have one or more of the following capabilities when compared to its competitors, such as lower prices, higher quality, higher dependability and shorter delivery time. These capabilities will enhance the organization's overall performance (Mentzer *et al*., 2000). Leading pioneers in the quality area, such as Deming (1986) and Juran and Gryna (1993), also asserted that competitive advantage can be gained by providing quality products or services. Additionally, Eng and Yusof (2003) argued that quality holds the key competitiveness in today's global market. Organization can increase its profit margin, if they can able to offer the high quality products consistently. Therefore, the occurrence of corporate performance, companies must obtain considerable some kinds of competitive advantage first, so as to obtain the excess profits.

The aim of this study is to test the relationships among TQM practice, quality capabilities, competitive advantage and organizational performance. TQM practice is an antecedent for quality capabilities, indirectly related to organizational performance. In addition, this study investigates the mediating role of quality capabilities and competitive advantage in explaining the relationship between TQM practices and organizational performance.

LITERATURE REVIEW AND RESEARCH HYPOTHESES

By understanding the factors that impact the organizational performance, a model of recommended procedures can be developed to aid organizations in their management journey. In this section, we define the components of our framework (Fig. 1) relating quality activities, quality capabilities, competitiveness and organizational performance. After discussing the components of the framework, we present the theory that supports this framework and discuss the hypothesized that will be analyzed in this study.

TQM activities: According to Deming's viewpoints about TQM, quality is not a state to be achieved in manufacturing, but is, rather, an ongoing company-wide effort at continual improvement from employments and their organization. Obviously, the essence of successful TQM thinking is building people and then building products. Based on this argument, researchers have classified TQM's principles and practices into two main groups: the soft factors or social aspects and the hard factors or technical aspects

(Rahman and Bullock, 2005; Lewis *et al*., 2006; Schmidt *et al*., 2013). In general, hard aspects of quality management relate to technical tools and systems necessary for the implementation of quality management principles such as statistical tools or techniques, benchmarking, the quality standard and process management, measurement and product/service design, while soft quality management practices deal with the management of people, relationships and leadership. Soft practices and hard practices both are important to successful implementation of quality management. Details of this classification are given in Evans and Lindsay (1999), Wilkinson *et al*. (1998), Abdullah *et al*. (2008) and Schmidt *et al*. (2013). Besides these studies, several quality improvement models such as Malcolm Baldridge, European Foundation for Quality Management and the Deming Prize have also identified critical soft TQM such as leadership, process management, training, communication, teamwork and learning as the key practices for effective quality improvement.

Quality capabilities: Organizations adopt a quality management strategy focus on achieving and sustaining a high quality outputs, using management practices as the inputs and quality performance as the outputs (Flynn *et al*., 1994). Deming's Chain Reaction Theory states that quality management will lead to quality improvement first. This means that quality management is the antecedent factor of quality improvement, while quality is also the principal determinant of success in competitive environments (Deming, 1986). Deming pointed out the benefits of developing a competitive strategy based on quality. Consequently, enterprises can sustain a competitive advantage by continually reproducing product and management quality. Basically the idea was for management to move away from thinking about quality as a desirable outcome, to thinking about quality as a competitive strategy.

In the present study, the quality capabilities, mainly observe by the extent of quality failure, while fewer quality failure, quality capability is the better. Normally, cost-effectiveness will be reflected in the number of waste and re-work during production, namely internal failure costs (Juran and Gryna, 1993). Therefore, the number of waste and rework product can be regarded as an internal measure of quality (Flynn *et al*., 1995; Grandzol, 1998). This indicator fit Crosby meet specifications facets (Crosby, 1979, 1996). External failure costs include costs that are verifiable costs as warranties, replacements, lost sales because of bad reputation, payment for damages arising from the use of defective products etc., which are often reported as the only costs of external failure. The shipment of defective products can dissatisfy customers, damage goodwill and reduce sales and profits.

Competitive advantage: Organizations often seek ways to improve their competitive advantage. Total quality management is identified as an origin of innovation, competitive advantage and organizational culture (Irani *et al*., 2004). There are several complementary models of competitive advantage (Reed *et al*., 2000). One of the models is the market-based model, focuses on cost and differentiation. There is an agreement between Deming and Juran that the purpose of quality management is to reduce costs and improve customer satisfaction. These ideas fit closely with the market based view of competitive advantage arising from a superior cost structure or being able to differentiate products in a way that adds value for customers. Competitive advantage is the extent to which an organization is able to create a defensible position over its competitors (Porter, 1985; Barney, 1991). It comprises capabilities that allow an organization to differentiate itself from its competitors and is an outcome of critical management decisions.

Organizational performance: Performance measurement is recognized as an important factor by some researchers many years ago (Phusavat *et al*., 2009). According to Phusavat *et al*. (2009), performance measurement can be considered as a significant factor in failure and success of each quality effort of the organization. The concept refers to how well an organization achieves its market-oriented goals as well as its financial goals (Li *et al*., 2006). The traditional approach to performance measurement using only financial performance measure is flawed. A number of prior studies have measured organizational performance using both financial and market criteria, including Return on Investment (ROI), market share, profit margin on sales, the growth of ROI, the growth of sales and the growth of market share (Stock *et al*., 2000). This study attempts to improve the performance through TQM perspective. In line with the above literature, the performance measurement should be including financial and non-financial indicators (Wilson *et al*., 2003).

TQM activities link to quality capabilities, competitiveness and organizational performance: Overall, the empirical literature found connection between quality management practices and performance. To investigate these relationships and their mediated effects, many studies that quality management practices use soft and hard aspects, quality capabilities use internal and external failure concepts, but only a few studies explicitly classify them as individual idea.

Studies that analyze the effects of quality management practices as soft and hard aspects, in general, find that quality management practices have positive effects on achieving and sustaining a high quality outputs (Flynn *et al*., 1994). Deming's viewpoints about TQM also identified the potential

consequences of TQM activities. Obviously, quality management is the antecedent factor of quality improvement, while quality is also the principal determinant of success in competitive environments (Deming, 1986). Flynn *et al*. (1995) examined the relationships between quality management and performance using a path analysis. They show that some soft and hard quality management factors have a direct and indirect relationship with performance. Gadenne and Sharma (2009) found that all TQM factors are significantly associated with improved overall performance. Curkovic *et al*. (2000) also derived the similar relationships between competitive and dimensions of quality.

Some of these studies have shown significant positive relationships between performance and competitive advantage (Irani *et al*., 2004). In addition, some claimed that the successful implementation of TQM could generate improved products and services, as well as reduced costs, more satisfied customers and employees and improved financial performance (Garvin, 1991; Hendriks and Singhal, 1997). Based on the literatures of this study, the following eight hypotheses are proposed:

- **H1a:** Soft quality management factors have positive direct effects on external quality.
- **H1b:** Soft quality management factors have positive direct effects on internal quality.
- **H2a:** Hard quality management factors have positive direct effects on external quality.
- **H2b:** Hard quality management factors have positive direct effects on internal quality.
- **H3a:** Soft quality management factors have positive direct effects on competitive advantage.
- **H3b:** Hard quality management factors have positive direct effects on competitive advantage.
- **H4a:** Soft quality management factors have positive direct effects on organizational Performance.
- **H4b:** Hard quality management factors have positive direct effects on organizational Performance.

The relationship between quality capabilities, competitiveness and organizational performance: Deming's Chain Reaction Theory (Deming, 1981) states that quality management will lead to improve quality, costs decrease, productivity improves, capture the market share, stay in business and provide more jobs. Deming pointed out the results by continually reproducing product and management quality. Because of scrap and rework costs (internal quality) will affect the price of the product, which will affect the subsequent customer satisfaction and service (external quality). Besides, product performance and reliability (internal quality) will affect external quality in the complaining, quality assurance and market share. Lower defective products (internal quality) can help companies strengthen the positive experiences of customers (Hardie, 1998).

Fotopoulos and Psomas (2009) show that quality management elements have both a direct and indirect impact on the quality management results. It exists in different indicators. Eng and Yusof (2003) claimed that quality holds the key competitiveness. Deming proposed the same idea that the benefits of developing a competitive strategy based on quality. Generally, competitive advantage suggests that each organization have one or more capabilities when compared to its competitors, one of the most importance capabilities is higher quality. These capabilities will enhance the organization's overall performance (Mentzer *et al*., 2000). Therefore, organizations can increase their profit margin and competitive advantage, if they can able to offer the high quality products consistently.

These studies show that, in general terms, some internal and external quality factors may be related, that internal quality factors may have direct and indirect effects on competitive advantage and performance, which external factors may be directly related to competitive advantage and performance. In addition, external quality factors may act as a mediating variable between internal quality, competitive advantage and performance. Thus the following six hypotheses could be formulated as follows:

- **H5:** Internal quality factors have positive direct effects on External Quality.
- **H6a:** External quality factors have positive direct effects on competitive advantage.
- **H6b:** Internal quality factors have positive direct effects on competitive advantage.
- **H7a:** External quality factors have positive direct effects on organizational Performance.
- **H7b:** Internal quality factors have positive direct effects on organizational Performance.
- **H8:** Competitive advantages have positive direct effects on organizational Performance.

Specific hypotheses are discussed above. Figure 1 presents the conceptual framework of the research and depicts the major research hypotheses of the study.

METHODOLOGY

Instrumentation: The questionnaire was developed in three steps. Step one was a comprehensive literature review, which led to the first draft of the questionnaire. Then, there was an initial test for clarity by graduate students at a major Taiwan university. Finally, refined and tested the instrument utilized in-depth interview of personnel at two consultant companies.

For most of the questions included a seven-point Likert scale anchored at (1) strongly disagree and (7) strongly agree, indicating respondents' disagreement or agreement with each item.

The scale used in this study was developed following the recommendations and the standard psychometric scale development procedures presented by Devellis (2003) Respondents were provided with a self-administered questionnaire to complete. The constructs in the questionnaire were developed from the literature review and previous questionnaires. The scale items for TQM activity (redefined into soft aspects and hard aspects) were adapted from Ahire *et al*. (1996) and Powell (1995); the items of quality were adapted from Ahire and Dreyfus (2000), business performance were adapted from Powell (1995) and Venkatraman and Ramanujam (1986). In addition, the items used to measure advantage were adapted from Powell (1995).

Sample and descriptive statistics: The data used for empirical analysis of the causal model were collected from major industries in Taiwan. Twelve hundred firms were surveyed. A total of 455 completed survey forms were returned and 22 incomplete responses were discarded. This yielded 423 valid responses for the statistical analysis and a valid response rate of 35.2% for the initial sample.

The respondents comprised 372 men (87%) and 51 women (13%); more than 68% respondents achieved a bachelor degree; 5 years seniority were 186 (44%), less than 2 years were only 51 (12%). From the percentage of educational level and job seniority indicated that most of the respondents who should have considerable understanding of the industry. This data even showed that manufacturing industry accounted for 314 (74%), overall, about 18% of the enterprises had no intention to implement TQM; more than 80% were willing to or had been implemented TQM activities. Obviously, most of the enterprises were considerable emphasis on quality management activities.

Data analysis: This research used SmartPLS Version 2.0 to obtain Partial Least Squares (PLS) estimates for both the measurement and structural parameters in our structural equation model (Chin, 2003; Hulland, 1999). In this study, we assessed the reliability and validity of the measurement model first and then assessed the structural model. This sequence gives the model's constructs a foundation of validity and reliability before attempting to make any assertions regarding the relationships between those constructs (Barclay *et al*., 1995).

This research model contains six variables (including four dependent variables and two independent variables) and each of the constructs comprises suitable items according to their corresponding literature. Thus, the sample of 423 participants in this research was higher than the minimum required sample size and large enough for the PLS technique. PLS is a family of alternating least squares algorithms, which extend principal component and canonical correlation analysis.

Table 1: Summary of construct validity and reliability results

Constructs	CR	AVE	Cronbach's α
Soft TQM	0.947	0.582	0.939
Hard TQM	0.941	0.517	0.933
Internal Qul.	0.945	0.681	0.933
External Qul.	0.919	0.693	0.890
Advantage	0.832	0.500	0.747
Performance	0.961	0.754	0.953

Measurement validity: The measurement model was assessed for reliability, individual item loadings, convergent validity and discriminant validity. Three criteria were considered in the process:

- All item loadings (λ)
- Investigation of reliability coefficients (Cronbach's alpha) and composite Reliability Coefficients (CR)
- Average Variance Extracted (AVE) (Bagozzi and Yi, 2012; Chin, 1998; Fornell and Larcker, 1981; Hair *et al*., 2010; Jöreskog and Sörbom, 2005). Table 1 shows the indices of reliability and convergent validities for the scale

The Cronbach's α coefficient ranged from 0.747 to 0.953, which suggests a high level of reliability. All constructs displayed a higher Cronbach's α coefficient than the 0.70 benchmark suggested by Hair *et al*. (2010). Composite Reliability (CR) is a set of latent construct indicators that are consistent on their measurement. These CR coefficients ranged from 0.832 to 0.961. The constructs also exhibited a higher CR than the 0.6 benchmark advised by Fornell and Larcker (1981). Convergent validity was examined using Average Variance Extracted (AVE) and factor loadings. In this research, all constructs demonstrated AVE values between 0.500 and 0.754. The value of the AVE for all constructs was above 0.5, which exceeds the limit recommended by Fornell and Larcker (1981). The overall AVE from the constructs demonstrated a satisfactory reliability and validity. In summary, the internal reliability and validity results were acceptable, which enabled us to proceed to an estimation of the structural model.

Hypotheses testing: For the structural model, we used the R^2 value for the endogenous latent variables as a measure of model fit (Chin, 1998; Tenenhaus *et al*., 2005). Tenenhaus *et al*. (2005) have developed a global fit measure for PLS, GoF indictor, which is defined as the geometric mean of Average communality (AVE) and average R^2 for the endogenous constructs.

According to the effect sizes for R^2 (small: 0.02; medium: 0.13; large: 0.26) proposed by Cohen (1988), we inferred that the following GoF criteria for small, medium and large effect sizes: 0.1, 0.25 and 0.36. The GoF indictor found in this study is 0.67 and can be classified as large. To test the effects and the statistical significance of the parameters in the structural model, we used a bootstrapping procedure with 500 re-samples (Chin, 1998).

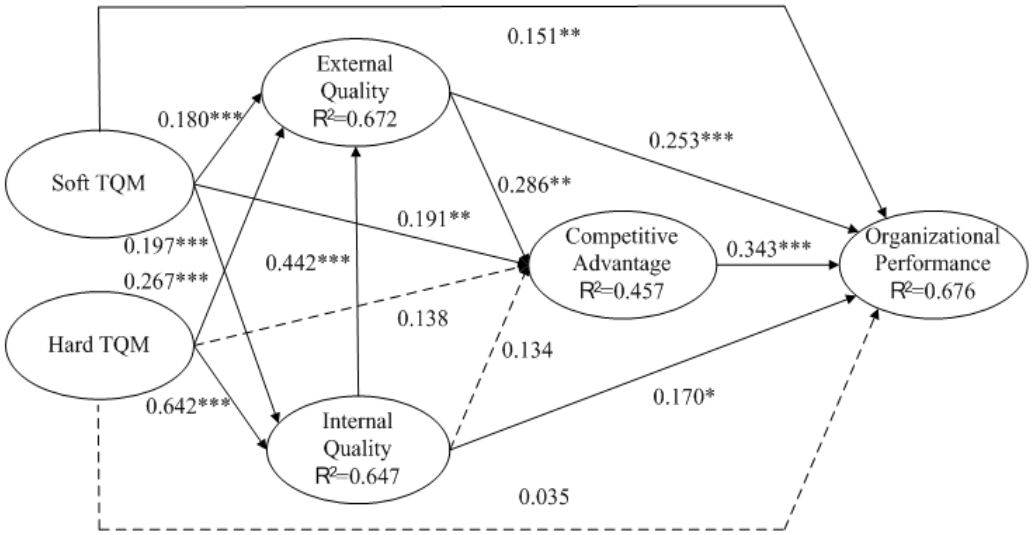

Fig. 2: Structural model results
Value on path: Standardized coefficients (â); R^2: Coefficient of determination; *: p<0.05; **: p<0.01; ***: p<0.001

Given adequate convergent validity and discriminant validity, we proceeded to empirically test the hypotheses using SEM paths. The standardized beta-coefficients from the estimated structural model and the associated t-values for each construct and PLS analysis results are presented in Fig. 2.

More specifically, external quality and internal quality are significantly and positively influenced by perceived soft TQM (β = 0.180, p<0.001, t = 3.520 and β = 0.197, p<0.001, t = 4.266) and hard TQM (β = 0.267, p<0.001, t = 4.293 and β = 0.642, p<0.001, t = 15.264), respectively. Consequently, H1a, H1b, H2a and H2b are supported.

The results support H3a and H4a, which states that soft TQM have significant effect toward competitive advantage (β = 0.191, p<0.01, t = 2.958) and organizational performance (β = 0.151, p<0.01, t = 3.152). Surprisingly, none of the proposed positive effects of hard TQM on both competitive advantage (β = 0.138, p>0.05, t = 1.732) and organizational performance (β = 0.035, p>0.05, t = 0.480) are found to be insignificant. Accordingly, H3b and H4b are not supported. The statistical significance of H5 confirms that the internal quality may directly improve external quality performances (β = 0.442, p<0.001, t = 6.791). As demonstrated in Fig. 2, we also find a strong positive relationship between external quality and competitive advantage (β = 0.286, p<0.001, t = 4.401), interestingly, none of the proposed positive effects of internal quality on competitive advantage is found to be significant (β = 0.134, p>0.05, t = 1.615). Therefore, H6a, is supported, H6b is not. In support of H7a and H7b, external quality and internal quality positively contribute to the level of organizational performance (β = 0.253, p<0.001, t = 4.401; β = 0.170, p<0.05, t = 2.518). Finally, competitive advantage has a positive effect on organizational performance (β = 0.343, p<0.001, t = 7.206). Consequently, support for H8 is also found.

In terms of the fit of the structural model, inspection of the R^2 for the endogenous variables shows large effect sizes in terms of R^2 (R^2 = 0.36) for external quality (R^2 = 0.672), internal quality (R^2 = 0.647), competitive advantage (R^2 = 0.457) and organizational performance (R^2 = 0.676); significant at α = 0.01. According to the effect sizes defined for R^2 by Cohen (1988), these effects can be classified as large (R^2>0.36).

RESULTS AND DISCUSSION

From the test results of the hypothesis H1a, H1b, H2a and H2b, both soft and hard TQM activities have significant effects toward quality capabilities. This means that no matter what kinds of TQM activities will result in quality improvement. This result fit to Deming's Chain Reaction Model, as he postulated that effective TQM activities would get better quality improvement. However, while quality and cost are arguably related, TQM proponents have suggested a direct and inverse relationship between each other. Garvin (1984) suggests that when quality is defined in a broader context than 'conformance to specification'. Companies need to invest in other costs, namely prevention and appraisal costs (Crosby, 1979) to achieve a reduction in failure costs. This result can be confirmed in the hypothesis H5, H6a and H6b. It is obvious that improving internal failure costs by cutting down the rework and waste can enhance the external quality performance, but it will not benefit cost leader in competitive advantage. On the contrary, if the organizations have better external quality performance,

meaning that they would have the opportunity of better reputation in line with customer needs. This will make them to get a larger market share and thus have a higher competitive advantage.

As for the situation of hypothesis H3a, H3b, H4a and H4b, this result is substantiated by the findings suggesting that soft TQM is significantly and positively related to the quality capabilities, competitive advantage and organizational performance, indicating that soft TQM can be employed as an effective means for implementing a decisive role to achieve satisfactory organizational performance. However, the findings do not indicate any positive relationship between hard TQM and competitive advantage and organizational performance. This insignificant relationship is of particular interest because a certain degree of support for this relationship has been identified (Kaynak, 2003; Rahman and Bullock, 2005). An analysis from Fig. 2 also shows that the soft TQM have direct and positive influence on organizational performance as well as an indirect effect through the quality capabilities and competitive advantage. The results suggest that organizational performance is much more influenced by competitive advantage (hypothesis H8) than soft TQM (hypothesis H4a). These finding indicates that soft TQM promotes quality capabilities (hypothesis H1a, H1b) or competitive advantage (hypothesis H3a) to the organization and then competitive advantage will improve the organizational performance.

CONCLUSION

The aim of this study was to test the impacts of TQM activities on quality capabilities, competitive advantage and organizational performance. By reviewing prior literatures and identifying important components among the causal model, this study investigated the Deming chain reaction model and measures how they influence each other in the causal model. The findings of this research show that hypotheses H3b, H4b and H6b do not support, the rest are in line with the model inference. Particularly, from the results indicate that soft TQM is the most important resource, which has strong effects on organizational performance. Thus, managers should consider that improvement in soft TQM would support the successful implementation of quality capabilities, competitive advantage and organizational performance. Much efforts relating to social aspects in TQM activities are particularly key issues to improve performance and compete in a global market.

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