THE RELATIONSHIPS BETWEEN MANAGERIAL METACOGNITION, TOTAL QUALITY MANAGEMENT, AND A FIRM'S SUSTAINABLE COMPETITIVE ADVANTAGES: AN EMPIRICAL INVESTIGATION BASED ON STRUCTURAL EQUATION MODELING ANALYSIS

A Dissertation

by

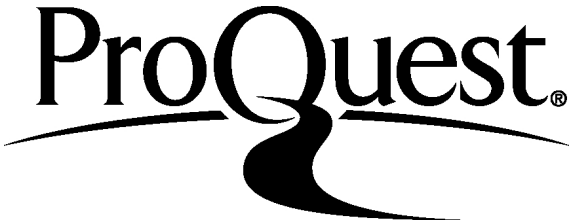
YOUNG SIK CHO

Submitted to the Graduate School of
The University of Texas - Pan American
In partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

July 2015

Major Subject: Business Administration with emphasis in Management



THE RELATIONSHIPS BETWEEN MANAGERIAL METACOGNITION, TOTAL QUALITY MANAGEMENT, AND A FIRM'S SUSTAINABLE COMPETITIVE ADVANTAGES: AN EMPIRICAL INVESTIGATION BASED ON STRUCTURAL EQUATION MODELING ANALYSIS

A Dissertation
by
YOUNG SIK CHO

COMMITTEE MEMBERS

Dr. Joo Jung
Chair of Committee

Dr. Kevin Linderman
Committee Member

Dr. Sibin Wu
Committee Member

Dr. Jorge Gonzalez
Committee Member

July 2015

ABSTRACT

Cho, Young Sik, The Relationships Between Managerial Metacognition, Total Quality Management, and a Firm's Sustainable Competitive Advantages: an Empirical Investigation Based on Structural Equation Modeling Analysis. Doctor of Philosophy (Ph.D.), July, 2015, 139 pp., 18 tables, 13 figures, references, 168 titles.

The purpose of this study is to explore how managerial metacognition has an influence on the effective implementation of total quality management (TQM) and the creation of a firm's sustainable competitive advantages (P) by using the lens of Resource-Based View (RBV). In particular, this study conceptualized the existing TQM framework by two sub-constructs, technical quality management (TQ) and behavioral quality management (BQ) practices, and newly proposed the sequential relationship of 'TQ→BQ→P' based on the premise of the RBV. In addition, through post-hoc analysis, this study tested the mediation effect of a firm's TQ practices on the relationship between managerial metacognition and their BQ implementation.

An online survey method was adopted to collect a primary data for this study, and a total of 235 viable samples were obtained from quality managers working in the U.S.-based firms. Confirmatory factor analysis (CFA) was first conducted in order to examine the validation of the measurement models, and then structural equation modeling (SEM) analysis was performed to test the hypothesized research model by using AMOS 22.

The test results show that a significant positive association between managerial metacognition and a firm's quality practices, suggesting that a better effective TQM implementation could eventuate in a firm when they have a higher level of metacognitive ability. The study results also reveal that 'TQ→BQ→P' is a statistically more robust structure than 'BQ→TQ→P', implying that a firm's BQ is a more critical strategic resource for generating a firm's sustainable competitive advantages than is TQ. Furthermore, the test results of post hoc analysis demonstrate that a firm's TQ-related tools and techniques have a role as an indispensable vehicle in materializing the positive influence of managerial metacognition on BQ implementation.

DEDICATION

In memory of Dr. Joseph M. Juran (1904 – 2008) who was an evangelist for quality management and also first conceptualized that the success of quality management heavily relied on human-related factors.

ACKNOWLEDGMENTS

With respect to this dissertation, I would first like to express the deepest appreciation to my parents, Dr. Kwang-Hyun Cho & Sun-Ok Shin, and my wife, Kwon-Ah La. Thank you for all of your support, encouragement, faith and love during this journey. You are all a constant source of happiness in my life.

In addition, I would specially like to thank to Dr. Joo Jung, Chair of my dissertation committee, for his excellent mentoring, advice, and tremendous support during my Ph.D. study. I will never forget and always be grateful to you!

My thanks also go to my dissertation committee members: Dr. Kevin Linderman, Dr. Sibin Wu, and Dr. Jorge Gonzalez. In particular, I deeply appreciate Dr. Linderman, Professor of the Carlson School of Management at University of Minnesota, for all his insightful feedbacks, academic inspiration, and distinguished professionalism which he has shown as an outside committee member for the last two years.

Finally, I am thankful to all the faculties and staffs of the College of Business Administration at UT - Pan Am for their great assistance and leadership (Dean: Dr. Teofilo Ozuna, Jr.) that helped me in successfully accomplishing my Ph.D. degree, eventually contributing to opening a new chapter in my life as an Assistant Professor of the College of Business at Jackson State University in the U.S.

TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER I

INTRODUCTION

"*Real knowledge is to know the extent of one's ignorance.*"

Confucius (551–479 BC)

1.1 Statement of the Problem

This study aims to explore how a firm's managerial metacognition have an influence on the effective implementation of total quality management (TQM) and the creation of a firm's sustainable competitive advantage by using the lens of the resource-based view (RBV). Metacognition can generally be defined as a higher-order process reflecting one's awareness and controling over the knowledge structure used by people in making an assessment or a decision (Haynie, Shepherd, Mosakowski, and Earley, 2010). Specifically, in the context of operations management, this study defines a firm's managerial metacognition as a higher-order process mechanism actually possessed by a firm through which it is able to develop a new knowledge structure in order to realize more effective implementation of its technically-driven mechanisms (e.g., TQM, Six Sigma, and lean system) based on a keen understanding of its motivations, assumptions, strengths, and weaknesses (Flavell, 1987; Haynie, 2005; Choo, Linderman, and Schroeder, 2007; Haynie and Shepherd, 2009; Haynie et al., 2010). In the literature, it is recognized that TQM practices and metacognition inherently have the following strong

functional similarities. Both mechanisms mainly: (i) focus on process effectiveness (e.g., Berardi-Coletta, Buyer, Dominowski, and Rellinger, 1995; Silver, 2004); (ii) emphasize a learning-by-doing approach, that is, learning how to perform the activity better by actually doing it (e.g., Paris and Winograd, 1990; Hayes et al., 2005); and (iii) pursue continuous improvement by an ongoing knowledge creation process (e.g., Kluwe, 1982; Linderman, Schroeder, Liedtke, Zaheer, and Choo, 2004). Taking these similarities into consideration, it is rationally anticipated that a functional relationship exists between the two mechanisms.

However, there is a little insight into the relationship between the "technical mechanism" (i.e., TQM practices) and the "psychological mechanism" (i.e., metacognition) (Choo et al., 2007, p. 437) in the operations management literature. Further, to the best of my knowledge, the role played by metacognitive mechanism on the effectiveness of the technical mechanism such as TQM implementation has not yet been investigated. In addition, the metacognitive mechanism within organizational activities is typically too ambiguous for competitors to recognize; as a result, the mechanism cannot easily be imitated and substituted by competitors. Hence, based on the premise of the RBV (Barney, 1991), it is also assumed that a firm's well-developed metacognitive abilities can act as a source of the firm's sustained competitive advantage. Based on these arguments, the following research questions are introduced for examination through this study:

(1) What is the role of managerial metacognition on the effective implementation of total quality management (TQM)? In other words, is managerial metacognition related to the effective implementation of TQM practices?

(2) If so, how does the synergy of managerial metacognition and TQM influence the creation of a firm's sustained competitive advantage?

1.2 Significance of the Research

1.2.1 Contributions to TQM Theory

It is anticipated that this research can make some meaningful contributions not only to TQM research but also to TQM practices. First, in terms of this research's theoretical contributions, the psychological mechanism has been actively studied for a long time at the metacognition level in many other disciplines such as education (e.g., Schoenfeld, 1987; Borkowski and Muthukrishna, 1992), psychology (e.g., Flavell, 1976; Davidson, Deuser, and Sternberg, 1994), entrepreneurship (e.g., Haynie, 2005; Haynie, Shepherd, and Patzelt, 2012; Cho and Jung, 2014), and international management (e.g., Ang, Van Dyne, Koh, Ng, Templer, Tay, and Chandraseka, 2007; Kim and Van Dyne, 2012).

On the other hand, to date, the impact of metacognitive mechanism on the systematic mechanism such as TQM, Six sigma, and Lean system has not yet been explored in operations literature. Further, psychological mechanism-related research in operations management has only been conducted at the cognitive level. However, metacognition is considered as the higher-order process which controls the existing knowledge structure while cognition is regarded as the existing knowledge structure used by people in making an assessment or a decision. Accordingly, it is anticipated that the functional role of such a higher-order process (i.e., metacognition) on technical mechanisms such as TQM may be quite different from the role of a lower-order process (i.e., cognition) on these mechanisms. Thus, it is expected that this study can make some theoretical contributions to the TQM literature not only by expanding the research scope, but also by providing a new insight into the functional relationship between psychological and technical mechanisms.

1.2.2 Contributions to TQM Practice

With respect to TQM practices, there is a strong tendency across TQM-embedded firms to simply adopt or mimic the most popular TQM framework that has been successfully implemented by their leading competitors; this so-called isomorphic nature of TQM practices can be explained by institutional theory (Selznick, 1996; Hendricks and Singhal, 1997; Dahlgaard, Kristensen, Kanji, Juhl, and Sohal, 1998; Jun, Cai, and Shin, 2006). However, numerous studies have argued that successful TQM implementation is not accomplished equally by every TQM-embedded firm (Powell, 1995; Beer, 2003; Jun et al., 2006); for example, one survey study indicated that only approximately one-third of all TQM efforts have been successful (Hayes, Pisano, Upton, and Wheelwright, 2005). Therefore, this study presumes that the isomorphism of TQM practices acts as one of the primary sources of the failure of TQM implementation. Based on this argument, this study postulates that a firm's metacognitive capabilities can help the firm to better understand and control the problems generated through mimicking other firms' TQM practices. In turn, these metacognitive findings can help the firm to develop a more effective TQM framework in accordance with their operation systems' characteristics.

CHAPTER II

LITERATURE REVIEW AND HYPOTHESES

"*If I have seen further it is by standing on the shoulders of giants.*"

Isaac Newton (1643-1727)

2.1. A Firm's Managerial Metacognition

Metacognition is typically illustrated as "thinking about thinking" and "cognition about cognition" (Flavell, 1979, 1987). The study of Haynie et al. (2010) more specifically defined metacognition as "the control that the individual has over their own cognitions as a function of a differing ability to consider alternative cognitive strategies in light of a changing environment" (p.219). Cognition is the knowledge structure used by people in making a decision; whereas, metacognition is a higher-order process controlling over the knowledge structure (Mitchell, Busenitz, Lant, McDougall, Morse, and Smith, 2002; Cho and Jung, 2014). Metacognition is also understood as the process of formulating strategies in order to select from a set of possible cognitive mechanisms (Flavell, 1987; Haynie, 2005; Haynie et al., 2010). Further, numerous studies indicate that the metacognitive abilities of people can be improved by appropriate training and practices, which is intrinsically different from the intelligence quotient (IQ) of people (Mevarech, 1999; Nietfeld & Schraw, 2002; Schmidt & Ford, 2003; Haynie et al., 2010). Furthermore, in terms of neuroscience, metacognition is known as a function of the

prefrontal cortex in human brain which is generally regarded as one of the few distinctions from other primates (Fleming, Weil, Nagy, Dolan, and Rees, 2010; Baird, Smallwood, Gorgolewski, and Margulies, 2013).

Although metacognition can be slightly differently classified into sub-dimensions (Flavell, 1979, 1987; Griffin and Ross, 1991; Nelson, 1996), Hayine and Shepherd (2009) conceptualized metacognition as the following five dimensions: goal orientation, metacognitive knowledge, metacognitive experience, metacognitive strategy (or metacognitive choice), and monitoring. This study basically adopted the Haynie and Shepherd's (2009) "Measure of Adaptive Cognition (MAC)" to measure a managerial metacognition after slightly revising the items to reflect the purpose of this study. Thus, this study employs Haynie and Shepherd's (2009) the original definitions for each metacognition dimension as follows:

In the context of metacognition literature, *goal orientation* can be defined to be "the extent to which the individual interprets environmental variations in light of a wide variety of personal, social, and organizational goals" (Haynie and Shepherd, 2009, p.699). *Metacognitive knowledge* can be described as "the extent to which the individual relies on what is already known about oneself, other people, tasks, and strategy when engaging in the process of generating multiple decision frameworks focused on interpreting, planning, and implementing goals to manage a changing environment" (Haynie and Shepherd, p.699). *Metacognitive experience* can be illustrated as "the extent to which the individual relies on idiosyncratic experiences, emotions, and intuitions when engaging in the process of generating multiple decision frameworks focused on interpreting, planning, and implementing goals to manage a changing environment" (p.699). *Metacognitive choice* (also called as *metacognitive strategy*) can be conceptualized to be "the extent to which the individual engages in the active process of

selecting from multiple decision frameworks the one that best interprets, plans, and implements a response for the purpose of managing a changing environment" (p.700). Finally, *metacognitive monitoring* can be defined as "seeking and using feedback to reevaluate goal orientation, metacognitive knowledge, metacognitive experience, and metacognitive choice for the purposes of managing a changing environment" (p.700).

As previously discussed, the metacognition has been actively studied for a long time in many other disciplines such as education (e.g., Schoenfeld, 1987; Borkowski and Muthukrishna, 1992), psychology (e.g., Flavell, 1976; Davidson et al., 1994), entrepreneurship (e.g., Haynie, 2005; Haynie, Shepherd, and Patzelt, 2012; Cho and Jung, 2014) and international management (e.g., Ang, Van Dyne, Koh, Ng, Templer, Tay, and Chandraseka, 2007; Kim and Van Dyne, 2012). However, the relationship between metacognitive mechanism and operations system has not yet been studied even though strong functional similarities are identified; it will be discussed later. Table 2.1 summarizes the major metacognition-related studies in management literature.

Table 2.1: Major Metacognition Studies in Management Literature

Study	Purpose	Discipline & Research Type	Sample	Key Finding
Haynie (2005)	To explore how metacognition affects 'cognitive adaptability' in the context of an entrepreneurial task.	Entrepreneurship/ Empirical	Entrepreneurs in the US (N = 73)	Metacognitive awareness relates positively to cognitive adaptability at entrepreneurial tasks; the enhanced cognitive adaptability contributes to improving entrepreneurial task performance.
Ang, Van Dyne, Koh, Ng, Templer, Tay, and Chandraseka (2007)	To explore the relationship between cultural intelligence (CQ) and intercultural effectiveness outcome.	International management/ Empirical	Undergraduate students in the US (N = 235) and Singapore (N = 358); international managers (N = 98); foreign professionals (N = 103)	Metacognitive CQ has a significantly positive effect on both cultural judgment and decision making (CJDM) effectiveness and task performance, while cognitive CQ has a significantly positive effect on CJDM, but not on task performance.
Haynie and Shepherd (2009)	To develop an instrument to assess metacognitive awareness in an	Entrepreneurship/ Empirical	Undergraduate business students in the US (N = 432)	36 measure items were constructed to be used for assessing the five dimensions of metacognitive awareness such as metacognitive experience, knowledge,

	entrepreneurial context.			monitoring, choice, and goal orientation.
Haynie, Shepherd, Mosakowski, and Earley (2010)	To conceptualize a situated metacognitive model of an entrepreneurial mindset.	Entrepreneurship/ Conceptual	Not applicable	The study proposed a metacognitive process model that is able to elucidate how entrepreneurial metacognition affects entrepreneurial task and consequently, entrepreneurial outcome.
Chua, Morris, and Mor (2012)	To investigate how individual variation in terms of cultural metacognition impacts success in intercultural creative collaboration.	Organizational behavior/ Empirical	Middle-level managers (N = 43) and managers attending an executive MBA course in the US (N = 60); university students in the US (N = 236)	The study result indicates that individuals with higher metacognitive CQ are more positively associated with intercultural creative collaborations.
Van Dyne, Ang, Ng, Rockstuhl, Tan, and Koh (2012)	To conceptualize sub-dimensions for each of the four CQ factors.	International management/ Conceptual	Not applicable	The study conceptualized the sub-dimensions of metacognitive CQ as follows: planning, awareness, and checking.
Haynie, Shepherd, and Patzelt (2012)	To explore the role of metacognitive	Entrepreneurship/ Empirical	Undergraduate business students in	The study result demonstrates that the benefits of cognitive-based feedback are

	ability and feedback on the cognitive adaptability of naive entrepreneurs.		the US (N = 217)	greater for the naive entrepreneurs with higher metacognitive knowledge.
Kim and Van Dyne (2012)	To examine the relationships between prior intercultural contact, cultural intelligence, and international leadership potential.	International management/ Empirical	Working adults in the US (N = 441); employees (N = 181) and their observers in the US (N = 708)	Cultural intelligence has a mediating effect on the relationship between prior intercultural contact and international leadership potential.
Cho and Jung (2014)	To investigate the relationships between a metacognitive ability, entrepreneurial orientation, and firm performance.	Entrepreneurship/ Empirical	Entrepreneurs in the US (N = 190)	The study has found that an entrepreneurial metacognitive ability is significantly associated with entrepreneurial orientation (EO). Further, the study result demonstrates that EO mediates the effects of entrepreneurial metacognition on entrepreneurial task performance.

2.2 Behavioral and Technical Quality Management

2.2.1 Conceptualization

Over the last two decades, many studies have shown that total quality management (TQM) practices can be restructured by two intrinsically different characteristics; behavioral-related quality practices and technical-related quality practices (Flynn, Schroeder, and Sakakibara, 1995; Anderson, Rungtusanatham, Schroeder, and Devaraj, 1995; Powell, 1995; Dow, Samson, and Ford, 1999; Rahman and Bullock, 2005; Naor, Goldstein, Linderman, and Schroeder, 2008; Jung and Hong, 2008; Gadenne and Sharma 2009; Zu, 2009). However, the studies have adopted different terminologies to best articulate their conceptualization of TQM clusters: for instance, infrastructure versus core quality practices (Flynn et al., 1995), tangible versus intangible quality practices (Powell, 1995), people versus tools quality practices (Dow et al., 1999), and soft versus hard quality practices (Rahman and Bullock, 2005). Further, it is evident that there are some minor differences between each study in terms of key TQM elements. As a result, the related literature is still explicitly recognized as somewhat fragmentary.

Nevertheless, the studies apparently indicate a strong similarity with respect to the conceptualization of their TQM classifications (Flynn et al., 1995; Powell, 1995; Dow et al., 1999; Rahman and Bullock, 2005; Naor et al., 2008; Jung and Hong, 2008; Zu, 2009). For instance, quality management (QM) practices such as employee involvement, cooperative supplier relations, customer focus, and commitment of top management are generally clustered as the behavioral aspects of TQM practices (‘behavioral QM’ or 'BQ' hereafter), while QM practices such as process management, information and analysis, strategic planning, and benchmarking techniques are typically conceptualized as the technical aspects of TQM practices (‘technical QM’ or 'TQ' hereafter), as shown in Table 2.2. The studies also demonstrate that

behavioral QM is normally characterized by features such as human-oriented, intangible, and relationship-driven practices, whereas technical QM can be distinguished by attributes such as mechanical-oriented, tangible, and technology-driven practices, as summarized in Table 2.3 (Powell, 1995; Dow et al., 1999; Jun et al., 2006; Naor et al., 2008).

Table 2.2: Key Elements of Behavioral QM and Technical QM on Major Studies

	Flynn et al. (1995)	Powell (1995)	Dow et al. (1999)	Rahman & Bullock (2005)	Jun et al. (2006)	Naor et al. (2008)	Jung & Hong (2008)	Zu (2009)
Behavioral QM Practices	*Infrastructure:* ▪ Work attitudes ▪ Top management support ▪ Workforce management ▪ Supplier relationship ▪ Customer relationship	*Intangible:* ▪ Executive commitment ▪ Adopting the philosophy ▪ Closer to customers ▪ Closer to suppliers ▪ Open organization ▪ Employee empowerment	*People:* ▪ Employee commitment ▪ Share vision ▪ Customer focus ▪ Use of teams ▪ Personnel training ▪ Cooperative supplier relations	*Soft:* ▪ Workforce commitment ▪ Shared vision ▪ Customer focus ▪ Use of teams ▪ Personnel training ▪ Cooperative supplier relations	*HR-focused:* ▪ Employee empowerment ▪ Employee training ▪ Teamwork ▪ Appraisal system ▪ Employee compensation	*Infrastructure:* ▪ Top management support ▪ Workforce management ▪ Supplier involvement ▪ Customer involvement	*Soft* ▪ Leadership ▪ People management ▪ Customer focus	*Infrastructure:* ▪ Top management support ▪ Workforce management ▪ Supplier relationship ▪ Customer relationship
Technical QM Practices	*Core:* ▪ Statistical control and feedback ▪ Process flow management ▪ Product design process	*Tangible:* ▪ Benchmarking ▪ Training ▪ Zero defects mentality ▪ Flexible manufacturing ▪ Process improvement ▪ Measurement	*Tools:* ▪ Use of benchmarking ▪ Use of advanced manufacturing systems ▪ Use of just-in-time principles	*Hard:* ▪ Computer based technologies ▪ Just-in-time principles ▪ Technology utilization ▪ Continuous improvement enables		*Core:* ▪ Quality information on processes ▪ Process management ▪ Product design	*Hard* ▪ Planning ▪ Process management ▪ Information & analysis	*Core:* ▪ Quality information ▪ Process management ▪ Product/ service design

Table 2.3: A Comparison between Behavioral vs. Technical QM Practices

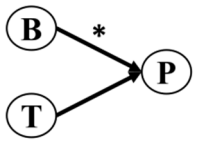
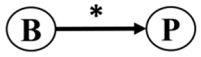
	Behavioral QM	**Technical QM**
Perspective	Relationship-Driven	Technology-Driven
Type of Resource	Intangible	Tangible
Primary Functional Concern	How to do	What to do
Locus of Managerial Efforts	Leading	Controlling
Key Practices	Top management support, employee training & empowerment, customer involvement, and cooperative supplier relations	Process management, quality information & analysis, strategic planning, use of benchmarking, product/service design

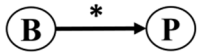
2.2.2 Major Studies on Behavioral QM vs. Technical QM

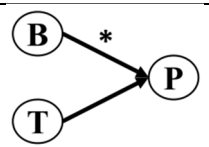
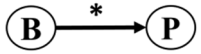
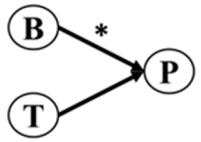
There are two major research streams in the extant literature with respect to the relationship between technical QM, behavioral QM, and organizational performance, as demonstrated in Table 2.4. One research stream is concerned with the relative importance of technical QM versus behavioral QM practices in affecting organizational performance (Powell, 1995; Samson and Terziovski, 1999; Naor et al., 2008; Jung and Hong, 2008; Gadenne and Sharma, 2009). For instance, Powell's study (1995) illustrates that tacit and behavioral QM practices such as executive commitment, employee empowerment, and an open culture significantly relate to the competitive advantage of a firm, while tangible and technical QM tools such as quality training, process improvement, and benchmarking generally do not lead to the generation of a firm's competitive advantage. Samson and Terziovski (1999) argue that not all QM practices serve as strong predictors of operational performance. For instance, behavioral aspects of QM practices such as people management, top management leadership, and customer focus are primarily associated with operational performance. In the same vein, Naor et al. (2008) investigated 189 manufacturing plants located across multiple nations including the U.S., Japan, Sweden, Finland, Germany, and South Korea in order to examine the relative importance of technical QM and behavioral QM practices on firm performance. The results of the study show that human-oriented quality practices (so-called 'infrastructure' quality practices) such as support from top management, workforce management, supplier involvement, and customer involvement have a significantly positive influence on manufacturing performance both in Eastern and Western countries, whereas system-oriented quality practices (so-called 'core' practices) such as quality information, product design, and process management do not directly affect firm performance in the six countries (Naor et al., 2008).

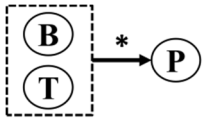
The other major research stream focuses on exploring the sequential relationships between behavioral QM, technical QM, and organizational performance, as shown in Table 2.4. (Flynn et al., 1995; Anderson et al., 1995; Sousa and Voss, 2002; Rahman and Bullock, 2005; Zu, 2009). For example, Flynn et al.'s (1995) study proposed a sequential model of the relationship between QM practices and performance, indicating that behavioral QM practices (e.g., top management support, customer relationship, supplier relationship, work force management, and work attitudes) have a supportive influence on technical QM practices (e.g., product design process, process flow management, and statistical control and feedback). Essentially, Flynn et al.'s (1995) model emphasizes the role of behavioral QM practices in boosting the effectiveness of technical QM on organizational performance. Rahman and Bullock's (2005) empirical study, which tested 261 manufacturing firms in Australia, obtained findings similar to those of Flynn et al.'s (1995) study. The study demonstrates that behavioral QM practices are strongly associated with technical QM practices, and that technical QM practices are significantly related to organizational performance. It further elucidates that behavioral QM practices indirectly have a positive effect on organizational performance by strengthening the effectiveness of technical QM practices (Rahman and Bullock, 2005). More recently, Zu's (2009) research investigated 226 US manufacturing plants, and similar to the findings of the extant literature, showed that behavioral QM indirectly contributes to firm performance by supporting technical QM practices. To sum up, the extant literature is predominantly concerned with testing or verifying the sequential relationship between behavioral QM, technical QM, and performance.

Table 2.4: Major Studies on Behavioral vs. Technical Quality Management Practices

Study	Objective	Type & Sample	Simplified Model & Results	Key Findings
Flynn, Schroeder, and Sakakibara (1995)	To investigate the relationship between total quality management (QM) practices and quality performance.	Empirical / 706 managers of 42 manufacturing plants located in the U.S.		Infrastructure QM practices (e.g., top management support, customer relationship, supplier relationship, work force management, and work attitudes) affect core QM practices (e.g., product design process, process flow management, and statistical control and feedback). The core QM practices have a direct influence on quality performance.
Powell (1995)	To examine QM as a potential source of sustainable competitive advantage.	Empirical / 54 US-based firms, employing 50 or more workers.		Intangible QM practices such as employee empowerment, executive commitment, and open culture significantly contribute to firm's competitive advantage, while tangible QM techniques such as process improvement, benchmarking, quality training do not generally relate to competitive advantage.
Dow, Samson, and Ford (1999)	To identify the core dimensions of quality management	Empirical / 698 manufacturing		Only three of the nine quality practice constructs such as employee commitment, shared vision, and customer focus have a

	practices and investigate how these practices contribute to superior quality outcomes.	plants located in Australia and New Zealand.		significant positive association with superior quality performance.
Rahman and Bullock (2005)	To investigate the relationships among soft QM, hard QM, and organizational performance.	Empirical / 261 manufacturing firms located in Australia.		The study results indicate that there are significant positive associations between soft QM and hard QM and between hard QM and organizational performance. The study denotes that soft QM has an indirect influence on performance by strengthening the effect of hard QM.
Jun, Cai, and Shin (2006)	To identify critical elements of QM practices that would contribute to the enhancement of employee satisfaction and loyalty.	Empirical / 407 employees of two Maquiladora-based firms in Mexico.		HR-focused QM practices such as teamwork, employee compensation, and employee empowerment have a significantly positive effect on employee satisfaction. In turn, the reinforced employee satisfaction contributes to a higher level of employee loyalty.
Naor, Goldstein,	To investigate the relationship among	Empirical / 189		Organizational culture more significantly impacts on infrastructure quality management

Linderman, and Schroeder (2008)	organizational culture, infrastructure and core quality practices, and manufacturing performance.	manufacturing plants located in six countries including the U.S., Japan, Sweden, Finland, Germany, and South Korea.		practices than on core quality management practices, regardless of where the manufacturing plant is located in six countries. Besides, infrastructure quality practices have a positive and significant effect on manufacturing performance while core quality practices have no significant effect on it both in the Eastern and the Western countries.
Abdullah, Uli, and Tari (2008)	To examine the impact of soft factors of QM practices on quality improvement and organizational performance.	Empirical / 255 managers of electronics firms located in Malaysia.		Soft QM factors such as management commitment, employee involvement, customer focus, reward, and training are significantly associated with quality improvement. Some soft factors such as management commitment, employee involvement, and customer focus are also significantly associated with organizational performance.
Jung and Hong (2008)	To investigate the relationships among the organizational citizenship behavioral (OCB), soft QM,	Empirical / 230 Maquiladora firms located at the border between Texas		Soft QM factor which consists of leadership, people management, and customer focus shows a strong positive effect on firm performance, while hard QM factor which contains planning, process management, and

	hard QM, and firm performance.	in the U.S. and Mexico.		information analysis does not represent any significant impact on firm performance.
Gadenne and Sharma (2009)	To explore key soft and hard QM factors in Australian firms and their effect on performance.	Empirical / 119 CEOs and senior managers of Australian small and medium-sized firms.		The study indicates that a higher achievement in firm performance is likely to be influenced by a combination of both soft and hard QM factors.
Zu (2009)	To examine the different influences of infrastructure and core QM practices on quality performance.	Empirical / 226 manufacturing plants located in U.S.		The study shows that infrastructure QM has a significant positive influence on core QM, and that core QM practices significantly affect quality performance. Based on the results, the study suggests that infrastructure QM practices indirectly contribute to quality performance by improving the effectiveness of core QM practices.

Note: * Significant positive effect; B = behavioral-related quality practices; T = technical-related quality practices; P = performance-related variables.

2.3 The Relationship between Metacognition and TQM Practices

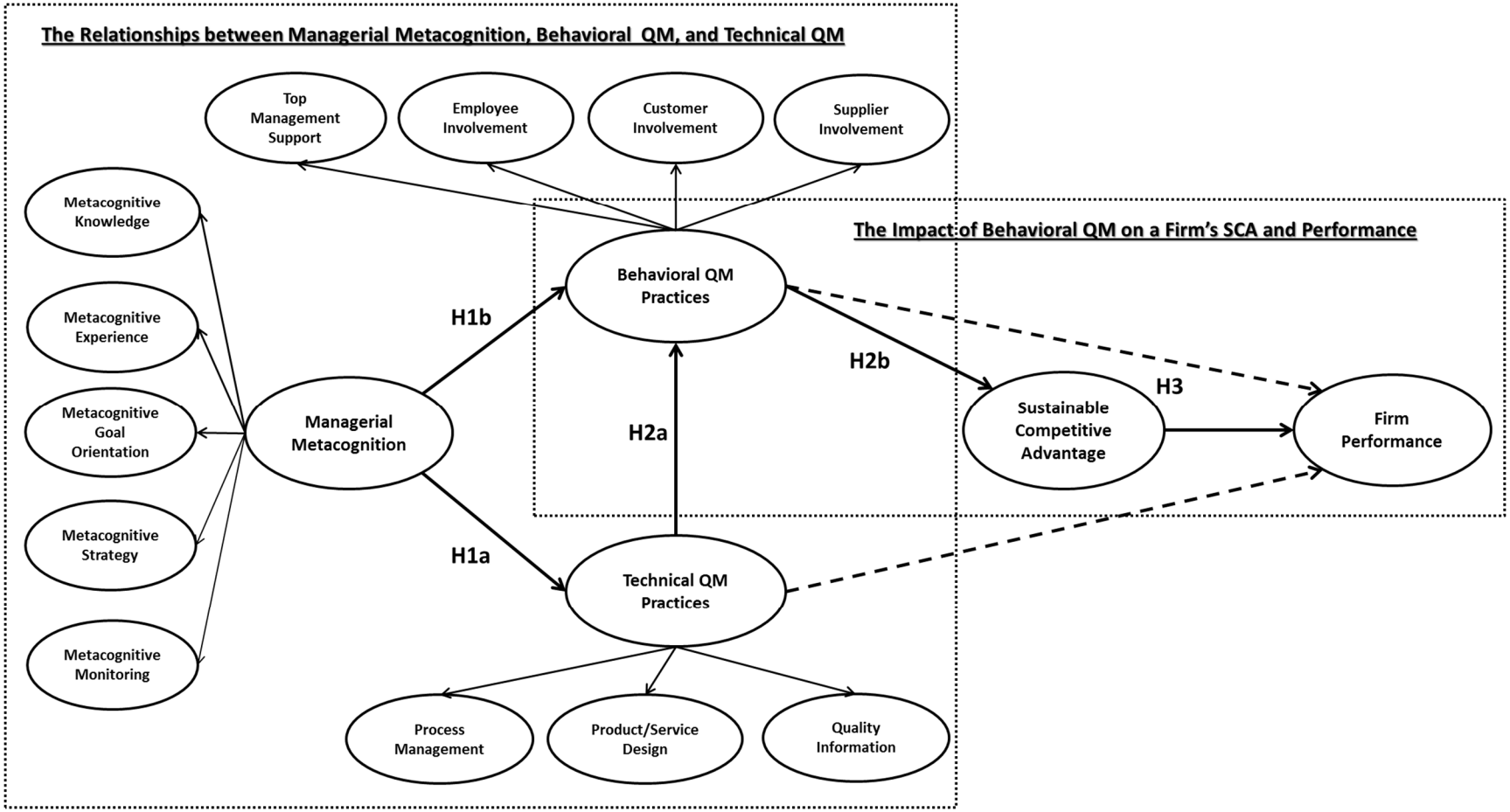
Figure 2.1 illustrates the hypothesized research model of this study. This model demonstrates the relationship between managerial metacognition, TQM practices, a firm's sustainable competitive advantage, and firm performance. In specific, it shows how metacognition have an influence on the effectiveness of TQM practices and also how the synergy effect of managerial metacognition and TQM could contribute to a firm's creation of sustainable competitive advantages.

As previously discussed, in the literature, it is recognized that TQM practices and metacognition inherently have the following strong functional similarities. Both mechanisms mainly: (i) focus on process effectiveness (e.g., Berardi-Coletta et al., 1995; Silver, 2004); (ii) emphasize a learning-by-doing approach, that is, learning how to perform the activity better by actually doing it (e.g., Paris and Winograd, 1990; Hayes et al., 2005); and (iii) pursue continuous improvement by an ongoing knowledge creation process (e.g., Kluwe, 1982; Linderman et al., 2004). These similarities are depicted in Figure 2.2. Taking these similarities into consideration, it is rationally anticipated that a strong functional relationship exists between the two mechanisms. Thus, I suggest the following hypotheses to empirically examine how managerial metacognition affects a firm's TQM practices:

Hypothesis 1a: Managerial metacognition is positively related to a firm's technical quality management practices.

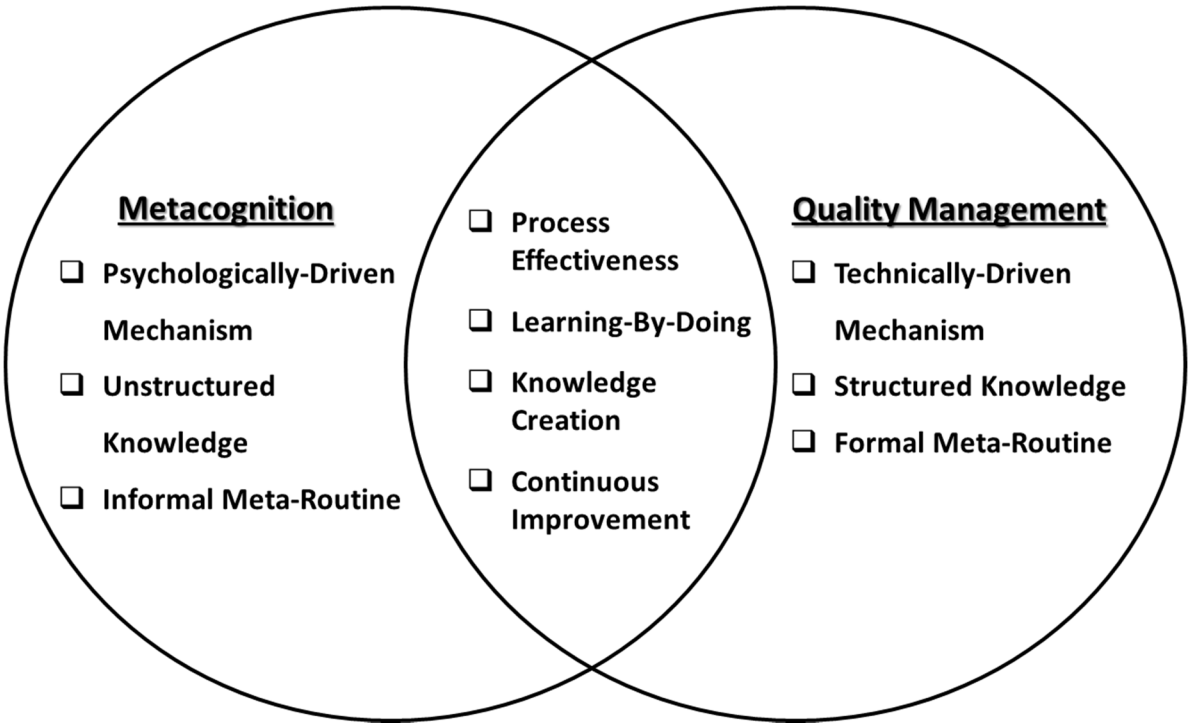
Hypothesis 1b: Managerial metacognition is positively related to a firm's behavioral quality management practices.

Figure 2.1: Hypothesized Research Model



Note: Solid paths describe a significant relationship whereas dashed paths represent a non-significant relationship.

Figure 2.2: A Comparison of TQM and Metacognition



2.4 The Relationship between TQM and Sustainable Competitive Advantages

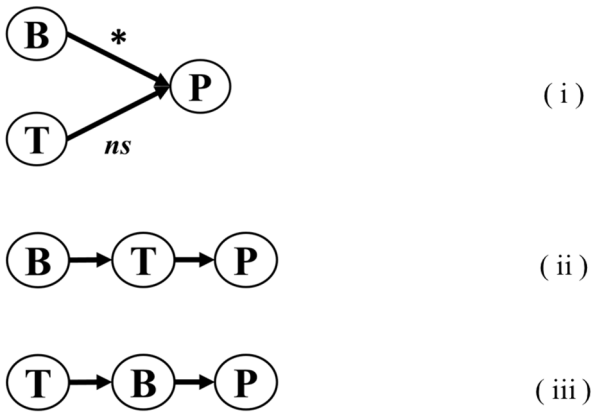
In terms of a particular relationship model, the existence of consistent agreements alone cannot be regarded as sufficient evidence to confirm that the relationship is absolutely valid owing to the relativism of knowledge, specifically in the social sciences (Erasmus, 1952; Berger and Luckmann, 1966; Peile and McCouat, 1997; Denzin and Lincoln, 2011). Berger and Luckmann (1966) point out that the knowledge of social science may be understood as a 'socially constructed nature of reality'. Specifically, people's knowledge of what they believe as reality is frequently no more than an outcome that was socially embedded in their community through the process of institutionalization (Luckmann and Berger, 1991; Denzin and Lincoln,

2011). From this point of view, I raise a question about the existing 'behavioral QM → technical QM → performance' relationship model ('BQ→TQ→P' hereafter) for the following reasons:

Above all, my thorough literature review of the studies over the past two decades has maintained that behavioral QM practices have a significantly greater positive influence on organizational performance than do technical QM practices (Powell, 1995; Samson and Terziovski, 1999; Naor et al., 2008; Jung and Hong, 2008). Hence, if the existing findings on the relative importance of technical QM and behavioral QM in influencing firm performance (i) are true, logically, the sequential relationship of BQ→TQ→P (ii) is in conflict with case (i); rather, it is rationally assumed that the sequential relationship of technical QM → behavioral QM → performance (iii) ('TQ→BQ→P' hereafter) may be more in sync with case (i), as shown in Figure 2.3. In other words, cases (i) and (ii) contradict each other because case (ii) indicates that behavioral QM has an indirect effect on organizational performance by supporting the direct effect of technical QM on performance, while case (i) empirically proves that behavioral QM has a more significant direct effect on performance than does technical QM.

Nevertheless, to the best of my knowledge to date, I was unable to find any study that investigated the relationship represented in case (iii), or challenged the relationship represented in case (ii), even though a logical contradiction between cases (i) and (ii) was explicitly identified, as discussed above. Thus, these arguments lead to question the validity of extant knowledge with respect to the relationship between behavioral and technical QM practices.

Figure 2.3: Paradox of the Relationships between BQ, TQ, and Performance



Note: * = significant positive effect; *ns* = no significant effect; B = behavioral QM; T= technical QM; P = performance.

The resource-based view (RBV) argues that a firm's sustainable competitive advantages (SCA) are greatly dependent upon the characteristics of the firm's operating resources (Powell, 1993; Barney, 1991; Barney and Arikan, 2005). Advocates of the RBV specify the following four as critical attributes of resources that potentially generate the SCA of a firm: valuable, rare, imperfectly imitable, and non-substitutable (Lado, Boyd, and Wright, 1992; Powell, 1993; Barney, 1991; Barringer and Harrison, 2000; Barney and Hesterly, 2006). I revisit Powell's (1995) study, which asserts that behavioral QM components such as employee empowerment and executive commitment typically act as potential sources of SCA because of their imperfectly imitable features; however, QM techniques such as the use of benchmarking and process improvement can be easily mimicked and cannot, therefore, typically act as strategic resources to produce SCAs. Similarly, Reed, Lemak, and Mero (2000) argue that tacit QM aspects such as the commitment of top management, employee education, teams, and culture are closely associated

with a firm's SCA because they inherently generate complexity from their interactions with one another, consequently building a barrier against the competitor's imitation. Hence, it is admissible that behavioral QM practices have a more critical and direct effect on a firm's competitive advantage than do technical QM practices, at least based on the lens of RBV.

To summarize, all the arguments above can be condensed as the following two statements; first, the sequential relationship of case (iii) could be more in sync with case (i) than case (ii) and second, the relationship of case (iii) can be elucidated by the RBV. Thus, there is a need to investigate the statistical relationship of case (iii) so I propose the hypotheses 2a and 2b. In addition, it is rationalized that a firm's SCAs, generated by a strong behavioral QM practices, eventually contribute to realizing their desired firm performance. Therefore, I also suggest the following hypothesis 3 to examine whether a firm's SCAs have a mediation effect on the relationship between quality practices and firm performance:

Hypothesis 2a: Technical quality management practices are positively related to behavioral quality management practices.

Hypothesis 2b: Behavioral quality management practices are positively related to a firm's sustainable competitive advantages.

Hypothesis 3: A firm's sustainable competitive advantages mediate the positive relationship between behavioral quality management practices and firm performance.

The hypothesis for each pathway in the research model can be mathematically expressed by the equations (1) to (5), where β is the regression coefficient, i is regression intercept, and ε is error in the estimation. Additionally, the following abbreviations were used for simplicity:

managerial metacognition (MC), technical quality management (TQ), behavioral quality management (BQ), sustainable competitive advantage (SCA), and firm performance (FP):

$$\text{H1a: } TQ = i_1 + \beta_1(MC) + \varepsilon_1 \quad (1)$$

$$\text{H1b: } MC = i_2 + \beta_2(BQ) + \varepsilon_2 \quad (2)$$

$$\text{H2a: } BQ = i_3 + \beta_3(TQ) + \varepsilon_2 \quad (3)$$

$$\text{H2b: } SCA = i_4 + \beta_4(BQ) + \varepsilon_4 \quad (4)$$

In particular, the mediation effect of a firm's SCAs on the relationship between behavioral QM and firm performance can be described by the following linear equation:

$$\text{H3: } FP = i_5 + \beta_5(BQ) + \beta_6(SCA) + \varepsilon_5 \quad (5)$$

CHAPTER III

METHODOLOGY

"*Historical methodology, as I see it, is a product of common sense applied to circumstances.*"

Samuel E. Morison (1887–1976)

3.1 Measures Development

3.1.1 Technical and Behavioral QM Practices

In terms of a survey research, the content validity of survey questions might be considered as one of the most critical prerequisites (Singleton and Straits, 2010). Thus, I first synthesized the somewhat fragmentary knowledge of the literature regarding behavioral and technical QM practices, as previously summarized in Table 2.2 and then identified the most commonly used dimensions and measure items for behavioral QM practices and technical QM practices. Subsequently the QM-related measures were developed based on a variety of sources such as Powell (1995), Flynn, Schroeder, and Sakakibara (1995), Samson and Terziovski (1999), Flynn and Saladin (2006), Jun, Cai, and Shin (2006), Naor, Goldstein, Linderman, and Schroeder (2008), Zu (2009), Zu, Robbins, and Fredendall (2010), and Baird, Jia Hu, and Reeve (2011).

The survey questionnaire was designed to estimate the degree to which the respondents agreed or disagreed with the given statement, based on a seven-point Likert scale, with 1 being

strongly disagree and 7 being strongly agree. Scale description and more detailed references for each variable are given in Table 3.1.

Table 3.1: Measures of Behavioral and Technical QM Practices

Second-Order Factor *Theme*	**First-Order Factor** *Dimension*	**Scale Description**	**Sources**
• **Technical Quality Management**	• **Process Management**	• Clear work or process instructions are given to employees. (PM1)	Zu (2009)
		• We make extensive use of statistical techniques to reduce variance in processes. (PM2)	Baird, Jia Hu, and Reeve (2011)
		• Our plant/shop floor is kept clean at all times. (PM3)	Adapted from Flynn, Schroeder, and Sakakibara (1995)
	• **Product/Service Design**	• We thoroughly review new product/service design before the product/service is produced. (PD1)	Adapted from Flynn et al. (1995)
		• We work in teams, with members from a variety of areas (marketing, purchasing, manufacturing, etc.) to introduce new products/services. (PD2)	Adapted from Flynn et al. (1995)
		• Quality of new products/services is emphasized in relation to cost or schedule objectives. (PD3)	Zu (2009); Baird et al. (2011)

	• **Quality Information**	• Information on quality performance is readily available to employees. (QI1) • Our quality data (error rates, defect rates, scrap, etc.) are accurate and reliable. (QI2) • Quality data are timely. (QI3)	Flynn and Saladin (2006) Adapted from Baird et al. (2011) Zu (2009); Zu, Robbins, and Fredendall (2010)
• **Behavioral Quality Management**	• **Top Management Support**	• Our top management provides personal leadership for quality products and quality improvement. (TS1)	Flynn et al. (1995); Naor, Goldstein, Linderman, and Schroeder (2008)
		• Our top management creates and communicates a vision focused on quality improvement. (TS2)	Naor et al. (2008)
		• Our top management actively encourages change and implements a culture of trust, involvement, and commitment in moving towards "Best Practice." (TS3)	Samson and Terziovski (1999)
	• **Employee Involvement**	• Employees receive quality-related training. (EI1)	Adapted from Powell (1995); Flynn and Saladin (2006); Jun, Cai, and Shin (2006)

		• Employees are recognized and rewarded for superior quality improvement. (EI2)	Adapted from Flynn et al. (1995); Zu et al. (2010)
	• **Customer Involvement**	• Customer complaints are used as a method to initiate improvements in our current processes. (CI1)	Samson and Terziovski (1999)
		• Our customers give us feedback on our quality and delivery performance. (CI2)	Flynn et al. (1995); Naor et al. (2008)
	• **Supplier Involvement**	• We actively engage suppliers in our quality improvement efforts. (SI1)	Naor et al. (2008)
		• We maintain close communication with suppliers about quality considerations and design changes. (SI2)	Naor et al. (2008)

3.1.2 Managerial Metacognition

The managerial metacognition-related measure items were adapted from the study of Haynie and Shepherd (2009) but, some items were slightly revised to reflect the purpose of this study, referring to the studies of Haynie (2005) and Haynie et al. (2010). According to the Haynie and Shepherd's (2009) study, this study was designed to measure the five different metacognitive dimensions such as metacognitive knowledge, metacognitive experience, metacognitive goal-orientation, metacognitive strategy, and metacognitive monitoring.

Scale description for each variable is provided in Table 3.2. For each question, the respondents indicated the extent to which they disagree or agree with the statement on a seven-point Likert type scale anchored by strongly disagree (1) and strongly agree (7).

Table 3.2: Measures of Managerial Metacognition

Second-Order Factor *Theme*	**First-Order Factor** *Dimension*	**Scale Description**	**Sources**
• **Managerial Metacognition**	• **Metacognitive Knowledge**	• We think of several ways to solve a problem and choose the best one. (MK1)	Adapted from Haynie (2005); Haynie and Shepherd (2009)
		• We try to use strategies that have worked in the past. (MK2)	Adapted from Haynie (2005); Haynie and Shepherd (2009)
		• We think about how competitors may react to our business actions. (MK3)	Adapted from Haynie (2005); Haynie and Shepherd (2009)
		• We find ourselves automatically employing strategies that have worked in the past. (MK4)	Adapted from Haynie (2005); Haynie and Shepherd (2009)
	• **Metacognitive Experience**	• We know what kind of information is most important to consider when faced with a problem. (ME1)	Adapted from Haynie and Shepherd (2009)
		• We consciously focus our attention on important business information. (ME2)	Adapted from Haynie and Shepherd (2009)
		• We use different business strategies depending on the market situation. (ME3)	Adapted from Haynie and Shepherd (2009)

		• We are good at organizing information. (ME4)	Adapted from Haynie and Shepherd (2009)
	• **Metacognitive Goal-Orientation**	• We often define goals for ourselves. (MG1)	Adapted from Haynie and Shepherd (2009)
		• We set specific goals before we begin a task. (MG2)	Adapted from Haynie and Shepherd (2009)
		• We understand how accomplishment of a task relates to our goals. (MG3)	Adapted from Haynie and Shepherd (2009)
		• We ask ourselves how well we have accomplished our goals once we have finished. (MG4)	Adapted from Haynie and Shepherd (2009)
	• **Metacognitive Strategy (Control)**	• We ask ourselves if we have considered all the options when solving a problem. (MS1)	Adapted from Haynie (2005); Haynie and Shepherd (2009); Haynie, Shepherd, Mosakowski, and Earley (2010)
		• We re-evaluate our assumptions when we get confused. (MS2)	Adapted from Haynie (2005); Haynie and Shepherd (2009); Haynie et al. (2010)
		• We ask ourselves if we have learned as much as we could have when we	Adapted from Haynie (2005); Haynie and Shepherd (2009);

		finished the task. (MS3)	Haynie et al. (2010)
		• We ask ourselves if we have considered all the options after we solve a problem. (MS4)	Adapted from Haynie (2005); Haynie and Shepherd (2009); Haynie et al. (2010)
	• **Metacognitive Monitoring**	• We stop and go back over information that is not clear. (MM1)	Adapted from Haynie and Shepherd (2009)
		• We find ourselves analyzing the usefulness of a given strategy while engaged in a given task. (MM2)	Adapted from Haynie and Shepherd (2009)
		• We find ourselves pausing regularly to check our comprehension of the problem or situation at hand. (MM3)	Adapted from Haynie and Shepherd (2009)
		• We stop and re-examine when we get confused. (MM4)	Adapted from Haynie and Shepherd (2009)

3.1.3 Sustainable Competitive Advantage

The resource-based view (RBV) (Barney, 1991) assumes that competing firms within an industry may control different bundles of resources and these resources may not be perfectly mobile across firms so firms' resource differences can be long lasting (Barney and Arikan, 2005). Barney (1991) illustrates four primary features of firm's resource to be sustained competitive advantage (SCA) as follows: valuable, rare, imperfectly imitable, and non-substitutable. Premised on the RBV, Weerawardena (2003) argues that the SCA construct can be operationalized as "whether it is possible for competitors to duplicate the firm' competitive strategy (Barney, 1991; Grant, 1991) and distinctive capabilities on which advantages have been founded (Grant, 1991; Hall, 1993)" (p.21).

However, with respect to a firm's sustainable competitive advantage (SCA), a widely recognized set of measures was not available so I needed to develop most of the measurement scales for this study based on the comprehensive literature review. Accordingly most of items used in this study were newly developed in this study, referring to Barney (1991), McEvily & Chakravarthy (2002), Wiggins & Ruefli (2002), Weerawardena (2003), Barney & Arikan (2005), Barney & Hesterly (2006), and Hitt, Ireland, and Hoskisson (2011).

For items SA1, SA2, SA3, SA4, SA4, SA5, SA6, SA7, the respondents indicated the extent to which they disagree or agree with the statement on a seven-point Likert type scale anchored by strongly disagree (1) and strongly agree (7); for item SA8, very easy (1) and very difficult (7).

For the newly developed SCA measures, I conducted a pilot test with MBA students (N = 24) at the University of Texas-Pan American. The primary purpose of the pilot test was to increase the reliability of scales by identifying and removing any problematic items. The

statistical test was limited to only computing Cronbach's alpha coefficients for each scale because of a small sample size (Cronbach, 1951; Kaynak & Hartley, 2008). The specific scales description and their supporting literature are presented in Table 3.3.

Table 3.3: Measures of a Firm's Sustainable Competitive Advantages

Variable	Scale Description	Supporting Literature
• Sustainable Competitive Advantages (α =.928)	• *My company's resources or capabilities are so VALUABLE that they enable us to exploit opportunities or neutralize threats in our external environment. (SA1)	Newly developed by author, referring to Barney (1991); Barney and Arikan (2005)
	• My firm has RARE resources or capabilities that are not possessed by the most of our competitors. (SA6)	Newly developed, referring to Barney (1991); Hitt, Ireland, and Hoskisson (2011)
	• *My company has COSTLY-TO-IMITATE resources or capabilities that our competitors cannot easily imitate or develop. (SA2)	Newly developed, referring to Barney (1991); Hitt et al. (2011)
	• *My company has DIFFICULT-TO-SUBSTITUTE resources or capabilities that cannot be easily substituted by those of our competitors. (SA3)	Newly developed, referring to Barney (1991), Barney & Arikan (2005)
	• My firm's resources or capabilities are SIMULTANEOUSLY valuable, rare, costly-to-imitate, and difficult-to-substitute. (SA7)	Newly developed, referring to Hitt et al. (2011)
	• *My firm has mainly produced ABOVE average market return. (SA4)	Newly developed, referring to Barney (1991); Barney and Hesterly (2006); Hitt et al. (2011)

	• *My company has shown PERSISTENT superior business performance to our competitors for a long time. (SA5)	Adapted by author, referring to McEvily & Chakravarthy (2002), Wiggins & Ruefli (2002), Barney & Hesterly (2006);
	• How easy is it for your competitors to imitate your firm's products or services? (SA8)	Adapted by author, referring to McEvily & Chakravarthy (2002), Weerawardena (2003).

Note: α stands for Cronbach's alpha (test result of a pilot test, N = 24).

The items marked with * were employed for an actual survey after completing a preliminary pilot test.

3.1.4 Firm Performance

To measure a firm's performance, eight items were initially adapted from the studies of Samson and Terziovski (1999), Kaynak (1999), Kaynak (2003), Jung and Hong (2008), Kaynak and Hartley (2008), Cho and Jung (2013), Cho and Jung (2014). For each item, the respondents were asked to measure the extent to which they agreed with the given statement, based on a seven-point Likert type scale.

Regarding the development of the firm performance-related measures, a pilot test was conducted with MBA students (N = 24) at UTPA to preliminarily evaluate the reliability of scales based on Cronbach's alpha testing for each scale (Cronbach, 1951; Singleton and Straits, 2010). Scale description and more detailed references for each measure item are represented in Table 3.4.

3.1.5 Demographic Survey

The demographic survey questionnaire is listed in the Part V of Appendix A. Particularly, item DS1 was developed by an author, referring to Calantone, Cavusgil, & Zhao (2002); item DS2 was developed, referring to Damanpour (1992), Camisón-Zornoza, Lapiedra-Alcamí, Segarra-Ciprés, & Boronat-Navarro (2004). Sin, Tse, Yau, Chow, & Lee (2005); Items DS3 and DS4 were employed from Cho & Jung (2013, 2014a); item DS5 was adapted from Kaynak (1997).

Table 3.4: Measures of Firm Performance

Variable	Scale Description	Sources
• Firm Performance (α =.917)	• Product/Service Quality-Please check the best description of your company's Product/Service Quality over the last three years.	Adapted from Kaynak (1999); Kaynak (2003); Kaynak and Hartley (2008)
	• Productivity -Please check the best description of your company's Productivity over the last three years.	Adapted from Kaynak (1999); Kaynak (2003); Kaynak and Hartley (2008)
	• *Sales Growth - Please check the best description of your company's Sales Growth over the last three years.	Adapted from Cho and Jung (2013); Cho and Jung (2014)
	• Market Share- Please check the best description of your company's Market Share over the last three years.	Adapted from Kaynak (1999); Kaynak (2003); Kaynak and Hartley (2008)
	• *Market Share Growth - Please check the best description of your company's Market Share Growth over the last three years.	Adapted from Cho and Jung (2013); Cho and Jung (2014)
	• *Net Profit Margin - Please check the best description of your company's Net Profit Margin over the last three years.(FR6)	Adapted from Cho and Jung (2013); Cho and Jung (2014)

	• *Customer Satisfaction - Please check the best description of your company's customer satisfaction level over the last three years.	Adapted from Samson & Terziovski (1999); Jung and Hong (2008)
	• *Cost of Quality (error, scrap, rework, inspection) as a % of Sales - Please check the best description of your company's cost of quality.	Adapted from Samson & Terziovski (1999); Jung and Hong (2008)

Note: α stands for Cronbach's alpha (test result of a pilot test, N = 24).

The items marked with * were employed for an actual survey after completing a preliminary pilot test.

3.2 Sample and Data Collection

3.2.1 Target Population and Sampling

A survey research method was used to collect a primary data for this study. Initially CEOs was considered as the most ideal target population of this study because CEOs are generally regarded to have a ability to access their organization's comprehensive information and knowledge such as their managerial capabilities, competitive advantages, and firm performances (Miller & Toulouse, 1986; Zahra & Covin, 1993). However, it is a reality that in many cases CEOs are not available for a survey in many cases and moreover, a major part of the survey is directly related to a firm's quality management practices so I extended my target population to Quality Managers as well as senior-level Managers of participating firms. In order to obtain more reliable sample data, I also developed the following criteria for selecting appropriate respondents (Cho and Jung, 2014):

(i) Survey respondents must be in an active position in U.S. firms;

(ii) Survey respondents must be deeply knowledgeable about their managerial capabilities as well as quality management practices;

(iii) Survey respondents must be at least 21 years old to participate;

(iv) Survey respondents must be a single respondent of each participating firm; if there is more than one respondent from the same firm, the target respondent will be chosen based on the position in their firm, preferably the highest rank among the respondents.

3.2.2 Survey Procedure

Online survey research was designed to collect a primary sample data for this study, referring to the studies of Dillman, Smyth, and Christian (2008) and Dillman et al. (2014).

Survey participants were recruited online through invitation emails. In particular, the email lists of quality managers (N = 2,000) and senior business managers (N = 52,576) were purchased from both Dun & Bradstreet, Inc. and Specialdatabases.com. Specific industrial description of the D&B emails list is given in Appendix B.

The target sample size for this study was initially set at 200 respondents and a response rate of the online-based survey was normally expected less than 3%. Hence, after scrutinizing the whole email databases based on the selecting criteria developed in this study, a total of 12,000 email lists were finally prepared for the survey research. At the same time, I developed the uniform resource locator (URL) for this survey research, email invitation script, online survey consent form, and reminder letter (see Appendices C, D, and E). In addition, this survey study had been reviewed and fully approved by the Institutional Review Board for Human Subjects Protection (IRB).

3.3 Methods of Data Analysis

First, using SPSS statistic 22 and Excel 2010, the sample demographics were produced and Cronbach's alpha coefficients were computed to test the reliability for each scale (Cronbach, 1951). Using both AMOS 22 and Excel 2010, the values of the average variance extracted (AVE) was calculated to evaluate the convergent validity of each construct. Then, confirmatory factor analysis (CFA) was conducted in order to examine the validity of the measurement model of this study (Hair, Black, Babin, & Anderson, 2010). Finally structural equation modeling (SEM) analysis was performed to test the hypothesized research model of this study using AMOS 22. All the results of these tests were presented in the next chapter.

CHAPTER IV

DATA ANALYSIS AND FINDINGS

"*War is ninety percent information.*"

Napoleon Bonaparte (1769–1821)

4.1 Sample Demographics

Email invitations with a web survey link were sent to a total of 12,000 target respondents in over 46 states of the U.S. I administered three rounds of survey invitations and obtained a total of 235 viable samples with a response rate of 1.95%. The χ^2 tests were conducted to examine whether a response bias exists among each round sample; any significant differences (at $p < 0.05$ level) were not reported between the samples (Zu, 2009).

Of the whole sample, about 70% had more than 21 years business history as well as at least 100 employees. Of the sample, 31% was manufacturing firms and 66% was service firms. Of the respondents, 71% were more than 45 years old and 57% were male.

The majority of survey participants had a directly QM-related job titles such as Quality Assurance Manager, Quality Control Manager, Director of Quality and Continuous Improvement, Quality Engineer, VP Quality, Supplier Quality Engineer, and Quality Enhancement Director. However, some respondents had job titles such as President, Vice President, CEO, COO, Warehouse Lead, Owner-Principal Attorney, Manager-the Operations Side of a Broadcast,

Business Owner, and Director of Operations, even though they were actively involving in their quality management practices. A demographic profile of the sample is demonstrated in Table 4.1. The detailed industrial classifications and SIC codes of participating firms are also summarized in Table 4.2.

Table 4.1: Sample Demographics

Category			Count	Proportion (%)
Firm's Age (Length of Time in Business)		Less than 5 years	7	3%
		5 ~ 10 years	16	7%
		11 ~ 20 years	30	13%
		21 ~ 30 years	48	20%
		31 ~ 50 years	46	20%
		51 ~ 100 years	55	23%
		More than 100 years	26	11%
		Missing responses	7	3%
Firm's Size (Number of Employees)		Less than 10 employees	20	9%
		11 ~ 50 employees	34	14%
		51 ~ 100 employees	14	6%
		101 ~ 500 employees	49	21%
		501 ~ 1,000 employees	21	9%
		1,001 ~ 10,000 employees	51	22%
		More than 10,000 employees	39	17%
		Missing responses	7	3%
Industry		Manufacturing	74	31%
		Service	154	66%
		Missing responses	7	3%
Survey Respondent	Age	Less than 18	0	0%
		18 ~ 29	11	5%
		30 ~ 44	51	22%
		45 ~ 59	124	53%
		More than 59	42	18%
		Missing responses	7	3%
	Gender	Female	93	40%
		Male	135	57%

		Missing responses	7	3%
	Job Title	Directly QM-related: *Quality Assurance Manager, Quality Control Manager, Director of Quality and Continuous Improvement, Quality Engineer, VP Quality, Supplier Quality Engineer, Quality System Analyst, Quality Enhancement Director, Quality Manager, Q.C. Inspector, Q. A. Associate, QA Engineer, Quality Engineer, Quality Control Inspector, Quality Assurance Specialist, Clinical Quality Audit Analyst, Leading healthcare quality improvement projects, Quality Assurance Specialist, Quality Control Technician, Quality Control Microbiology, Q.C. Inspector, Quality Assurance Supervisor, Quality Assurance Coordinator, QMS Systems Specialist, Quality Assurance Engineer, Quality Director, Quality System Analyst, Quality Assurance Specialist, Quality and Risk Coordinator, Quality Coordinator, Software Quality Assurance, Quality Assurance Director, Manager-Quality/M&P/Process, Quality Compliance Manager, Quality Integrations Manager, Senior Secretary for Quality Assurance Division, and so on.*		
		Some others: *President, Vice President, CEO, COO, Process Compliance Lead, Warehouse Lead, Owner-Principal Attorney, Station & Production Manager/Digital Director, Manager-the Operations Side of a Broadcast, Business Owner, Director of Operations, General Manager-Operating System and Transformation, Vice President of Operations.*		

Note: N = 235.

Table 4.2: Industrial Classification of the Sample

Industrial Classification	Count	Proportion (%)
Agriculture, Forestry & Fishing [01-09][a]	4	2%
Construction [15-17]	10	4%
Apparel & Fabricated Textile Products [23]	2	1%
Papers & Allied Products [26]	0	0%
Printing & Publishing [27]	5	2%
Pharmaceuticals [28]	10	4%
Chemical Products [28]	9	4%
Petroleum Refining [29]	3	1%
Semiconductors & Related Devices [36]	2	1%
Transportation Services [47]	10	4%
Communications Services [48]	8	3%
Wholesale Trade [50-51]	9	4%
Retail Trade [52-59]	12	5%
Financial Services [60-64]	13	6%
Hotels & Other Lodging Places [70]	2	1%
Prepackaged Software [73]	2	1%
Healthcare [80]	23	10%
Legal Services [81]	2	1%
Education [82]	11	5%
Accounting & Business Consulting Services [87]	4	2%
Others	84	36%
Missing responses	10	4%

Note: N =235.

[a] Two-digit numbers represent the SIC codes.

4.2 Reliability and Validity Tests

4.2.1 Reliability of Scales

Reliability is defined as “the stability or consistency of an operational definition," while validity means "the goodness-of-fit between an operational definition and the concept it is purported to measure” (Singleton and Straits, 2010: 146). In other words, a reliable measure may or may not be valid, whereas a valid measure is necessarily reliable (Singleton and Straits, 2010). Thus, I conducted several reliability and validity tests for the measures before testing the hypothesized structural model. First the reliability of scales can be examined by calculating the value of Cronbach's alpha coefficient for each construct (Cronbach, 1951; Nunnally, 1967). As represented in Tables 4.3, 4.4., and 4.5, the values of Cronbach's alpha for all scales exceeded the acceptable level point of 0.70, ranged from 0.75 for customer involvement to 0.94 for metacognitive strategy (Nunnally and Bernstein, 1994). In addition, Table 4.6 presents the descriptive statistics and correlations among all variables.

4.2.2 Convergent Validity

Convergent validity refers that all items consisting of a specific construct should share a high proportion of variance in common (Hair et al., 2010). The size of factor loading is considered as a criterion for identifying whether the scale items converge on their assigned latent construct. Thus, the factor loading for each item was computed to examine the convergent validity and the results showed that all items satisfied the suggested threshold of 0.50 factor loading (Hair et al., 2010). In particular, Table 4.3 includes the description of each item and the test results of the confirmatory factor analysis (CFA) for the TQM-related measures, ranged between 0.75 and 0.95 factor loadings; Table 4.4 shows the test results for the metacognition-

related measure items, ranged between 0.84 and 0.93 factor loadings; Table 4.5 represents the test results for the items of both SCA and firm performance, ranged between 0.71 and 0.88 factor loadings.

4.2.3 Discriminant Validity

The values of the average variance extracted (AVE) were calculated to investigate the discriminant validity among factors. "Average Variance Extracted refers to the amount of variance that is captured by the latent variable in relation to the amount of variance due to the measurement error in the latent variable (Dillon and Goldstein 1984)" Akgün (2011: 201). The AVE of a value 50 percent or higher indicates discriminant validity among factors (Hair et al., 2010). In this study, the AVE estimate for each factor ranges between 60% for the factor of sustainable competitive advantage and 89% for the factor of supplier involvement, demonstrating that all factors satisfy the adequate level of discriminant validity.

4.2.4. Unidimensionality

Unidimensional measures are described as "a set of measured variables (indicators) can be explained by only one underlying construct" (Hair et al., 2010, p. 674). With respect to the CFA, a comparative fit index (CFI) of above 0.90 suggests statistical evidence of unidimensionality (Bentler, 1992; Al-Hawari, Hartley, and Ward, 2005; Zu, 2009). As shown in Table 4.7, all the CFI indices for the measurements are higher than 0.90, indicating acceptable unidimensionality.

Table 4.3: CFA Test Results of Technical QM and Behavioral QM Measures

Factors and Underlying Variables	Loading[a]	S.E.[b]	C.R.[c]	AVE[d]
Technical QM Measures				
Process Management (α = .789)				
Clear work or process instructions are given to employees	.834***	n/a	n/a	.654
We make extensive use of statistical techniques to reduce variance in processes	.782***	.070	13.208	(65%)
Product/Service Design (α = .772)				
We thoroughly review new product/service design before the product/service is produced.	.811***	n/a	n/a	.630
We work in teams, with members from a variety of areas (marketing, purchasing, manufacturing, etc.) to introduce new products/services.	.776***	.082	12.080	(63%)
Quality Information (α = .919)				
Information on quality performance is readily available to employees.	.830***	n/a	n/a	.802
Our quality data (error rates, defect rates, scrap, etc.) are accurate and reliable.	.900***	.060	17.564	(80%)
Quality data are timely.	.952***	.059	18.962	
Behavioral QM Measures				
Top Management Support (α^e = .932)				
Our top management provides personal leadership for quality products and quality improvement.	.941***	n/a[f]	n/a	.872 (87%)

Our top management creates and communicates a vision focused on quality improvement.	.927***	.041	23.868	
Employee Involvement (α = .840)				
Employees receive quality-related training.	.854***	n/a	n/a	.725
Employees are recognized and rewarded for superior quality improvement.	.849***	.068	15.416	(73%)
Customer Involvement (α = .745)				
Customer complaints are used as a method to initiate improvements in our current processes.	.809***	n/a	n/a	.597
Our customers give us feedback on our quality and delivery performance.	.735***	.081	10.202	(60%)
Supplier Involvement (α = .939)				
We actively engage suppliers in our quality improvement efforts.	.938***	n/a	n/a	.885
We maintain close communication with suppliers about quality considerations and design changes.	.944***	.044	22.256	(89%)

Note: N = 235; [a] Standardized factor loading; [b] Standard error; [c] Critical ratio (*t*-value); [d] Average Variance Extracted; [e] Cronbach's alpha; [f] Not applicable (not estimated when loading set to fixed value: i.e., 1.000); *** $p < 0.001$.

Table 4.4: CFA Test Results of Metacognition Measures

Factors and Underlying Variables	Loading[a]	S.E.[b]	C.R.[c]	AVE[d]
Metacognitive Knowledge (α^e = .801)				
We think of several ways to solve a problem and choose the best one.	.892***	n/a[f]	n/a	.679 (68%)
We try to use strategies that have worked in the past.	.750***	.054	14.535	
Metacognitive Experience (α = .899)				
We know what kind of information is most important to consider when faced with a problem.	.909***	n/a	n/a	.816 (82%)
We consciously focus our attention on important business information.	.898***	.045	21.919	
Metacognitive Goal-Orientation (α = .927)				
We often define goals for ourselves.	.928***	n/a	n/a	.865 (87%)
We set specific goals before we begin a task.	.932***	.044	23.350	
Metacognitive Strategy (α = .939)				
We ask ourselves if we have considered all the options when solving a problem.	.934***	n/a	n/a	.839 (84%)
We re-evaluate our assumptions when we get confused.	.914***	.037	25.575	
We ask ourselves if we have learned as much as we could have	.899***	.040	24.281	

when we finished the task.				
Metacognitive Monitoring (α = .908)				
We stop and go back over information that is not clear.	.928***	n/a	n/a	
We find ourselves analyzing the usefulness of a given strategy while engaged in a given task.	.846***	.043	19.923	.762 (76%)
We find ourselves pausing regularly to check our comprehension of the problem or situation at hand.	.842***	.043	19.758	

Note: N = 235; [a] Standardized factor loading; [b] Standard error; [c] Critical ratio (*t*-value); [d] Average Variance Extracted; [e] Cronbach's alpha; [f] Not applicable (not estimated when loading set to fixed value: i.e., 1.000); *** $p < 0.001$.

Table 4.5: CFA Test Results of SCA and Firm Performance Measures

Factors and Underlying Variables	Loading[a]	S.E.[b]	C.R.[c]	AVE[d]
Firm Performance (α^e = .891)				
Sales Growth	.876***	n/a[f]	n/a	
Market Share Growth	.871***	.053	17.973	
Customer Satisfaction	.668***	.062	11.666	.632
Net Profit Margin	.812***	.056	15.823	(63%)
Cost of Quality (error, scrap, rework, inspection) as a % of Sales	.728***	.056	13.256	
Sustainable Competitive Advantage (α = .884)				
My company's resources or capabilities are so VALUABLE that they enable us to exploit opportunities or neutralize threats in our external environment.	.796***	n/a	n/a	
My company has COSTLY-TO-IMITATE resources or capabilities that our competitors cannot easily imitate or develop.	.712***	.077	11.535	.592 (60%)
My company has DIFFICULT-TO-SUBSTITUTE resources or capabilities that cannot be easily substituted by those of our competitors.	.649***	.080	10.329	

My firm has mainly produced ABOVE average market return.	.840***	.069	14.243
My company has shown PERSISTENT superior business performance to our competitors for a long time.	.832***	.069	14.074

Note: N = 233 (2 missing values); [a] Standardized factor loading; [b] Standard error; [c] Critical ratio (*t*-value); [d] Average Variance Extracted; [e] Cronbach's alpha; [f] Not applicable (not estimated when loading set to fixed value: i.e., 1.000); *** $p < 0.001$.

Table 4.6: Descriptive Statistics and Correlations

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Mean	s.d.
1. Firm's Age[a]																		4.662	1.566
2. Firm's Size[b]	.440**																	4.429	1.950
3. Firm's Industry[c]	-.108	-.126																1.675	.469
4. Metacognitive Knowledge	-.078	-.104	-.034															4.842	1.504
5. Metacognitive Experience	-.060	-.034	-.060	.847**														4.774	1.531
6. Metacognitive Goal-Orientation	-.048	.011	-.015	.755**	.769**													4.802	1.626
7. Metacognitive Strategy	-.053	-.055	-.056	.838**	.894**	.794**												4.514	1.611
8. Metacognitive Monitoring	-.024	-.051	-.013	.816**	.856**	.787**	.921**											4.527	1.499
9. Process Management	.048	.061	-.111	.737**	.712**	.652**	.747**	.720**										4.342	1.595
10. Product/Service Design	-.024	.075	-.076	.736**	.719**	.659**	.710**	.719**	.708**									4.491	1.525
11. Quality Information	-.023	.073	-.142*	.704**	.713**	.663**	.736**	.727**	.772**	.726**								4.473	1.658
12. Top Management Support	-.076	-.042	-.069	.725**	.724**	.679**	.745**	.713**	.703**	.674**	.713**							4.702	1.750
13. Employee Involvement	-.079	-.029	-.064	.701**	.697**	.632**	.710**	.687**	.758**	.708**	.744**	.792**						4.200	1.692
14. Customer Involvement	-.059	-.053	-.141*	.668**	.603**	.559**	.587**	.584**	.604**	.598**	.654**	.578**	.554**					5.063	1.441
15. Supplier Involvement	-.056	.066	-.174**	.571**	.571**	.569**	.576**	.564**	.605**	.614**	.634**	.616**	.598**	.652**				4.544	1.559
16. Sustainable Competitive Advantage	-.033	.101	-.124	.627**	.608**	.575**	.610**	.628**	.582**	.667**	.608**	.630**	.623**	.523**	.554**			4.323	1.307
17. Firm Performance	-.093	.103	-.136*	.569**	.564**	.500**	.572**	.565**	.565**	.565**	.580**	.564**	.580**	.462**	.481**	.784**		4.689	1.166

Note: N = 235; Pearson correlation coefficients; ** Correlation is significant at $p < 0.01$ level (two-tailed); * Correlation is significant at $p < 0.05$ level (2-tailed). [a] The Length of Time in Business; [b] The Number of Employees; [c] "Manufacturing" = 1, "Service" = 2.

4.2.5 Goodness-of-Fit of the Model

The goodness-of-fit of the model was assessed by several different fit indices such as the normed Chi-square (χ^2/d.f.), the comparative fit index (CFI), the root mean square error of approximation (RMSEA), the RMSEA 90% confidence interval, the parsimony normed fit index (PNFI), and the Tucker-Lewis coefficient index (TLI) (Bentler and Bonett, 1980; Mulaik, James, Van Altine, Bennett, Lind, and Stilwell, 1989; Bollen and Long, 1993; Byrne, 1998; Segars and Grover, 1998; Hair et al., 2010). Table 4.7 presents the goodness-of-fit statistics regarding the all measurement models (second-order factors) and Table 4.8 summarizes the goodness-of-fit test results of the overall measurement as well as the structural models for the sample (N = 235). As shown in Table 4.8, All the goodness-of-fit statistics for measurement model (CFA) meet the desirable thresholds for each fit index (χ^2/d.f. = 2.259; CFI = .914; RMSEA = .073; RMSEA 90% Confidence Interval = .068 ~ .079; PNFI = .740; TLI = .900), indicating that the developed model for this study has a fully acceptable fit level. Further, all the model fit statistics for the structural model (SEM) were also within the recommended cutoff criteria (χ^2/d.f. = 2.250; CFI = .914; RMSEA = .073; RMSEA 90% Confidence Interval = .068 ~ .078; PNFI = .743; TLI = .901). All detailed model fit statistics based on AMOS test results is presented in Appendix F.

Table 4.7: Goodness-of-Fit Statistics of the Measurement Models (Second-Order Factors)

Fit Index	Desirable Threshold	Managerial Metacognition	Technical QM	Behavioral QM
Chi-square (χ^2)		104.131	32.598	24.253
Degree of Freedom (d.f.)		44	11	14
χ^2/d.f.	< 3.00[e]	2.367	2.963	1.732
CFI[a]	> 0.90[f]	.982	.982	.993
RMSEA[b]	< 0.08[g]	.076	.092	.056
RMSEA 90% Confidence Interval		.058 ~ .095	.056 ~ .129	.010 ~ .092
PNFI[c]	> 0.50[h]	.646	.510	.492
TLI[d]	Close to 1.00[i]	.973	.966	.986

Note: N = 235; [a] Comparative fit index; [b] Root mean square error of approximation; [c] Parsimony normed fit index; [d] Tucker-Lewis coefficient index; [e] Segars and Grover (1998), Hair et al. (2010); [f] Byrne (1998); [g] Bollen and Long (1993); [h] Mulaik, James, Van Altine, Bennett, Lind, and Stilwell (1989); [i] Bentler and Bonett (1980).

Table 4.8: Goodness-of-Fit Statistics of the Hypothesized Research Model

Fit Index	Desirable Threshold	Measurement Model	Structural Model
Chi-square (χ^2)		1371.236	1372.334
Degree of Freedom (d.f.)		607	610
χ^2/d.f.	< 3.00[e]	2.259	2.250
CFI[a]	> 0.90[f]	.914	.914
RMSEA[b]	< 0.08[g]	.073	.073
RMSEA 90% Confidence Interval		.068 ~ .079	.068 ~ .078
PNFI[c]	> 0.50[h]	.740	.743
TLI[d]	Close to 1.00[i]	.900	.901

Note: N = 235.

[a] Comparative fit index.

[b] Root mean square error of approximation.

[c] Parsimony normed fit index.

[d] Tucker-Lewis coefficient index.

[e] Segars and Grover (1998), Hair et al. (2010).

[f] Byrne (1998).

[g] Bollen and Long (1993).

[h] Mulaik, James, Van Altine, Bennett, Lind, and Stilwell (1989).

[i] Bentler and Bonett (1980).

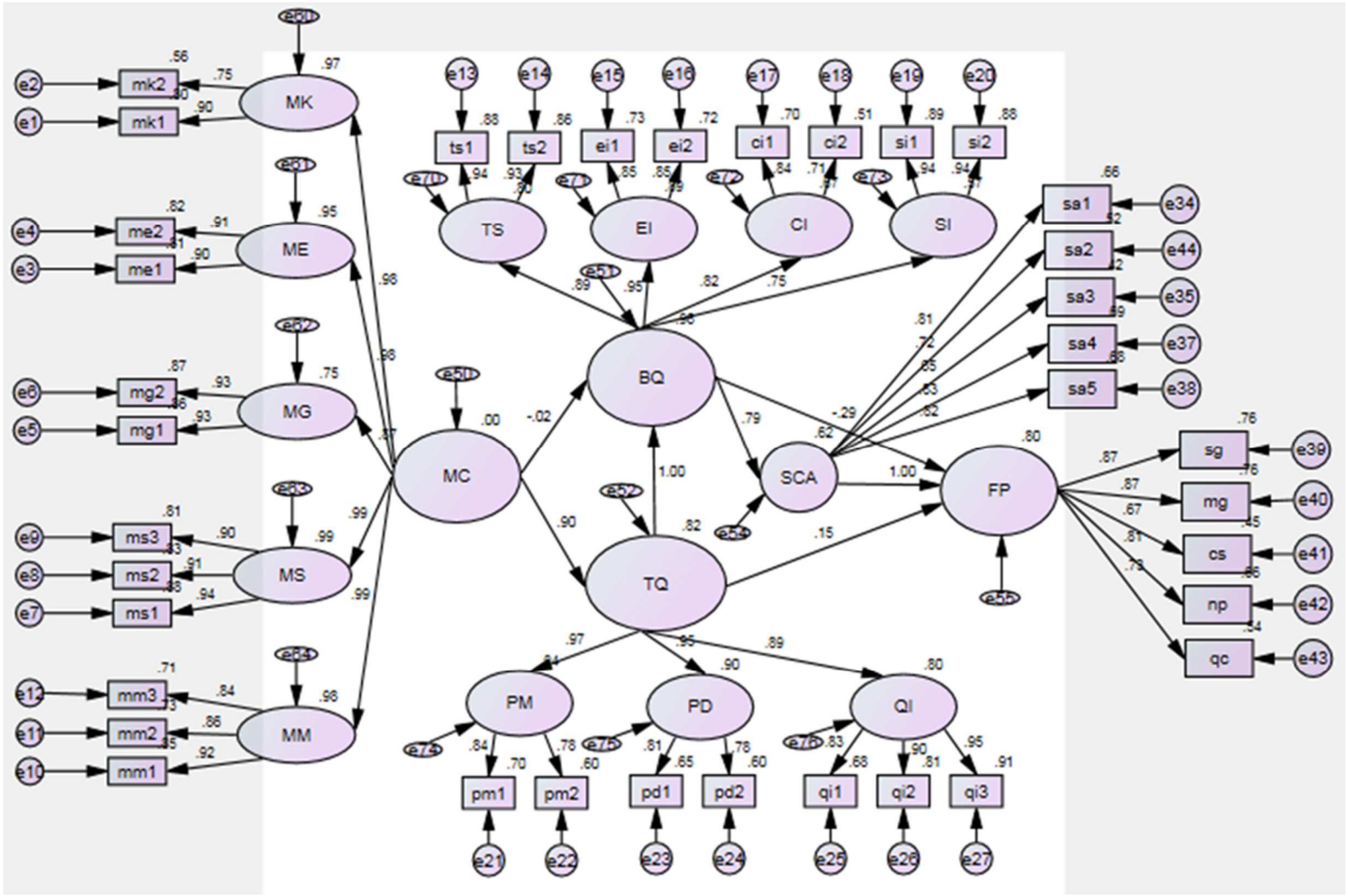
4.3 Test Results of the Structural Equations Model

The structural equation modeling (SEM) analysis was used to test the hypothesized research model in this study. Figure 4.1 depicts the test results of SEM analysis (N = 235) computed by AMOS 22 and the minimization history of default model is presented in Appendix G. Figure 4.2 summarized each path with the standardized path coefficient, significance level, and critical ratio. The hypothesized structural model is recursive and also fits the data very well (χ^2/d.f. = 2.250; CFI = .914; TLI = .901; RMSEA = .073).

As demonstrated in Figure 4.2, the path coefficient between managerial metacognition and technical QM is not only positive but also statistically significant (ß = .904, $p < .001$), supporting hypothesis 1a, *managerial metacognition is positively related to a firm's technical quality management practices*. On the other hand, the path coefficient between managerial metacognition and behavioral QM is non-significantly negative (ß = -.020, t = -.173), hence not supporting hypothesis 1b.

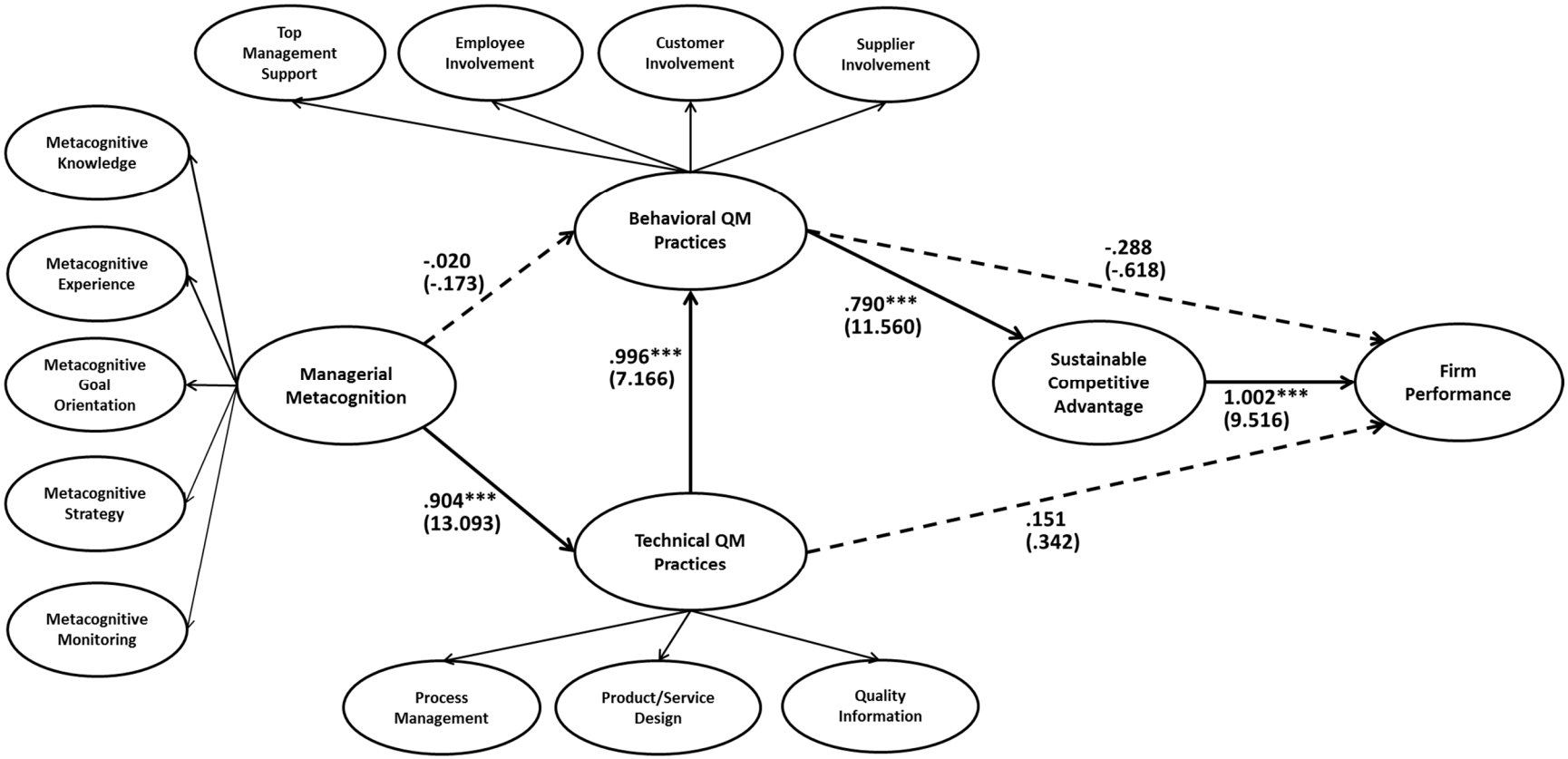
In support of hypothesis2a, *technical quality management practices are positively related to behavioral quality management practices,* the path coefficient between technical QM and behavioral QM is significantly positive (ß = .996, $p < .001$) and the path coefficient between behavioral QM and a firm's sustainable competitive advantage (SCA) is also significantly positive (ß = .790, $p < .001$), supporting hypothesis 2b, *behavioral quality management practices are positively related to a firm's sustainable competitive advantages.*

Figure 4.1: AMOS Results of the Structural Equations Modeling Analysis (Default Model)



Note: N = 235; Standardized path coefficients (β) are reported; χ^2/d.f. = 2.250; CFI = .914; TLI = .901; RMSEA = .073; MC, managerial metacognition; TQ, technical quality management; BQ, behavioral quality management; SCA, sustainable competitive advantage; FP, firm performance.

Figure 4.2: Standardized Path Estimates for the Hypothesized Structural Model



Note: N = 235; Standardized path coefficients (β) are reported; *** $p < 0.001$; Dashed paths are not significant; χ^2/d.f. = 2.250; CFI = .914; TLI = .901; RMSEA = .073; the figure in the parenthesis represents the critical ratio (*t* value).

4.4 Test Results of the Mediation Model

To test the mediation effect of a firm's SCA on the relationship between behavioral QM and firm performance, I employed the Baron and Kenny's (1986) mediation test method. Thus, first the direct effect of behavioral QM on firm performance was tested in order to examine whether the model meets the prerequisites for testing a medication relationship. As demonstrated in Figure 4.3, test results of the direct effect model (N = 235; χ^2/d.f. = 2.099; CFI = .936; TLI = .925; RMSEA = .069) indicates that behavioral QM has a significantly positive influence on firm performance (ß = .645, p < .001).

Further, as the prerequisite steps of Baron and Kenny's (1986) mediation test method, all the other direct effects of behavioral QM on SCA (N = 235; CFI = .933; ß = .776, $p < .001$) as well as SCA on firm performance (N = 235; CFI = .857; ß = .896, $p < .001$) were significantly positive. The related AMOS test outputs were posted in Appendix H.

However, as illustrated in Figure 4.4 (N = 235; χ^2/d.f. = 2.246; CFI = .914; TLI = .901; RMSEA = .073), the direct positive influence of behavioral QM on firm performance is significantly weakened (ß = -.132, t = -1.563) when inserting the SCA factor between behavioral QM and firm performance even though both the direct effect of behavioral QM on SCA (ß = .789, $p < .001$) and the direct effect of SCA on firm performance (ß = .996, $p < .001$) are still significantly positive. This implies that a firm's SCAs have a full mediating influence on the relationship between behavioral QM practices and firm performance. Therefore, the hypothesis 3, *a firm's sustainable competitive advantages mediate the positive relationship between behavioral quality management practices and firm performance,* is completely supported.

In addition, to check the robustness of this mediation analysis, I performed the Aroian (1947), Goodman (1960), and Sobel (1982) mediation tests. The calculator was employed from http://quantpsy.org/sobel/sobel.htm, and the test equations used for each method were as follows:

- Sobel test equation:

$$z\text{-value} = a*b/\text{SQRT}(b^2*s_a^2 + a^2*s_b^2)$$

- Aroian test equation:

$$z\text{-value} = a*b/\text{SQRT}(b^2*s_a^2 + a^2*s_b^2 + s_a^2*s_b^2)$$

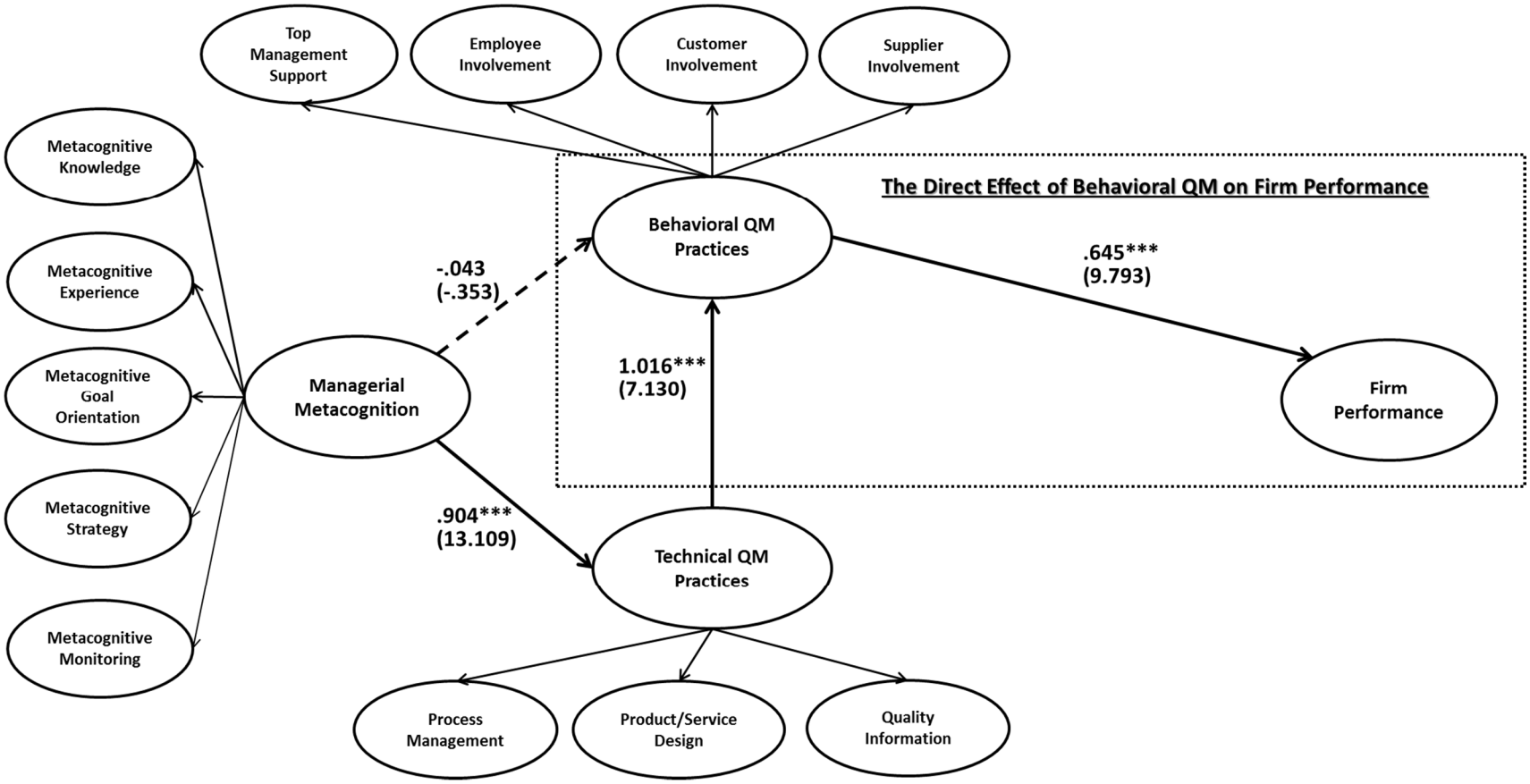
- Goodman test equation:

$$z\text{-value} = a*b/\text{SQRT}(b^2*s_a^2 + a^2*s_b^2 - s_a^2*s_b^2)$$

where a are the unstandardized regression coefficient for the association between behavioral quality management practices (BQ) and a firm's sustainable competitive advantages (SCA) factors; b denotes the unstandardized coefficient for the association between a firm's SCA and firm performance factors; s_a stands for the standard error of a; s_b represents standard error of b.

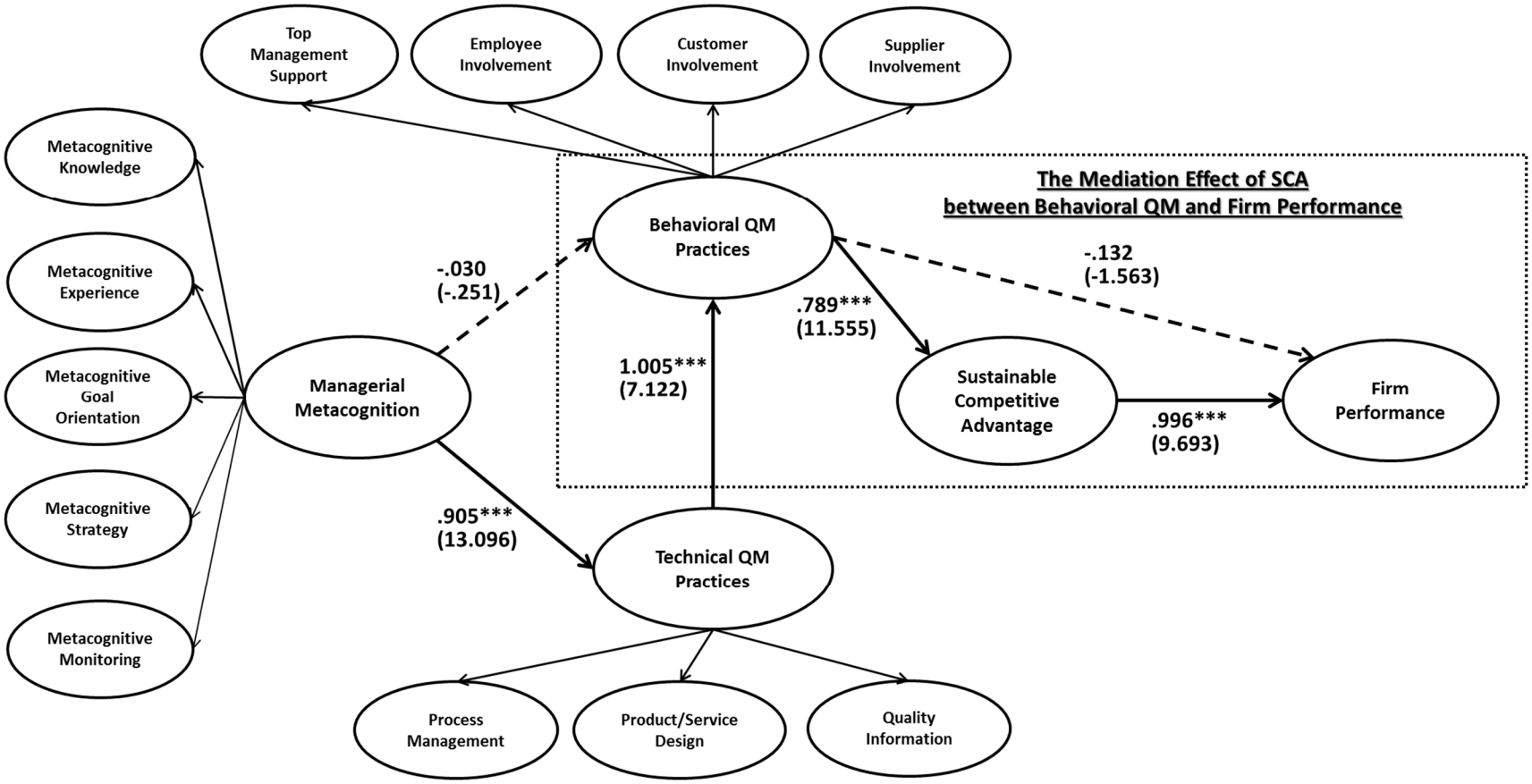
The test results indicate that the critical ratio (z-value) is 7.328 (S.E. = 0.087, $p < 0.001$) for the Sobel test, 7.311 (S.E. = 0.087, $p < 0.001$) for the Aroian test, and 7.345 (S.E. = 0.087, $p < 0.001$) for the Goodman test, as presented in Figure 4.5. Thus, it is evident that a significant mediation relationship exists in the model.

Figure 4.3: Test Results for the Direct Effect of BQ on Firm Performance



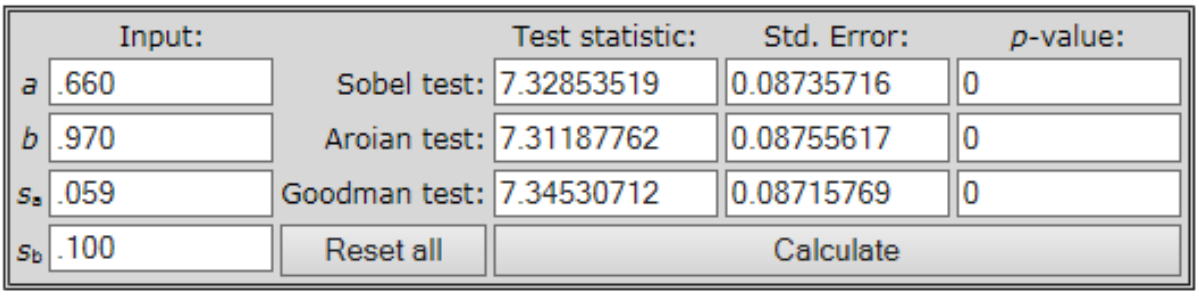
Note: N = 235; Standardized path coefficients (β) are reported; BQ, behavioral quality management; *** $p < 0.001$; Dashed paths are not significant; χ^2/d.f. = 2.099; CFI = .936; TLI = .925; RMSEA = .069; the figure in the parenthesis represents the critical ratio (*t* value).

Figure 4.4: Test Results for the Mediation Effect of SCA between BQ and Firm Performance



Note: N = 235; Standardized path coefficients (β) are reported; *** $p < 0.001$; BQ, behavioral quality management; SCA, sustainable competitive advantage; Dashed paths are not significant; χ^2/d.f. = 2.246; CFI = .914; TLI = .901; RMSEA = .073; the figure in the parenthesis represents the critical ratio (*t* value).

Figure 4.5: Test Statistics of the Significance of Mediation: 'BQ→SCA→FP' Model



Input:			Test statistic:	Std. Error:	*p*-value:
a	.660	Sobel test:	7.32853519	0.08735716	0
b	.970	Aroian test:	7.31187762	0.08755617	0
s_a	.059	Goodman test:	7.34530712	0.08715769	0
s_b	.100	Reset all	Calculate		

Note: N = 235; Two-tailed probability.

This calculator was adopted from http://quantpsy.org/sobel/sobel.htm.

a = Unstandardized regression coefficient for the association between behavioral QM and a firm's sustainable competitive advantages (SCA) factors.

s_a = Standard error of *a*.

b = Unstandardized coefficient for the association between a firm's SCA and firm performance factors.

s_b = Standard error of *b*.

4.5 Post Hoc Study I: Relationships between Metacognition, TQ, and BQ

The hypothesis 1b, *managerial metacognition is positively related to a firm's behavioral QM practices*, was not supported; whereas, the test results indicate that the path coefficient between managerial metacognition and technical QM is significantly positive (ß = .904, $p < .001$) and the relationship between technical QM and behavioral QM is also significantly positive (ß = .996, $p < .001$), as shown in Figure 4.2, Thus, considering the overall relationships between managerial metacognition, technical QM, and behavioral QM, it is strongly presumed that the statistical association between managerial metacognition and behavioral QM could be weakened due to the significant mediation effect of the technical QM on the relationship between managerial metacognition and behavioral QM. In other words, it is doubtful that a positive association between managerial metacognition and behavioral QM exists in reality. Therefore, I suggest the following post hoc hypothesis in order to investigate the mediation effect of technical QM between managerial metacognition and behavioral QM:

> *Post Hoc Hypothesis: Technical quality management practices mediate the positive relationship between managerial metacognition and behavioral quality management practices.*

The mediation effect of technical QM on the relationship between managerial metacognition and behavioral QM can be mathematically illustrated by the following linear equations:

$$TQ = i_7 + \beta_7(MC) + \varepsilon_6 \quad (6)$$

$$BQ = i_8 + \beta_8(MC) + \beta_9(TQ) + \varepsilon_7 \quad (7)$$

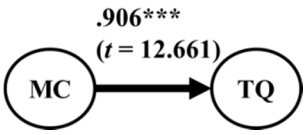
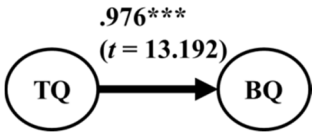
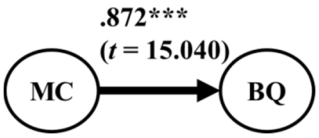
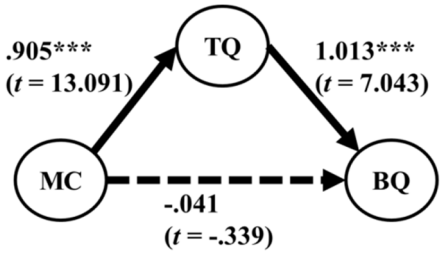
where β_7, β_8, and β_9 are the regression coefficients given to the antecedent variables in the model in the estimation of the consequents, i_7 and i_8 are regression intercepts, and ε_6 and ε_7 are errors in the estimation of TQ and BQ correspondingly. Also, the following abbreviations were used for simplicity: managerial metacognition (MC), technical quality management (TQ), and behavioral quality management (BQ).

Baron and Kenny's (1986) mediation analysis technique was adopted again to test the mediation effect of technical QM on the relationship between managerial metacognition and behavioral QM. Hence, all prerequisite analyses were conducted according to the Baron and Kenny's (1986) study, and all the test results were summarized in Table 4.9.

In specific, the direct effect of managerial metacognition on a firm's behavioral QM practices were first tested, and Figure 4.5 demonstrates the results computed by AMOS 22 (N = 235; χ^2/d.f. = 2.164; CFI = .964; TLI = .957; RMSEA = .071). It represents that managerial metacognition has a significantly positive influence on a firm's behavioral QM activities (ß = .872, p < .001). Nevertheless, as illustrated in Figure 4.6, the direct positive influence of managerial metacognition on a firm's behavioral QM practices is significantly weakened (ß = -.041, t = -.339) when inserting the technical QM factor between managerial metacognition and behavioral QM, while both the direct effect of metacognition on technical QM (ß = .905, p < .001) and the direct effect of technical QM on behavioral QM (ß = 1.013, p < .001) are still significantly positive (N = 235; χ^2/d.f. = 2.139; CFI = .949; TLI = .942; RMSEA = .070.). This implies that a firm' technical QM practices have a full mediating influence on the relationship between a firm's managerial metacognition and behavioral QM practices. Additionally the robustness for the test results of this mediation analysis were checked by the Aroian (1947),

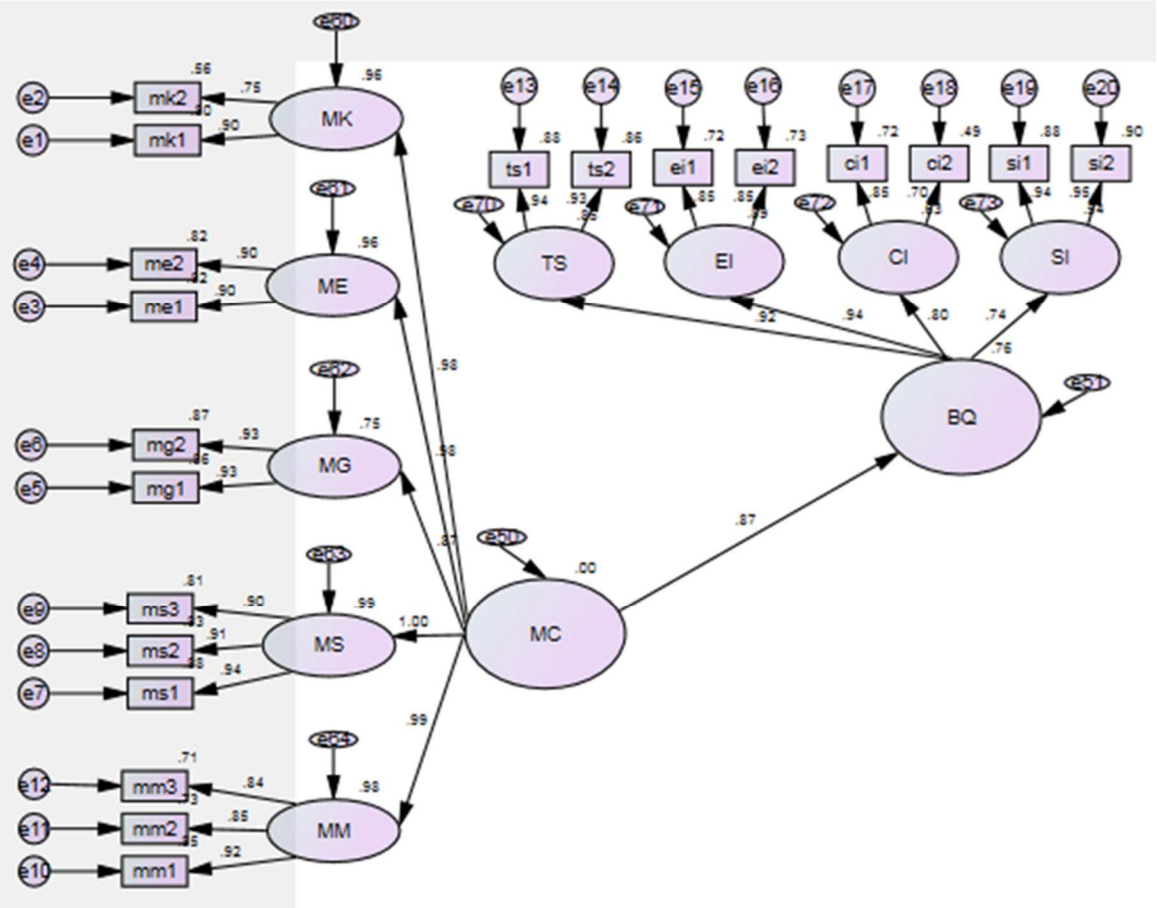
Goodman (1960), and Sobel (1982) tests. As demonstrated in Appendix I. the all test statics support that a significant mediation relationship exists in the model.

Table 4.9: Test Results of Various Relationships between Metacognition, TQ and BQ

Test	Purpose	Result
1	To examine the direct effect of MC on TQ	
2	To examine the direct effect of TQ on BQ	
3	To examine the direct effect of MC on BQ	
4	To examine the mediating effect of TQ on the relationship between MC and BQ	

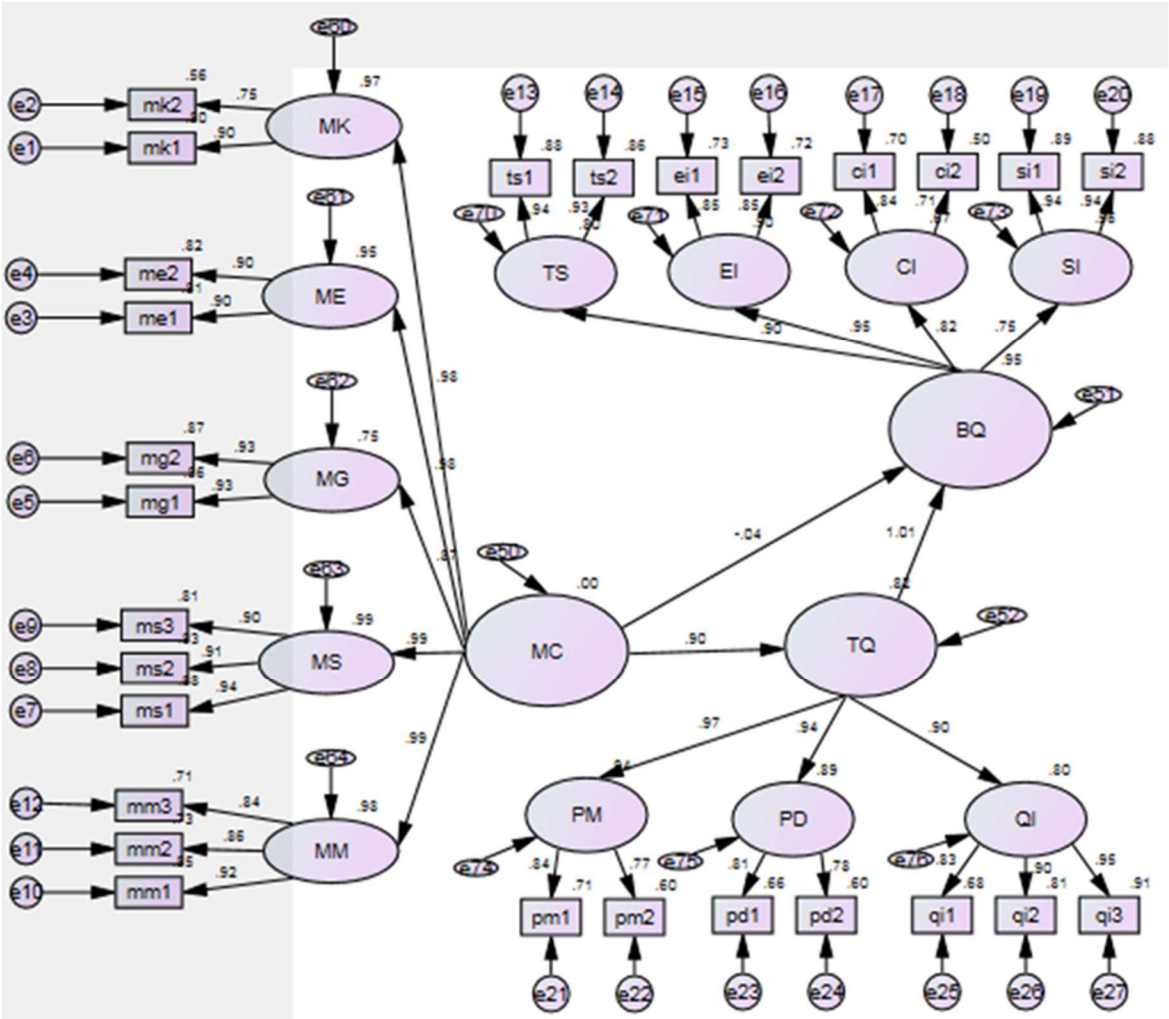
Note: N = 235; Standardized path coefficients (β) are reported; *** $p < 0.001$; Dashed path is not significant; MC, managerial metacognition; BQ, behavioral quality management; TQ, technical quality management.

Figure 4.6: AMOS Results of the Direct Effect of Metacognition on BQ



Note: N = 235; Standardized path coefficients (β) are reported (significant at $p < 0.001$ level); MC, managerial metacognition; BQ, behavioral quality management; χ^2/d.f. = 2.164; CFI = .964; TLI = .957; RMSEA = .071.

Figure 4.7: AMOS Results of the Mediation Effect of TQ between Metacognition and BQ



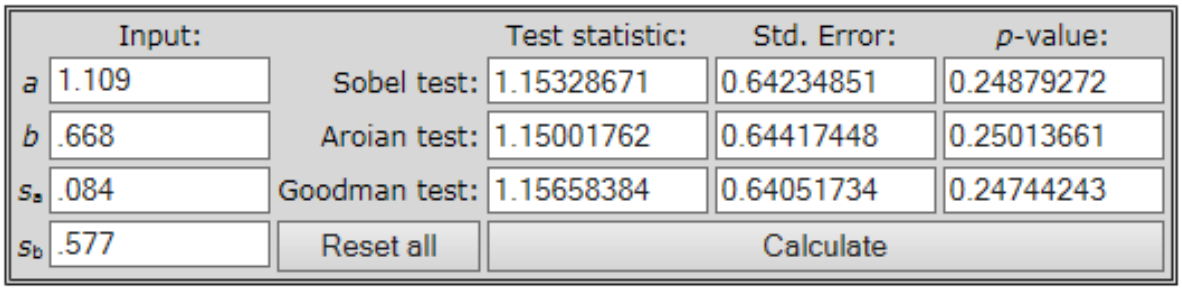
Note: N = 235; Standardized path coefficients (β) are reported; MC, managerial metacognition; TQ, technical quality management; BQ, behavioral quality management; χ^2/d.f. = 2.139; CFI = .949; TLI = .942; RMSEA = .070.

4.6 Post Hoc Study II: Two Competing Models

As represented in Figure 4.2., the test results of the research model indicate that the sequential relationship of 'TQ→BQ→P' is significant. Now it is needed to examine whether the 'TQ→BQ→P' relationship is a statistically more robust than the 'BQ→TQ→P' relationship.

First I investigated whether 'TQ→BQ→P' has a better structural model fit than 'BQ→TQ→P'; however, there was no significant difference between these two competing models in terms of a chi-square test. Then, I conducted the Sobel test (Sobel, 1982) to examine whether the indirect effect of the independent variable on the dependent variable via the mediator variable is significant. The test results indicate that the indirect effect of the TQ on P through BQ (critical ratio = 1.153; S.E. = 0.642; p =0.248) is more significant than the indirect effect of the BQ on P through TQ (critical ratio = 0.102; S.E. = 0.562; p = 0.918), as shown in Figures 4.8 and 4.9. Besides, the relative effect of technical QM versus behavioral QM practices in affecting performance was tested by using SEM analysis. As demonstrated in Figure 4.10, behavioral QM practices has a significantly greater positive direct influence on a firm's SCA than do technical QM practices, although a strong interdependence relationship between behavioral QM and technical QM are found. This result is in sync with the existing literature (Flynn et al., 1995; Powell, 1995; Samson and Terziovski, 1999; Naor et al., 2008; Jung and Hong, 2008). Thus, considering all the test results above, it is inferred that the sequential relationship of 'TQ→BQ→P' is statistically more robust than the 'BQ→TQ→P' relationship.

Figure 4.8: Sobel Test Results for the 'TQ→BQ→P' Model



Input:			Test statistic:	Std. Error:	*p*-value:
a	1.109	Sobel test:	1.15328671	0.64234851	0.24879272
b	.668	Aroian test:	1.15001762	0.64417448	0.25013661
s_a	.084	Goodman test:	1.15658384	0.64051734	0.24744243
s_b	.577	Reset all	Calculate		

Note: N = 235; Two-tailed probability; This calculator was employed from http://quantpsy.org/sobel/sobel.htm; TQ, technical quality management; BQ, behavioral quality management; P, sustainable competitive advantages.

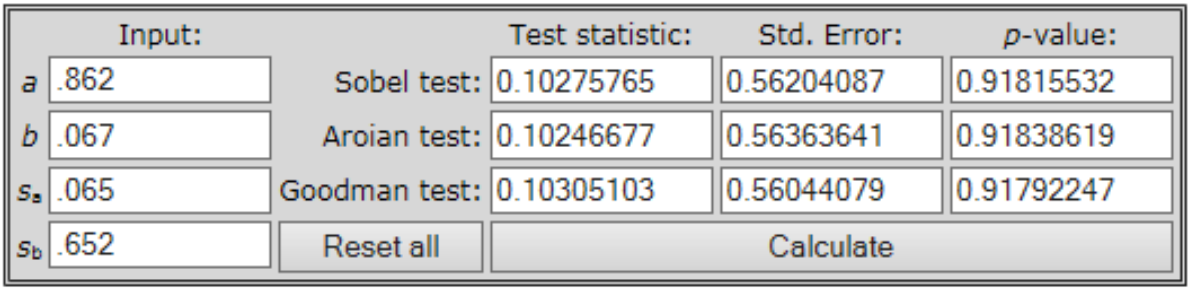
a = Unstandardized regression coefficient for the association between TQ and BQ.

s_a = Standard error of *a*.

b = Unstandardized coefficient for the association between BQ and P

s_b = Standard error of *b*.

Figure 4.9: Sobel Test Results for the 'BQ →TQ→P' Model



Input:			Test statistic:	Std. Error:	*p*-value:
a	.862	Sobel test:	0.10275765	0.56204087	0.91815532
b	.067	Aroian test:	0.10246677	0.56363641	0.91838619
s_a	.065	Goodman test:	0.10305103	0.56044079	0.91792247
s_b	.652	Reset all	Calculate		

Note: N = 235; Two-tailed probability; This calculator was employed from http://quantpsy.org/sobel/sobel.htm; TQ, technical quality management; BQ, behavioral quality management; P, sustainable competitive advantages.

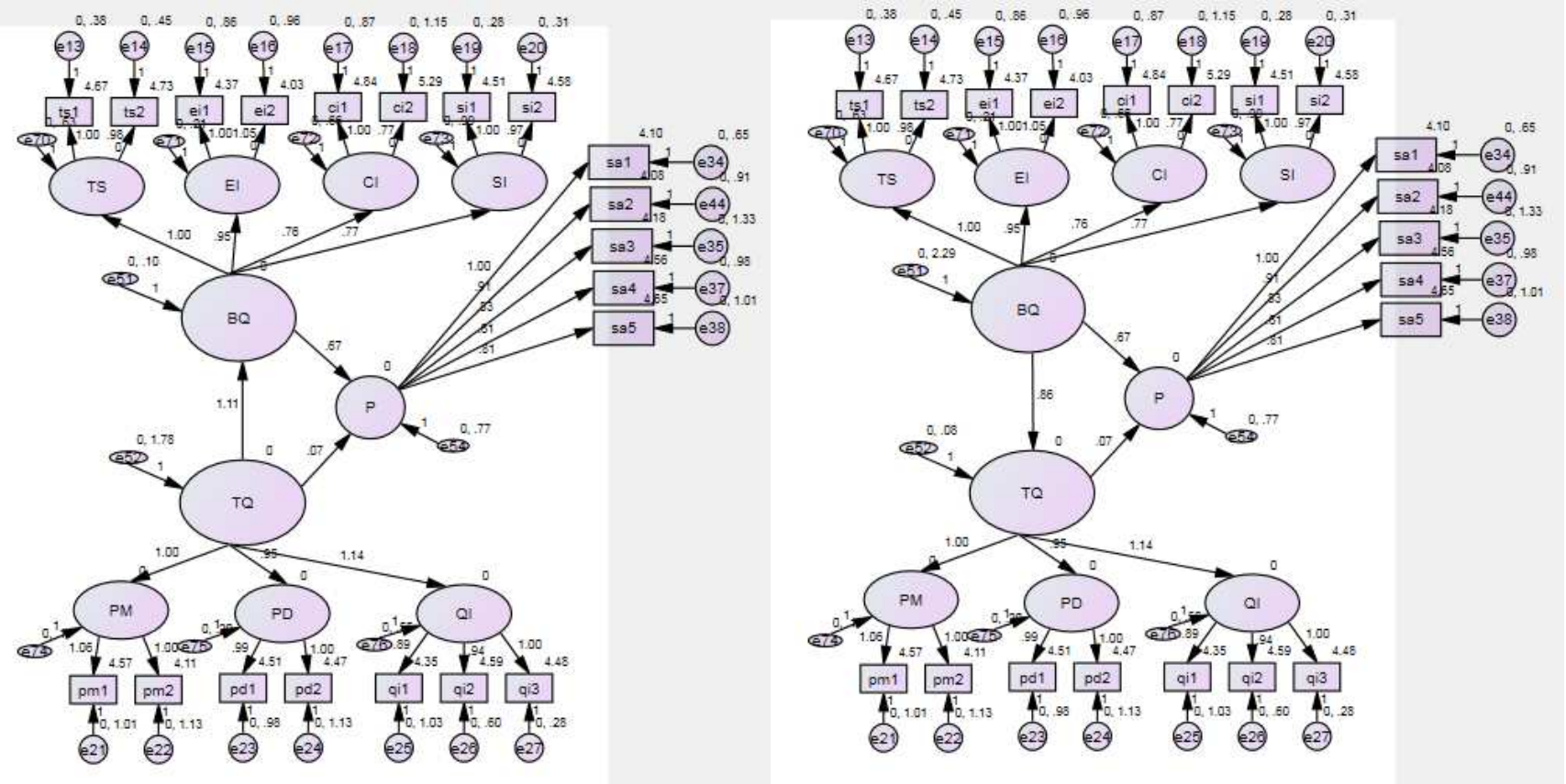
a = Unstandardized regression coefficient for the association between BQ and TQ.

s_a = Standard error of *a*.

b = Unstandardized coefficient for the association between TQ and P

s_b = Standard error of *b*.

Figure 4.10: AMOS Test Results of the Two Competing Models



Note: N = 235; Unstandardized path coefficients are reported; TQ, technical quality management; BQ, behavioral quality management; P, sustainable competitive advantages; Model fit statistics are presented in APPENDIX F.

CHAPTER V

DISCUSSION AND CONCLUSION

"*All things are subject to interpretation.*"

Friedrich W. Nietzsche (1844–1900)

5.1 Summary of Findings

Overall, four of the five hypothesized relationships developed in this study were found to be significant, providing support for H1a, H2a, H2b, and H3 with only H1b not supported.

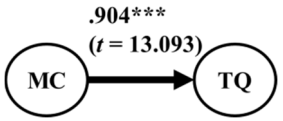
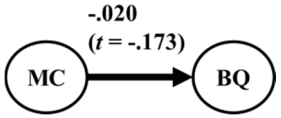
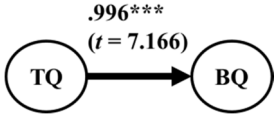
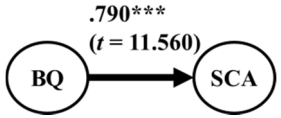
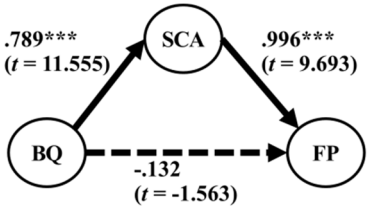
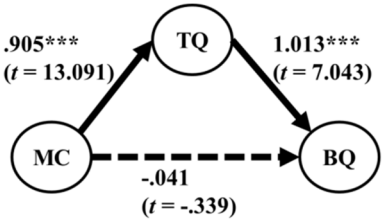
Particularly, this study reveals that a significant positive association exists between managerial metacognition and a firm's technical QM practices (H1a). This finding indicates that better technical QM practices could eventuate in a firm when they have a higher level of managerial metacognitive abilities. However, no evidence supports that managerial metacognition positively influences a firm's behavioral QM practices (H1b) in the condition of the proposed research model.

As for the relationships between technical QM, behavioral QM, and a firm's SCAs, the test results represent that technical quality practices are positively related to behavioral quality practices, and a significant association between such behavioral quality practices and a firm's SCAs, as hypothesized in H2a and H2b respectively. These findings imply that well-developed

a firm's behavioral quality practices might act as their strategic resources which directly contribute to the creation of a firms' SCAs. In terms of the mediation model (H3), this study provides a significant evidence for the mediation effect of a firm's SCAs on the relationship between behavioral quality practices and firm performance.

Moreover, the post hoc hypothesis was also significantly supported, indicating that a firm's technical QM practices mediate the positive relationship between managerial metacognition and behavioral QM practices. All the test results regarding the hypotheses of this study are summarized in Table 5.1.

Table 5.1: Summary of the Hypothesis Test Results

Hypothesis	Association	Pathway and Result	Hypothesis supported
H1a	Managerial metacognition and technical QM		**Yes**
H1b	Managerial metacognition and behavioral QM		**No**
H2a	Technical QM and behavioral QM		**Yes**
H2b	Behavioral QM and a firms' SCA		**Yes**
H3	Mediation effect of a firm's SCA		**Yes**
Post-Hoc H	Mediation effect of Technical QM		**Yes**

Note: N = 235; Standardized path coefficients (β); *** $p < 0.001$; Dashed path is not significant; MC, managerial metacognition; TQ, technical quality management; BQ, behavioral quality management; SCA, sustainable competitive advantage; FP, firm performance.

5.2 Theoretical and Managerial Implications

First, the study results clearly raise a critical issue about the validity of the 'BQ→TQ→P' framework that has been predominantly adopted by numerous TQM research studies. The test results in this study show that the 'TQ→BQ→P' relationship is statistically significant as well as more robust than the 'BQ→TQ→P' relationship. These findings can be understood by a RBV (Wernerfelt 1984; Barney 1991). The study results verify that behavioral QM may be a more critical strategic resource for generating a firm's SCA than is technical QM. Hayes et al. (2005) argue that although it seems that the QM program contributes to improving a firm's operating performance, most of the improvement comes from soft QM components such as commitment of top management, customer involvement, and employee involvement. In the same vein, the study results support the idea that behavioral QM practices have a significantly greater positive influence on the creation of a firm's sustainable competitive advantages than do technical QM practices (Powell, 1995; Dow et al., 1999; Samson and Terziovski, 1999; Naor et al., 2008; Jung and Hong, 2008; Abdullah et al., 2008). In revisiting the RBV, it is identified that the behavioral QM aspects of a firm such as skilled leadership, human resource management, and relationships with its customers and suppliers are typically non-substitutable knowledge-based resources that its competitors cannot easily imitate (Barney, 1991; Lado, Boyd, and Wright 1992; Powell, 1993; Barringer and Harrison, 2000; Barney and Hesterly, 2006). Therefore, considering the study results along with those of the extant literature, I suggest that behavioral QM practices should be regarded as a more critical strategic resource for a firm's SCA than are technical QM practices.

Next, according to institutional theory, organizations tend to be institutionalized by adapting to the rules, structure, values, and practices of their environments to obtain social legitimacy (Selznick 1957, 1996; Meyer and Rowan, 1977; Suchman, 1995). In fact, quality

practices are broadly accepted as a typical example of organizational isomorphism, because the adoption of popular TQM techniques contributes to a firm's social legitimacy and professionalism (Westphal, Gulati, and Shortell, 1997; Staw and Epstein, 2000; Rungtusanatham, Forza, Koka, Salvadora, and Nie, 2005; Jun et al., 2006). Further, advocates of institutional theory argue that, owing to the isomorphic nature of TQM practices, firms might adopt similar TQM practices, eventually leading to similar TQM implementations as well as performances among TQM-embedded firms (Dahlgaard, Kristensen, Kanji, Juhl, and Sohal, 1998; St. John, Cannon, and Pouder, 2001). That is, the institutional theory justifies the so-called the 'universality of TQM practices' across organizational boundaries (Mitki and Shani, 1995; Yavas, 1995).

However, some studies question such universality of TQM practices (Hendricks and Singhal, 1997, 2001). For instance, Jun et al. (2006) argue the conventional TQM framework was conceptualized based on survey results that were mostly conducted in developed countries; hence, the universality would be limited to firms in developed countries (Jun et al., 2006; Cho and Jung, 2014). In addition, a study by Hendricks and Singhal (2001) indicates that the effectiveness of TQM practices can be differentiated, depending upon various characteristics of the firm such as size, capital-intensity, and maturity of a firm's TQM implementation. Furthermore, other studies also suggest that organizational culture affects QM practices (McDermott, 2005; Naor et al., 2008; Jung, Su, Baeza, and Hong, 2008; Zu, Robbins and Fredendall, 2010; Naor, Linderman, and Schroeder, 2010). In fact, those arguments are mainly based on the contingency theory perspective, positing that the organization's performance is determined by its ability to cope with the environment (Burns and Stalker, 1961; Lawrence and Lorsch, 1967; Child, 1972; Donaldson, 1987).

Back to the findings of this study, the study results indicate that there is a significantly positive association between managerial metacognition and a firm's quality practices, suggesting that better quality practices could eventuate in a firm when they have a higher level metacognitive ability. These findings are basically consistent with the Donaldson's (1987) structural adaptation to regain fit (SARFIT) model, which elucidates that an organizational structure should be continuously adapted to their contingencies for survival. That is, in terms of the contingency theory (Lawrence and Lorsch, 1967; Child, 1972; Donaldson, 1987), the study results imply that a firm's internal contingency factors (e.g., managerial metacognitive knowledge, experience, strategy, and monitoring abilities) can result in the heterogeneous implementation of the firm's TQM practices. Consequently, the findings in this study also weaken the 'universal applicability of TQM practices' across organizational boundaries, based on institutional theory (Mitki and Shani 1995; Yavas 1995). In addition, based on the RBV (Barney, 1991), the study results also imply that a firm's well-developed metacognitive capabilities can be a source of a firm's SCA since the metacognitive mechanism within firm activities is generally so ambiguous that cannot be easily imitated and substituted by competitors.

Finally, the results of this study raise a more fundamental question regarding the existing conceptualization of TQM practices. For instance, in the extant literature, behavioral-related QM practices are known as 'infrastructure' practices, which constitute the fundamental environment that supports the effective implementation of technical QM practices, while technical-related QM practices are known as 'core' practices, which are more directly related to the improvement of organizational performance (Flynn et al., 1995; Samson and Terziovski, 1999; Rahman and Bullock, 2005; Zu, 2009). However, the study results indicate that behavioral-related QM practices are significantly associated with successful firm performance by directly contributing

to the creation of a firm's SCAs; on the other hand, technical-related QM practices mainly act as the infrastructural facilities for the overall quality practices. Thus, based on these study findings, it is cautiously rationalized that throughout the more than 30 years TQM implementation history, behavioral-related QM practices might have being evolved as a firm's 'order winner' which makes a great contribution to the firm's competitive advantages, while technical-related QM practices might have being stayed as an 'order qualifier' which serves as a firm's minimum requirement for a survival in their competition market.

Considering these arguments, I suggest that it is probably more appropriate to refer to behavioral-related quality practices as ‘core’ practices and technical-related quality practices as ‘infrastructure’ practices. Figuratively speaking, a horse-drawn coach (e.g., technical-related quality practices) would not achieve its main purpose, transportation (e.g., a firm's competitive advantages), without a coachman (e.g., behavioral-related quality practices), suggesting that the successful transportation of the coach is more critically dependent upon the driving capabilities of the coachman (i.e., behavioral-related quality practices = core practices), rather than on the structural excellence of the coach (i.e., technical-related quality practices = infrastructure practices). In short, behavioral-related quality practices might be rephrased as core practices, while technical-related quality practices might be reworded as infrastructure practices.

5.3 Limitation and Conclusion

The findings of this study are based on the self-reported survey data so it may not be free from common method variance (Campbell & Fiske, 1959; Podsakoff & Organ, 1986). However, Miller & Roth (1994) and Kaynak (1997) argue that the self-report obtained from upper level

informants are likely to be more reliable sources than that from lower level informants, consequently decreasing the probability of common method variance (CMV). In terms of the survey research in this study, the target informants were preselected senior-level managers. Furthermore, of the survey sample in this study, approximately 70 % were over 45 years old and 21 years business history. Hence, it is anticipated that the CMV regarding the study results is probably minimal.

In spite of this limitation, I believe that the study findings have made at least one meaningful contribution to the TQM theory by uncovering a contentious issue that had been overlooked by the TQM literature for a long time. Through the analysis of hypothesized structural model, it was found that 'TQ→BQ→P' is a statistically more robust structure, at least in the context of the U.S.-based firms' TQM implementation. Thus, we are now faced with some unavoidable questions. Why has only 'BQ→TQ→P' been considered and tested as a standard research framework so far? Has 'TQ→BQ→P' been simply ignored? Was there any actual structure movement of 'BQ→TQ→P' to 'TQ→BQ→P' as TQM practices reach maturity stage? Regarding the last question, this study could not suggest a concrete answer even though it implied some possibilities. Hence, it is strongly recommended that future research should involve conducting 'generalizability replication' by using a similar design (i.e., 'BQ→TQ→P' frame) but different data (i.e., more recent data), or 'validity replication' using a different design (i.e., 'TQ→BQ→P' frame) but similar data (i.e., used data) for the previously conducted TQM studies (Tsang and Kwan, 1999; Eden, 2002; Frohlich and Robb Dixon, 2006). This is necessary to investigate whether the structural movement of 'BQ→TQ→P' to 'TQ→BQ→P' historically happened.

Last but not least, it is also anticipated that this study makes some theoretical contributions to the TQM literature not only by expanding the research scope, but also by providing a new insight into the functional relationship between psychologically-driven (e.g., managerial metacognition) and technically-driven (e.g., TQM) mechanisms. In short, this study has newly discovered that the significant positive association between managerial metacognition and a firm's quality practices, suggesting that a better effective TQM implementation could eventuate in a firm when they have a higher level of metacognitive ability. Furthermore, the test results of post hoc analysis suggest that a firm's TQ-related tools and techniques have a role as an indispensable vehicle in materializing the positive influence of managerial metacognitive abilities on their BQ implementation.

In conclusion, I hope that the findings in this study can facilitate firms to establish more effective TQM framework, eventually contributing to their better business performance. I further expect that the study findings ultimately help firms, as dynamic entities, in making better strategic decisions for achieving sustainable competitive advantages in current high-velocity business environments (Cho, 2013a).

REFERENCES

Abdullah, M. M. B., Uli, J., & Tari, J. J. (2008). The influence of soft factors on quality improvement and performance: perceptions from managers. *The TQM Journal,* 20(5), 436-452.

Ahire, S. L., Golhar, D. Y., & Waller, M. A. (1996). Development and validation of TQM implementation constructs. *Decision Sciences,* 27(1), 23-56.

Al-Hawari, M., Hartley, N., & Ward, T. (2005). Measuring banks' automated service quality: a confirmatory factor analysis approach. *Marketing bulletin*, 16(1), 1-19.

Anderson, J. C., Rungtusanatham, M., Schroeder, R. G., & Devaraj, S. (1995). A Path Analytic Model of a Theory of Quality Management Underlying the Deming Management Method: Preliminary Empirical Findings. *Decision Sciences,* 26(5), 637-658.

Aroian, L. A. (1947). The probability function of the product of two normally distributed variables. *The Annals of Mathematical Statistics*, 265-271.

Atuahene-Gima, K., & Ko, A. (2001). An empirical investigation of the effect of market orientation and entrepreneurship orientation alignment on product innovation. *Organization Science*, 12(1), 54-74.

Akgün, A. E., Ince, H., Imamoglu, S. Z., Keskin, H., & Kocoglu, İ. (2014). The mediator role of learning capability and business innovativeness between total quality management and financial performance. *International Journal of Production Research,* 52(3), 888-901.

Baird, B., Smallwood, J., Gorgolewski, K. J., & Margulies, D. S. (2013). Medial and lateral networks in anterior prefrontal cortex support metacognitive ability for memory and perception. *The Journal of Neuroscience*, 33(42), 16657-16665.

Baird, K., Jia Hu, K., & Reeve, R. (2011). The relationships between organizational culture, total quality management practices and operational performance. *International Journal of Operations & Production Management*, 31(7), 789-814.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. *Journal of Personality and Social Psychology,* 51, 1173-1182.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management,* 17(1), 99-120.

Barney, J. (2002). *Gaining and sustaining competitive advantage*. Upper Saddle River, NJ: Prentice Hall.

Barney, J., & Arikan, A. (2005). The resource-based view: Origins and implications. *The Blackwell Handbook of Strategic Management,* 124-188.

Barringer, B. R., & Harrison, J. S. (2000). Walking a tightrope: creating value through interorganizational relationships. *Journal of Management,* 26, 367-403.

Barney, J. B., & Hesterly, W. S. (2006). *Strategic management and competitive advantage: concepts and cases*. Upper Saddle River, NJ: Pearson.

Beer, M. (2003). Why total quality management programs do not persist: the role of management quality and implications for leading a TQM transformation. *Decision Sciences*, 34(4), 623-642.

Berardi-Coletta, B., Buyer, L. S., Dominowski, R. L., & Rellinger, E. R. (1995). Metacognition and problem solving: A process-oriented approach. *Journal of Experimental Psychology: Learning, Memory, and Cognition,* 21(1), 205-223.

Borkowski, J. G., & Muthukrishna, N. (1992). *Moving metacognition into the classroom: "Working models" and effective strategy teaching*. In M. Pressley, K. R. Harris, & J. T. Guthrie (Eds.), Promoting academic competence and literacy in school (pp. 477-501). San Diego, CA: Academic.

Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin,* 88, 588-606.

Bollen, K. A., & Long, J. S. (1993). *Testing Structural Equation Models*. Thousand Oaks, CA: Sage Publications.

Bentler, P. M. (1992). *EQS: Structural Equations Program Manual*, BMDP Statistical Software, Los Angeles: CA.

Berger, P. L., & Luckmann, T. (1966). *The Social Construction of Reality: A Treatise in the Sociology of Knowledge*, NY: Anchor Books.

Black, S. A., & Porter, L. J. (1996). Identification of the Critical Factors of TQM. *Decision Science,* 27(1), 1-21.

Bolton, M. (2004). Customer centric business processing. *International Journal of Productivity and Performance Management,* 53(1), 44-51.

Bryman, A. (1992). *Charisma and leadership in organizations*. London: Sage Publications.

Burns, T., and Stalker, G. M. (1961). *The Management of Innovation*. Tavistock: London.

Burns, J. M. (1978). *Leadership.* New York: Harper & Row.

Byrne, B. M. (1998). *Structural Equation Modeling with LISREL, PRELIS, and SIMPLIS: Basis Concepts, Application and Programming*. Mahwah, NJ: Lawrence Erlbaum Associates Inc.

Calantone, R. J., Cavusgil, S. T., & Zhao, Y. (2002). Learning orientation, firm innovation capability, and firm performance. *Industrial Marketing Management*, 31(6), 515-524.

Camisón-Zornoza, C., Lapiedra-Alcamí, R., Segarra-Ciprés, M., & Boronat-Navarro, M. (2004). A meta-analysis of innovation and organizational size. *Organization Studies*, 25(3), 331-361.

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological bulletin*, 56(2), 81.

Capon, N., Farley, J. U., Lehmann, D. R., & Hulbert, J. M. (1992). Profiles of product innovators among large US manufacturers. *Management Science*, 38(2), 157-169.

Child, J. (1972). Organizational structure, environment and performance: the role of strategic choice. Sociology, 6(1), 1-22.

Cho, Y. S., & Jung, J. Y. (2013). Blue Ocean Strategy vs. Competitive Strategy: The Effect of Business Strategic Choices on Firm Performance, According to the Industry Life Cycle. *International Research Journal of Business and Economics,* 1(1), 36-45.

Cho, Y. S. (2013a). The Effect of Business Diversification on a Firm's Performance, Depending on Its Dynamic Capabilities and Market Dynamism. *Journal of Management and Strategy*, 4(3): 1-8.

Cho, Y. S., & Jung, J. Y. (2014). The Relationship between Metacognition, Entrepreneurial Orientation, and Firm Performance: An Empirical Investigation. *Academy of Entrepreneurship Journal,* 20(2), 71-84.

Cho, Y. S., & Jung, J. Y. (2014a). The Verification of the Effective Leadership Style for TQM: A Comparative Study between USA-Based Firms and China-Based Firms. *International Journal of Quality and Reliability Management,* 31(7), 822-840.

Choi, T. Y., & Eboch, K. (1998). The TQM paradox: relations among TQM practices, plant performance, and customer satisfaction. *Journal of Operations Management,* 17(1), 59-75.

Choo A., Linderman, K., & Schroeder, R. G. (2007). Method and Psychological Effects on Learning Behaviors and Knowledge Creation in Quality Improvement Projects. *Management Science*, 53(3), 437-450.

Chow, C.W., Lindquist, R.M., & Wu, A. (2001). National culture and the implementation of high-stretch performance standards: an exploratory study. *Behavioral Research in Accounting,* 13(1), 85–109.

Conger, J. A., & Kanungo, R. N. (1987). Toward a behavioral theory of charismatic leadership inorganizational settings. *Academy of Management Review*, 12(4), 637-647.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika,* 16(3), 297-334.

Dahlgaard, J. J., Kristensen, K., Kanji, G. K., Juhl, H. J., & Sohal, A. S. (1998). Quality management practices: a comparative study between east and west. *International Journal of Quality and Reliability Managemen*t, 15(8/9), 812–826.

Damanpour, F. (1992). Organizational size and innovation. *Organization Studies*, 13(3), 375-402.

Damanpour, F., & Gopalakrishnan, S. (2001). The dynamics of the adoption of product and process innovations in organizations. *Journal of Management Studies*, 38(1), 45-65.

Das, A., Handfield, R. B., Calantone, R. J., & Ghosh, S. (2000). A Contingent View of Quality Management-The Impact of International Competition on Quality. *Decision Sciences,* 31 (3), 649-690.

Davidson, J. E., Deuser, R., & Sternberg, R. J. (1994). The role of metacognition in problem solving. In J. Metcalfe & A. P. Shimamura (Eds.), *Metacognition: Knowing about knowing* (pp. 207-226). Cambridge, MA: MIT.

Dean (Jr.), J. W., & Bowen, D. E. (1994). Management theory and total quality: improving research and practice through theory development. *Academy of Management Review*, 19(3), 392-418.

Denzin, N. K., & Lincoln, Y. S. (2011). *The SAGE handbook of qualitative research. 4th ed.* CA: Sage.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2008). *Internet, Mail, and Mixed-Mode Surveys: The Tailored Design Method*. 3rd ed. NY: Wiley

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, Phone, Mail and Mixed-Mode Surveys: The Tailored Design Method.* 4th ed. NY: Wiley

Donaldson, L. (1987). Strategy and structural adjustment to regain fit and performance: In defense of contingency theory. *Journal of Management Studies*, 24(1), 1-24.

Dow, D., Samson, D., & Ford, S. (1999). Exploding the myth: do all quality management practices contribute to superior quality performance. *Production and Operations Management,* 8(1), 1-27.

Eden, D. (2002). Replication, Meta-Analysis, Scientific Progress, and AMJ's Publication Policy. *Academy of Management Journal,* 45(5), 841-846.

Erasmus, C. J. (1952). Changing folk beliefs and the relativity of empirical knowledge. *Southwestern Journal of Anthropology*, 411-428.

Ernst and Young., & American Quality Foundation. (1992). *The international quality study: The definitive study of the best international quality management practices: Top-line findings*. Cleveland, OH: Ernst & Young.

Ettlie, J. E., & Reza, E. M. (1992). Organizational integration and process innovation. *Academy of Management Journal*, 35(4), 795-827.

Flavell, J. H. (1976). Metacognitive aspects of problem solving. In L. B. Resnick (Eds.), *The nature of intelligence.* Hillsdale, NJ: Erlbaum.

Flavell, J. H. (1987). Speculations about the nature and development of metacognition. In F.E. Weinert & R. H. Kluwe (Eds.), *Metacognition, motivation, and understanding*. Hillside, NJ: Erlbaum.

Fleming, S. M., Weil, R. S., Nagy, Z., Dolan, R. J., & Rees, G. (2010). Relating introspective accuracy to individual differences in brain structure. *Science*, 329(5998), 1541-1543.

Flynn, B., Schroeder, R. G., & Sakakibara, S. (1995). The impact of quality management practices on performance and competitive advantage. *Decision Sciences,* 26(5), 659–691.

Flynn, B. B., & Saladin, B. (2006). Relevance of Baldrige constructs in an international context: A study of national culture. *Journal of Operations Management*, 24(5), 583-603.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39–50.

Frohlich, M. T., & Robb Dixon, J. (2006). Reflections on replication in OM research and this special issue. *Journal of Operations Management,* 24(6), 865-867.

Fuchsberg, G. (1993). Baldrige Awards may be losing some luster. *Wall Street Journal*, April 19, B1.

Gadenne, D., & Sharma, B. (2009). An investigation of the hard and soft quality management factors of Australian SMEs and their association with firm performance. *International Journal of Quality & Reliability Management,* 26(9), 865-880.

Goodman, L. A. (1960). On the exact variance of products. *Journal of the American Statistical Association,* 55(292), 708-713.

Gopalakrishnan, S., & Damanpour, F. (1997). A review of innovation research in economics, sociology and technology management. *Omega*, 25(1), 15-28.

Gopalakrishnan, S., Bierly, P., & Kessler, E. H. (1999). A reexamination of product and process innovations using a knowledge-based view. *The Journal of High Technology Management Research*, 10(1), 147-166.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis (7th ed.).* Upper Saddle River, NJ: Prentice-Hall.

Hayes, R., Pisano, G., Upton, D., & Wheelwright, S. (2005). *Operation, strategy, and technology: pursuing the competitive edge.* Hoboken, NJ: Wiley.

Haynie, J. M. (2005). *Cognitive adaptability: the role of metacognition and feedback in entrepreneurial decision polices*, Doctoral dissertation, University of Colorado at Boulder.

Haynie, J. M., & Shepherd, D. A. (2009). A measure of adaptive cognition for entrepreneurship research. *Entrepreneurship Theory and Practice*, 33, 695-714.

Haynie, J. M., Shepherd, D. A., Mosakowski, E., & Earley, P. C. (2010). A situated metacognitive model of the entrepreneurial mindset. *Journal of Business Venturing*, 25, 217-229.

Hendricks, K. B., & Singhal, V. R. (1997). Does implementing an effective TQM program actually improve operating performance? Empirical evidence from firms that have won quality awards. *Management Science*, 43(9), 1258–1274.

Hendricks, K. B., & Singhal, V. R. (2001). Firm characteristics, total quality management, and financial performance. *Journal of Operations Management*, 19(3), 269-285.

Hitt, M. A., Ireland, R. D., & Hoskisson, R. E. (2011). *Strategic Management: Competitiveness & Globalization: Concepts (9th ed.).* Mason, OH: Cengage Learning.

Howell, J. M., & Avolio, B. J. (1993). Transformational leadership, transactional leadership, locus of control, and support for innovation: Key predictors of consolidated business business-unit performance. *Journal of Applied Psychology*, 78(6), 891–902.

Hofstede, G. (1984). *Culture's consequences: International differences in work-related values.* Newbury Park, CA: Sage Publications.

Hofstede, G. (2001) *Culture's Consequences: Comparing Values, Behaviors, Institutions, and Organizations Across Nations (2nd ed.).* Thousand Oaks CA: Sage Publications.

Hofstede, G., Hofstede, G. J., & Minkov, M. (2010). *Cultures and organizations: software of the mind. Revised and expanded 3rd Edition.* New York: McGraw-Hill.

Jun, M., Cai, S., & Shin, H. (2006). TQM practice in maquiladora: Antecedents of employee satisfaction and loyalty. *Journal of Operations Management*, 24(6), 791-812.

Jung, J. Y., Su, X., Baeza, M., & Hong, S. (2008). The effect of organizational culture stemming from national culture towards quality management deployment. *The TQM Magazine*, 20(6), 622-635.

Jung, J. Y., & Hong, S. (2008). Organizational citizenship behavior (OCB), TQM and performance at the maquiladora. *International Journal of Quality & Reliability Management,* 25(8), 793-808.

Juran, J. M. (1992). *Juran on quality by design: the new steps for planning quality into goods and services.* New York City, NY: Simon & Schuster.

Kaynak, H. (1997). *Total quality management and just-in-time purchasing: their effects on performance of firms operating in the U.S*. New York & London: Garland Publishing.

Kaynak, H. (2003). The relationship between total quality management practices and their effects on firm performance. *Journal of Operations Management,* 21(4), 405–435.

Kaynak, H., & Hartley, J. L. (2008). A replication and extension of quality management into the supply chain. *Journal of Operations Management,* 26(4), 468-489.

Kim, D. Y., Kumar, V., & Kumar, U. (2012). Relationship between quality management practices and innovation. *Journal of Operations Management,* 30, 295-315.

Kluwe, R. H. (1982). Cognitive knowledge and executive control: Metacognition. In *Animal mind-human mind* (pp. 201-224). Springer Berlin Heidelberg.

Knight, K. E. (1967). A descriptive model of the intra-firm innovation process. *Journal of Business*, 40, 478-496.

Krajewski, L. J., Ritzman, L. P., & Malhotra, M. K. (2010). *Operations management: Processes and supply chains. (9th ed.).* Upper Saddle River, NJ: Prentice Hall.

Krajewski, L. J., Ritzman, L. P., & Malhotra, M. K. (2013). *Operations management: Processes and supply chains* (*10th ed.).* Upper Saddle River, NJ: Pearson/Prentice Hall.

Lado, A. A., Boyd, N. G., & Wright, P. (1992). A competency-based model of sustainable competitive advantage: toward a conceptual integration. *Journal of Management,* 18, 77-91.

Lawrence, P. R., & Lorsch, J. W. (1967). Differentiation and integration in complex organizations. *Administrative Science Quarterly*, 12(1), 1-47.

Lawrence, P. R., & Lorsch, J. W. (1967). Differentiation and integration in complex organizations. *Administrative Science Quarterly,* 12(1), 1-47.

Lowe, K. B., Kroeck, G., & Sivasubramaniam, N. (1996). Effectiveness correlates of transformational and transactional leadership: A meta-analytic review. *Leadership Quarterly,* 1, 385-426.

Linderman, K., Schroeder, R. G., Liedtke, C., Zaheer, S., & Choo, A. (2004). Integrating Quality Management Practices with Knowledge Creation Processes. *Journal of Operations Management*, 22(6), 589-607.

Luckmann, T., & Berger, P. L. (1991). *The social construction of reality: A treatise in the sociology of knowledge*. UK: Penguin.

McEvily, S. K., & Chakravarthy, B. (2002). The persistence of knowledge-based advantage: An empirical test for product performance and technological knowledge. *Strategic Management Journal*, 23, 285-305.

Meyer, J. W., & Rowan, B. (1977). Institutionalized organizations: formal structure as myth and ceremony. *American Journal of Sociology,* 83, 340-363.

Mevarech, Z. R., (1999). Effects of metacognitive training embedded in cooperative settings on mathematical problem solving. *Journal of Educational Research,* 92 (4), 195–205.

Miller, J. G., & Roth, A. V. (1994). A taxonomy of manufacturing strategies. *Management Science*, 40(3), 285-304.

Miller, D., & Toulouse, J. M. (1986). Chief executive personality and corporate strategy and structure in small firms. *Management Science*, 32(11), 1389-1409.

Mitchell, R., Busenitz, L., Lant, T., McDougall, P., Morse, E., & Smith, B. (2002). Toward a theory of entrepreneurial cognition: rethinking the people side of entrepreneurship research. *Entrepreneurship Theory & Practice*, 27(2), 93–105.

Mitki, Y., & Shani, A.B. (1995). Cultural challenges in TQM implementation: some learning from the Israeli experience. *Canadian Journal of Administrative Sciences,* 12(2), 161-170.

Mulaik, S. A., James, L. R., Van Altine, J., Bennett, N., Lind, S., & Stilwell, C. D. (1989). Evaluation of goodness-of-fitness indices for structural equation models. *Psychological Bulletin,* 105, 430–445.

Naor, M., Goldstein, S. M., Linderman, K. W., & Schroeder, R. G. (2008). The Role of Culture as Driver of Quality Management and Performance: Infrastructure Versus Core Quality Practices. *Decision Sciences,* 39(4), 671-702.

Naor, M., Linderman, K., & Schroeder, R. (2010). The globalization of operations in Eastern and Western countries: Unpacking the relationship between national and organizational culture and its impact on manufacturing performance. *Journal of Operations Management*, 28(3), 194-205.

Nietfeld, J., & Schraw, G. (2002). The effect of knowledge and strategy training on monitoring accuracy. *Journal of Educational Research*, 95(3), 131–142.

Nunnally, J. C. (1967). *Psychometric theory (1st ed.)*. New York: McGraw Hill.

Nunnally, J. C., & Bernstein I. H. (1994). *Psychometric Theory (3rd ed.)*. New York: McGraw-Hill.

Paris, S. G., & Winograd, P. (1990). How metacognition can promote academic learning and instruction. In B. F. Jones, & L. Idol (Eds.), *Dimensions of thinking and cognitive instruction* (pp. 15-51). Hillsdale, NJ: Erlbaum.

Peile, C., & McCouat, M. (1997). The rise of relativism: The future of theory and knowledge development in social work. *British Journal of Social Work*, 27(3), 343-360.

Podsakoff, P. M., & Organ, D. W. (1986). Self-reports in organizational research: Problems and prospects. *Journal of management*, 12(4), 531-544.

Powell, T. C. (1993). Firm-specific competitive advantage in high technology firms. *The Journal of High Technology Management Research,* 4, 197-209.

Powell, T. C. (1995). Total quality management as competitive advantage: a review and empirical study. *Strategic Management Journal*, 16(1), 15-37.

Prajogo, D. I., & McDermott, C. M. (2005). The relationship between total quality management practices and organizational culture. *International Journal of Operations & Production Management*, 25(11), 1101-1122.

Prajogo, D. I., & Sohal, A. S. (2006). The relationship between organization strategy, total quality management (TQM), and organization performance - the mediating role of TQM. *European Journal of Operational Research*, 168(1), 35-50.

Prajogo, D. I., & Hong, S. W. (2008). The Effect of TQM on Performance in R&D Environments: A Perspective from South Korean Firms. *Technovation,* 28, 855–863.

Rahman, S. U., & Bullock, P. (2005). Soft TQM, hard TQM, and organizational performance relationships: an empirical investigation. *Omega,* 33(1), 73-83.

Real, K., & Poole, M. S. (2005). Innovation implementation: Conceptualization and measurement in organizational research. *Research in Organizational Change and Development*, 15: 63-134.

Reed, R., Lemak, D. J., & Mero, N. P. (2000). Total quality management and sustainable competitive advantage. *Journal of Quality Management,* 5(1), 5-26.

Robinson, J. P., Shaver, P. R., & Wrightsman, L. S. (1991). *Measures of Personality and Social Psychological Attitudes*. San Diego: Academic Press.

Rui, C., Emerson, M., & Luis, L. (2010). Transformational leadership and TQM implementation. *Advances In Management*, 3(6), 7-18.

Rungtusanatham, M., Forza, C., Filippini, R., & Anderson, J. C. (1998). A replication study of a theory of quality management underlying the Deming management method: insights from an Italian context. *Journal of Operations Management,* 17(1), 77-95.

Rungtusanatham, M., Forza, C., Koka, B. R., Salvadora, F., & Nie, W. (2005). TQM across multiple countries: convergence hypothesis versus national specificity arguments. *Journal of Operations Management,* 23(1), 43–63.

Samson, D., & Terziovski, M. (1999). The relationship between total quality management practices and operational performance. *Journal of Operations Management*, 17(4), 393-409.

Saraph, J. V., Benson, P. G., & Schroeder, R. G. (1989). An instrument for measuring the critical factors of quality management. *Decision Sciences,* 20(4), 810–829.

Schoenfeld, A. H. (1987). What's all the fuss about metacognition? In A. H. Schoenfeld (Eds.), *Cognitive science and mathematics education* (pp. 189-215). Hillsdale, NJ: Erlbaum.

Schmidt, A., & Ford, K. (2003). Learning within a learner control training environment: the interactive effects of goal orientation and metacognitive instruction on learning outcomes. *Personnel Psychology,* 56(2), 405–429.

Segars, A. H., & Grover, V. (1998). Strategic information systems planning success: an investigation of the construct and its measurement. *MIS Quarterly,* 22(2), 139–163.

Selznick, P. (1957). *Leadership in Administration*. New York: Harper and Row.

Selznick, P. (1996). Institutionalism ‘‘old’’ and ‘‘new’’. *Administrative Science Quarterly*, 41 (2), 270–277.

Shepherd, D. A., & Wiklund, J. (2005). *Entrepreneurial Small Businesses: A Resource-based Perspective.* Northampton, MA: Edward Elgar Publishing.

Sheth, J. N., Sisodia, R. S., & Sharma, A. (2000). The antecedents and consequences of customer-centric marketing. *Journal of the Academy of Marketing Science,* 28(1), 55-66.

Silver, E. A. (2004). Process management instead of operations management. *Manufacturing & Service Operations Management,* 6(4), 273–279.

Sin, L. Y., Tse, A. C., Yau, O. H., Chow, R. P., & Lee, J. S. (2005). Market orientation, relationship marketing orientation, and business performance: the moderating effects of economic ideology and industry type. *Journal of International Marketing*, 36-57.

Singleton, Jr., R. A., & Straits B. C. (2010). *Approaches to social research (5th ed.).* New York: Oxford University Press.

Smith, P. B., Peterson, M. F., Akande, D., Callan, V., Cho, N. G., Jesuino, J., & Viedge, C. (1994). Organizational event management in fourteen countries: A comparison with Hofstede's dimensions. *Journeys into cross-cultural psychology*, 364-373.

Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. *Sociological methodology*, 13(1982), 290-312.

Sousa, R., & Voss, C. (2002). Quality management re-visited: a reflective review and agenda for future research. *Journal of Operations Management,* 20(1), 91–109.

Staw, B. M., & Epstein, L. D. (2000). What bandwagons bring: effects of popular management techniques on corporate performance, reputation, and CEO pay. *Administrative Science Quarterly,* 45(3), 523–556.

St. John, C. H., Cannon, A. R., & Pouder, R. W. (2001). Change drivers in the new millennium: implications for manufacturing strategy research. *Journal of Operations Management,* 19 (2), 143–160.

Suchman, M. C. (1995). Managing legitimacy: Strategic and institutional approaches. *Academy of Management Review,* 20(3), 571-610.

Tafarodi, R. W., Lang, J. W., & Smith, A. J. (1999). Self-esteem and the cultural trade-off: evidence for the role of individualism-collectivism. *Journal of Cross-Cultural Psychology*, 30(5), 620–640.

Tichy, N. M., & DeVanna, M. A. (1986). *The Transformational Leader*. New York: Wiley.

Tsang, E. W., & Kwan, K. M. (1999). Replication and theory development in organizational science: A critical realist perspective. *Academy of Management Review,* 24(4), 759-780.

Valle, S., & Vázquez-Bustelo, D. (2009). Concurrent engineering performance: Incremental versus radical innovation. *International Journal of Production Economics*, 119(1), 136-148.

Vanichchinchai, A., & Igel, B. (2011). The impact of total quality management on supply chain management and firm's supply performance. *International Journal of Production Research,* 49(11), 3405-3424.

Waldman, D. A. (1993). A theoretical consideration of leadership and total quality management. *Leadership Quarterly*, 4(1), 65-79.

Weerawardena, J. (2003). The role of marketing capability in innovation-based competitive strategy. *Journal of Strategic Marketing*, 11(1), 15-35.

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal,* 5(2), 171-180.

Wernerfelt, B. (1995). The resource-based view of the firm: Ten years after. *Strategic Management Journal*, 16(3): 171-174.

Westphal, J. D., Gulati, R., & Shortell, S. M. (1997). Customization or conformity? An institutional and network perspective on the content and consequences of TQM adoption. *Administrative Science Quarterly,* 42(2), 366–394.

Wibowo, C., & Ng, K. M. (2002). Product-centered processing: Manufacture of chemical-based consumer products. *AIChE Journal,* 48(6), 1212–1230.

Wiggins, R. R., & Ruefli, T. W. (2002). Sustained competitive advantage: Temporal dynamics and the incidence and persistence of superior economic performance. *Organization Science*, 13, 82-105.

Yavas, B. F. (1995). A comparison on the quality perceptions of US and Asian firms in the electronics industry. *Management International Review*, 35(2), 171–188.

Zahra, S. A., & Covin, J. G. (1993). Business strategy, technology policy and firm performance. *Strategic Management Journal*, 14(6), 451-478.

Zu, X., Fredendall, L. D., & Douglas, T. J. (2008). The evolving theory of quality management: the role of Six Sigma. *Journal of Operations Management,* 26(5), 630-650.

Zu, X. (2009). Infrastructure and core quality management practices: how do they affect quality? *International Journal of Quality and Reliability Management,* 26(2), 129-149.

Zu, X., Robbins, T. L., & Fredendall, L. D. (2010). Mapping the critical links between organizational culture and TQM/Six Sigma practices. *International Journal of Production Economics,* 123(1), 86-106.

APPENDIX A

APPENDIX A

SURVEY QUESTIONNAIRE

PART I. Please think of your company's Quality Management practices, and then please check your responses after reading the following statements carefully on a scale of 1 to 7 according to your agreement with each statement, with 1 being "Strongly Disagree" and 7 being "Strongly Agree".

1. Our top management provides personal leadership for quality products and quality improvement.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

2. Our top management creates and communicates a vision focused on quality improvement

Strongly Disagree *1 2 3 4 (Neutral) 5 6 7* *Strongly Agree*

3. Employees receive quality-related training.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

4. Employees are recognized and rewarded for superior quality improvement.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

5. Customer complaints are used as a method to initiate improvements in our current processes.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

6. Our customers give us feedback on our quality and delivery performance.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

7. We actively engage suppliers in our quality improvement efforts.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

8. We maintain close communication with suppliers about quality considerations and design changes.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

9. Clear work or process instructions are given to employees.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

10. We make extensive use of statistical techniques to reduce variance in processes.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

11. Our plant/shop floor is kept clean at all times.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

12. We thoroughly review new product/service design before the product/service is produced.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

13. We work in teams, with members from a variety of areas (marketing, purchasing, manufacturing, etc.) to introduce new products/services.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

14. Information on quality performance is readily available to employees.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

15. Our quality data (error rates, defect rates, scrap, etc.) are accurate and reliable.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

16. Quality data are timely.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

PART II. Please think of your company's Leadership/Management Style, and then please check your responses after reading the following statements carefully on a scale of 1 to 7 according to your agreement with each statement, with 1 being "Strongly Disagree" and 7 being "Strongly Agree".

1. We (my company) think of several ways to solve a problem and choose the best one.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

2. We try to use strategies that have worked in the past.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

3. We know what kind of information is most important to consider when faced with a problem.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

4. We consciously focus our attention on important business information.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

5. We ask ourselves if we have considered all the options when solving a problem.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

6. We re-evaluate our assumptions when we get confused.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

7. We ask ourselves if we have learned as much as we could have when we finished the task.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

8. We stop and go back over information that is not clear.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

9. We find ourselves analyzing the usefulness of a given strategy while engaged in a given task.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

10. We find ourselves pausing regularly to check our comprehension of the problem or situation at hand.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

11. We often define goals for ourselves.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

12. We set specific goals before we begin a task.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

PART III. Please think about your company's Resources/Capabilities regarding current business implementation and then please check your responses after reading the following statements carefully on a scale of 1 to 7 according to your agreement.

1. My company's resources or capabilities are so VALUABLE that they enable us to exploit opportunities or neutralize threats in our external environment.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

2. My company has COSTLY-TO-IMITATE resources or capabilities that our competitors cannot easily imitate or develop.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

3. My company has DIFFICULT-TO-SUBSTITUTE resources or capabilities that cannot be easily substituted by those of our competitors.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

4. My firm has mainly produced ABOVE average market return.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

5. My company has shown PERSISTENT superior business performance to our competitors for a long time.

Strongly Disagree 1 2 3 4 *(Neutral)* 5 6 7 *Strongly Agree*

PART IV. Please think about your company's Business Performance over the Last Three Years and then please check your responses after reading the following statements carefully on a scale of 1 to 7 according to your agreement.

1. Sales Growth - Please check the best description of your company's Sales Growth over the last three years.

Worse than competition 1 2 3 4 *(Neutral)* 5 6 7 *Better than competition*

2. Market Share Growth - Please check the best description of your company's Market Share Growth over the last three years.

Worse than competition 1 2 3 4 *(Neutral)* 5 6 7 *Better than competition*

3. Customer Satisfaction - Please check the best description of your company's customer satisfaction level over the last three years.

Worse than competition 1 2 3 4 *(Neutral)* 5 6 7 *Better than competition*

4. Net Profit Margin - Please check the best description of your company's Net Profit Margin over the last three years.

Worse than competition 1 2 3 4 *(Neutral)* 5 6 7 *Better than competition*

5. Cost of Quality (error, scrap, rework, inspection) as a % of Sales - Please check the best description of your company's cost of quality.

Worse than competition 1 2 3 4 *(Neutral)* 5 6 7 *Better than competition*

PART V. Please think of your company's current position, and please check (or specify) the following that best describes your company:

DS1. Your Company's Age (The Length of Time in Business):

___ (1) Less than 5 years

___ (2) 5 - 10 years

___ (3) 11 - 20 years

___ (4) 21 - 30 years

___ (5) 31 - 50 years

___ (6) 51 - 100 years

___ (7) More than 100 years

DS2. Your Company's Size (The Number of Employees):

___ (1) Less than 10 (employees)

___ (2) 11 - 50

___ (3) 51 - 100

___ (4) 101 - 500

___ (5) 501 - 1,000

___ (6) 1,001 - 10,000

___ (7) More than 10,000 (employees)

DS3. Your Company's Industry:

___ (1) Manufacturing

___ (2) Service

DS4. Please DESCRIBE your Job Title or Position in your company: _____

DS5. Your Firm's Industrial Classification (*the 2-digit numbers represent the SIC codes):

___ Agriculture, Forestry & Fishing [01-09]

___ Apparel & Fabricated Textile Products [23]

___ Printing & Publishing [27]

___ Chemical Products [28]

___ Semiconductors & Related Devices [36]

___ Communications Services [48]

___ Construction [15-17]

___ Papers & Allied Products [26]

___ Pharmaceuticals [28]

___ Petroleum Refining [29]

___ Transportation Services [47]

___ Wholesale Trade [50-51]

___ Retail Trade [52-59]
___ Financial Services [60-64]
___ Hotels & Other Lodging Places [70]
___ Prepackaged Software [73]
___ Healthcare [80]
___ Legal Services [81]
___ Education [82]
___ Accounting & Business Consulting Services [87]
___ Others

If other, please SPECIFY your firm's industry: _____

DS6. What is your Age?

___ (1) < 18
___ (2) 18 ~ 29
___ (3) 30 ~ 44
___ (4) 45 ~ 59
___ (5) More than 59

DS7. What is your Gender?

___ (1) Female
___ (2) Male

ANY COMMENTS: _____

Thank you very much for your time and consideration!

APPENDIX B

APPENDIX B

INDUSTRIAL DESCRIPTION OF EMAILS LIST

The emails list of "Quality Control Manager (H7O7)", "Quality Assurance Director (C6P9)" and "Quality Control Director" (H6O7)" were purchased from Dun & Bradstreet, Inc.; Standard Industrial Classification (SIC) codes, industry titles, and email numbers are as follows:

SIC Code	Description of Industry	Email Numbers
20	FOOD & KINDRED PRODUCTS	100
23	APPAREL, FINISHED PRODUCTS FROM FABRICS & SIMILAR MATERIALS	100
26	PAPER & ALLIED PRODUCTS	100
27	PRINTING, PUBLISHING & ALLIED INDUSTRIES	100
28	CHEMICALS & ALLIED PRODUCTS	200
29	PETROLEUM REFINING & RELATED INDUSTRIES	100
36	INDUSTRIAL & COMMERCIAL MACHINERY & COMPUTER EQUIPMENT	200
36	ELECTRONIC & OTHER ELECTRICAL EQUIPMENT & COMPONENTS	200
37	TRANSPORTATION EQUIPMENT	100
38	MEASURING, PHOTOGRAPHIC, MEDICAL, & OPTICAL GOODS, & CLOCKS	100

42	MOTOR FREIGHT TRANSPORTATION	200
48	COMMUNICATIONS	100
53	GENERAL MERCHANDISE STORES 100	100
54	FOOD STORES	100
60	DEPOSITORY INSTITUTIONS	200

APPENDIX C

APPENDIX C

E-MAIL INVITATION SCRIPT

To: **Dear (First Name) (Last Name)**

Subject: **A Survey of Quality Management Effectiveness in U.S. Enterprises**

We would like to invite you to participate in the 2015 Quality Management Survey, being conducted by Mr. Young Sik Cho, Ph.D. Candidate of Management at the University of Texas-Pan American (Faculty Advisor: Dr. Joo Jung, Associate Professor of Management at UTPA).

The purpose of this study is to explore how a firm's metacognitive capabilities have an influence on the effective implementation of quality management (QM) and the creation of a firm's sustained competitive advantage. We believe that your response will be part of the ongoing effort to develop a guideline for U.S. companies to be able to reach more optimal decision-making in their quality management practices. Thus, we would like to hear your experience of managing quality assurance in your company, an important industry representative.

In addition, we would provide you with a copy of the aggregated final study results. So if you would like to receive this report, please note your email address on the last page of the survey.

To complete survey click on the following link: Take the Survey

Your responses are strictly confidential and will not be seen by anyone other than the researchers. Any individually identifiable data will be securely stored on campus. Only the researchers listed on the study will have access to the data. All data will be kept for a minimum of 3 years before being destroyed.

If you have any questions regarding the survey please contact Mr. Young Sik Cho (Email: ycho@utpa.edu /Phone: 414-520-6700) or the faculty advisor Dr. Joo Jung (Email: joojung@utpa.edu/Phone: 956-665-5225)

This research has been reviewed by the Institutional Review Board for the Protection of Human Subjects (IRB). If you have any questions about your rights as a participant, or if you feel that your rights have been violated, please contact the IRB at 956-665-2889 or irb@utpa.edu. You may also submit anonymous comments to the IRB at www.utpa.edu/IRBfeedback

Thank you in advance for your time and thoughtful responses!

Young Sik Cho, M.B.A.
Ph.D. Candidate of Management
College of Business Administration
The University of Texas-Pan American

Joo Jung, Ph.D. (Faculty Advisor)
Associate Professor of Management
College of Business Administration
The University of Texas-Pan American

Follow the link to opt out of future emails: Click here to unsubscribe

APPENDIX D

APPENDIX D

ONLINE SURVEY CONSENT FORM

A Survey of the Relationship between a Firm's Managerial Metacognition, Quality Management, and Sustainable Competitive Advantage

Principal Investigator: Mr. Young Sik Cho, Ph.D. Candidate of Management at the University of Texas-Pan American (Faculty Advisor: Dr. Joo Jung, Associate Professor at the University of Texas-Pan American)

Background: This research aims to explore how a firm's metacognitive capabilities have an influence on the effective implementation of quality management (QM) and the creation of a firm's sustained competitive advantage

Procedure: We will ask you the degree of your firm's metacognitive capabilities and also measure the effectiveness of your firm's QM practices. The survey should take about 10-15 minutes to complete. You must be at least 21 years old to participate. If you are not 21 or older, please do not complete the survey.

Anonymity and/or Confidentiality: Your responses are strictly confidential and will not be seen by anyone other than the researchers. Any individually identifiable data will be securely stored on campus. Only the researchers listed on the study will have access to the data.

All data will be kept for a minimum of 3 years before being destroyed. However, given that the surveys can be completed from any computer (e.g., personal, work, school), we are unable to guarantee the security of the computer on which you choose to enter your responses. As a participant in our study, we want you to be aware that certain technologies exist that can be used to monitor or record data that you enter and/or websites that you visit.

Benefits of Participation: We believe that your responses will be part of the ongoing effort to develop a guideline for U.S. enterprises to be able to reach more optimal decision-making in their quality management practices. In addition, we would provide you with a copy of the aggregated final study results. So if you would like to receive this report, please note your email address on the last page of the survey. Your individual answers are strictly confidential and will not be seen by anyone other than our researchers. No personal data will be used for any purpose other than the research exercise itself.

Risks or Possible Discomforts Associated with the Study: There are no anticipated risks/possible discomforts associated with your participation in this study.

Voluntary Participation: Your participation in this study is voluntary; you may discontinue your participation at any time without penalty. If for any reason you decide that you would like to discontinue your participation, simply stop or incomplete survey. We would ask that you try to answer all questions. However, if there are any questions that you would prefer to skip, simply leave the answer blank.

Who to Contact for Research Related Questions: For questions about the research itself, or to report any adverse effects during or following participation, contact Mr. Young Sik Cho

(Email: ycho@utpa.edu/Phone: 414-520-6700/1201 W. University Drive, Edinburg, TX 78539) or Dr. Joo Jung (Email: joojung@utpa.edu/Phone: 956-665-5225).

Who to Contact Regarding Your Rights as a Participant: This research has been reviewed and approved by the Institutional Review Board for Human Subjects Protection (IRB). If you have any questions about your rights as a participant, or if you feel that your rights as a participant were not adequately met by the researcher, please contact the IRB at 956-665-2889 or irb@utpa.edu. You are also invited to provide anonymous feedback to the IRB by visiting www.utpa.edu/IRBfeedback.

Implied Consent: By participating in the survey, you indicate that you are voluntarily agreeing to participate in this study and that the procedures involved have been described to your satisfaction. Please keep a copy of this form for your own reference.

Thank you in advance for your time and consideration!

APPENDIX E

APPENDIX E

REMINDER LETTER

Dear (First Name) of (Company Name):

Earlier last week we sent an E-mail to you asking for your participation in the 2015 Quality Management Survey, being conducted by Mr. Young Sik Cho, Ph.D. Candidate of Management at the University of Texas-Pan American (Email: ycho@utpa.edu/Phone: 414-520-6700/1201 W. University Drive, Edinburg, TX 78539). The purpose of this survey is to explore the relationships between a firm's managerial metacognition, quality practices, and sustainable competitive advantages.

Benefits of Participation: We believe that your responses provided in this survey will be tremendously helpful in the process to establish more innovative QM framework for the U.S. enterprises. We also believe that your responses will be part of the ongoing effort to develop a guideline for U.S. enterprises to continuously produce sustainable competitive advantages. In addition, we would provide you with a copy of the aggregated final study results. So if you would like to receive this report in the future, please note your email address on the last page of the survey.

Now we would like to hear your expertise, as an important industry representative. This survey would take about less than 10 minutes to be completed.

Please follow this link to the survey: Take the Survey

****If you have already taken this survey, please disregard the invitation; we will contact you with a copy of the aggregated final study results again.*

Anonymity and Confidentiality: This is an anonymous survey and your responses will be strictly confidential. No personal data will be used for any purpose other than the research exercise itself. This research has been reviewed by the Institutional Review Board for the Protection of Human Subjects (IRB). If you have any questions about your rights as a participant, or if you feel that your rights have been violated, please contact the IRB at 956-665-2889 or irb@utpa.edu. You may also submit anonymous comments to the IRB at www.utpa.edu/IRBfeedback.

Your response is voluntary and we appreciate your considering our request.

Yours Sincerely,

Young Sik Cho, M.B.A.
Ph.D. Candidate of Management
College of Business Administration
The University of Texas-Pan American

Joo Jung, Ph.D. (Faculty Advisor)
Associate Professor of Management
College of Business Administration
The University of Texas-Pan American

Follow the link to opt out of future emails: Click here to unsubscribe

APPENDIX F

APPENDIX F

MODEL FIT SUMMARY

1. Model Fit Summary of the Measurement Model (N = 235)

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	133	1371.236	607	.000	2.259
Saturated model	740	.000	0		
Independence model	37	9573.319	703	.000	13.618

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.857	.834	.915	.900	.914
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.863	.740	.789
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	764.236	660.559	875.617
Saturated model	.000	.000	.000
Independence model	8870.319	8557.637	9189.442

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	5.860	3.266	2.823	3.742
Saturated model	.000	.000	.000	.000
Independence model	40.912	37.907	36.571	39.271

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.073	.068	.079	.000
Independence model	.232	.228	.236	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	1637.236	1688.807		
Saturated model	1480.000	1766.939		
Independence model	9647.319	9661.666		

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	6.997	6.554	7.473	7.217
Saturated model	6.325	6.325	6.325	7.551
Independence model	41.228	39.892	42.592	41.289

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	114	118
Independence model	19	20

2. Model Fit Summary of the Structural Model (N = 235)

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	130	1372.334	610	.000	2.250
Saturated model	740	.000	0		
Independence model	37	9573.319	703	.000	13.618

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.857	.835	.915	.901	.914
Saturated model	1.000		1.000		1.000

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.868	.743	.793
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	762.334	658.679	873.696
Saturated model	.000	.000	.000
Independence model	8870.319	8557.637	9189.442

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	5.865	3.258	2.815	3.734
Saturated model	.000	.000	.000	.000
Independence model	40.912	37.907	36.571	39.271

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.073	.068	.078	.000
Independence model	.232	.228	.236	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	1632.334	1682.742		
Saturated model	1480.000	1766.939		
Independence model	9647.319	9661.666		

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	6.976	6.533	7.452	7.191
Saturated model	6.325	6.325	6.325	7.551
Independence model	41.228	39.892	42.592	41.289

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	114	119
Independence model	19	20

3. Model Fit Summary of the 'TQ→BQ→P' Model (N = 235): Post Hoc Study II

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	70	420.030	160	.000	2.625
Saturated model	230	.000	0		
Independence model	20	4164.801	210	.000	19.832

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.899	.868	.935	.914	.934
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.762	.685	.712
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	260.030	203.161	324.568
Saturated model	.000	.000	.000
Independence model	3954.801	3748.755	4168.133

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	1.795	1.111	.868	1.387
Saturated model	.000	.000	.000	.000
Independence model	17.798	16.901	16.020	17.813

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.083	.074	.093	.000
Independence model	.284	.276	.291	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	560.030	573.833		
Saturated model	460.000	505.352		
Independence model	4204.801	4208.744		

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	2.393	2.150	2.669	2.452
Saturated model	1.966	1.966	1.966	2.160
Independence model	17.969	17.089	18.881	17.986

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	107	114
Independence model	14	15

APPENDIX G

APPENDIX G

MINIMIZATION HISTORY OF DEFAULT MODEL

Iteration		Negative eigenvalues	Condition #	Smallest eigenvalue	Diameter	F	NTries	Ratio
0	e	31		-.816	9999.000	9849.009	0	9999.000
1	e	43		-.340	3.661	6942.631	19	.513
2	e*	28		-.609	2.508	4279.724	4	.915
3	e*	19		-.796	1.018	3212.525	5	.905
4	e*	9		-11.876	.929	2663.662	5	.525
5	e	8		-.673	.475	2273.294	6	.435
6	e	3		-.275	.497	1942.107	6	.821
7	e*	0	1783.365		.789	1601.579	5	.768
8	e	1		-.003	1.035	1590.019	2	.000
9	e	0	19093.199		.781	1411.049	7	.968
10	e	0	21061.001		.707	1379.320	1	1.075
11	e	0	84302.334		1.396	1375.751	1	.543
12	e	0	35118.897		.108	1373.131	1	.926
13	e	0	8033.020		.961	1372.645	2	.000
14	e	0	7929.838		.272	1372.344	1	1.068
15	e	0	8441.047		.034	1372.334	1	1.007
16	e	0	8593.437		.002	1372.334	1	1.000
17	e	0	8584.299		.000	1372.334	2	.000

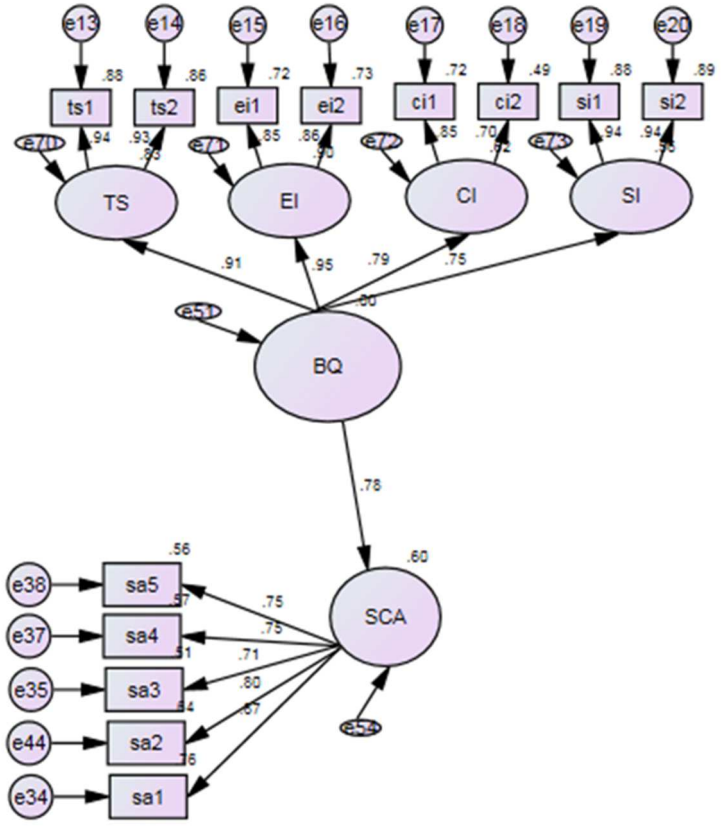
Note: The value of the discrepancy function at the end of each iteration. The discrepancy function value for iteration 0 is its value when minimization starts.

APPENDIX H

APPENDIX H

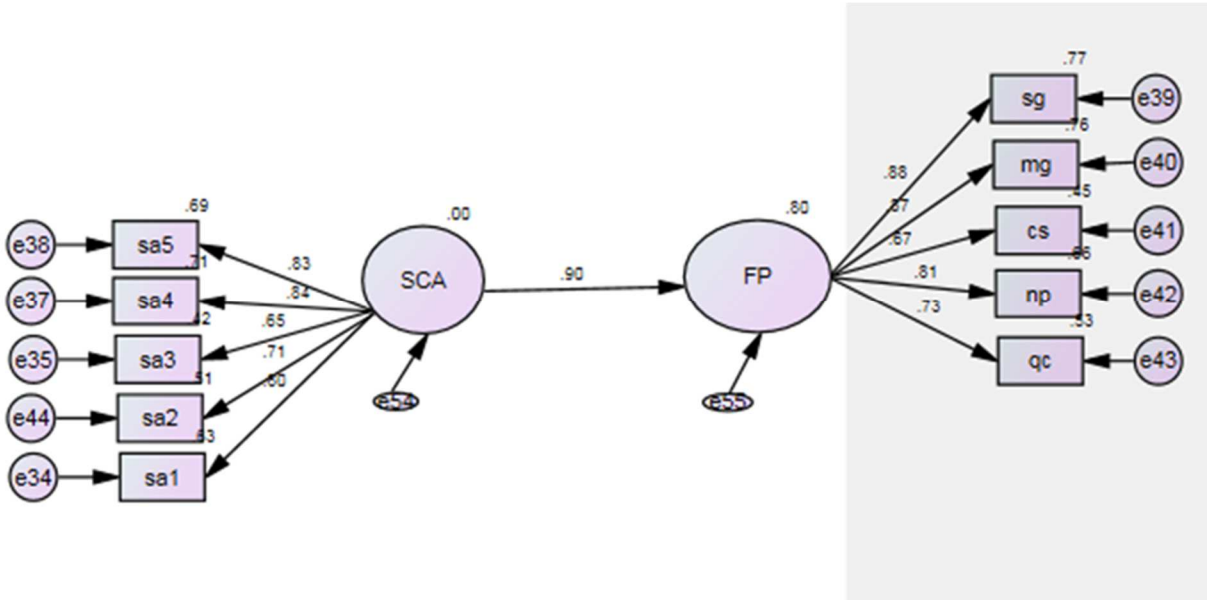
AUXILIARY AMOS OUTPUTS

1. AMOS Outputs of the Direct Effect of Behavioral QM on a Firm's SCA



Note: N = 235; Standardized path coefficients (β) are reported (significant at $p < 0.001$ level); CFI = .933; BQ, behavioral quality management; SCA, sustainable competitive advantage.

2. AMOS Outputs of the Direct Effect of a Firm's SCA on Performance



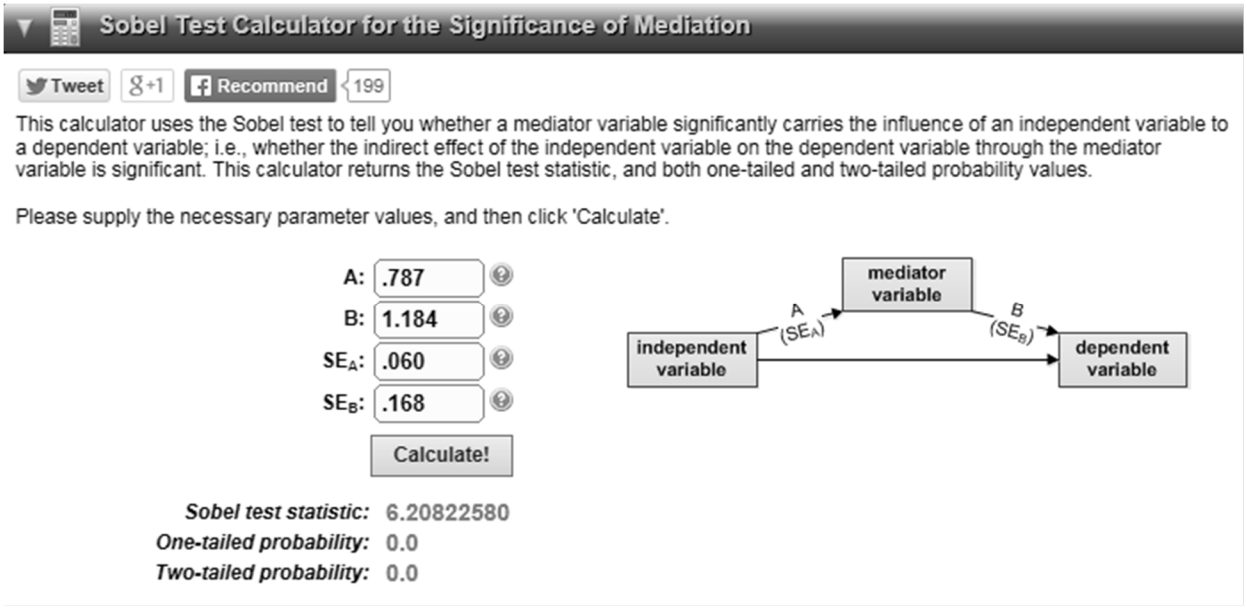
Note: N = 235; Standardized path coefficients (β) are reported (significant at $p < 0.001$ level); CFI = .857; SCA, sustainable competitive advantage; FP, firm performance.

APPENDIX I

APPENDIX I

ROBUSTNESS CHECK FOR THE MEDIATION MODEL

1. Sobel Test for the Significance of Mediation: 'Metacognition→TQ→BQ' Model



Note: N = 235.

This calculator was employed from http://www.danielsoper.com/statcalc3/calc.aspx?id=31.

A = Unstandardized regression coefficient for the association between managerial metacognition and technical QM factors.

B = Unstandardized coefficient for the association between technical QM and behavioral QM factors.

SE_A = Standard error of A.

SE_B = Standard error of B.

2. A Comparison of Soble, Aroian, and Goodman Test Results

Input:			Test statistic:	Std. Error:	*p*-value:
a	.787	Sobel test:	6.2082258	0.15009248	0
b	1.184	Aroian test:	6.19427257	0.15043058	0
s_a	.060	Goodman test:	6.22227374	0.14975362	0
s_b	.168	Reset all	Calculate		

Note: N = 235; Two-tailed probability.

This calculator was adopted from http://quantpsy.org/sobel/sobel.htm.

a = Unstandardized regression coefficient for the association between managerial metacognition and technical QM factors.

b = Unstandardized coefficient for the association between technical QM and behavioral QM factors.

s_a = Standard error of *a*.

s_b = Standard error of *b*.

BIOGRAPHICAL SKETCH

Young Sik Cho is an Assistant Professor of Management at the College of Business, Jackson State University in the U.S. (August 2015 ~ Present). He received B.Com in International Business & Trade from the Kyung Hee University (Seoul in Korea); MBA from the University of Wisconsin - Milwaukee; Ph.D. in Business Administration with emphasis in Management from the University of Texas - Pan American.

Cho's research to date focuses on three broad areas: (i) Total Quality Management, (ii) Strategic Leadership, and (iii) Managerial Metacognition. He believes that these fields are highly related as well as interdisciplinary so they cannot be fully understood in isolation. For this reason, he has being tried to construct a single research agenda, "the Behavioral Aspects of Quality Management," that integrates the fields of Operations Management and Organizational Behavior. With respect to this research agenda, he has already published several journal articles. During the Ph.D. study, Cho published seven peer-reviewed articles in such journals as the *International Journal of Quality and Reliability Management* (SCOPUS Indexed/Q1) and the *Academy of Entrepreneurship Journal* (SCOPUS Indexed). His many other studies were also presented & proceedings at the top-tier annual conferences such as the *Academy of Management* and the *Decision Sciences Institute*. In terms of research award and prize, Cho received Research Grant ($3,000) from UTPA Faculty Research Council; the Second-Place Prizes twice at the COBA Research Competition; the Best Paper Award at 17th Annual Conference of the GBDI; the Conference Travel Grant from 74th Annual Meeting of the *Academy of Management*.