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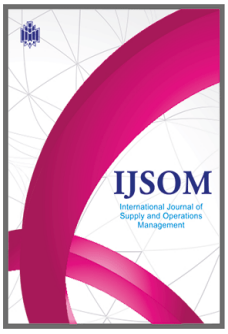


## An Empirical Investigation of the Universal Effectiveness of Quality Management Practices: A Structural Equation Modeling Approach

Young Sik Cho[a], Ramin Maysami[a], Joo Jung[b] and C. Christopher Lee[c]

[a]*Jackson State University, College of Business, United States*
[b]*University of Texas - Rio Grande Valley, College of Business and Entrepreneurship, United States*
[c]*Central Connecticut State University, School of Business, United States*

**Abstract**
Institutional theory argues that the isomorphic nature of quality management (QM) practices leads to similar QM implementation and performance among QM-embedded firms. However, contingency theory questions such 'universal effectiveness of QM practices'. Considering these conflicting arguments, this study tests samples from the U.S. and China to examine whether the 'universal effectiveness of QM practices' across national boundaries actually exists. First, the confirmatory factor analysis was performed to examine the validity of the survey instruments developed in this study. Then, the hypotheses were tested using the structural equation modeling (SEM) analysis. The SEM test results indicated that the positive effect of behavioral QM on firm performance was more significant in the U.S. sample than in the China sample. The test results also presented that the relative effect of behavioral QM versus technical QM on firm performance was noticeably different in service firms, according to national economic maturity. The study's findings demonstrated that a firm's contingency factors, such as national economic maturity and industry type, could result in the heterogeneous implementation of the firm's QM program; consequently, the findings weakened the 'universal effectiveness of QM practices'.

**Keywords:** Quality management; Contingency theory; Survey research; Factor analysis; Structural equation modeling.

Corresponding's author email address: young_sik.cho@jsums.edu

## 1. Introduction

According to institutional theory, organizations become 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; Zavvar Sabegh et al., 2016). In fact, quality practices are broadly accepted as a typical example of organizational isomorphism, because the adoption of popular quality management (QM) techniques contributes to a firm's social legitimacy and professionalism (Westphal et al., 1997; Staw and Epstein, 2000; Rungtusanatham et al., 2005; Jun et al., 2006). Further, advocates of institutional theory argue that, owing to the isomorphic nature of QM practices, firms might adopt similar QM practices. This could eventually lead to similar QM implementations as well as performances among QM-embedded firms (Dahlgaard et al., 1998; St. John et al., 2001). That is, the institutional theory justifies the so-called 'universality of QM practices' across organizational boundaries (Mitki and Shani, 1995; Yavas, 1995).

However, some studies question such universality of QM practices (Hendricks and Singhal, 1997, 2001). For instance, Jun et al. (2006) argue the conventional QM 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 QM practices can differ depending upon characteristics of the firm such as size, capital-intensity, and maturity of a firm's QM implementation. Furthermore, other studies suggest that the hidden elements of quality costs (Sailaja et al., 2015) and organizational culture (Naor et al., 2008; Jung et al., 2008; Zu et al., 2010) affects QM practices. Those arguments mainly derive from the contingency theory perspective that posits that an organization's ability to cope with its environment determines its performance (Burns and Stalker, 1961; Lawrence and Lorsch, 1967; Child, 1972; Donaldson, 1987).

Considering these conflicting arguments about the ‘universal effectiveness of QM practices’ (Mitki and Shani, 1995; Yavas, 1995; Dahlgaard et al., 1998; Jun et al., 2006), this study tests samples from the U.S. and China to examine whether the ‘universal effectiveness of QM practices’ across national boundaries actually exists. Specifically, this study empirically tests how differently behavioral and technical quality practices impact a firm's performances in both the U.S. and China.

## 2. Literature Review and Hypotheses

Understanding the market requirements and adopting an appropriate operations strategy might be one of the first demands for survival of any firms (Kaviani and Abbasi, 2014). In general, firms mainly operating in developed countries, such as the U.S. and Japan, confront a customer-oriented market environment, while firms in developing countries, such as China and Mexico, typically operate in a product-oriented market environment (Sheth et al., 2000). As a result, firms in developed countries have a higher tendency towards customer-centric business processing (Bolton, 2004). Under the circumstances, customer satisfaction might be considered as a primary driving force to sustain the competitive edge of a firm (Chen and Chen, 2014). On the other hand, firms in developing countries are more likely to rely on product-centric business

processing for effectively adapting to their emerging market (Sheth et al., 2000; Wibowo and Ng, 2002). Therefore, one can rationally expect that a firm's QM activities would adapt to the national economic maturity for survival. In addition, the firm's behavioral-related quality practices (e.g., management commitment, employee involvement, customer involvement, and supplier involvement) would likely relate more closely to customers and deal with their needs and complaints more directly compared to technical quality practices (e.g., strategic planning, process management, use of benchmarking, and information analysis) (Powell, 1995; Dow et al., 1999). Considering these arguments, one can anticipate that the importance of behavioral QM on performance would be enhanced as the national economy matures further. One can presume that firms primarily operating in developed countries may have a higher level of dependency on behavioral QM practices than firms in developing countries. Therefore, we suggest the following hypothesis:

> *Hypothesis 1: Behavioural QM practices are more positively related to firm performance than technical QM practices, particularly in firms in developed countries compared to those in developing countries.*

Additionally, we propose the following extended hypotheses to improve our understanding of the relationships between behavioural QM, technical QM, and firm performance in different industry types:

> *Hypothesis 2a: In manufacturing industries, behavioral QM practices are more positively related to firm performance than technical QM practices, particularly in firms in developed countries compared to those in developing countries.*
> *Hypothesis 2b: In service industries, behavioral QM practices are more positively related to firm performance than technical QM practices, particularly in firms in developed countries compared to those in developing countries.*

## 3. Methodology

### 3.1 Cross-National Survey Research

We employed the survey research method to collect primary data for testing the hypotheses of the study. The measurement items relevant to QM practices were prepared based on many QM-related studies such as Samson and Terziovski (1999), Dow et al. (1999), Rahman and Bullock (2005), Naor et al. (2008), and so on. The measures related to the firm performances were developed using the following studies: Kaynak (1997), Samson and Terziovski (1999), Jung and Hong (2008), Zu (2009), Cho and Jung (2014), Akgün et al. (2014), and so on. Table 1 summarizes the variables and their references. We adopted a five-point Likert scale for the survey questionnaire. More specific description of each measure item was presented in Appendix. This study was designed for a cross-national survey research in both the U.S. and China, so we invited a China-based professor to translate our English survey questionnaire into Chinese and to operate the survey research in China. We set the target respondent of this survey as a senior-level quality manager. In the U.S., we collected 152 usable samples (43.4% manufacturing and 56.6% service firms). In China, we obtained 222 usable samples (51.8% manufacturing and 48.2% service firms).

**Table 1.** Measures

| Variables | | References |
|---|---|---|
| Behavioral Quality Practices | Management Commitment | Samson and Terziovski, 1999 |
| | Employee Involvement | Samson and Terziovski, 1999 |
| | Customer Involvement | Dow et al., 1999; Das et al., 2000; Rahman and Bullock, 2005; Abdullah et al., 2008; Naor et al., 2008; Zu, 2008; Akgün et al., 2014. |
| | Supplier Involvement | Saraph et al., 1989; Powell, 1995; Dow et al., 1999; Kaynak, 2003; Rahman and Bullock, 2005; Naor et al., 2008; Kaynak and Hartley, 2008. |
| Technical Quality Practices | Strategic Planning | Samson and Terziovski, 1999; Cho and Jung, 2014 |
| | Process Management | Samson and Terziovski, 1999 |
| | Use of Benchmarking | Samson and Terziovski, 1999; Jung and Hong, 2008. |
| | Information and Analysis | Choi and Eboch, 1998; Naor et al., 2008; Akgün et al., 2014. |
| Firm Performance | Quality Outcome | Kaynak, 1997; Samson and Terziovski, 1999; Kaynak, 2003; Jung and Hong, 2008 |
| | Customer Satisfaction | Choi and Eboch, 1998; Rungtusanatham et al., 1998; Das et al., 2000; Rahman and Bullock, 2005; Jung and Hong, 2008; Zu, 2009. |
| | Business Performance | Samson and Terziovski, 1999; Akgün et al., 2014; Cho and Jung, 2014. |

### 3.2 Factor Analysis and Validity Test

We performed the confirmatory factor analysis (CFA) to examine the validity of the survey instruments developed in this study. IBM SPSS and AMOS 22 were employed for CFA test. The final results of CFA test and the average variance extracted (AVE) appear in Table 2 and illustrate that all factors met the suggested threshold of an AVE value of 50% or higher (Hair et al., 2010). We also tested the validity of our measures by using various fit indices such as the normed chi-square ($X^2$/df), the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and the Tucker-Lewis coefficient index (TLI). All test results satisfied the desirable threshold for each fit index ($X^2$/df < 3.00; CFI > 0.90; RMSEA < 0.08; TLI is close to 1.00) (Hair et al., 2010).

**Table 2.** Results of Confirmatory Factor Analysis

| Factors | Total Sample (N=374) | US Sample (N=152) | China Sample (N=222) |
|---|---|---|---|
| Strategic Planning (AVE = 0.55, CR = 10.91, α = .71) | | | |
| SP1 | .74*** | .74*** | .66*** |
| SP2 | .74*** | .94*** | .63*** |
| Process Management (AVE = 0.51, CR = 10.80, α = .68) | | | |
| PM1 | .68*** | .60*** | .70*** |
| PM2 | .75*** | .85*** | .74*** |
| Use of Benchmarking (AVE = 0.71, CR = 15.13, α = .83) | | | |
| UB1 | .85*** | .92*** | .81*** |

**Table 2.** Continued

| | | | |
|---|---|---|---|
| UB2 | .83*** | .90*** | .76*** |
| Information and Analysis (AVE = 0.72, CR = 14.36, α = .83) | | | |
| IA1 | .87*** | .91*** | .85*** |
| IA2 | .82*** | .88*** | .75*** |
| Management Commitment (AVE[a] = 0.59, CR = 12.87, α[b] = .74) | | | |
| MC1 | .76*** | .79*** | .68*** |
| MC2 | .78*** | .88*** | .68*** |
| Employee Involvement (AVE = 0.50, CR = 11.35, α = .66) | | | |
| EI1 | .72*** | .82*** | .66*** |
| EI2 | .70*** | .72*** | .63*** |
| Customer Involvement (AVE = 0.66, CR = 12.84, α = .79) | | | |
| CI1 | .81*** | .83*** | .78*** |
| CI2 | .81*** | .89*** | .76*** |
| Supplier Involvement (AVE = 0.72, CR = 11.92, α = .83) | | | |
| SI1 | .83*** | .85*** | .81*** |
| SI2 | .87*** | .95*** | .80*** |

**Note:** Standardized beta coefficients; *** $p < 0.001$; [a] Average variance extracted; [b] Cronbach's alpha.

## 4. Results

We employed the structural equation modeling (SEM) technique to test our hypothesized research model. Table 3 presents the results of the hypothesis 1 testing. The test results indicate that the positive effect of behavioral QM on firm performance is more significant in the U.S. sample than in the China sample, supporting hypothesis 1.

Figure 1 demonstrates the results of testing hypothesis 2a and hypothesis 2b. The test results present that according to national economic maturity, the relative effect of behavioral QM versus technical QM on firm performance differs noticeably in service firms (ß = .21, p = .095 → ß = .66, p < .001) as compared to manufacturing industries (ß = .30, p = .007 → ß = .66, p < .001). Thus, the results support hypothesis 2b strongly, but not hypothesis 2a.

**Table 3.** SEM Test Results of Hypothesized Research Model

| | Path | Standardized beta coefficient | Standard error | Critical ratio | P |
|---|---|---|---|---|---|
| **U.S. Sample (N = 152)** | Behavioral Quality Practices ➔ Performance | .648 | .086 | 7.773 | *** |
| | Technical Quality Practices ➔ Performance | -.115 | .103 | -1.564 | .118 |
| **China Sample (N = 222)** | Behavioral Quality Practices ➔ Performance | .276 | .108 | 3.183 | .001 |
| | Technical Quality Practices ➔ Performance | .024 | .105 | .326 | .745 |

**Note:** *** $p < 0.001$.

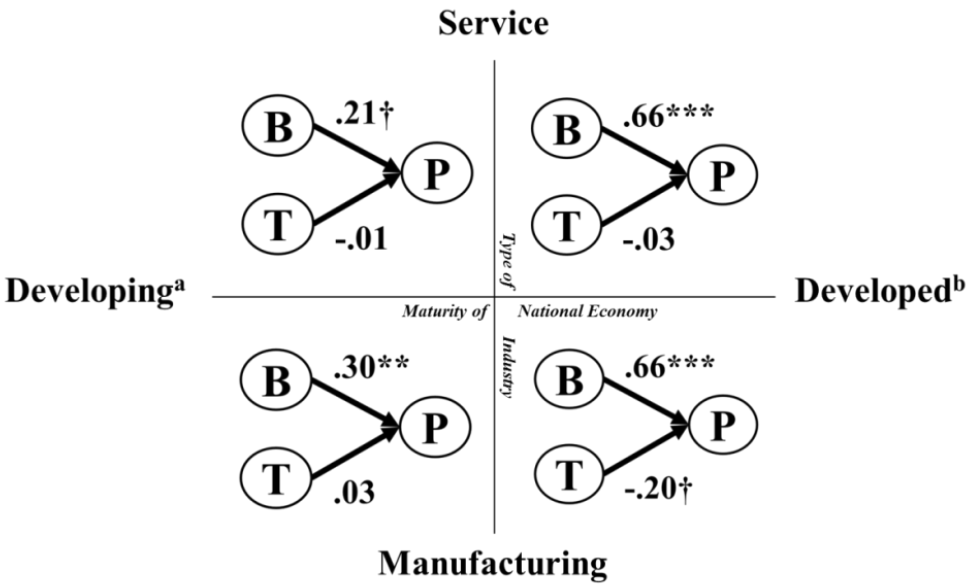


**Figure 1.** Relative Effect of Behavioral vs. Technical Quality Practices on Performance according to Industry Type and National Economic Maturity

**Note:** Standardized beta coefficients, † $p < 0.1$, ** $p < 0.01$, *** $p < 0.001$.
[a] China sample (Manufacturing N = 115, Service N = 103).
[b] U.S. sample (Manufacturing N = 66, Service N = 86).
B = behavioral quality practices, T = technical quality practices, P = firm performance.

## 5. Implication and Conclusion

In terms of the contingency theory (Lawrence and Lorsch, 1967; Child, 1972; Donaldson, 1987), our study results imply that a firm's contingency factors, such as national economic maturity and industry type, could result in the heterogeneous implementation of the firm's QM programme. The results show that the association between behavioral QM and firm performance differs significantly between developed (the U.S.) and developing (China) countries, particularly for service firms. These findings align with Hendricks and Singhal's (2001) study and empirically support Donaldson's (1987) structural adaptation to regain the fit (SARFIT) model, which states that an organizational structure should adapt to new contingencies for survival. Consequently, our findings weaken the 'universal effectiveness of QM practices' assumption that institutional theory justifies (Mitki and Shani 1995; Yavas 1995).

Our test results explicitly verified that behavioural QM generally has a more critical influence on a firm's performance than does technical QM; however, our results also suggest that the relative importance of behavioural QM on performance could vary according to a firm's contingency factors. Therefore, future research should focus on identifying external and internal contingencies that affect a firm's QM implementation. We believe that our findings have contributed to the QM practitioners by explicitly stating why their QM programs should be more customized to their changing environments.

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**Appendix:**
**Survey Questionnaire**
**Technical Quality Practices**

- We have a comprehensive and structured quality planning process which regularly sets and reviews short and long-term goals (SP1)
- We have a mission statement that has been communicated throughout the company and is supported by our employees (SP2)

- Our suppliers have an effective system for measuring the quality of the materials they send to us (PM1)
- We have well-established methods to measure the quality of our products and services (PM2)
- We have undertaken benchmarking in relative cost position (UB1)
- We have undertaken benchmarking in operating processes (UB2)
- We regularly review our product quality and procedures (IA1)
- We regularly review other firms' processes in bringing new products to market (IA2)

**Behavioral Quality Practices**

- Senior managers actively encourage change and implement a culture of trust, involvement, and commitment in moving towards "Best Practice" (MC1)
- There is a high degree of unity of purpose throughout our company, and we have eliminated barriers between individuals and/or departments (MC2)
- Our company has effective 'top-down' and 'bottom-up' communication processes (EI1)
- Employee flexibility, multi-skill, and training are actively used to support improved performance (EI2)
- We have an effective process for resolving external customers' complaints (CI1)
- Customer complaints are used as a method to initiate improvements in our current processes (CI2)
- Our suppliers work closely with us in product development (SI1)
- We work closely with our suppliers to improve each other's processes (SI2)

**Firm Performances**

- Defects as a % of production volume (QO1)
- Cost of Quality (error, scrap, rework, inspection) as a % of total sales (QO2)
- Your company's customer satisfaction level (CS1)
- Customer satisfaction with regard to our products/services has increased over the past three years (CS2)
- Growth In Sales (BP1)
- Growth In Market Share (BP2)
- Net Profit Margin (BP3)