



Investigating the Relationship between Quality Management Principles, Conformance and Non-Conformance Cost of Quality, and Organizational Performance

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ABSTRACT

This paper examines the components of cost of quality (using the conformance cost of quality and non-conformance cost of quality method) in the context of Malaysian construction industry. Cost of quality becomes an important issue for organizations to consider since the cost of quality is one of the quality management practices (tools and techniques) to achieve the Total Quality Management (TQM) in an organization. However, in the Malaysian context there is still lack of researches that seek to understand the best cost of quality practices especially in construction industry. This paper attempts to discuss the conceptual model between selective quality management principles, conformance cost of quality, non-conformance cost of quality and organizational performance (OP) in the process of identifying the best practices for Malaysia construction industry. This study proposes four quality management principles and tries to investigate the effect of these principles on organizational performance. Since the relationship between the quality management principles and organizational performance is widely discussed by the previous researchers, therefore this study therefore aims to understand the role of conformance cost of quality as a mediating variable and non-conformance as an intervening variable in selective quality management principles and an organizational performance relationship. The outcome of this research may offer a better outcome in the organizational performances namely productivity improvement and customer satisfaction.

Keywords: Cost of quality, Construction industry, Conformance cost of quality, Non-conformance cost of quality, Organizational performance, Quality management principles.

INTRODUCTION

Quality is an effective strategic weapon for improving productivity in the organization (Hasan & Kerr, 2003). With quality, it provides a clear path to

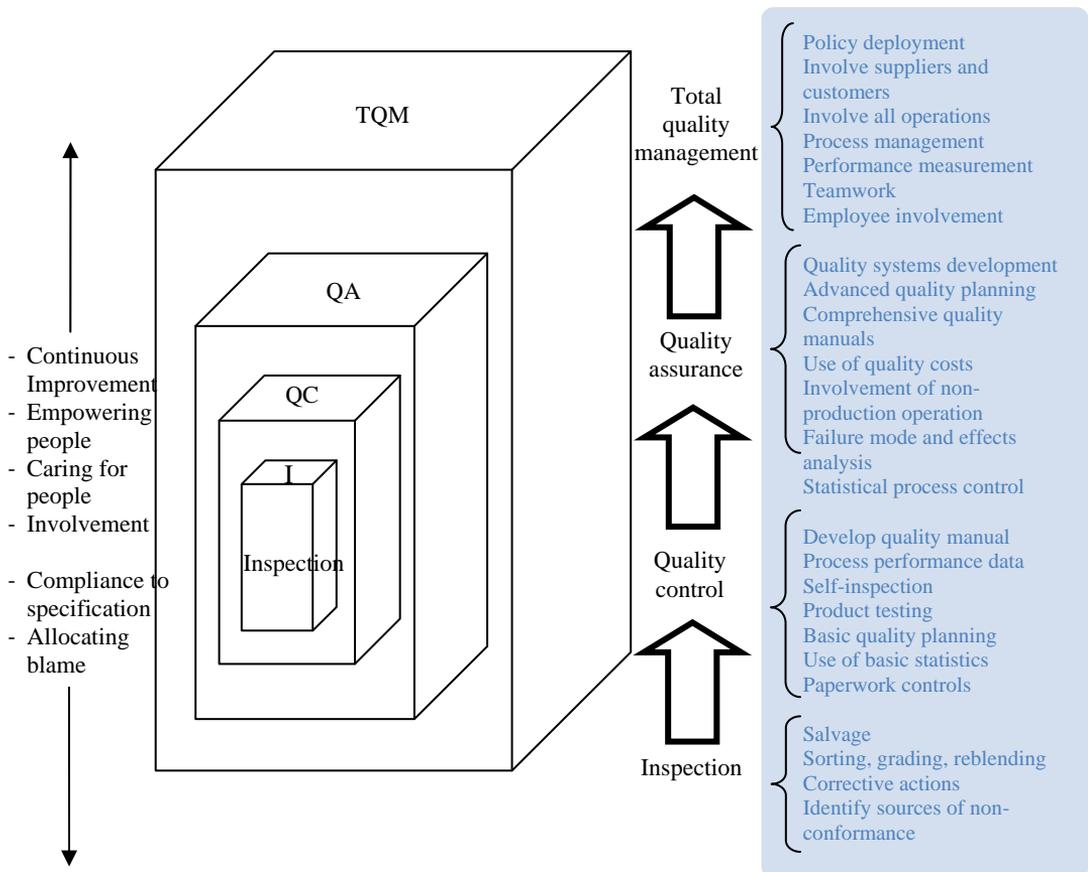
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achieve better organizational performance. One of the ways on how quality should be managed in an organization is through quality management (Rushami, 2005). Badri *et al.* (1995) suggested that quality management is a key factor in gaining competitive advantage. Monitoring and managing quality has evolved rapidly since 1970's when it first started with simple inspection activities then being replaced or supplemented by quality control, then the development of quality assurance and lastly, nowadays more organizations are working with Total Quality Management (TQM) (Dale *et al.*, 1994; Khalifa & Aspinwall, 2000). This can be seen in Figure 1 on the evolution of quality management.

Figure 1: Evolution of Quality Management



Taken from B.G. Dale (1990) and B.G. Dale & J.J. Plunkett (1995)

By looking into the quality assurance activities or procedures (from the above figure), these stages mainly tackle the issues of prevention-based system. As stated by Dale *et al.* (1994):

“Quality assurance is prevention-based system, which improves product and service quality and increases productivity by placing the emphasis on product, service and process design. By concentrating on source activities, it stops non-conforming products being produced or non-conforming services being delivered in the first place.”

This shows that, the quality assurance philosophy and approach were highly stressed on the issues of quality costing. By implementing the quality costing, it can be considered by some to be more useful for organizations taking the first steps along Total Quality Management (TQM) journey than it is for those who have considerably more operating experience of TQM (Dale & Plunkett, 1995). As commonly reported in the scholarly literature, without some systematic approach to track quality costing, it might be difficult to identify the potential areas for improvement and to track improvement results (Rodin, 2009). Empirically, quality cost must be considered within the overall organization's quality management system structure. Quality cost is not the cost of running the quality department; however it is a cost that could be avoided at a reasonable expense and one that it is economically inefficient to avoid (Hwang & Aspinwall, 1999; Halis & Oztas, 2002).

After looking through a series of literatures, the concept of quality cost had emerged during the 1950's by the quality gurus Joseph Juran (Quinn, 1999). Moreover, the concept of quality cost is also widely discussed in numerous literatures such as Crosby, Dale and Plunkett, Feigenbaum, Campanella and many more authors. According to them, the concept of quality cost refers to Cost of Quality (CoQ) and Cost of Poor Quality (COPQ). By looking into the dimension given, CoQ is usually understood as sum of conformance plus non-conformance costs, where cost of conformance is the price paid for prevention of poor quality whereas cost of non-conformance is the cost of poor quality caused by product and service failure (Schiffauerova & Thomson, 2003). Otherwise, the traditional CoQ concept that being suggested by Juran (1951) and Feigenbaum (1956) are using the prevention, appraisal and failure (P-A-F) model which prevailed prevention costs as associated with actions taken to ensure that a process provides quality products and services, appraisal costs are associated with measuring the level of quality attained by the process, and failure costs are incurred to correct quality in products and services before (internal) or after (external) delivery to the customer (Schiffauerova & Thomson, 2006). However, there is no major difference between these two methods of CoQ since the conformance cost involved in making certain thing right for the first time. Nevertheless the non-conformance cost is the money wasted when work fails to conform to customer requirements.

By looking from the above perspective, it is clear that the application and the use of CoQ model in an organization apparently increase the organizational performance. Empirically, many previous studies (Uyar, 2008; Oyrzanowski,

1996; Bamford & Land, 2003; Czuchry *et al.*, 1999; Laszlo, 1997; Moen, 1998; Kumar & Brittain, 1995; Oliver & Qu, 1999; Superville & Gupta, 2001; Keogh *et al.*, 2003; Halis & Oztas, 2002) have revealed that there is a significant relationship between CoQ and organizational performance. Research done in other countries, such as in the United Kingdom, the United States, Australia, Canada, Brazil, Norway, Taiwan, Mexico, Greece and China, also support that CoQ application contributes towards business improvement and organization performance (R. Bamford and Land, 2004; Harrington, 1999; P. Laszlo, 1997; Oliver and Qu, 1999; Schiffauerova and Thomson, 2006; Miguel and Pontel, 2004; Moen, 1998; Hsien Tsai, 1996; Sandoval-Chavez and Beruvides, 1998; Fassoula, 2005; Jun Lin and Johnson, 2004).

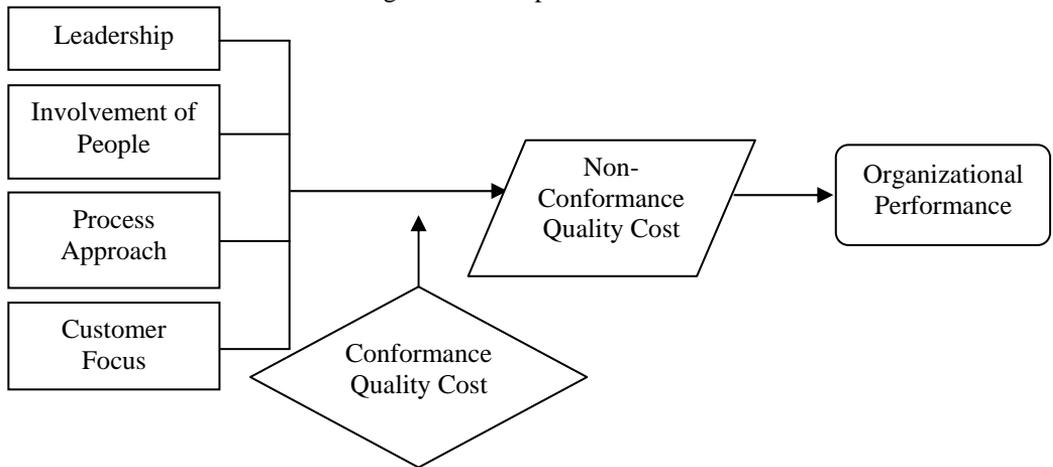
Thus, CoQ is now regarded as a competitive weapon to enable organizations to survive in the global marketplace and the adoption of CoQ is driven by the desire to gain a competitive advantage in the marketplace (Oliver & Qu, 1999). Due to its successful implementation, organizations in other sectors such as the public sector are recommended to adopt the method even though this quality management practices is widely used in the manufacturing sector. In a previous study, the implementation of CoQ is widely discussed in the manufacturing sector (Mandal & Shah, 2002; Czuchry *et al.*, 1999; Halis & Oztas, 2002).

The focus of this study is to investigate the theoretical and empirical aspects of selective quality management principles since certain QM principles, such as continual improvement, factual approach, system approach to management and mutually beneficial supplier relationship have been covered in the CoQ model using the conformance and non-conformance by Crosby's and organizational performance. Finally, the contribution of this paper to CoQ literature is then presented.

CONCEPTUAL FRAMEWORK

The development of proposed framework following discussion will focus upon the development of a conceptual framework and ensuing propositions surrounding the components of critical success factors and its relationship with organizational performance and the influence of integration strategy on the relationships. Figure 1 summarizes the conceptual framework to lead further discussion.

Figure 1: Conceptual Framework



THEORETICAL COMPONENTS

The main concern of this paper is to empirically support the quality management's critical success factors with the intervention and moderation of conformance and non-conformance cost of quality contribute to organizational performance. Cost of quality is a process that can produce behavior change and dramatically improve business performance (Millar, 1999) and the business that follows through quality management practices and principles may achieve the competitive advantage (Wang *et al.*, 2007). The statement above supports the authors' attempt to conduct a study on the cost of quality control under quality management which has become a very important factor especially in today's challenging global market. They suggested three practical guidelines to successful implement cost of quality:

- The satisfactory performance of quality cost control not only depends on the efforts of accounting professional but also the support and involvement of the top management leadership.
- Quality cost control supports company decision making on quality inputs and product improvement, and gain higher profit.
- Quality cost control establishes and raises company goodwill which leads to increase the return on investments.

QUALITY MANAGEMENT PRINCIPLES

QM consist of a set of principles, dimensions or critical success factors (Saraph *et al.*, 1989, Flynn *et al.* (1994), Anderson *et al.* (1994, 1995), Ahire *et al.* (1996), Porter and Black (1996), Zeitz *et al.* (1997), and Terziovski and Samson (1999) which can be used by top management as a framework to guide their

organizations towards improving organizational performance (ISO/FDIS 9004:2009). According to Ludwig-Becker (1999), the benefits of QM principles are beginning to be documented as improved worker productivity increased process efficiency, reduced errors, time saved, access to real time information and data for making decisions, positive customer surveys and empowered workers (Murphy, 1996).

After working through the literature review, this paper will focus on four critical success factors in quality management principles, namely: leadership, involvement of people, process approach and customer focus.

LEADERSHIP

The idea of top management commitment to represent the leadership was also ushered by Samson and Terziovski (1998) who consider leadership as:

“the major driver of TQM which examines senior executives’ leadership and personal involvement in setting strategic directions and building and maintaining a leadership system that will facilitate high organizational performance, individual development and organizational learning.”

By looking from their definition, the understanding of leadership can be understood as top management because top management is the only leadership who will get involved in setting and building up the strategic directions, creating values, goals and systems that lead to satisfied customers’ expectations and to improve an organization’s performance (Senge, 1990; Ahire & Shaughnessy, 1997, Ahire *et al.*, 1996). The statement were supported by (Badri *et al.*, 1995 and Zakaria & Zulnaidi, 2006) who identified the top management commitment / top management leadership as one the critical success factors in their studies to represent the leadership understanding/variable. In other situations, top management leadership was separated into distinctive factor known as corporate quality culture and strategic quality management since the author studies the comparison of factor models between the TQM approach and 1995 Baldrige framework (Black and Porter, 1996).

The dimensions used in this paper adapt and modify from Zeitz *et al.* (1997), Ahire *et al.* (1996) and Claver *et al.* (2003). The first dimension is related to the employee’s survey measuring TQM practices and culture, the idea was taken from the philosophy, management and planning (Zeitz *et al.*,1997). The second dimension attempts to identify top management commitment as one of the major determinants of successful quality management implementation. These reflect with Ahire and Shaughnessy (1997) argument on the upper management should not only give quality the highest priority possible but also demonstrate through

their commitment to quality by providing adequate resources for implementing quality management. The third dimension attempts to discover the leadership functions activities by showing high values for firms in which managers communicate a quality commitment, encourage their employees to implement changes, allow them to make their own decisions and motivate them (Claver *et al.*, 2003).

INVOLVEMENT OF PEOPLE

Involvement of people is as important as leadership as it indicates that without the element of involvement of people in the organization, the top management leadership will not be able to lead the subordinates toward achieving or aligning with the organization's quality vision, mission and strategies. Previous study came out with their own understanding to represent the involvement of people in the organization. However involvement of people is always tied up with the human resources practice, hence Anderson and Sohal used other terminologies to represent the human resources aspects. They used "People" to include the human resource management planning, employee involvement, performance management, education and training, and communication (Anderson & Sohal, 1999). Several authors (Ahire *et al.*, 1996; Ahire & Shaughnessy, 1997) see it as employee involvement since these authors agreed that organizations must develop formal systems to encourage, track and reward employee involvement; otherwise the extent and quality of participation declines and might lead to a dissatisfied work force.

This study attempts to come up with the operational definition for involvement of people on leading the human resources practices and tied into and aligned with the organization's strategic direction (Samson & Terziovski, 1999). This was supported by Rao *et al.*'s (1999) understanding on human resource, they come out with the human resource dimension of quality management and divided into: training; providing resources for training, employee involvement and empowerment, building quality awareness, and employee recognition for quality. The dimensions here were from Samson & Terziovski (1999) and Rao *et al.* (1999) as both studies depend heavily on training in their research, so this study choose to adapt and modify their questions in order to tally up with the theoretical framework which cover the dimension of training under conformance cost of quality dimensions (moderating variable). All of the human resource development issues such as human resources management, employee involvement, employee recognition and performance, and employee well-being and morale question's were taken from Rao *et al.* (1999).

The other part that is less concentrated by previous literature is human resource development, communication, safety, employee responsibility and measurement of employee satisfaction. This was taken from Samson & Terziovski, 1999). For

the purpose of this study, we decide to combine the human resource and people management dimensions in order to obtain a comprehensive understanding of involvement of people.

PROCESS APPROACH

The principle of process approach is considered as necessary step under the quality management principles. When activities and related resources are managed as a process, desired result can be achieved more efficiently. Three key benefits that organizations hope to achieve through process approach are lower costs and shorter cycle times through effective use of resources, improved, consistent and predictable results, and focused and prioritized improvement opportunities (ISO/FDIS 9004:2009, 2009, p. 40).

Zhang *et al.* (1999) used process control and improvement to represent the process approach dimension or understanding. Many other authors such as Zhang *et al.* (1999) and Flynn *et al.* (1995) view the process approach from manufacturing context which focuses on managing the process flow so that their operation operates as expected and efficiently in order to reduce the process variance which heavily impact on quality performance.

This study will stand firm with their acknowledgment on process management. The dimension used here were taken from Prajogo (2006) and Samson & Terziovski (1999) as their study apply the principle of TQM on the organizations are sets of interlinked processes and the that improvement of these processes is the foundation of performance improvement (Deming, 1986), how the organization designs and introduces products and services, integrates production and delivery requirements, and manages the performance of suppliers (Evans & Lindsay, 1995), some organizations experienced dramatic performance improvements through process redesign and reengineering (Hammer & Champy, 1993; Stewart, 1993).

CUSTOMER FOCUS

Knowing what customers want and provide products and services that meet their requirements are essential for implementing TQM (Ishikawa, 1985; Das *et al.*, 2008). An organization should carefully plan and execute their activities by improving processes leads to producing high quality products or services. The elements of quality should be focus into these activities so that it might give the customer focus. Therefore, customer focus must be embedded in the overall planning and execution of quality efforts (Ahire & Shaughnessy, 1997). According to above authors, the propose understanding of customer focus can be understood as customer involvement in the product design and development

process is necessary at every stages involve (in term of input) so that there is less likelihood of quality problems once full production begins (Flynn *et al.*, 1994; Zhang *et al.*, 1999 and Das *et al.*, 2008).

A study by Dow *et al.*, 1999 indicated that the customer focus are grouped under soft TQM dimensions with two items studied; customer requirements are disseminated and understood, and know our customers' current and future needs were asked to the respondents (Rahman & Bullock, 2005). However Mady (2009) found the "customer focus" is one of the dimensions widely recognized in MBNQA and ISO 9000:2000 models for a quality management system. Hence, the dimension considered for this study is taken from Zhang *et al.*, 1999 because they used customer focus effort methods which include customer complaints information. However this dimension was omitted since this dimension have been covered under the dimension of non-conformance cost of quality or the intervening variable, market investigations and customer satisfaction surveys.

The second consideration used in this study is taken from Mady (2009), the author used to operationalize the customer focus concept : customer needs and requirements are thoroughly analyzed, each department is considered an internal customer to other departments, the plant has customer feedback on quality and delivery measurements, a formal customer service system is implemented and taking customers' complaints seriously.

COST OF QUALITY

The understanding of "quality cost" sometimes gives different meanings to different quality-control practitioners. Gryna (1988) defined the quality costs as the costs of attaining quality, Crosby (1979) views the cost of quality as the expense of doing things wrong and British Standards Institution (BS4778: Part 2[1]) (1991) defined quality cost as the expenditure incurred by the producer, by the user and by the community associated with product or service quality. Whereas in the early 1980s the cost of quality were perceived as "*the cost of running the quality assurance department, plus scrap, rework, testing and warranty costs, it is now widely accepted that they are the costs incurred in the design, implementation, operation and maintenance of an organization's quality management system, the cost or organizational resources committed to the process of continuous and company-wide quality improvement, the costs of system, product and service failures, and non-value added activity and wastage in all its various forms*" (Dale & Plunkett, 1995).

This study will look into the common elements of cost of quality as factors for a successful implementation by adapting the Crosby's (1979) conformance and non-conformance quality cost model into Dale and Plunkett (1995) cost elements of prevention, appraisal and failure model. The factors are quality planning,

design and development of quality measurement and test equipment, quality review and verification of design, calibration and maintenance of quality measurement and test equipment, calibration and maintenance of production equipment used to evaluate quality, supplier assurance, quality training, quality auditing, acquisition analysis and reporting of quality data, quality improvement program, pre-production verification, receiving inspection, laboratory acceptance testing, inspection and testing, inspection and test equipment, materials consumed during inspection and testing, analysis and reporting of tests and inspection results, field performance testing, approvals and endorsements, stock evaluation, record storage, scrap, replacement; rework and repair, troubleshooting or defect/failure analysis, reinspection and retesting, fault of subcontractor, modification permits and concessions, downgrading, downtime, complaints, warranty claims, products rejected and returned, concessions, loss of sales and recall costs.

ORGANIZATIONAL PERFORMANCE

Following the performance management literature, Hasan and Kerr (2003) discuss the relationship between TQM practices and organizational performance in service organization, performance are discussed from the dimension of productivity and quality (productivity, efficiency, cost of quality, and errors or defects), scheduling and delivery (lead time, timeliness of delivery and vendor relations), financial results (return on assets, return on sales, return on total quality and market share), and customer satisfaction performance (customer satisfaction, employee satisfaction, and employee turnover). Meanwhile, Lakhal *et al.* (2004) chosen three organizational performance dimensions financial performance which were taken from Kaplan and Norton (1992), operational performance taken from Grandzol and Gershon (1998) and product quality operationalized from Garvin (1987), Forker *et al.* (1996), Curkovic *et al.* (1999) and Kelada (1996). Therefore, Terziovski (2006) studies the productivity improvement and customer satisfaction as part of the organizational performance dimensions in his studies on the quality management practices dimensions such as leadership, people management, customer focus, strategic planning, information and analysis, and process management.

Mehra and Ranganathan (2007) particularly stressed the dimensions of organizational performance as customer satisfaction in their study on addressing the TQM program which focus on enhancing the customer satisfaction. Similarly to Lee *et al.* (2009), they suggested their study on overall performance includes items concerning customer satisfaction (Varvra, 2002), internal administration efficiency (O'Neill, 1998; Chen *et al.*, 2001), cost of quality (Besterfield *et al.*, 2003; Gustafsson *et al.*, 2001) and employee turnover rate (Guimaraes, 1997). Compared to Anderson and Sohal (1999) studied, as they identify the organizational performance as business performance in their study focusing in

SMEs and this was accordance to their findings on manufacturing performance was significantly related to business performance. Table 2 views the summaries on organizational performance from previous study.

Table 2: Previous Study in Dimension's of Organizational Performance

Author / Year	Dimension of organizational performance
Hasan and Kerr (2003)	Productivity and quality (productivity, efficiency, cost of quality and errors or defects) Scheduling and delivery (lead time, timeliness of delivery and vendor relations) Financial results (return on assets, return on sales, return on total quality and market share) Customer satisfaction performance (customer satisfaction, employee satisfaction and employee turnover)
Lakhal <i>et al.</i> (2004)	Financial performance (Kaplan and Norton, 1992) Operational performance (Grandzol and Gershon, 1998) Product quality (Garvin, 1987; Forker <i>et al.</i> , 1996; Curkovic <i>et al.</i> , 1999; Kelada, 1996)
Terziovski (2004)	Productivity improvement Customer satisfaction * against the quality management practice such as leadership, people management, customer focus, strategic planning, information and analysis, and process management.
Mehra & Ranganathan (2007)	Customer satisfaction * in their study on addressing the TQM program has direct positive impact on customer satisfaction.
Lee <i>et al.</i> (2009)	Customer satisfaction (Varvra, 2002) Internal administration efficiency (O'Neill, 1998; Chen <i>et al.</i> , 2001) Cost of quality (Besterfield <i>et al.</i> , 2003; Gustafsson <i>et al.</i> , 2001) Employee turnover rate (Guimaraes, 1997)
Anderson & Sohal (1999)	Business performance * Six dimension for business performance : Overall competitiveness Sales Market share Employment levels Cash flow Exports
Samson & Terziovski (1998)	Customer satisfaction Employee morale Productivity Quality Delivery performance

For the purpose of this paper, we decide to look into the operational and business performance indicators (Samson & Terziovski, 1999). Samson and Terziovski (1999) studied provide comprehensive guide in term construct validity of organizational performance by identified item's of study based on the committee used in variety of sources included the Malcolm Baldrige National Quality Award Criteria (1994 version), the Deming Prize Criteria, the Australian Quality Award Criteria, 1994 and Made in Britain, 1992.

CONCLUSION

This study proposes four fundamental principles of quality management and tries to investigate the effect of these principles on organizational performance. However, the relationship between principles and performance is not well understood. Therefore, this study analyzes also the role of conformance cost of quality as moderating variable and non-conformance cost of quality as intervening variable in selective QM principles and organizational performance relationship. Assuming the results of those analyses will derive towards explaining the selective QM principles-conformance cost of quality-non-conformance cost of quality- organizational performance relationship.

Hopefully this paper might trigger some idea to investigate further in QM principles, CoQ and performance relationship in improving the organization operational performance and non-operational performance. Focusing on the operational and business performance indicator is fundamental to achieve organization's goals and objectives. In sum, the theoretical framework portrayed in this paper provides new dimension for future research to further study the QM principles-CoQ-performance relationship in other sector such service industry since this industry features with new demanded customer needs and requirements.

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