

**AN EMPIRICAL INVESTIGATION OF RELATIONSHIP BETWEEN  
TOTAL QUALITY MANAGEMENT PRACTICES AND  
ORGANIZATION'S PERFORMANCE IN INDIAN CONTEXT**

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**DOCTOR OF PHILOSOPHY**  
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*By*

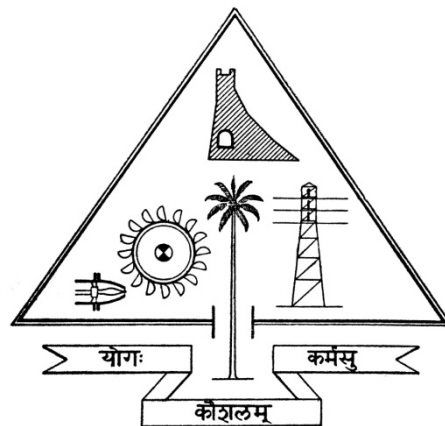
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**DECEMBER 2017**

## **DECLARATION**

I hereby declare that this thesis entitled **AN EMPIRICAL INVESTIGATION OF RELATIONSHIP BETWEEN TOTAL QUALITY MANAGEMENT PRACTICES AND ORGANIZATION'S PERFORMANCE IN INDIAN CONTEXT** submitted to the University of Calicut, for the award of Degree of Doctor of Philosophy under the Faculty of Engineering is an independent work done by me under the supervision of Dr. Satish K.P. Professor, Department of Production Engineering, Government Engineering College, Thrissur, University of Calicut.

I also declare that this thesis contains no material which has been accepted for the award of any degree or diploma of any University or Institution and to the best of my knowledge and belief, it contains no material previously published by any other person, except where due references are made in the text of the thesis.

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The suggestions /corrections from the adjudicators Ref No. 11526/RESEARCH-C-ASST-1/2018/Admn dated 30.08.2018 have been incorporated in this thesis.

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**CERIFICATE**

This is to certify that the work reported in this thesis entitled **AN EMPIRICAL INVESTIGATION OF RELATIONSHIP BETWEEN TOTAL QUALITY MANAGEMENT PRACTICES AND ORGANIZATION'S PERFORMANCE IN INDIAN CONTEXT** that is being submitted by **Mrs. ANU P.ANIL** for the award of the Degree of Doctor of Philosophy, to the University of Calicut, is based on the bonafide research work carried out by her under my supervision and guidance in the Department of Mechanical Engineering, Government Engineering College, Thrissur, University of Calicut. The results embodied in this thesis have not been included in any other thesis submitted previously for the award of any degree or diploma of any other University or Institution.

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## ABBREVIATIONS

AMOS	Analysis of Moment Structures
ANSI	American National Standards Institute
ASQ	American Society for Quality
BP	Business Performance
BTS	Bartlett's test of Sphericity
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
D-W	Durbin-Watson
EFA	Exploratory Factor Analysis
GFI	Goodness of Fit Index
ISO	International Organization for Standardization
KMO	Kaiser Meyer Olkin
LV	Latent Variable
MRA	Multiple regression analysis
MV	Manifest Variable
RMSEA	Root Mean Square Error of Approximation
SEM	Structural Equation Modeling
TQM	Total Quality Management
VIF	Variance Inflation Factor
$\chi^2/df$	Chi-square divided by degrees of freedom

# CHAPTER 1

## INTRODUCTION

### 1.1 INTRODUCTION

In this new era of globalization, customers are more conscious about quality more than quantity. Escalating demands of customers for getting high quality products, as well as services and intensified global competition, have stimulated the organizations to allocate resources in time, effort and capital in adapting and implementing quality procedures, tools, and techniques (Thiagaragan et al., 2001). In an endeavor to improve quality, various approaches for quality management and continuous improvement have been explored, and among them, the most acclaimed and recommended approach is the concept of total quality management (TQM). TQM is an integrated management philosophy aimed for continuously improving the quality of products and services delivered through the participation of all levels and functions of the organization (Henderson et al., 2004; Mellat-Parast, 2013; Dubey and Gunasekaran, 2015). The emergence of TQM plays a major role and have become a top priority for many quality oriented firms worldwide in order to achieve objectives such as better customer satisfaction, superior quality of goods and services, productivity and profits, and reduced waste and cost among other benefits (Oakland, 2004; Wali and Boujelbene 2010; Nair and Choudhary, 2016). In addition to that, it is a widely adopted strategy for improving competitiveness around the world (Aghasizadeh et al., 2012; Ahmad et al., 2015; Gorantiwar and Shrivastava, 2014) but with mixed success (Kaynak, 2003; York and Miree, 2004; Prajogo and Sohal, 2001; Nair, 2006; Sadikoglu and Zehir, 2010 and Talib et al., 2013).

Meeting the expectation of the customers and attaining product quality are the prerequisites to survive in this global market (Nair and Choudhary, 2016; Pattanayak and Punyatoya, 2015). In the quest to remain competitive, many organizations have looked upon TQM practices as an effective approach to achieve this objective (Brah et al., 2002; Yang, 2006; Kumar et al., 2009; Fuentes et al., 2006; Sila, 2007; Pattanayak and Punyatoya, 2015; Singh and Shrivastava, 2012; Al-Refaie and Hanayneh, 2014 and Majumdar and Manohar, 2016).

In recent decades, the level of awareness towards TQM has increased significantly and has gone to its zenith to become a well acclaimed field of research due to intense global competition, increasing customer consciousness of quality, rapid technology transfer, and towards achieving world-class status. The advocates of TQM claimed that, the adoption of this philosophy leads to enhanced organizational performance through continuous improvement in organization's activities. But there are mixed and ambiguous results about the relationship between TQM practices and organization's performance. There are differences in those studies because there was no universalistic approach for TQM implementation in organizations. This means organizations would have adopted different or any proven approaches to TQM and would have reaped benefits. Moreover the previous studies have used different methods; by using different TQM practices and by measuring different performance indicators (Hendricks and Singhal, 2001; Shenaway et al., 2007; Prajogo and Sohal, 2003; Arumugam et al., 2008; Kannan and Tan, 2005; Rahman and Bullock, 2005; Yang et al., 2009; Prajogo and Sohal, 2004; Santos-Vijande and Alvarez-Gonzalez, 2007). Also, the researchers were conducted in different contexts such as in different countries and different industries. Even though most of the studies gave positive results, some found that there is no significant advantage for using TQM practices. This necessitates the need for an intensive investigation in the relationship between TQM practices and organization performance to identify exactly which are all TQM practices that are critically contributing to improvement in organization performance.

While there is a considerable volume of researches carried out to investigate the linkage between TQM and organization's performance across the globe, still little is evidenced regarding the impact of TQM practices particularly in Indian manufacturing context. The Indian manufacturing industry is considered to be one of the main contributors to the country's economy. Increased globalization and intense competition from multinational organizations are the major challenges confronted by them (Karuppusami and Gandhinathan, 2007). Managing of the TQM practices towards achieving multiple performance indicators is strategically and tactically important for gaining competitive advantage. Thus, studying the relationships between TQM and organization performance is essential to provide a theoretical as well as practical platform to the organizations in the efforts to gain sustainable competitive advantage.

Also, there are very few empirical studies that investigate and formulate propositions regarding mediating effect of performance indicators with others in TQM literature. Thus the scope of this research is to develop a research model which shows the direct and indirect relationship between TQM practices and organization's performance particularly in Indian manufacturing context through an empirical approach. Thus this work attempts to extend and add knowledge to this line of research, as well as to bridge the gap and provide sufficient empirical evidence specifically in the Indian scenario. This study will help managers to find out the interrelationships between the core TQM practices and the performance measures. Moreover, the findings assist organizations by providing guidance as to the organizational culture that is favorable to TQM, thereby contributing to the achievement of desired performance outcomes.

Likewise, less attention has been paid to the potential effects of contextual factors such as ISO 9001 implementation as well as organization size on TQM implementation and TQM – performance relationships. It is thus pertinent for further investigation, as differences in characteristics between large, medium and small sized organizations as well as ISO 9001 and non ISO 9001 certification may influence the use and impacts of TQM practices.

## **1.2 SCOPE AND NEED FOR RESEARCH**

This study has addressed the impact of TQM practices on various performance measures in Indian manufacturing organizations. The scope of organizations include manufacturing organizations that are ISO 9001 certified, Quality Management Excellence Award (QMEA) winners, any other local or international business quality management and business excellence winners, applied TQM or any other proven approaches and operate in India. The study has empirically examined the direct and indirect relationship between TQM practices and organization's performance in the organizations selected for the study.

Many organizations had adopted many practices which are considered as proven TQM approaches. From the literature analysis, it has been observed that many of the Indian firms, that are taking strategic initiatives to implement TQM in their business units, are not able to sustain these initiatives, because they often lack in articulating the critical factors that are needed for continual pursuance. As a result, total quality

management activities have become stand-alone types and the programmes have lost their defined objectives.

Investigating the past TQM literature, it becomes clear that the TQM practices differ somewhat in scope from one study to another. In addition to that, there arises a question regarding the deployment of apposite TQM practices for different performance indicators. There is no clear conformity in respect of this throughout the literature. Thus it is pertinent to investigate the relationship between TQM practices and multiple performance indicators identified in this work.

In addition, it is evident from literature that there are mixed and ambiguous results about the relationship between TQM practices and organization's performance, thus there is a necessity to reexamine the linkages. These mixed findings and the need to gain further insights into generalized TQM practices-performance link provide motivation for the study. This necessitates the need for an intensive investigation of the relationship between TQM practices and organization performance to identify exactly which are all TQM practices that are critically contributing to improvement in organization performance. Thereby, to develop a model showing the interrelationships between TQM practices and performance outcomes.

### **1.3 PROBLEM DEFINITION**

From the literature analysis, it has been evident that there was no concrete study performed to identify and systematically analyze various practices impelling TQM implementation in the Indian manufacturing context. Besides that, there is no clear framework existing in the past studies portraying the relationship between TQM practices and organization's performance as well as the direct and indirect effects of TQM practices on various performance indicators. Therefore a model which depicts the linkage between TQM practices and organization's performance is a requisite in this competitive global scenario. Similarly, it is also relevant to determine the impact of contextual factors such as ISO 9001 implementation and organization size for confirming the significance of ISO 9001 certification as well as the universal applicability of TQM respectively, pertaining to manufacturing sector with empirical support. On account of its importance, these topics warrant a sound empirical study, so this work aims to fill the void.

## 1.4 OBJECTIVE

From the context of the problem statement in the previous section, research questions impelling in the study directly leads to the following objectives.

1. To develop a research model which explore the relationship between TQM practices and organization's performance indicators;
  - *To identify the critical factors impelling effective implementation of TQM in an organization.*
  - *To determine the impact of TQM practices individually and collectively on organization's performance by measuring the quality performance QP, customer satisfaction level CSL, employee performance EP, operating performance OP, innovation performance IP, society results SR and financial performance FP as performance indicators.*
2. To identify the mediating effects of multiple performance indicators on others;
  - *Mediating effect of employee performance on TQM practices and QP, CSL, OP, IP, SR, and FP respectively.*
  - *Mediating effect of innovation performance on TQM practices and QP, CSL, OP, SR, and FP respectively.*
  - *Mediating effect of operating performance on TQM practices and QP, CSL, SR, and FP respectively.*
  - *Mediating effect of quality performance on TQM practices and CSL, SR and FP respectively.*
  - *Mediating effect of society results on TQM practices and CSL, FP.*
  - *Mediating effect of customer satisfaction level on TQM practices and FP.*
3. To develop an integrated model which show the interrelationships between TQM practices and performance indicators.
4. To investigate the influence of the contextual factors such as organization size as well as ISO 9001 certification on TQM practices and performance indicators, in the case of the Indian manufacturing industry.

## 1.5 RESEARCH METHODOLOGY

The methodology followed to carry out the study reported in this thesis is pictorially depicted in Figure 1.1. During the beginning phase of this work, literature survey was carried out to identify the critical factors impelling effective implementation of TQM in an organization and also summarize the previous arguments regarding linkage of TQM practices on various performance indicators. Subsequently developed a research framework which shows the impact of TQM practices on organization's performance. Then quantitative analysis using multiple regression and structural equation modeling (SEM) was carried out to examine the direct and indirect linkages. Finally to investigate the influence of the contextual factors on TQM practices and performance indicators, in the case of the Indian manufacturing scenario.

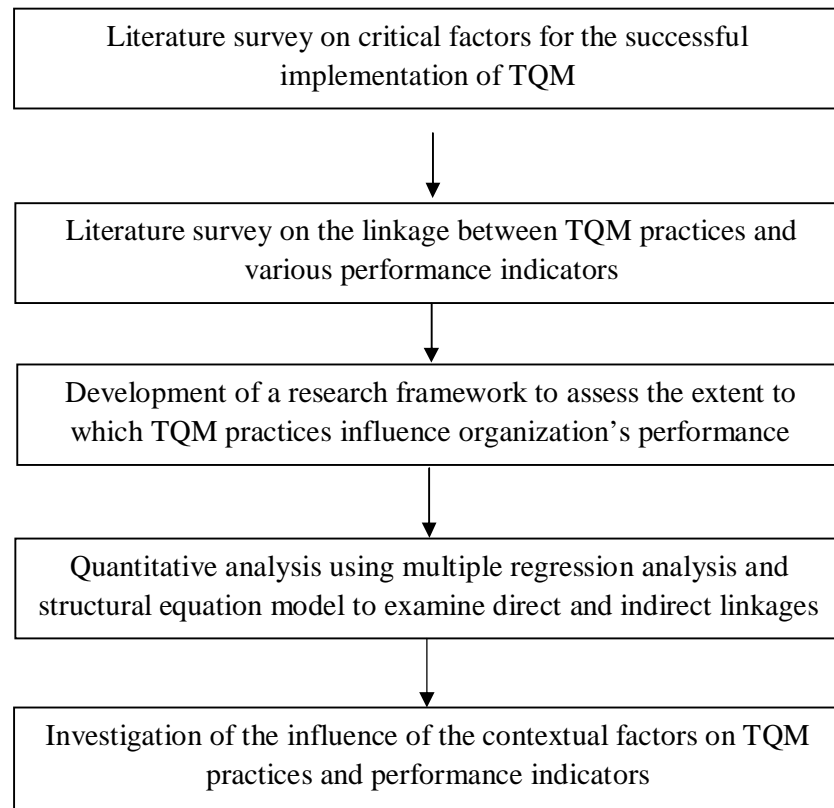


Figure 1.1 Research methodology

## 1.6 CHAPTER ORGANIZATION

The thesis is organized in three major parts covering theoretical framework of the thesis, the research design of this study and an analysis of the empirical results. These main parts are followed by discussion of findings, results, and further research

implications. Each part is further divided into chapters which lead to the following structure of the thesis which is presented in Figure 1.2

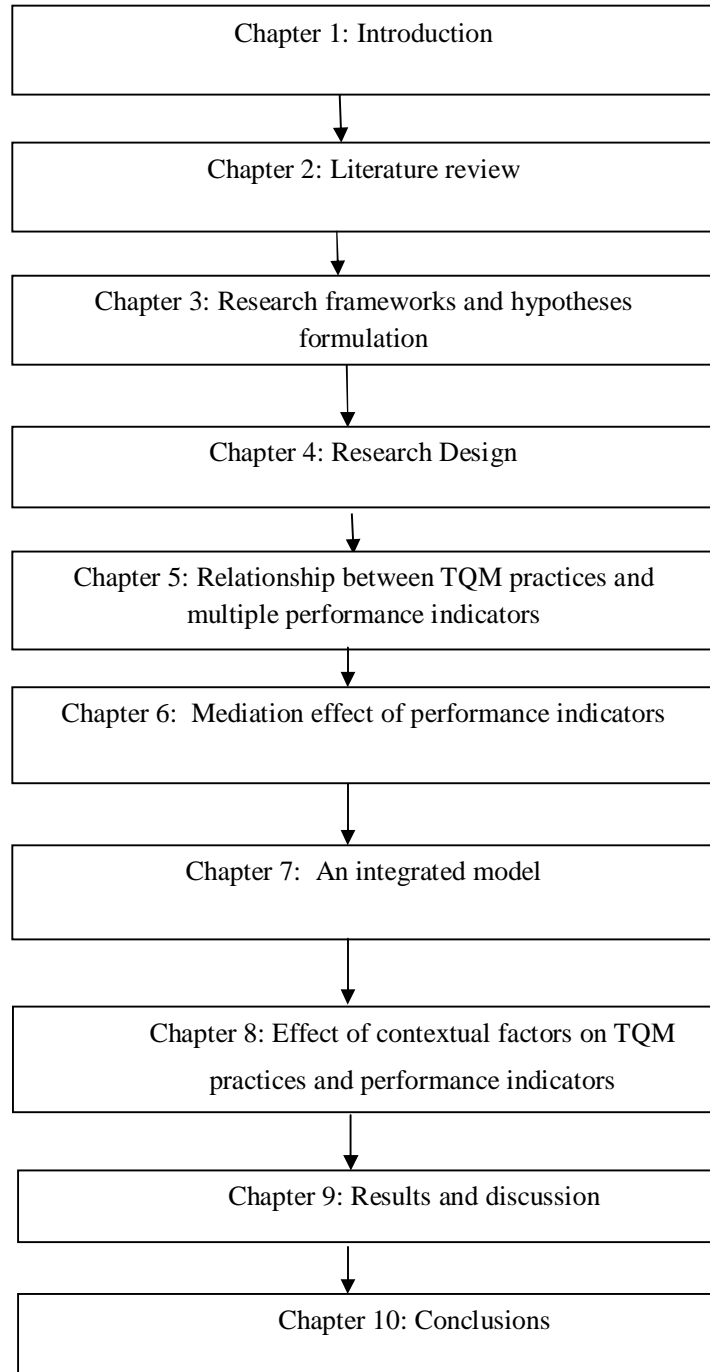


Figure 1.2 Chapter organization

Part I: After the introduction chapter, the literature survey carried out in the beginning phase of the study is elaborately presented in the second chapter. Consequently,



hypothesis formulation and development of conceptual framework based on the literature review is discussed in the third chapter.

Part II: In the fourth chapter, the research design behind study which encompasses sample design adopted for this study, followed by the development of research instrument, data collection procedure and finally reliability and validity analysis is depicted.

Part III: In the fifth through eighth chapters, the empirical data analysis is presented. In the fifth chapter, the impact of TQM practices on multiple performance indicators individually and collectively using multiple regression analysis is discussed. The mediation effect of multiple performance indicators on others using SEM is explored in the subsequent chapter. Then the model which shows the interrelationship between various performance indicators is illustrated in the seventh chapter. Consequently, the impact of contextual factors on both TQM practices and performance indicators is examined in the eighth chapter.

Part IV: In the ninth chapter, the main findings of the thesis were discussed. The thesis is concluded in the tenth chapter, which summarizes study. In addition hereto, the contribution and application of the empirical results are proposed, as well as avenues for further research and limitations.

## CHAPTER 2

### LITERATURE REVIEW

The objective of this chapter is to provide an introduction to the philosophy of Total Quality Management (TQM) including definitions of the concept, its historical background and key practices required for the success of TQM. In addition, this chapter encompasses the theoretical applicability of quality management practices across nations and industries. Moreover it also incorporates an extensive review of previous research works which investigate the relationship between TQM practices and multifaceted performance dimensions of an organization. As the study focuses on the relevance of implementing TQM practices in Indian manufacturing context, special emphasis is placed on encompassing this element. After completing this exercise, the need for developing models was realized.

#### 2.1 CONCEPT OF TQM

Revisiting the literature of quality management, it is evident that the definitions of both quality and TQM have been debated for several years, by quality management practitioners and researchers, which have resulted in abundant perspectives of this concept. Still, there is no universal agreement on these definitions. As far as quality is concerned, it does not have any single standard definition. Various authors and researchers have viewed different perspectives of quality and hence defined it differently. According to the American National Standards Institute (ANSI) and the American Society for Quality (ASQ), quality refers to: *“The totality of features and characteristics of a product or service that bears on its ability to satisfy given needs”* (Evans and Lindsay, 2010). From Crosby view, quality is *“Conformance to specifications”* (Crosby, 1979). Juran also cited the definition of quality, i.e. *“Fitness for use”* (Juran, 1993). In the words of Ishikawa, quality is the *“Support service provided”* (Ishikawa, 1985). Taguchi (1981) coined quality as *“The losses a product imparts to the society from the time the product is shipped,”* likewise Gronroos (1983) as *“meeting and exceeding customers’ expectations.* In the era of globalization and privatization, manufacturing firms are greatly relying upon the principle of total quality management to fight with the challenges of current market trends.

It is generally accepted that most of the current TQM literature evolved from works of 'quality gurus' such as Crosby, Deming, Ishikawa, Juran, and Feigenbaum. Likewise quality, there is no clear agreement prevails regarding the definition of TQM. But they share various common elements and similarities specifically the holistic feature of TQM.

## **2.2 RESEARCH ON TQM IN GLOBAL SCENARIO**

The global interest in implementing TQM has increased drastically over the past twenty years. This implies that the principles and techniques of TQM are universal and practical across firms, industries, and countries which help organizations to compete internationally and achieve competitive edge in the global market. Presently, developed and developing countries are at different stages of quality movement (Lai et al., 2002). In early days, most research on TQM has primarily paid attention to developed countries. Nowadays the research has been extended to other countries around the world. By implementing the TQM practices established in developed countries, assist the developing countries to follow the quality path.

From the literature, it is evident that organizations of developed countries in USA, Europe, Australia as well as Japan have adopted TQM practices to enhance organizational effectiveness. This global concept serves as a motivation for developing universalistic TQM standard for evaluating quality practices within countries.

Saraph et al. (1989) attempted to identify the critical factors for the successful implementation of TQM in an organization was conducted in the USA. This pioneer empirical work incorporates both organizational and managerial perspectives of quality gurus. The critical factors of this instrument were highly recommended, and it is later replicated in various studies conducted throughout the world (Motwani et al., 1994; Badri et al., 1995; Quazi et al., 1998).

At the nascent stage of TQM evolution, the empirical work was carried out to develop instruments for measuring quality practices through some critical factors. Using these critical factors, several studies were conducted to investigate the relationship between TQM practices and organization's performance. A vast majority of the literature supported positive significance of TQM practices on performance indicators (Flynn et

al., 1995; Anderson et al., 1995; Choi and Eboch, 1998; Das et al., 2000; Ahire and Dreyfus, 2000; Cua et al., 2001; Douglas and Judge, 2001; Ho et al., 2001; Kaynak, 2003; Shah and Ward, 2003). Conversely few studies point out the negative or insignificant role of TQM in delivering the desired performance benefits (Sadikoglu, 2004; York and Miree, 2004). These mixed findings and need to gain further insight regarding the linkage motivate the importance of replication studies. Replication research contributes empirical generalizations, knowledge development, and consistent research findings, which give support to the strength and generality of research results (Kaynak, 2003).

Generally, previous literature have argued direct relationship between TQM practices and performance measures (Kaynak, 2003; York and Miree, 2004; Prajogo and Sohal, 2001; Nair, 2006; Sadikoglu and Zehir, 2010 and Talib et al., 2013). In this line, the possibility of complex relationships was also examined, but it is evidenced in very few empirical works. Likewise, the presence of mediating variables was also highlighted (Kaynak,2003; Prajogo and Sohal, 2006, 2004; Choi and Eboch,1998; Sila,2007). In addition to that, some studies were undertaken with TQM as a mediator (Prajogo and Sohal, 2004).

Another aspect that has been examined by researchers, were the influence of contextual factors such as organization size, country origin, industry, age of TQM implementation, manufacturing strategy and ISO certification (Benzon et al.,1991; Adam et al., 1997; Martinez Lorente et al.,1998; Solis et al., 2000; Sousa and Vossa, 2001; Rungtusanatham et al., 2005 and Sila, 2007). Moreover there are cross comparison studies to understand the similarities and differences of quality management practices in various countries, which provide opportunities for developing countries to learn from the successes and failures of the quality practices of developed countries (Rao et al., 1999; Sila and Ebrahimpour, 2003; Aziz et al., 2000; Ahmad and Schroeder, 2002; Noronha, 2003; Khoo and Tan., 2003; Jabnoun., 2005; Rothenberg et al., 2005; Schnirderjans et al., 2006; Iwaarden et al., 2006; Parast et al., 2006; Tari et al., 2007).

### **2.3 EMPIRICAL STUDIES IN INDIAN CONTEXT**

As previously stated TQM practices are primarily embraced by developed countries to gain competitive advantage, and later were followed by developing countries like India. The entry of multinational players changed the whole complexion of business environment in India. As a result, the domestic organizations have confronted the serious challenges of improving quality and productivity. Today, majority of Indian manufacturing organizations are making efforts to integrate the business with the global economy. For that cultural transformation is required. In this scenario, TQM has gained wide acceptance as a strategic management approach.

India is explicitly involved in espousal of TQM practices to march ahead in global market similar to the organizations in other developing countries like Malaysia, Singapore, Hongkong, South Korea and China. Currently, Indian industries have reached a developed stage, where they can implement TQM practices effectively.

Sarkar (1991) presented a detailed discussion on the status of Indian industries with respect to Deming's 14 points individually, necessary for adopting TQM. Motwani et al. (1994) conducted the replication study on the basis of data collected from 73 organizations highlighted the relevance of quality product in Indian manufacturing scenario. Mohanty and Lakame (1998) conducted an empirical study to identify TQM critical factors in Indian industries. Similarly, Joseph et al. (1999) developed a reliable and valid instrument for measuring TQM implementation in business units in India. Mehta et al. (1999) shared the Indian experience of using quality to achieve business excellence.

Wali et al. (2003) conducted an exploratory study in Indian organizations engaged in manufacturing and service and critical factors for successful TQM implementation was identified. Mani et al. (2003) proposes a conceptual framework mainly based on Tamil classical literature to sustain business with success in a highly competitive world. In this line, Kanji (2003) put forward a universal business model that applies to all sectors based on the well established Vedanta philosophy of business culture.

Mahadevappa and Kotreshwar (2004) evaluate the degree of implementation and adoption of TQM practices and its impact on quality performance. The empirical results indicate that developing ISO 9000 standards significantly helped the sample

organizations in implementing TQM practices, contributing to the improvements in the quality performance. Additionally, it established the fact that ISO 9000 certification is not the end in itself. Conversely, it is only the primary step in the endless road to quality. Also, enlighten the relevance of improvement in product design through innovation, maintain long term supplier relationships, providing continuous education and training to employees, employees empowerment and incorporating transparent quality into the system.

In this line Banerji et al. (2005) extended the current literature in quality management research that focuses completely on firms in the advanced economies by investigating firms in the emerging economy. Seth and Tripathi (2006) make a comparative assessment of the effectiveness of TQM and TPM on business performance of Indian manufacturing organizations, and the results highlighted the combined application brings out significantly higher improvements than individual drive.

Due to the challenges from their global competitors, Indian industries are enforced to achieve world class manufacturing standards by adopting and practicing TQM philosophy. Karuppusami and Gandhinathan (2007) demonstrated a web based methodology to measure the level of TQM implementation in Indian industries. Moreover, this study provides a synthesis of the quality literature by identifying critical success factors of quality management in manufacturing sector.

Likewise, Mahadevappa and Kotreshwar (2004), Padma et al. (2008) explores the critical factors of ISO 9001:2000 and determine the impact of certification on organization performance. The results gravitate the fact that ISO 9001:2000 as the first big step in a TQM program and implementing this helps to pave the way for continual improvement. Parvadavardini et al. (2015) conducted an empirical study on manufacturing organizations underline the impact of TQM practices on quality and financial performance. In addition to that, it also accentuates the direct impact of quality performance on financial performance.

Apart from manufacturing industries, several types of research were carried out in service sector too. Issac et al. (2004) attempted to investigate the role of TQM practices in software firms. The results emphasize the relevance of TQM practices as well as the implementation period in improving operational performance in the case of software industry. Saravanan and Rao (2006) identified and empirically validated

twelve total quality service dimensions from the perspective of management covering all aspects of TQM in service organizations.

Talib et al. (2010) carried out an empirical study to assess the extent to which TQM practices have impact on quality performance specifically in Indian service sector. This study has contributed 17 TQM practices and their association with quality performance. Accordingly, the results are providing valuable knowledge to the top management of service organizations to refine the current quality practices and compare the quality performance.

Even though many researchers conducted on various TQM dimensions independently, it seems that no research work has collectively taken all these dimensions into consideration in the manufacturing sector. This necessitates the scope for developing a model showing the interrelationship between TQM practices and multiple performance indicators.

#### **2.4 TQM CRITICAL FACTORS**

Having depicted the concept of TQM, it is imperative to establish an understanding and knowledge of the underlying critical factors for the successful implementation of TQM in an organization. Numerous researches have been carried out to determine the critical factors required for the successful implementation of TQM in an organization. These studies have been performed in three different ways: contributions from quality leaders (Crosby, 1979; Deming, 1982; Ishikawa, 1985; Juran, 1988; Feigenbaum, 1991), formal evaluation of business excellence models (European Quality Award, Malcolm Baldrige National Quality Award, and The Deming Award), and formal empirical research works (Saraph et al., 1989; Flynn et al., 1994; Badri et al., 1995; Ahire et al., 1996; Black and Porter, 1996; Grandzol and Gershon, 1998; Sohal et al., 1998; Quazi et al., 1998). This leads to reach an inconclusive approach for implementing TQM (Kanji, 2001). Also, as such, no study has identified a universalistic set of TQM practices.

Through a comprehensive review of TQM literature, this work identified 13 critical factors based on following reasons (Hoang, Igel, & Laosirihongthong, 2006) and it is presented in Table 2.1.

- They have been identified as critical TQM practices for both manufacturing and service organizations.
- They represent hard and soft elements of TQM in the past literature.
- They are selected based on the frequency of occurrence in various research works.
- And they incorporate the most well-known quality award criteria followed by TQM practitioners and academicians.

Table 2.1 Critical factors selected for the research work

No	Critical factors selected for the present study	Description
1	Leadership and top management commitment (LTMC)	Commitment to ensure and maintain the quality within the organization, sharing vision and quality goals, visibility in developing and maintaining an environment of organizational quality excellence.
2	Customer focus (CF)	Identifying customer's requirements, assessing their satisfaction and supporting activities for improving customer satisfaction. Increasing contacts between the organization and customers.
3	Supplier quality management (SQM)	Supplier quality, involvement and relationships.
4	Continuous improvement (CI)	Indicates whether the organization has created an organizational structure (quality committee, a person in charge of quality and work teams) responsible for this improvement by identifying actions through information management.
5	Employees empowerment (EE)	Recognition and reward activities for excellent suggestions and superior performance
6	Education and training (ET)	Measures whether the organization shows an interest in employees learning about all the basic aspects and its business by encouraging continuous learning, also include training in problem-solving and teamwork.
7	Quality information analysis (QIA)	Use of information technology and quality tools, extend to which quality data used for planning and decision making.
8	Quality assurance (QA)	Design of process that meets and exceeds product/service quality requirements. Error and failure prevention activities along the value-added chain. Sound procedures for design and introduction of new or improved products and services.
9	Quality citizenship (QCZ)	Consideration for public health, safety, and environmental issues as company's responsibility. Extension of organization's quality leadership to the external community.
10	Quality culture (QC)	Feeling of togetherness, accepting quality as a strategic weapon, also about sticking to core value, i.e., excellence, integrity, teamwork, and service to customer.
11	Process management (PM)	Continuous control and improvement of key processes, preventing faulty products/services is a strong practice in this organization, clarity of work or process instructions given to employees, stability of work schedules.
12	Product innovation (PI)	New products should be innovated by thoroughly considering customer requirements. Approaches such as quality function deployment, and experimental design used by organizations to translate customer requirements into action by cross functional product innovation teams.
13	Knowledge management (KM)	Specific framework to capture, acquire, organize, and communicate both tacit and explicit knowledge of employees so that other employees may apply them to be more effective and productive in their work and maximize organization's knowledge.

Over the past few years a number of studies have been reported in literature, which have examined and compared quality management practices in different countries around the world, which is summarized in Table 2.2.



Table 2.2 Summary of past TQM empirical works

	1	2	3	4	5	6	7	8	9	10	11	12	13	COUNTRY
Crosby,1979	X	X		X				X						
Deming, 1982	X	X		X	X			X						
Saraph et al.,1989	X		X		X	X	X	X			X			USA
Berry,1991	X	X		X	X			X						
Juran & Gyra,1993	X	X		X				X						
Wilkinson et al.,1993	X	X		X				X						UK
Anderson et al.,1994,1995	X	X		X	X	X		X			X			Australia
Dean & Bowen,1994	X	X		X	X			X						USA
Mohrman et al.,1995		X	X					X		X				USA
Powell,1995	X	X	X		X	X					X			Australia
Flynn et al.,1995	X	X	X		X		X				X			USA
Black & Porter,1996	X	X		X	X			X						Europe
Ahire et al.,1996	X	X	X		X	X	X				X			UAE
Adam et al.,1997	X							X					X	Multiple countries
Grandzol & Gershon,1997	X	X		X	X	X					X			USA
Ahire &O'Shaughnessy,1998	X	X			X	X	X				X			USA
Forza & Flippini,1998		X	X		X					X	X			Italy
Rungtusantham et al.,1998	X			X	X	X					X			Multiple countries
Sohal et al.,1998	X	X						X		X	X			Australia
Rao et al.,1999	X	X	X			X	X		X					Multiple countries
Dow et al.,1999	X	X	X			X								Australia
Samson & Terziovski,1999	X	X	X			X								Australia
Das et al.,2000								X		X				Thailand
Wilson & Collier,2000	X				X		X				X			USA
Yusof & Aspinwall,2000	X		X	X	X	X					X			UK
Agus & Sagir,2001	X	X	X			X								Malaysia
Ho e al.,2001			X			X	X							Hong Kong
Brah et al.,2002	X	X	X		X	X	X			X	X			Singapore
Kaynak,2003	X		X			X	X				X			USA
Claver et al.,2003	X	X	X	X		X					X			Spain
Sadikoglu & Olcay,2004	X	X	X			X					X		X	Turkey
Prajogo & Sohal,2004	X	X			X		X				X			Australia
Kannan & Tan,2005	X													Thailand
Parast et al.,2006	X	X	X		X		X	X						Middle East
Jun,2006	X				X	X								Mexico
Arumugam & Ooi,2006	X	X	X	X			X				X			Malaysia
Fuentes et al.,2006	X	X		X	X	X					X			Spain
Sila,2007	X	X	X		X	X	X				X			US
Claver & Tari,2007	X	X	X	X	X	X					X			Spain
Tari et al.,2007	X	X	X	X		X					X			Spain
Prajogo & Hong,2008	X	X			X	X	X				X			Korea
Sadikoglu and Zehir,2010	X	X	X	X	X	X	X				X			Turkey
Zakuan et al.,2010	X	X	X			X	X	X						Literature
Kumar et al.,2011	X	X		X	X	X								India
Phan et al.,2011	X	X	X			X	X				X			Japan
Maroofi,2012	X	X	X								X			Iran
Parast & Adams,2012	X						X		X					US
Kim et al.,2012	X	X	X			X	X			X				Canada
Ooi et al.,2012	X	X		X	X	X	X				X	X		Malaysia
Talib et al.,2013	X	X	X	X	X	X	X	X		X	X	X		India
Tan,2013	X	X			X	X	X				X			Malaysia
Singh & Dubey,2013	X		X		X	X				X				India
Ooi ,2014	X	X			X		X				X		X	Malaysia
Valmohammadi & Roshanzamir,2014	X	X	X	X	X							X	X	Iran
Assarlind & Gremyr,2014	X					X								US
Lee & Lee,2014		X		X							X			Singapore
Refaie & Hanayneh,2014	X	X			X	X	X				X			Jordan
Pattanayak & Punyatoya,2015	X	X				X	X							India
Danyen & Callychurn,2015	X	X	X	X		X	X				X			Mauritius
Nair & Choudhary,2016	X	X	X	X	X		X				X			Qatar
Sweis et al.,2016	X	X		X		X								Jordan
<b>FREQUENCY OF OCCURANCE</b>	<b>56</b>	<b>48</b>	<b>31</b>	<b>24</b>	<b>33</b>	<b>37</b>	<b>27</b>	<b>16</b>	<b>2</b>	<b>8</b>	<b>34</b>	<b>3</b>	<b>4</b>	

1-13 indicates the critical factors selected in this study as shown in Table 2.1

## 2.5 RELATIONSHIP BETWEEN TQM PRACTICES AND MULTIPLE PERFORMANCE INDICATORS

TQM proponents have asserted that if properly implemented, TQM can lead to improved organization performance. Likewise, TQM practices, performance measures were also conceptualized differently across studies. Numerous empirical studies have carried out to establish the relationship between TQM practices and different performance indicators such as quality performance, customer related performance, operating performance, employees performance and financial performance which provides mixed and ambiguous results (Hendricks and Singhal, 2001; Shenaway et al., 2007; Prajogo and Sohal, 2003; Arumugam et al., 2008; Powell, 1995; Kannan and Tan, 2005; Rahman and Bullock, 2005; Yang et al., 2009; Prajogo and Sohal, 2004; Santos-Vijande and Alvarez-Gonzalez, 2007; Singh and Shrivastava, 2012; Talib et al., 2013; Danyen and Callychurn, 2015; Para-González et al., 2014; Sweis et al., 2016).

Having provided an insight to the various items used to form and assess the TQM practices, and the dependent variable, i.e. organizational performance, is operationalized by the use of seven performance measures detailed in Table 2.3.

Table 2.3 Performance indicators selected for the study

No	Performance indicators	Description
1	Quality performance, QP	Quality cost, reliability of product, decline in number of litigation claims, competitiveness, meeting product quality.
2	Customer satisfaction level, CSL	Level of satisfaction, customer retention, maintaining good relationship with customers, resolving complaints quickly
3	Employee performance, EP	Improved employee satisfaction, reduced level of absenteeism, improved employee skills, communication with employees has improved and reduced employee turnover ratio.
4	Operating performance, OP	Delivers the products on time to customers, cycle time reduction, decline in defect rate of products, productivity of the firm improved and reduced machine breakdown time.
5	Innovation performance, IP	Speed of new product introducing to market, use of latest technological innovations, innovations are introduced to work processes and methods and high technological competitiveness
6	Society results, SR	Improved social image or positive impact on society, improved safety and no. of accidents got lowered. Protection of environment has improved. Reduced pollution level and noise level has decreased.
7	Financial performance, FP	Return on total assets (ROA), Sales, growth in revenues, operating expenses, gross profit margin

These items are chosen, based on an assessment of the empirical literature review, with the aim of identifying items which are both valid and able to cover multiple aspects of organizational performance. This work thus seeks to overcome limitations of several former studies within the area of TQM, as many of the previous studies only investigate any one or two performance dimensions.

There is enormous amount of literature relating to TQM and its impact on various performance measures by innumerable researchers and practitioners. Table 2.4 summarizes the works conducted to identify the relationship between TQM practices and performance indicators.

Table 2.4 Summary of literature showing the relationship between TQM practices and performance indicators

	TQM-QP	TQM-CSL	TQM-EP	TQM-OP	TQM-IP	TQM-SR	TQM-FP	TQM-BP
Carter & Narasimhan,1994				X				
Anderson et al.,1994,1995		X						
Mohrmann et al.,1995			X				X	
Flynn et al.,1995	X			X				
Powell,1995				X			X	
Hendricks and Singhal 1996							X	
Fiatrault et al.,1996e		X						
Grandzol & Gershon,1997				X			X	
Adam et al.,1997			X	X			X	
Chenhall,1997							X	
Forza & Flippini,1998		X						
Choi & Eboch,1998		X						
Grandzol,1998		X	X					
Easton & Jarrell, 1998							X	
Anderson et al.,1998				X				
Anderson & Sohal, 1999				X				
Dow et al.,1999	X			X				
Samson & Terziovski,1999	X			X				
Tata et al.,2000				X				
Zhang 2000	X							
Das et al.,2000		X					X	
Parzinger & Nath,2000		X						
Sun,2000		X						X
Wilson & Collier,2000		X					X	
Ho et al.,2001				X				
Douglas & Judge,2001							X	
Su et al.,2001	X							
Cua et al., 2001	X			X				
McAdam & Bannister,2001			X					
Boselie & Wiele,2002			X					
Brah e al.,2002	X	X	X					
Kaynak,2003	X						X	
Shah & Ward,2003				X				
Claver et al.,2003		X	X			X		X
Prajogo & Sohal , 2003;2004;2006	X				X			
Sanchez-Rodriguez & Martinez-Lorente,2004							X	
Sadikoglu & Olcay,2004		X	X	X	X	X	X	
Lin et al.,2005								X
Rahman & Bullock,2005				X				X
Lakhal et al., 2006	X			X			X	
Arumugam & Ooi,2006	X							
Hermaann et al.,2006	X							
Yang,2006	X	X	X					

Table 2.4 (Contd.) Summary of literature showing the relationship between TQM practices and performance indicators

	TQM-QP	TQM-CSL	TQM-EP	TQM-OP	TQM-IP	TQM-SR	TQM-FP	TQM-BP
Fuentes et al.,2006			X	X			X	
Feng et al.,2006	X				X			
Joiner,2006								X
Jun,2006			X					
Sila e al.,2007		X	X				X	
Saravanan & Rao, 2007	X			X				
Claver & Tari,2007	X	X	X			X		
Tari et al.,2007	X	X	X			X		
E Sa & Abrunhosa,2007					X			
Arumugam et al., 2008	X							
Prajogo & Hong,2008	X				X			
Costa & Lorente,2008					X			X
Sit et al.,2009		X						
Sadikoglu & Zehir,2010			X		X			X
Zakuan et al.,2010		X	X					X
Wong et al.,2010	X							
Phan et al.,2011								X
Duh et al.,2012								X
Parast & Adams,2012				X				X
Kim et al.,2012					X			
Ooi et al.,2012					X			
Talib et al.,2013	X				X			
Tan,2013								X
Singh & Dubey,2013								X
Valmohammadi & Roshanzamir,2014								X
Youssef et al.,2014			X					
Lee & Lee,2014								X
Refaie & Hanayneh,2014								X
Pattanayak & Punyatoya,2015		X						
Danyen & Callychurn,2015	X			X				X
Sweis et al.,2016								X
Nair & Choudhary,2016							X	X

## 2.6 LITERATURE CONCLUSION

Based on an inclusive literature review, we could identify critical factors for the successful implementation of TQM in an organization and performance indicators. In addition literature survey thrown light for the identification of the possible methodologies to analyze the relationships between TQM practices and performance measures.

The past empirical works emphasized the importance to explore the interdependencies existing between the core TQM practices and their relationships with these performance measures. Additionally, several debates in positioning the nature of relationship between TQM practices and performance indicators have been identified. Thus an empirical study was designed to unravel these confusions by testing the relationship between variables. To guide in this direction for the analyses, the hypotheses were developed. The details of these activities are explained in the next chapter.

## **CHAPTER 3**

### **RESEARCH FRAMEWORKS AND HYPOTHESES FORMULATION**

From the literature analysis, it has been identified that there is no concrete research model for identifying the direct and mediating effects of TQM practices on various performance indicators. In addition to that, there is no clear framework existing in the past studies depicting the indirect effect of TQM practices on performance indicators pertinent to Indian manufacturing sector. Based on the previous literature review, conceptual frameworks were developed to examine the relationship between the TQM practices and multiple performance indicators. In this conceptual framework, TQM practices act as an independent variable and the performance indicators as dependent variables. With the help of this model showing the linkage between TQM practices and performance indicators, the managers and decision makers can suitably introduce or implement TQM in an organization with empirical evidence.

#### **3.1 CONCEPTUAL FRAMEWORKS SHOWING THE RELATIONSHIP BETWEEN TQM PRACTICES AND PERFORMANCE INDICATORS**

##### **3.1.1 QUALITY PERFORMANCE FRAMEWORK**

If an organization follows TQM practices, it is expected to improve quality performance. Thereby it is widely considered as a performance indicator by majority of researchers. As almost all other facets of performance were considered in this study, the conceptualization of quality performance was regarding quality aspect only. The majority of the previous researches report that overall TQM practices have been positively related to quality performance (Prajogo and Sohal, 2003, 2004, 2006; Dow et al., 1999; Samson and Terziovski, 1999; Cua et al., 2001). Conversely, some authors have asserted the negative or insignificant results (Rahman and Bullock, 2005; Yang et al., 2009). Hence it is required to formulate hypothesis showing the linkage of TQM practices on quality performance, and it is depicted in the framework given in Figure 3.1.

H1: TQM practices have a direct and positive effect on quality performance.

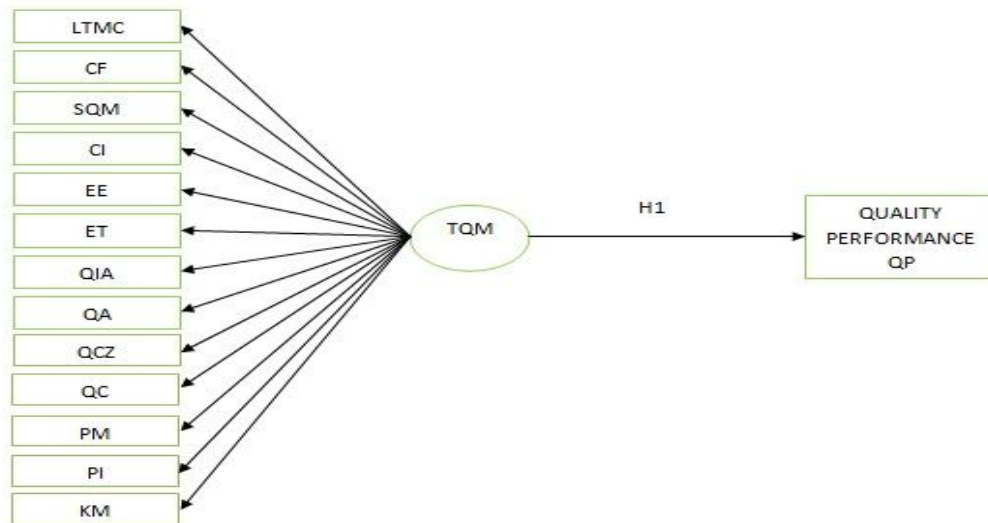


Figure 3.1 Quality performance framework

### 3.1.2 CUSTOMER SATISFACTION LEVEL FRAMEWORK

Previous research on quality management has exposed the fact that implementation of TQM practices is not only intended to achieve key business outcomes, but also internal as well as external customer satisfaction and also the positive impact on society. A firm's survival depends upon the satisfaction of their customers (Deming, 1986; Brah et al., 2002), and hence organizations should use customer satisfaction to measure their performance (Madu and Kuei, 1993). In the current research, the customer satisfaction level has been also chosen as a performance indicator for measuring the organization performance similar to prior studies (Choi and Eboch, 1998; Das, et al., 2000; Sun, 2000; Filiatrault, et al., 1996; Grandzol, 1998; Parzinger and Nath, 2000). Implementing TQM practices has been treated as strategic weapon for enhancing customer satisfaction and loyalty (Jablonski, 1992; Tennor and DeToro, 1992). Hence it is required to formulate hypothesis showing the linkage of TQM practices on customer satisfaction level and it is depicted in the framework given in Figure 3.2

H2: TQM practices have a direct and positive effect on customer satisfaction level.

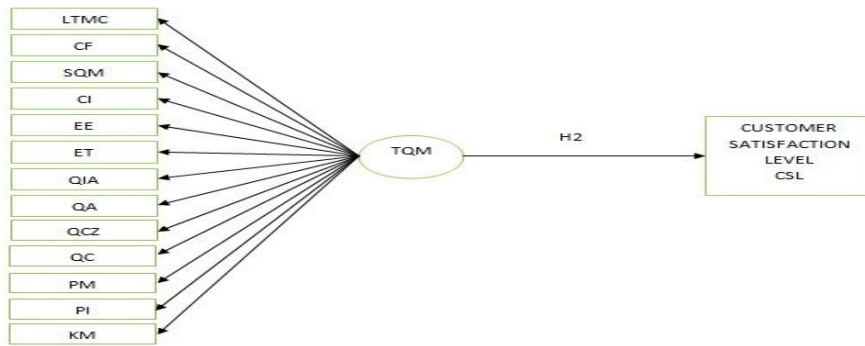


Figure 3.2 Customer satisfaction level framework

### 3.1.3 EMPLOYEE PERFORMANCE FRAMEWORK

Together with the external customers, the organizations must also recognize internal customers, the employees. An organization's success depends upon the knowledge, skills and creativity of employees. As indicated earlier, some literature had identified the influence of TQM practices on employee performance (Sila, 2007; Mohrman et al., 1995; McAdam and Bannister, 2001; Grandzol, 1998; Adam et al., 1997; Boselie and Wiele, 2002). Hence it is important for an organization to know which key factors they should focus their efforts on, in order to improve employee satisfaction. Accordingly, the following hypothesis is proposed showing the linkage of TQM practices on employee performance, and it is portrayed in the framework given in Figure 3.3.

H3: TQM practices have a direct and positive effect on employee performance.

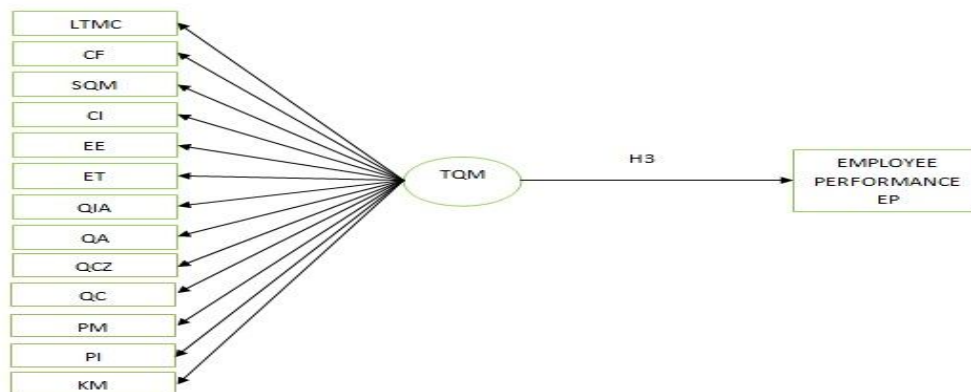


Figure 3.3 Employee performance framework

### 3.1.4 OPERATING PERFORMANCE FRAMEWORK

As depicted in Table 2.3, it is apparent from the literature that TQM practices have positive impact on operating performance (Grandzol and Gershon, 1997; Rahman and Bullock, 2005; Fuentes et al., 2004, 2006; Cua et al., 2001; Dow et al., 1999; Samson and Terziovski, 1999; Shah and Ward 2003; Anderson and Sohal 1999; Anderson et al., 1998; Tata et al., 1999; Carter and Narasimhan, 1994). Effectual TQM practices aid to reduce product variations and thereby reduce the need for rework, mistakes as well as inventory which continuously improve operating performance. Subsequently, the following hypothesis is suggested, and it is shown in Figure 3.4.

H4: TQM practices have a direct and positive effect on operating performance.

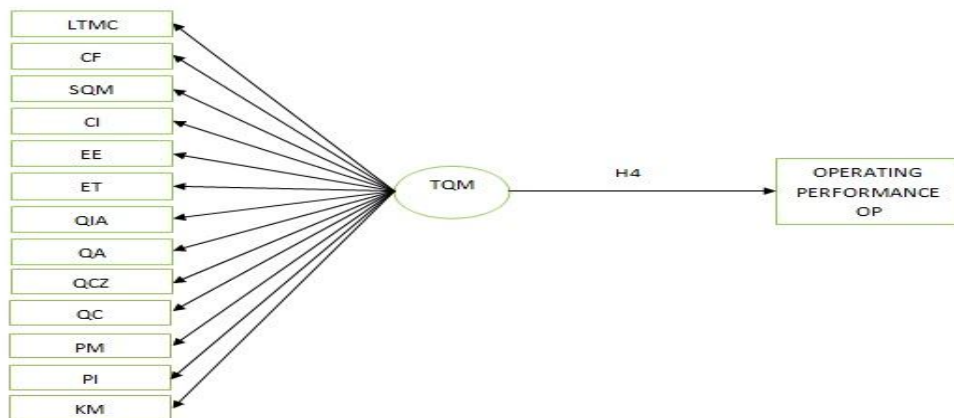


Figure 3.4 Operating performance framework

### 3.1.5 INNOVATION PERFORMANCE FRAMEWORK

Innovation has always been essential for the organization's long term survival. Hence it plays a vital role in the organization's future to follow the changing demands and requirements of the customers. The literature contains both negative and positive arguments regarding the linkage between TQM practices and innovation performance (Prajogo and Sohal, 2003, 2004; Costa and Lorente, 2008). Thus it is worthwhile to examine whether TQM practice enhances or hinders the innovation performance. Accordingly, propose the hypothesis, and it is depicted in Figure 3.5.

H5: TQM practices have a direct and positive effect on innovation performance.



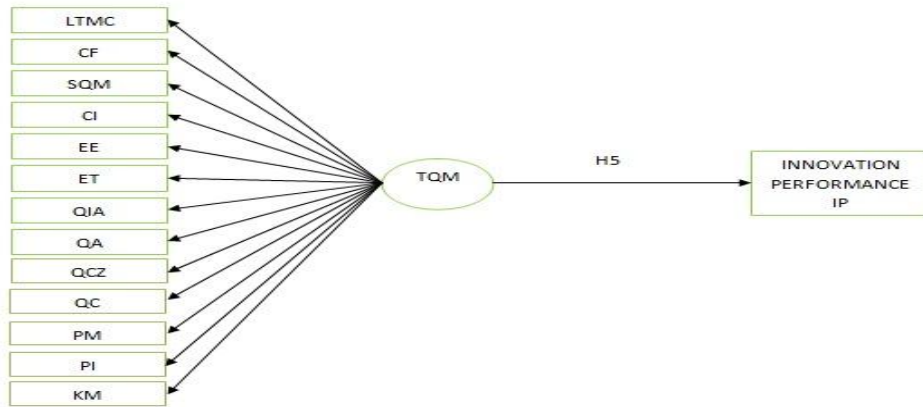


Figure 3.5 Innovation performance framework

### 3.1.6 SOCIETY RESULTS FRAMEWORK

According to Tari and Garceia (2011), the organizations which implement TQM practices successfully have a greater awareness of certain dimensions of social responsibility. There are only very few studies which addressed the linkage between TQM practices and society results and demonstrated how quality management could facilitate the development of social responsibility and environmental management in organization (Bernes et al., 2007). Presently, investors are more likely to invest in firms that are committed to socially responsible practices (Jo , 2003). Therefore the hypothesis is proposed to examine the relationship between TQM practices and society results, and it is represented in Figure 3.6.

H6: TQM practices have a direct and positive effect on society results.

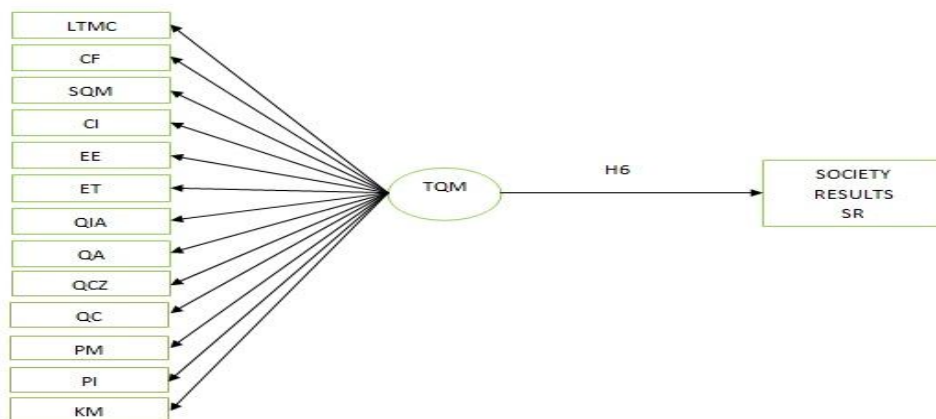


Figure 3.6 Society results framework

### 3.1.7 FINANCIAL PERFORMANCE FRAMEWORK

As indicated in the literature, effective TQM practices can lead to improved financial status which was corroborated by majority of the studies. Regarding this indicator, the conceptualization was only different across studies. Otherwise, the result supported the positive impact of TQM practices on financial performance (Hendricks and Singhal, 1996; Easton and Jarrell, 1998; Douglas and Judge, 2001; Mohrman et al., 1995; Sanchez-Rodriguez and Martinez-Lorente, 2004). It is considered as the ultimate goal of every organization irrespective of their profile. Therefore it is required to establish that if an organization implements TQM as an excellence tool, can it consequently lead to better financial results. Thus proposes the hypothesis to explore this relationship, which was depicted in Figure 3.7.

H7: TQM practices have a direct and positive effect on financial performance.

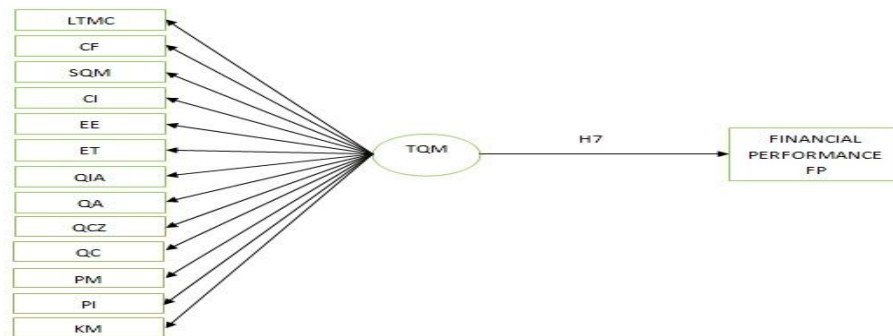


Figure 3.7 Financial performance framework

### 3.2 INDIVIDUAL IMPACT OF TQM PRACTICES ON PERFORMANCE INDICATORS

Based on the literature reviewed, the previous works obtained mixed results regarding the linkage between TQM practices and performance indicators. It demands this study to explore the key TQM practices corresponding to each performance indicator to achieve excellence in that area. The empirical support will strongly aid the organization to concentrate their focus on those key drivers to improve the performance. To examine the impact of TQM practices individually on the performance indicators, the following hypotheses were developed as shown in Figure 3.8.

### **3.2.1 LEADERSHIP AND TOP MANAGEMENT COMMITMENT**

As summarized in Table 2.1, previous researches emphasized the vital role of leadership and top management commitment for the successful implementation of TQM in an organization. To achieve total quality, top managers must clarify the quality goals; actively involve in quality initiatives and allocate adequate resources to quality improvement efforts. Top management commitment to quality management is evidenced as a primary step in an organization to adopt TQM culture (Anderson et al., 1995; Antony, et al., 2002). According to Kanji (2001), top management leadership and commitment is the fundamental driver of business excellence. Through supporting, implementing and reinforcing quality practices, top management commitment has a significant effect on improving organization's performance (Wilson and Collier, 2000; Kaynak, 2003). Additionally, previous studies have found that intensive leadership and management commitment improves quality performance, customer satisfaction level, employee performance, operating performance, innovation performance, society results and financial performance. In this context, the following set of hypotheses relating to the impact of leadership and top management commitment on multiple performance indicators are proposed.

- H1<sub>1</sub>: Leadership and top management commitment (LTMC) is positively associated with quality performance.
- H2<sub>1</sub>: Leadership and top management commitment (LTMC) is positively associated with customer satisfaction level.
- H3<sub>1</sub>: Leadership and top management commitment (LTMC) is positively associated with employee performance.
- H4<sub>1</sub>: Leadership and top management commitment (LTMC) is positively associated with operating performance.
- H5<sub>1</sub>: Leadership and top management commitment (LTMC) is positively associated with innovation performance.
- H6<sub>1</sub>: Leadership and top management commitment (LTMC) is positively associated with society results.
- H7<sub>1</sub>: Leadership and top management commitment (LTMC) is positively associated with financial performance.

### **3.2.2 CUSTOMER FOCUS**

Customer focus is a widely discussed TQM practice throughout the literature. It is thus clear that quality does not exclusively rely on the organization's capability to develop a product with predetermined technical specification. In order to stay competitive, organizations must be knowledgeable regarding customer requirements and responsive to customer demands and preferences. Apart from that, they have to adopt reliable feedback collection mechanisms as well as customer complaint monitoring systems to improve the customer satisfaction. Customer focus activities play a vital role in propelling organization performance (Deming, 1986; Dean and Bowen, 1994). To address the importance of customer focus, the following hypotheses are proposed.

- H1<sub>2</sub>: Customer Focus (CF) is positively associated with quality performance.
- H2<sub>2</sub>: Customer Focus (CF) is positively associated with customer satisfaction level.
- H3<sub>2</sub>: Customer Focus (CF) is positively associated with employee performance.
- H4<sub>2</sub>: Customer Focus (CF) is positively associated with operating performance.
- H5<sub>2</sub>: Customer Focus (CF) is positively associated with innovation performance.
- H6<sub>2</sub>: Customer Focus (CF) is positively associated with society results.
- H7<sub>2</sub>: Customer Focus (CF) is positively associated with financial performance.

### **3.2.3 SUPPLIER QUALITY MANAGEMENT**

For successful TQM implementation, organization's ability to satisfy and fulfill the interests of various stakeholders plays a crucial role. The importance of creating and sustaining superior supplier relationships is widely emphasized in empirical studies (Flynn et al., 1995; Turkyilmaz et al., 2011), as the quality of input, such as purchased raw materials, is directly related to the final product. Previous studies have found that effective supply management activities facilitate the suppliers, to practice quality management and deliver reliable as well as good quality products and services timely, which leads to improve the overall organization performance, particularly in manufacturing industries. With the point of departure in the above studies supporting the importance of supplier quality management, the following hypotheses are developed.

- H1<sub>3</sub>: Supplier quality management (SQM) is positively associated with quality performance.
- H2<sub>3</sub>: Supplier quality management (SQM) is positively associated with customer satisfaction level.
- H3<sub>3</sub>: Supplier quality management (SQM) is positively associated with employee performance.
- H4<sub>3</sub>: Supplier quality management (SQM) is positively associated with operating performance.
- H5<sub>3</sub>: Supplier quality management (SQM) is positively associated with innovation performance.
- H6<sub>3</sub>: Supplier quality management (SQM) is positively associated with society results.
- H7<sub>3</sub>: Supplier quality management (SQM) is positively associated with financial performance.

#### **3.2.4 CONTINUOUS IMPROVEMENT**

Continuous improvement has obtained a vital role for the effective implementation of TQM in an organization. It refers to both incremental changes, which are small and gradual. As specified earlier, continuous improvement means never ending efforts to act upon processes to develop new or improved method to make refinements. By implementing continuous improvement practices effectively, it reinforces incessant improvement of products, processes, and services in the organizations, reducing the process variability as well as developing specific organizational structures for quality improvements. Thereby helping to harness the optimum utilization of resources to reap valuable outputs (Anderson et al., 1994; Walton, 1986; Johston and Daniel, 1991). Thus the following set of hypotheses is proposed.

- H1<sub>4</sub>: Continuous improvement (CI) is positively associated with quality performance.
- H2<sub>4</sub>: Continuous improvement (CI) is positively associated with customer satisfaction level.
- H3<sub>4</sub>: Continuous improvement (CI) is positively associated with employee performance.

- H4<sub>4</sub>: Continuous improvement (CI) is positively associated with operating performance.
- H5<sub>4</sub>: Continuous improvement (CI) is positively associated with innovation performance.
- H6<sub>4</sub>: Continuous improvement (CI) is positively associated with society results.
- H7<sub>4</sub>: Continuous improvement (CI) is positively associated with financial performance.

### **3.2.5 EMPLOYEE EMPOWERMENT**

An organization's success depends on the knowledge, skills, creativity, and motivation of its employees. Therefore a TQM implemented organization, demonstrate their commitment to employees, provide opportunities for development and growth as well as share knowledge and encourage them to accept challenges. Additionally, recognize them beyond normal compensation system and incorporating them in the decision making process, improves satisfaction and loyalty of employees. These empowerment programs provide employees with a positive work environment and self sufficiency in initiating and regulating action, thereby leading to better employee satisfaction and consequently lead to improvement of overall organization performance ((Flynn et al., 1995; Fuentes et al., 2004; Rahman and Bullock, 2005; Mohrman et al., 1995; Deming,1986). To depict this relationship, following set of hypotheses is proposed:

- H1<sub>5</sub>: Employees empowerment (EE) is positively associated with quality performance.
- H2<sub>5</sub>: Employees empowerment (EE) is positively associated with customer satisfaction level.
- H3<sub>5</sub>: Employees empowerment (EE) is positively associated with employee performance.
- H4<sub>5</sub>: Employees empowerment (EE) is positively associated with operating performance.
- H5<sub>5</sub>: Employees empowerment (EE) is positively associated with innovation performance.
- H6<sub>5</sub>: Employees empowerment (EE) is positively associated with society results.

H7<sub>5</sub>: Employees empowerment (EE) is positively associated with financial performance.

### **3.2.6 EDUCATION AND TRAINING**

It is evident from the literature that education and training of employees is an important factor underlying the sustainability and enhancement of organizational growth. Effective training to employees helps to improve their proficiencies in their task; to mould them as problem solvers and innovators; assist them to acquire, disseminate and apply the knowledge at relevant situations; and also to produce reliable and high quality products. Also it helps to create motivated and loyal employees who improve employee involvement and satisfaction. Hence it seems reasonable that effective training improves different performance indicators of an organization (Kaynak, 2003; Anderson et al., 1998; Fuentes et al., 2006; Ahire and Dreyfus, 2000; Quazi et al., 1998). Thus the following set of hypotheses is proposed.

H1<sub>6</sub>: Education and training (ET) is positively associated with quality performance.

H2<sub>6</sub>: Education and training (ET) is positively associated with customer satisfaction level.

H3<sub>6</sub>: Education and training (ET) is positively associated with employee performance.

H4<sub>6</sub>: Education and training (ET) is positively associated with operating performance.

H5<sub>6</sub>: Education and training (ET) is positively associated with innovation performance.

H6<sub>6</sub>: Education and training (ET) is positively associated with society results.

H7<sub>6</sub>: Education and training (ET) is positively associated with financial performance.

### **3.2.7 QUALITY INFORMATION ANALYSIS**

Based on the literature reviewed, quality information analysis was identified as a vital practice in improving multiple performance indicators of an organization (Choi and Eboch, 1998; Prajogo and Sohal, 2004; Ho et al.,2001; Quazi et al.,1998). Proper quality information analysis helps the organization to ensure the availability of high quality timely data and information for all users like employees, suppliers, and

customers. Moreover it also make sure that the quality data is monitored properly and incorporate it into decision making, planning and controlling. Thus it improves the organization's performance.

Accordingly, the following set of hypotheses is proposed.

- H1<sub>7</sub>: Quality information analysis (QIA) is positively associated with quality performance.
- H2<sub>7</sub>: Quality information analysis (QIA) is positively associated with customer satisfaction level.
- H3<sub>7</sub>: Quality information analysis (QIA) is positively associated with employee performance.
- H4<sub>7</sub>: Quality information analysis (QIA) is positively associated with operating performance.
- H5<sub>7</sub>: Quality information analysis (QIA) is positively associated with innovation performance.
- H6<sub>7</sub>: Quality information analysis (QIA) is positively associated with society results.
- H7<sub>7</sub>: Quality information analysis (QIA) is positively associated with financial performance.

### **3.2.8 QUALITY ASSURANCE**

As indicated in the literature, it is vital to focus quality assurance efforts on both design and conformance to improve various dimensions of organization's performance. Therefore, the next set of hypothesis attempts to examine the relationship between quality assurance and multiple performance indicators.

- H1<sub>8</sub>: Quality assurance (QA) is positively associated with quality performance.
- H2<sub>8</sub>: Quality assurance (QA) is positively associated with customer satisfaction level.
- H3<sub>8</sub>: Quality assurance (QA) is positively associated with employee performance.
- H4<sub>8</sub>: Quality assurance (QA) is positively associated with operating performance.
- H5<sub>8</sub>: Quality assurance (QA) is positively associated with innovation performance.
- H6<sub>8</sub>: Quality assurance (QA) is positively associated with society results.
- H7<sub>8</sub>: Quality assurance (QA) is positively associated with financial performance.



### **3.2.9 QUALITY CITIZENSHIP**

Quality citizenship activities promote organization's responsibility and its social image which includes improvement of safety and health care in the community, environmental excellence, energy conservation as well as an extension of quality leadership to the external community. Several studies have reported the significant impact of quality citizenship activities on various outcomes of an organization. Therefore the following set of hypothesis is proposed.

- H1<sub>9</sub>: Quality citizenship (QCZ) is positively associated with quality performance.
- H2<sub>9</sub>: Quality citizenship (QCZ) is positively associated with customer satisfaction level.
- H3<sub>9</sub>: Quality citizenship (QCZ) is positively associated with employee performance.
- H4<sub>9</sub>: Quality citizenship (QCZ) is positively associated with operating performance.
- H5<sub>9</sub>: Quality citizenship (QCZ) is positively associated with innovation performance.
- H6<sub>9</sub>: Quality citizenship (QCZ) is positively associated with society results.
- H7<sub>9</sub>: Quality citizenship (QCZ) is positively associated with financial performance.

### **3.2.10 QUALITY CULTURE**

Previous research on TQM revealed the importance of quality culture and its significant impact on performance dimensions of an organization (Gore., 1999). In general, the organizational could impact individual behavior (Bose, 2004), knowledge sharing mechanisms (Ooi et al., 2012) as well as employee satisfaction (Ooi et al., 2007). Along with this, quality culture significantly contributes in improving the performance of the organization as well as influencing the thought, feeling and interaction among stakeholders of the organization (Yusof and Ali, 2000). Thus, quality culture is linked to the organization's performance, and set of hypotheses is developed:

- H1<sub>10</sub>: Quality culture (QC) is positively associated with quality performance.
- H2<sub>10</sub>: Quality culture (QC) is positively associated with customer satisfaction level.
- H3<sub>10</sub>: Quality culture (QC) is positively associated with employee performance.
- H4<sub>10</sub>: Quality culture (QC) is positively associated with operating performance.

H5<sub>10</sub>: Quality culture (QC) is positively associated with innovation performance.

H6<sub>10</sub>: Quality culture (QC) is positively associated with society results.

H7<sub>10</sub>: Quality culture (QC) is positively associated with financial performance.

### **3.2.11 PROCESS MANAGEMENT**

The importance of implementing process management techniques for properly organizing and systematically handling processes to secure a better level of stability was emphasized in various research studies mentioned earlier (Kaynak, 2003; Flynn et al.,1995; Prajogo and Sohal, 2004; Ahire and Dreyfus, 2000; Forza and Flippini, 1998; Cua et al.,2001; Choi and Eboch, 1998; Quazi et al.,1998; Feng et al., 2006). Thus it reduces process variations and the errors incurred due to that which aid to improve organization's performance. Based on this linkage, the following set of hypotheses is proposed.

H1<sub>11</sub>: Process management (PM) is positively associated with quality performance.

H2<sub>11</sub>: Process management (PM) is positively associated with customer satisfaction level.

H3<sub>11</sub>: Process management (PM) is positively associated with employee performance.

H4<sub>11</sub>: Process management (PM) is positively associated with operating performance.

H5<sub>11</sub>: Process management (PM) is positively associated with innovation performance.

H6<sub>11</sub>: Process management (PM) is positively associated with society results.

H7<sub>11</sub>: Process management (PM) is positively associated with financial performance.

### **3.2.12 PRODUCT INNOVATION**

As previously stated, customer plays a crucial role in the organization's survival. Thus the organization's continually develops new ways for enhancing customer satisfaction which necessitates the importance of inculcating an innovative culture. Thereby they design new products that truly delight their customers as well as respond rapidly to changing demands of the market which consequently improves the overall

performance of organization (Fuentes et al., 2004). The set of hypotheses showing this relationship is presented below:

- H1<sub>12</sub>: Product innovation (PI) is positively associated with quality performance.
- H2<sub>12</sub>: Product innovation (PI) is positively associated with customer satisfaction level.
- H3<sub>12</sub>: Product innovation (PI) is positively associated with employee performance.
- H4<sub>12</sub>: Product innovation (PI) is positively associated with operating performance.
- H5<sub>12</sub>: Product innovation (PI) is positively associated with innovation performance.
- H6<sub>12</sub>: Product innovation (PI) is positively associated with society results.
- H7<sub>12</sub>: Product innovation (PI) is positively associated with financial performance.

### **3.2.13 KNOWLEDGE MANAGEMENT**

Several research works have emphasized the importance of knowledge management practices and its positive association with performance indicators. The successfully implemented TQM organization properly acquires, disseminate and practically apply knowledge throughout the organization which may help to improve the entire performance. Subsequently, the following set of hypotheses is proposed.

- H1<sub>13</sub>: Knowledge management (KM) is positively associated with quality performance.
- H2<sub>13</sub>: Knowledge management (KM) is positively associated with customer satisfaction level.
- H3<sub>13</sub>: Knowledge management (KM) is positively associated with employee performance.
- H4<sub>13</sub>: Knowledge management (KM) is positively associated with operating performance.
- H5<sub>13</sub>: Knowledge management (KM) is positively associated with innovation performance.
- H6<sub>13</sub>: Knowledge management (KM) is positively associated with society results.
- H7<sub>13</sub>: Knowledge management (KM) is positively associated with financial performance.

As portrayed in the figure, the relationship between 13 TQM practices and seven performance indicators are depicted using (13\*7=91) distinct hypotheses.

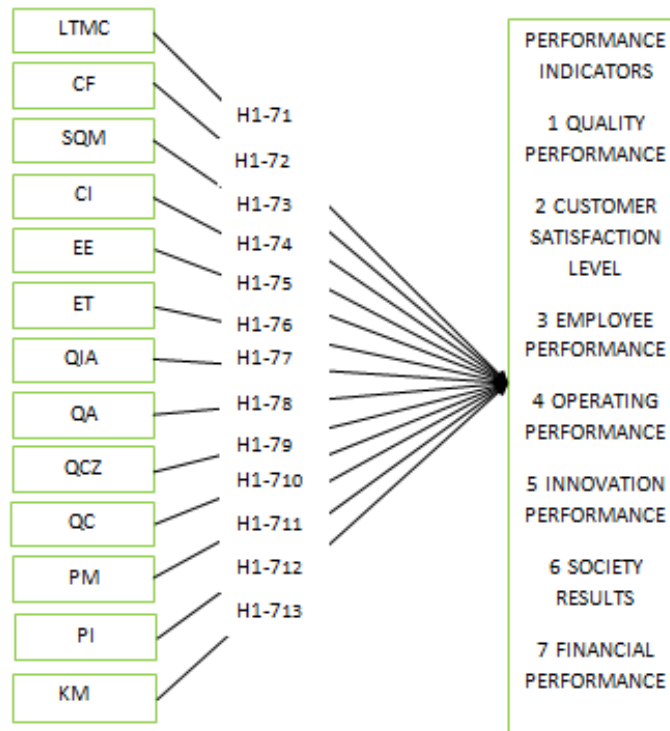


Figure 3.8 A conceptual framework showing the relationship between TQM practices and multiple performance indicators

### 3.3 MEDIATION EFFECT OF PERFORMANCE INDICATORS

#### 3.3.1 MEDIATING EFFECT OF EMPLOYEE PERFORMANCE

The effect of employee performance on customer satisfaction level was implicit from Deming’s era onwards. According to Deming’s perspective, customer satisfaction is the direct outcome of employee fulfillment. As a result, the crucial role of employee performance on customer satisfaction has drawn the interest of various researchers (Hallowell et al., 1996; Hartline and Ferrell.,1996; Sila,2007). Moreover, an empirical study by Grandzol, (1998) highlighted the impact of employee performance on operational performance. In addition, Sadikoglu and Zehir.,(2010) revealed the indirect effect of TQM practices on innovation performance. But there was no extensive empirical evidence regarding the impact of TQM practices on other performance indicators. Effective TQM practices create an environment and culture

that motivates employees which make them feel pride in their work as well as loyal and satisfied, thus leads to improve the overall performance of an organization. The indirect effect of TQM practices on other performance indicators through employee performance is shown in Figure 3.9.

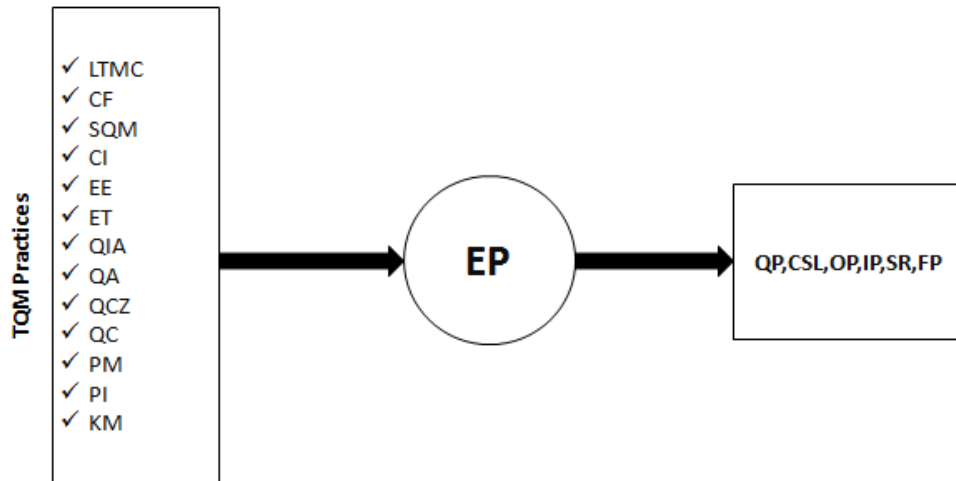


Figure 3.9 Mediating effect of employee performance

Thereby the following set of hypotheses is proposed to depict the mediating effect of employee performance

- Heq: TQM practices have an indirect and positive effect on quality performance through employee performance.
- Hec: TQM practices have an indirect and positive effect on customer satisfaction level through employee performance.
- Heo: TQM practices have an indirect and positive effect on operating performance through employee performance.
- Hei: TQM practices have an indirect and positive effect on innovation performance through employee performance.
- Hes: TQM practices have an indirect and positive effect on society results through employee performance.
- Hef: TQM practices have an indirect and positive effect on financial performance through employee performance.

### 3.3.2 MEDIATING EFFECT OF INNOVATION PERFORMANCE

As indicated earlier, innovative culture can improve customer satisfaction level by launching new products according to their demands and changes in market trends. In addition, it also inculcates latest changes in the design and technology, which improves process stability, reduce variations thereby reduce the operating and quality cost, which consequently lead to enhance financial performance. Moreover incorporating innovative technologies, may concern environmental and social issues as well as develop sustainable product design which helps to achieve a better social image. The mediating effect of innovation performance is portrayed in Figure 3.10.

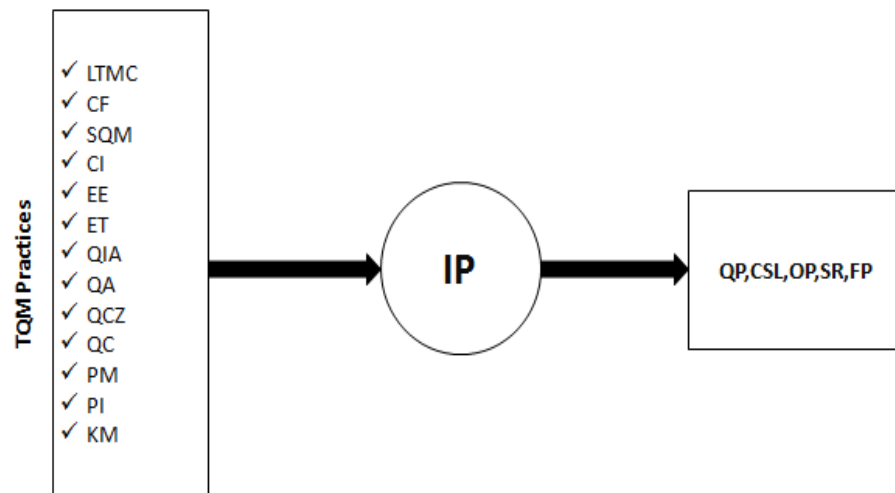


Figure 3.10 Mediating effect of innovation performance

To explore the mediating effect of innovation performance, the following set of hypotheses is proposed:

- Hiq: TQM practices have an indirect and positive effect on quality performance through innovation performance.
- Hic: TQM practices have an indirect and positive effect on customer satisfaction level through innovation performance.
- Hio: TQM practices have an indirect and positive effect on operating performance through innovation performance.
- His: TQM practices have an indirect and positive effect on society results through innovation performance.
- Hif: TQM practices have an indirect and positive effect on financial performance through innovation performance.

### 3.3.3 MEDIATING EFFECT OF OPERATING PERFORMANCE

Effective TQM practices should result in increased output uniformity as well as reduced rework and waste (Anderson et al., 1994; Forza and Flippini, 1998) because quality problems are identified and corrected immediately (Ahire and Dreyfus, 2000). This increased production quality leads to improved product quality and, in turn, other improvements in competitive priorities such as reduced costs and fast delivery. Continuously improving process and product quality will reduce the need for rework, mistakes, waste in resources which enhance productivity (Kaynak,2003) and enable it to meet the changing customer demands (Anderson et al.,1994;Rungtusanatham et al.,1998) which in turn leads to obtain greater profitability(Fuentes et al.,2004). Conversely, there is no empirical evidence regarding the impact of operating performance on society results. The mediating effect of operating performance is depicted in Figure 3.11.

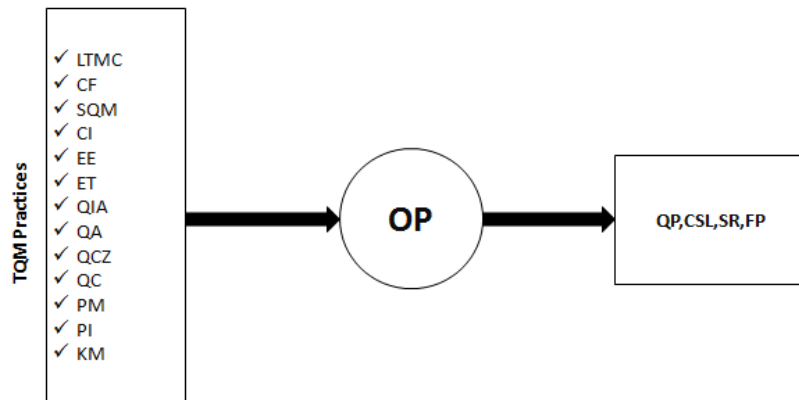


Figure 3.11 Mediating effect of operating performance

To examine the mediating effect of operating performance, the following set of hypotheses is proposed:

- Hoq: TQM practices have an indirect and positive effect on quality performance through operating performance.
- Hoc: TQM practices have an indirect and positive effect on customer satisfaction level through operating performance.
- Hos: TQM practices have an indirect and positive effect on society results through operating performance.
- Hof: TQM practices have an indirect and positive effect on financial performance through operating performance.

### 3.3.4 MEDIATING EFFECT OF QUALITY PERFORMANCE

Quality performance which directly and indirectly improves financial performance for which the literature offer several explanations for these effects. Improving product quality by reducing waste and improving efficiency will increase the return on assets (Handfield et al., 1998), which will increase profitability. If an organization gains a reputation for delivering high-quality products and services, the elasticity of demand can decrease, which, in turn, can enable them to charge higher prices and earn higher profits (Shetty, 1988). In addition, improvements in quality will result in more satisfied customers with greater loyalty which increases sales (Ahire and Dreyfus, 2000; Choi and Eboch, 1998; Handfield et al., 1998; Hendricks and Singhal, 1997), which enhance competitive position (Aaker and Jacobson, 1994; Fornell et al., 1996). But there was no empirical evidence regarding the impact of quality performance on society results.

The proposed set of hypotheses to depict the mediating effect of quality performance and it is shown in Figure 3.12.

Hqc: TQM practices have an indirect and positive effect on customer satisfaction level through quality performance.

Hqs: TQM practices have an indirect and positive effect on society results through quality performance.

Hqf: TQM practices have an indirect and positive effect on financial performance through quality performance.

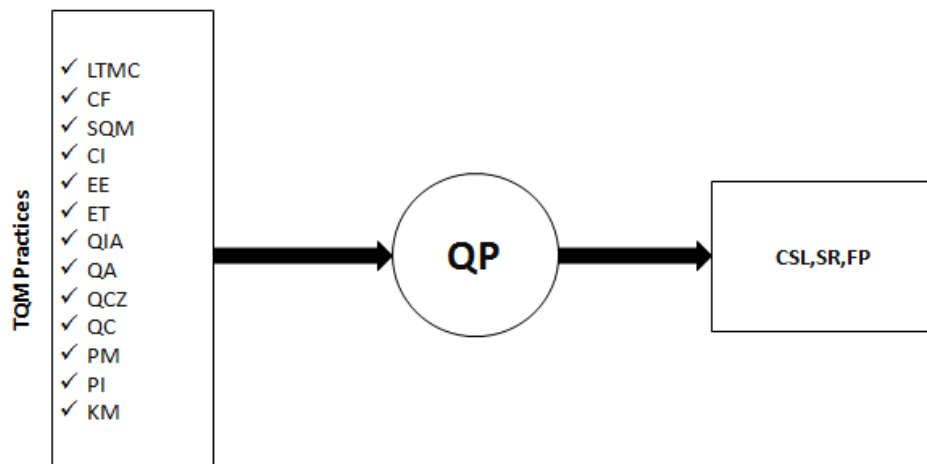


Figure 3.12 Mediating effect of quality performance



### 3.3.5 MEDIATING EFFECT OF SOCIETY RESULTS

As indicated earlier, several studies have addressed the impact of society results on customer satisfaction level and financial performance. As far as the literature is reviewed, there is no work conducted to determine the indirect effect of TQM practices on organization performance through society results. Thus the following set of hypotheses is developed to examine the mediating effect of society results and this linkage is depicted in Figure 3.13.

- Hsc: TQM practices have an indirect and positive effect on customer satisfaction level through society results.
- Hsf: TQM practices have an indirect and positive effect on financial performance through society results.

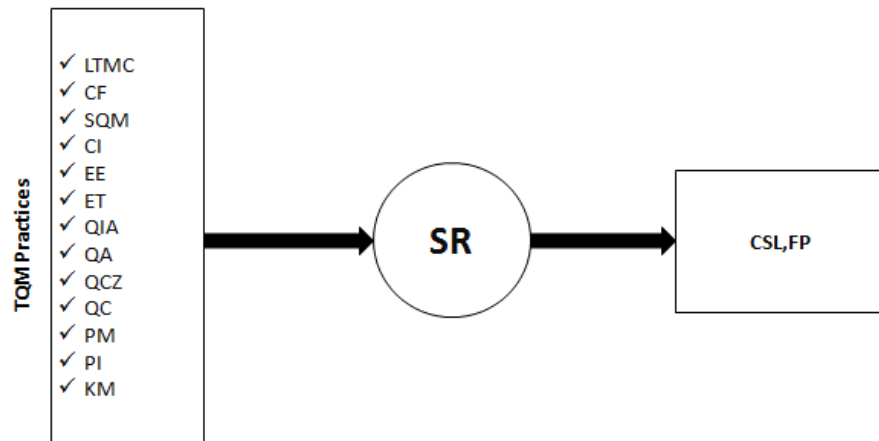


Figure 3.13 Mediating effect of society results

### 3.3.6 MEDIATING EFFECT OF CUSTOMER SATISFACTION LEVEL

Insisting on maintaining close contact with the customers continuously to identify their requirements and expectations will help to ensure customer satisfaction. Giving priority to customer focus creates customer loyalty and retention which results in repeated purchase, growth in sales, reduction in operating cost and increase in profit.(Das et al.,2000; Yeung and Ennew,2001). Based on the reviewed literature, the following hypothesis is proposed, and it is depicted in Figure 3.14:

- Hcf: TQM practices have an indirect and positive effect on financial performance through customer satisfaction level.

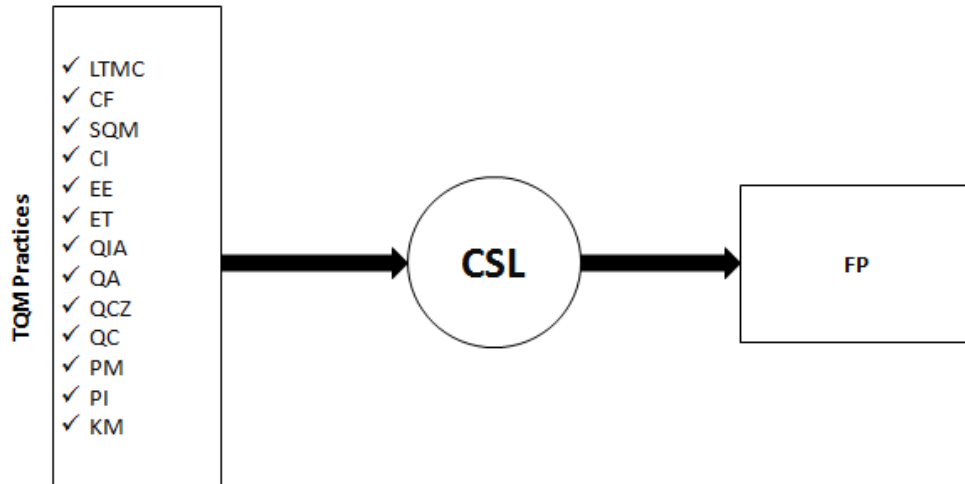


Figure 3.14 Mediating effect of customer satisfaction level

As previously indicated, the empirical evidence regarding the mediation effect of performance indicators was found to be limited to very few indicators, and it doesn't explore interrelationships between the multifaceted dimensions of organization's performance. Additionally, there is very scarce empirical evidence regarding the mediating effect, particularly in Indian manufacturing context. Majority of the organizations focus on customer satisfaction and financial performance, but the scope of this section illustrates the importance of continued efforts towards implementing TQM practices to improve other performance indicators other than customer and financial results as it mediates this linkage. It is likely that organization excelling in one performance area can lead to progress of another performance area too. Hence the mediation effect of performance indicators on others is depicted using the 21 set of distinct hypotheses.

## **CHAPTER 4**

### **RESEARCH DESIGN**

The underlying objective of this chapter is to explicate the methodological approach adopted in this work. The research method used in this study is intended to ensure the utmost satisfactory results to the research objectives posed in this study. The methodology encompasses numerous tasks. Initially, the constructs were operationalized by reviewing the existing literature and then the relevant items underlying each construct were identified. Later a survey instrument was developed which was improved by consulting with a panel of academicians and quality experts. Consequently, the reliability and validity of the TQM practices and performance indicators were confirmed.

The direct and mediation effect of TQM practices on multiple performance indicators were tested using multiple regression analysis and structural equation modeling respectively were discussed in the subsequent chapters. This chapter is commenced with the sample design adopted for this study, followed by development of research instrument, data collection procedure and finally reliability and validity analysis. The following subsections discuss each of these tasks in detail.

#### **4.1 SAMPLE DESIGN**

The sample unit of analysis in this empirical study consisted of Indian manufacturing organizations which were selected through a mixed sampling approach. A combined sampling methodology of clusterisation, stratification and convenience was adopted in this study which do not rule out the effect of randomness to a large extend. This approach was found to be appropriate for collecting ample information from the population to make statistical inferences. The population for the research is considered as the large, medium and small scale manufacturing organizations in India. Clusterisation refers to geographical cluster that is various states and districts. Kerala was selected in this study as cluster. Inter-cluster uniformity is ensured since for the implementation of TQM, the industries are working on proven TQM models as discussed in literature and uniformly accepted across nations. The factor which differentiates the sample into various strata is the size of the organization (large, medium and small manufacturing organizations in India) and each stratum exhibits

different characteristics. In Kerala, the manufacturing organizations play a crucial role in the development of the economy. Majority of the key industries in the state include, Wood Based, Food Products, Readymade Garments, Handlooms and Power-looms, Rubber / Bamboo /Coir Based Industries and General Engineering sectors.

#### **4.2 INSTRUMENT DESIGN**

A structured questionnaire was developed in this study based on the prior TQM literature, especially the works of Salaheldin (2009), Bayraktar et al., (2008), Brah et al., (2000), Sila and Ebrahimpour (2005), Saravanan and Rao (2007), Antony et al., (2002), Kaynak (2003), Santos-Vijande and Alvarez-Gonzalez (2007) and Talib et al. (2013) were adopted. First of all, a pilot survey was conducted with 30 manufacturing organizations and pre-tested several times. The survey instrument was modified based on the pilot study, and then validated with the help of quality practitioners, academicians, and experts. The data collection process was commenced only after that. The survey questionnaire has three major sections. The beginning section covers the general information about the organizations which was framed by researchers. The second section consists of 13 TQM practices with 57 items, whereas the last section comprises 35 items evaluating multiple performance indicators. A seven-point Likert scale ranging from 1(Strongly disagree), 2 (Disagree), 3 (Somewhat disagree), 4 (Neutral), 5 (Somewhat agree), 6 (Agree), 7 (Strongly agree) was used for all the items to ensure high statistical variability among survey responses. A seven-point scale is preferred to a five-point scale considering the following:

- It increases variance in measures and provides more granularity.
- Prevents people from being too neutral to their responses.
- The psychometric literature suggests that having more scale points is better, but there is a diminishing return after around 11 points (Nunnally, 1978).
- The bad effect due to skewness is reduced for more scale points.
- Reliability is optimised with a seven-point scale (Symonds, 1924; Ghiselli, 1955; Colman et al., 1997).

### 4.3 DATA COLLECTION

The survey questionnaire was administered to small, medium and large scale manufacturing organizations as per samples were chosen. Electronic mail and direct approach survey method (face to face interview) were employed for data collection. The target respondents for this research were top and middle-level administrators/managers who have put in sufficient level of experience and qualification and therefore, they are expected to be very well aware of the TQM practices followed in their respective organizations. This was mainly ensured to avert common method bias in the study. Addressed to the top and middle level administrators/managers of the organizations, the questionnaire was e-mailed and directly given to 950 manufacturing organizations. Ample time and attention were given to the respondents to understand the questionnaire. The importance regarding the survey and the relevance of each question was explained to every respondent. After several follow-ups and personal contacts, a total of 260 organizations responded which are approximately 27.4 percent of the sample size, were selected for the study.

The sectoral profile of respondents is shown in Table 4.1. Out of 250 large scale industries contacted 31 industries responded to the questionnaire. Out of 300 medium scale industries contacted 76 industries responded. Out of 400 small scale industries contacted 153 organizations were responded. Available data consisted of 31 large, 76 medium and 153 small scale industries and it is presented in Figure 4.1.

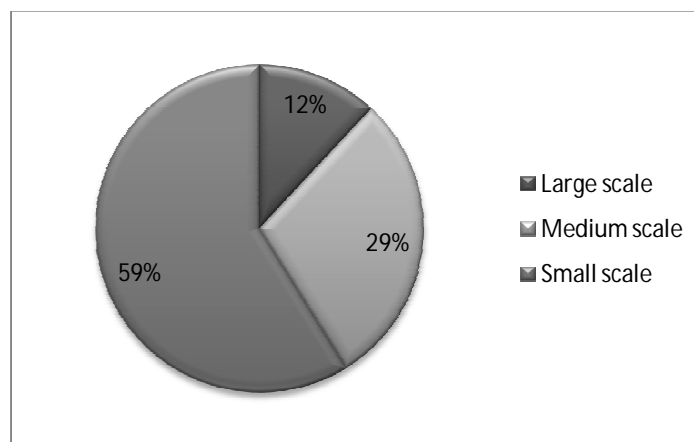


Figure 4.1 Sectoral wise classification based on organization size

Table 4.1 Sectoral profile of respondents

<b>Total No: of organizations :</b>	<b>260(100%)</b>
<b>Size of the organization :</b>	
Large scale manufacturing	31(11.92%)
Medium scale manufacturing	76(29.23%)
Small scale manufacturing	153(58.85%)
<b>Manufacturing Industry :</b>	
Engineering	75(28.80%)
Rubber/Plastic based	73(28.08%)
Chemical Manufacturer	22(8.46%)
Electrical Equipment	22(8.46%)
Textile	13(5.00%)
Food Manufacturing	10(3.85%)
Wood/Wooden based Furniture	8(3.08%)
Medical equipments	7(2.69%)
Paper Products based	6(2.31%)
Agro Based	5(1.92%)
Glass products	3(1.15%)
Footwear Manufacturing	3(1.15%)
Petro Based	3(1.15%)
Others	10(3.85%)
<b>ISO 9001 Certification:</b>	
ISO 9001 Certified	88(33.85%)
Non ISO 9001	172(66.15%)

The study also analyses the effect of ISO 9001 certification on TQM practices and multiple performance indicators. In the database out of 260 organizations, 88 organizations have ISO 9001 certification and rest is not certified. The pie diagram showing the data is shown in Figure 4.2, and sectoral profile based on industry type is shown in Figure 4.3.

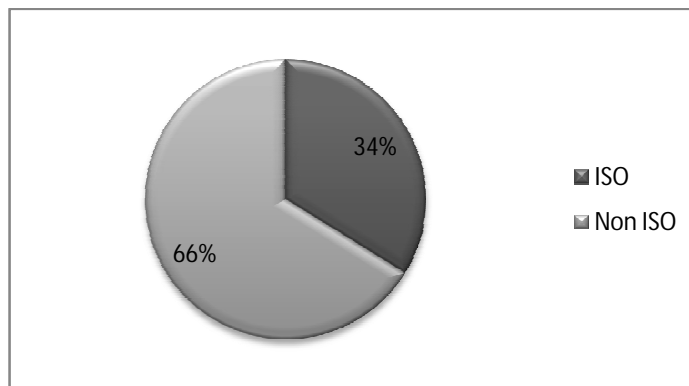


Figure 4.2 Sectoral wise classification based on ISO 9001 certification

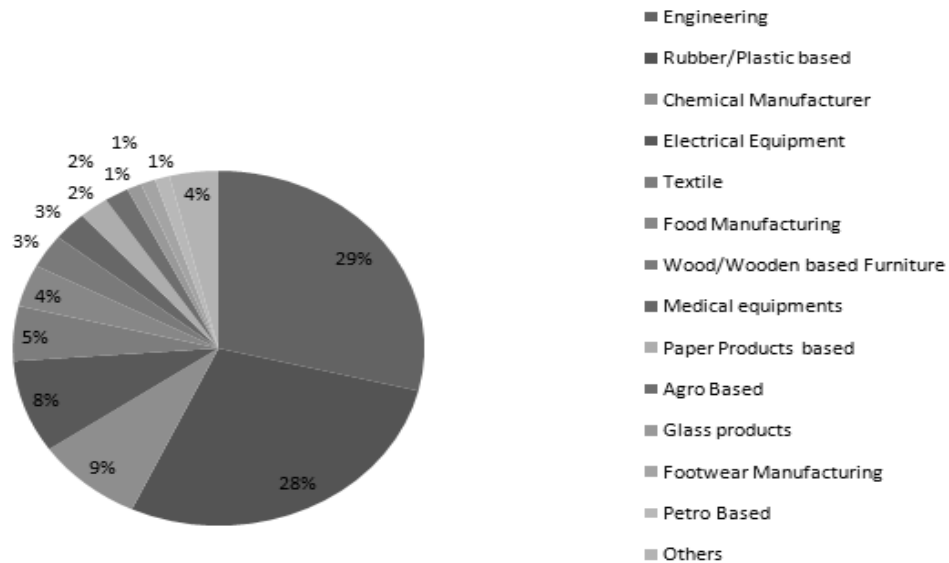


Figure 4.3 Sectoral wise classification based on type of manufacturing industry

#### 4.4 NON – RESPONSE BIAS TEST

Wave analysis was carried out to determine the non-response bias in the survey (Kureshi et al., 2010; Rahman and Siddiqui, 2006; Khanna, 2009). In this method, earliest and latest responses were checked and compared using t-tests with 95% confidence level ( $p \geq .05$ ) between these two groups. The findings revealed that there were no significant differences between the early and late respondents regarding the identification of TQM practices and performance indicators. Thus, it substantiates that there was no evidence of nonresponse bias in the data. Hence it may not be an issue in this research work.

#### 4.5 RELIABILITY AND VALIDITY TESTS FOR THE CONSTRUCTS

Reliability coefficients were initially computed to assess the internal consistency of the underlying items of the independent and dependent variables respectively. Face and content validity were also checked followed by the validation of constructs using exploratory factor analysis (EFA) of the study variables.

The reliability analysis was initially conducted by calculating the Cronbach's alpha for each scale to check the internal consistency of TQM constructs and performance

indicators separately. The reliability coefficients of the items used in the study exceed the minimum threshold level of 0.70 suggested by Nunnally and Bernstein (1994). The value of Cronbach's alpha ranges between 0.736 and 0.937, indicating high reliability of scales, is shown in Table 4.2.

Table 4.2 Cronbach's alpha ( $\alpha$ ) of TQM Practices and Performance indicators

No.	Variables	No of sub items	Cronbach's alpha ( $\alpha$ )
1	LTMC	4	0.770
2	CF	4	0.811
3	SQM	5	0.922
4	CF	5	0.792
5	EE	4	0.853
6	ET	4	0.837
7	QIA	4	0.760
8	QA	5	0.900
9	QCZ	5	0.736
10	QC	5	0.765
11	PM	4	0.785
12	PI	5	0.772
13	KM	3	0.898
14	QP	5	0.847
15	CSL	5	0.937
16	EP	5	0.743
17	OP	5	0.760
18	IP	5	0.871
19	SR	5	0.737
20	FP	5	0.783

Validity refers how well the concept is defined by the measures, whereas reliability relates to the consistency of the measure. A measure has content validity if there is a general agreement among the subjects and researchers. Construct validity is the degree to which a test measures what it claims, or purports, to be measuring (Hair et al., 1998). The constructs employed in this study have content validity because the underlying items were developed based on an extensive review of literature and detailed evaluation by academicians and practicing managers. Moreover, almost every item used in the instrument was pretested for content validity in the previous studies.

Construct validity was performed via the exploratory factor analysis using principal component extraction with varimax rotation to identify relevant items underlying a construct. However, the homogeneity and adequacy of the data need to be determined using the Kaiser–Meyer– Olkin (KMO) measure and the Bartlett's test of sphericity (BTS) before assessing construct validity,. The KMO was 0.803 which is greater than



0.60 indicate sufficient inter correlations while the BTS was significant ( $\chi^2=13986.534$ ,  $p=0.000 < 0.01$ ) for TQM practices. A KMO value close to 1 indicates that factor analysis should yield distinct and reliable constructs while values between 0.5 and 0.7 are middling and values between 0.7 and 0.8 are good (Bhat and Rajashekhar, 2009). Moreover, the result of BTS should be significant ( $p < 0.01$ ). Thus the empirical data was found to have homogeneity and adequacy for principal component analysis. The result indicates a strong construct validity which explained 77.736 percent of the total variance with an eigenvalue greater than one. Eight items relating to these factors were deleted due to low loadings and cross loadings (CI – two items; QA - one item; QCZ - two items; QC - one item; PI - two items). Similarly, another factor analysis was conducted to test the dimensionality of dependent variables – performance indicators. The KMO value was 0.835 which is greater than 0.60 indicate sufficient intercorrelations while the BTS was significant ( $\chi^2 = 6530.973$ ,  $p=0.000 < 0.01$ ). Results of the EFA extracted seven factors solution with eigen value greater than one, and the total variance explained was 74.284 percent. Five items relating to these factors were deleted due to low loadings and cross loadings (EP – two items; SR – one item; FP – two items). Hence the results indicate construct validity.

#### **4.6 UNIDIMENSIONALITY**

Unidimensionality is an essential component of construct validity. It refers to the characteristic of scale items that have only one underlying latent variable in common. In unidimensionality, a model was developed for each construct, and structural equation modeling is used to assess its statistical significance (Hair et al., 2005). A comparative fit index (CFI) of 0.90 or above implies strong scale unidimensionality (Byrne, 1994, 1998). The CFI values for all the 20 dimensions are above 0.90, testifying strong scale unidimensionality.

Both TQM practices and performance indicators were found to be reliable, valid and unidimensional. The direct and indirect effect of TQM practices on multiple performance indicators were tested using multiple regression analysis and structural equation modeling and the results obtained were also validated, which are discussed in the subsequent chapters.

## CHAPTER 5

### RELATIONSHIP BETWEEN TQM PRACTICES AND MULTIPLE PERFORMANCE INDICATORS

Investigating the past TQM literature, it becomes clear that the TQM practices differ somewhat in scope from one study to another. In addition to that, there arises a question regarding the deployment of apposite TQM practices for different performance indicators. There is no clear conformity in respect of this throughout the literature as documented in the second chapter. Thus it is pertinent to investigate the relationship between TQM practices and multiple performance indicators identified in this work. The proposed research hypotheses to explore the direct relationship individually and collectively were tested using multiple regression analysis, and it is discussed in this section.

#### 5.1 MULTIPLE REGRESSION ANALYSIS

Multiple regression analysis (MRA) is a statistical method which investigates the relationship between a single dependent variable and multiple independent variables (Hair et al., 1998). This analysis was undertaken to test the research hypothesis, whether there is any significant linkage between TQM practices and multiple performance indicators. In this work, the identified 13 TQM practices act as independent variables and each performance indicator out of seven performance indicators act as dependent variable, respectively. Sample size is a vital consideration in determining the appropriateness of multiple regression analysis (Hair et al., 1998). It is generally understood that the MRA requires large sample sizes. According to Soper's priori sample size calculator, the minimum sample size required for this study comes out to be 162 (Soper, 2015). Thus it was evident that the sample size was acceptable.

As regression is a parametric approach, it is restrictive in nature. It provides good results only if the data sets meet its assumptions.

- Linearity – The relationships between the predictors and the outcome variable should be linear. To validate about this relationship, scatter plot of the standardized predicted value with the standardized residual can be used. Nonlinearity can be detected by fitting a non-linear best fit line known as the

Loess Curve through the scatter plot. If those only updates scatter plot without changing the regression analysis, it is a good indication of the absence of a nonlinear relationship.

- Normality – The errors should be normally distributed. Normal P-P plot is used to infer about the assumption of normal distribution in a data set. If the plot exhibits a fairly straight line, then it can be concluded data comes from a normal distribution. The deviation in the straight line indicates non - normality in the errors.
- Homoscedasticity – The error terms must have constant variance. Scatter plots of residuals are used to detect this phenomenon. If the residuals are scattered uniformly and randomly, it can be inferred that the assumption is satisfied.
- Absence of autocorrelation - There should be no correlation between the residuals (error terms). The Durbin-Watson statistic can be used to detect this. If the value lies between 1.50 and 2.50, it indicates that there is no autocorrelation issue in the data (Durbin and Watson, 1951).
- Absence of multicollinearity - The independent variables should not be correlated. It is really a difficult task to unearth the true relationship of predictors with response variable in a model with correlated variables. If all the variables are having a tolerance value of more than 0.10 or variance inflation factor (VIF) of less than 10, the findings indicate that the model has no serious multicollinearity problem (Hair et al., 1998).
- Absence of influential outliers - Observations that are having high leverage is considered as extreme outliers, which changes coefficient estimates drastically if included. It can be detected by using Cook's distance and eliminate if it prevails.

Therefore, for a successful regression analysis, it's essential to validate these assumptions.

## **5.2 IMPACT OF TQM PRACTICES ON QUALITY PERFORMANCE**

The underlying purpose of this section is to determine the linkage between TQM practices and quality performance and also to identify the dominant practices which impel this relationship. The scatter diagram and normal P–P plot of residuals are depicted in Figure 5.1 and 5.2 respectively. It can be inferred that the data met the

assumptions regarding normality, homoscedasticity, and linearity. The Durbin–Watson value obtained is 1.540 which lies within the recommended range. Also, from Table 5.2, each of the variables had a tolerance value of more than 0.10 as well as VIF of less than 10. Moreover, there were no significant outliers in the data to eliminate. From all the above mentioned analysis, it can be concluded that data meet all the assumptions to ensure the validity of the significance test. The coefficient of determination,  $R^2$  value obtained is 0.706 which expresses that 70.6 percent of quality performance was explained by the identified thirteen TQM practices. The F-statistics {F (13,246) = 45.429} was significant at the 1 percent level ( $p < 0.01$ ). Thus, the overall model was statistically significant and supported the positive impact of TQM practices on quality performance. The magnitude of effects in this work was compared using Cohen’s rules for effects sizes. According to Cohen (1988), If  $R^2$  lies between 1.0 and 5.9 percent which indicates small, between 5.9 and 13.8 percent is medium, and above 13.8 percent is large. Thus, the effect size for this study is large, and H1 was partially supported. The individual model variables revealed that leadership and top management commitment, employee empowerment, education and training, quality assurance, quality culture, product innovation, and knowledge management were found to have a significant and positive effect on quality performance which substantiates the hypotheses H1<sub>1</sub>, H1<sub>5</sub>, H1<sub>6</sub>, H1<sub>8</sub>, H1<sub>10</sub>, H1<sub>12</sub>, and H1<sub>13</sub>. Other hypotheses were not supported.

Table 5.1 Quality performance – Regression model summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
0.84	<b>0.706</b>	<b>0.690</b>	0.438	1.540

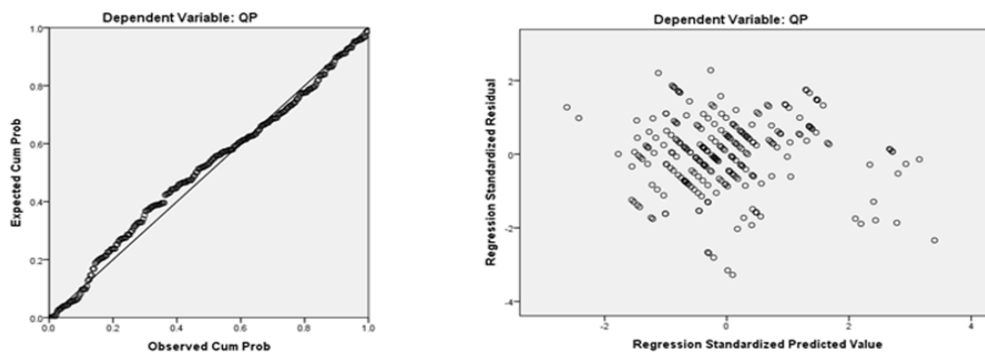


Figure 5.1 Normal P-P Plot and Scatter diagram of quality performance

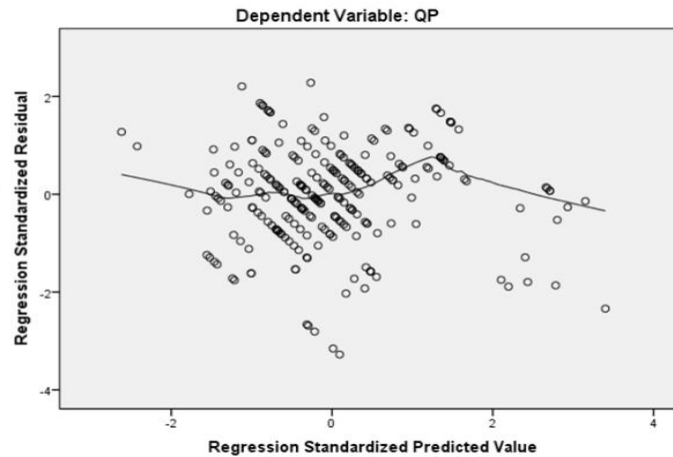


Figure 5.2 Loess curve of quality performance

Table 5.2 Multiple regression analysis of TQM practices on quality performance

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics		Results
	B	Std. Error	Beta			Tolerance	VIF	
(Constant)	-2.870	.710		-4.043	.000			
<b>LTMC</b>	<b>.193</b>	<b>.076</b>	<b>.102</b>	<b>2.528</b>	<b>.012</b>	<b>.734</b>	<b>1.362</b>	<b>ACCEPT H1<sub>1</sub></b>
CF	-.098	.081	-.058	-1.215	.226	.532	1.881	
SQM	.097	.061	.074	1.592	.113	.559	1.790	
CI	.066	.054	.054	1.232	.219	.612	1.633	
<b>EE</b>	<b>.243</b>	<b>.043</b>	<b>.219</b>	<b>5.604</b>	<b>.000</b>	<b>.784</b>	<b>1.275</b>	<b>ACCEPT H1<sub>5</sub></b>
<b>ET</b>	<b>.168</b>	<b>.037</b>	<b>.186</b>	<b>4.599</b>	<b>.000</b>	<b>.734</b>	<b>1.362</b>	<b>ACCEPT H1<sub>6</sub></b>
QIA	.032	.039	.038	.819	.414	.544	1.839	
<b>QA</b>	<b>.136</b>	<b>.066</b>	<b>.104</b>	<b>2.058</b>	<b>.041</b>	<b>.466</b>	<b>2.144</b>	<b>ACCEPT H1<sub>8</sub></b>
QCZ	-.052	.056	-.035	-.931	.353	.864	1.157	
<b>QC</b>	<b>.159</b>	<b>.063</b>	<b>.107</b>	<b>2.508</b>	<b>.013</b>	<b>.656</b>	<b>1.525</b>	<b>ACCEPT H1<sub>10</sub></b>
PM	-.007	.039	-.007	-.186	.853	.872	1.147	
<b>PI</b>	<b>.224</b>	<b>.039</b>	<b>.244</b>	<b>5.724</b>	<b>.000</b>	<b>.656</b>	<b>1.525</b>	<b>ACCEPT H1<sub>12</sub></b>
<b>KM</b>	<b>.351</b>	<b>.031</b>	<b>.489</b>	<b>11.169</b>	<b>.000</b>	<b>.624</b>	<b>1.604</b>	<b>ACCEPT H1<sub>13</sub></b>

Knowledge management was found to be the most predominant TQM practice that is positively related to quality performance. Ensuring proper knowledge management practices helps better sharing of data within the organization. Once quality related data are properly used, it will improve the quality performance of the organization. However, the findings also indicate the importance of proper training, empowerment of employees, innovative and quality culture, quality assurance activities and intensive leadership for predicting the organization's quality performance.

### 5.3 IMPACT OF TQM PRACTICES ON CUSTOMER SATISFACTION LEVEL

Similarly, the study has found that the coefficient of determination,  $R^2$  value obtained is 0.784 which expresses that 78.6% of customer satisfaction level was explained by TQM practices. From Tables 5.3 and 5.4 as well as Figure 5.3 and 5.4, it can be concluded that data meet all the assumptions to ensure the validity of the significance test. The F-statistics  $\{F(13,246) = 68.772\}$  was significant at the 1% level ( $p < 0.01$ ). Thus it became evident that overall model was statistically significant and supported the positive relationship between TQM practices and customer satisfaction level. Hence H2 was partially supported. The determinants of TQM practices in customer satisfaction level were leadership and top management commitment, supplier quality management, quality culture, process management, product innovation and knowledge management which confirm the hypotheses H2<sub>1</sub>, H2<sub>3</sub>, H2<sub>10</sub>, H2<sub>11</sub>, H2<sub>12</sub>, and H2<sub>13</sub>. Other hypotheses were not supported.

Table 5.3 Customer satisfaction level – Regression model summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
0.886	<b>0.784</b>	<b>0.773</b>	0.236	1.952

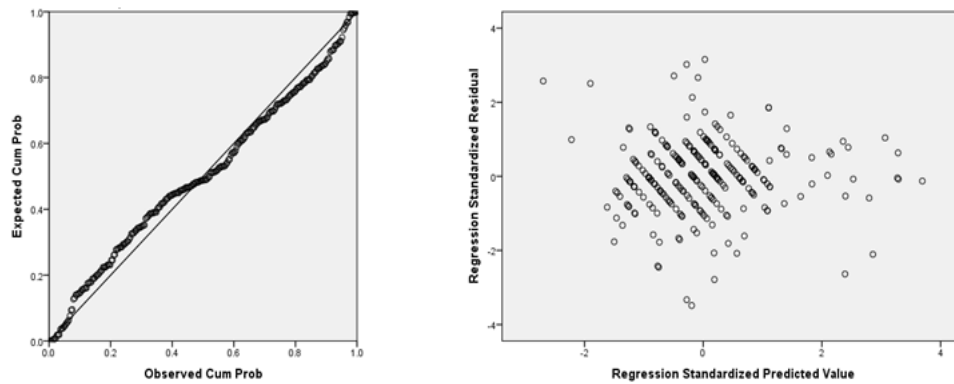


Figure 5.3 Normal P-P Plot and Scatter diagram of customer satisfaction level

Table 5.4 Multiple regression analysis of TQM practices on customer satisfaction level

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics		Results
	B	Std. Error	Beta			Tolerance	VIF	
(Constant)	-1.053	.383		-2.751	.006			
<b>LTMC</b>	<b>.170</b>	<b>.041</b>	<b>.142</b>	<b>4.120</b>	<b>.000</b>	<b>.734</b>	<b>1.362</b>	<b>ACCEPT H<sub>2</sub><sub>1</sub></b>
CF	-.031	.044	-.029	-.702	.483	.532	1.881	
<b>SQM</b>	<b>.147</b>	<b>.033</b>	<b>.178</b>	<b>4.483</b>	<b>.000</b>	<b>.559</b>	<b>1.790</b>	<b>ACCEPT H<sub>2</sub><sub>3</sub></b>
CI	.011	.029	.014	.367	.714	.612	1.633	
EE	.011	.023	.016	.479	.632	.784	1.275	
ET	.002	.020	.003	.083	.934	.734	1.362	
QIA	.022	.021	.043	1.067	.287	.544	1.839	
QA	.028	.036	.034	.778	.438	.466	2.144	
QCZ	-.028	.030	-.030	-.939	.349	.864	1.157	
<b>QC</b>	<b>.136</b>	<b>.034</b>	<b>.146</b>	<b>3.999</b>	<b>.000</b>	<b>.656</b>	<b>1.525</b>	<b>ACCEPT H<sub>2</sub><sub>10</sub></b>
<b>PM</b>	<b>.152</b>	<b>.021</b>	<b>.229</b>	<b>7.227</b>	<b>.000</b>	<b>.872</b>	<b>1.147</b>	<b>ACCEPT H<sub>2</sub><sub>11</sub></b>
<b>PI</b>	<b>.202</b>	<b>.021</b>	<b>.351</b>	<b>9.603</b>	<b>.000</b>	<b>.656</b>	<b>1.525</b>	<b>ACCEPT H<sub>2</sub><sub>12</sub></b>
<b>KM</b>	<b>.225</b>	<b>.017</b>	<b>.499</b>	<b>13.306</b>	<b>.000</b>	<b>.624</b>	<b>1.604</b>	<b>ACCEPT H<sub>2</sub><sub>13</sub></b>

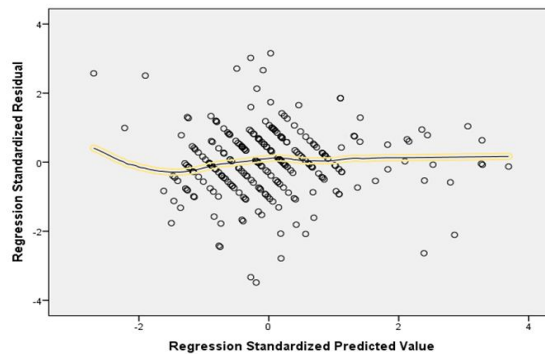


Figure 5.4 Loess curve of customer satisfaction level

Knowledge management and product innovation were revealed as the most dominant practices that are significantly and positively associated with customer satisfaction level. With effective knowledge management and innovative practices, the organization can introduce innovative products frequently which help to retain customers and achieve customer loyalty. Consequently which improve satisfaction level of the customers and thereby to become competitive.

## 5.4 IMPACT OF TQM PRACTICES ON EMPLOYEE PERFORMANCE

Likewise the coefficient of determination,  $R^2$  value is 0.472 which conveys that 47.2% of employee performance was explained by the TQM practices. From Tables 5.5 and 5.6 as well as Figure 5.5 and 5.6, it can be concluded that data meet all the assumptions to ensure the validity of the significance test. As the F-statistics  $\{F(13,246) = 16.936\}$  was significant at the 1% level ( $p < 0.01$ ), the proposed model was found to be adequate which established the positive relationship between TQM practices and employee performance. Customer focus, supplier quality management, employee empowerment, quality information analysis, quality culture, product innovation and knowledge management were significant predictors of TQM in employee performance. Thus it appears to be an implicit agreement supporting the hypotheses H3<sub>2</sub>, H3<sub>3</sub>, H3<sub>5</sub>, H3<sub>7</sub>, H3<sub>12</sub>, and H3<sub>13</sub>.

Table 5.5 Employee performance – Regression model summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
0.687	<b>0.472</b>	<b>0.444</b>	0.651	2.006

Table 5.6 Multiple regression analysis of TQM practices on employee performance

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics		Results
	B	Std. Error	Beta			Tolerance	VIF	
(Constant)	2.944	1.055		2.791	.006			
LTMC	-.017	.113	-.008	-.149	.882	.734	1.362	
<b>CF</b>	<b>-.247</b>	<b>.120</b>	<b>-.130</b>	<b>-2.052</b>	<b>.041</b>	<b>.532</b>	<b>1.881</b>	<b>ACCEPT H3<sub>2</sub></b>
<b>SQM</b>	<b>.232</b>	<b>.090</b>	<b>.159</b>	<b>2.570</b>	<b>.011</b>	<b>.559</b>	<b>1.790</b>	<b>ACCEPT H3<sub>3</sub></b>
CI	.010	.080	.007	.123	.903	.612	1.633	
<b>EE</b>	<b>.141</b>	<b>.064</b>	<b>.115</b>	<b>2.200</b>	<b>.029</b>	<b>.784</b>	<b>1.275</b>	<b>ACCEPT H3<sub>5</sub></b>
ET	-.073	.054	-.072	-1.335	.183	.734	1.362	
<b>QIA</b>	<b>.292</b>	<b>.058</b>	<b>.317</b>	<b>5.042</b>	<b>.000</b>	<b>.544</b>	<b>1.839</b>	<b>ACCEPT H3<sub>7</sub></b>
QA	-.180	.098	-.124	-1.829	.069	.466	2.144	
QCZ	.009	.083	.005	.104	.917	.864	1.157	
QC	-.243	.094	-.148	-2.585	.010	.656	1.525	
PM	.071	.058	.061	1.224	.222	.872	1.147	
<b>PI</b>	<b>.321</b>	<b>.058</b>	<b>.316</b>	<b>5.530</b>	<b>.000</b>	<b>.656</b>	<b>1.525</b>	<b>ACCEPT H3<sub>12</sub></b>
<b>KM</b>	<b>.286</b>	<b>.047</b>	<b>.359</b>	<b>6.127</b>	<b>.000</b>	<b>.624</b>	<b>1.604</b>	<b>ACCEPT H3<sub>13</sub></b>



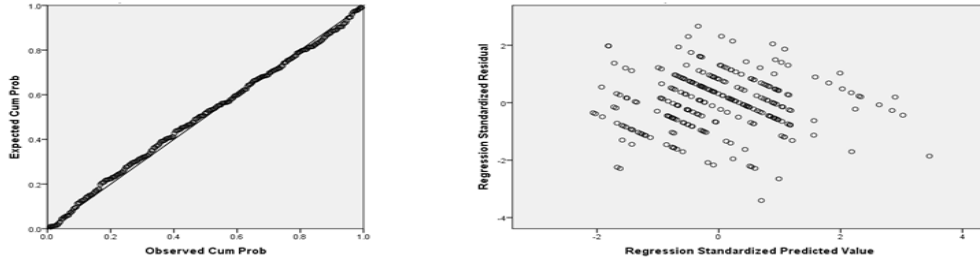


Figure 5.5 Normal P-P Plot and Scatter diagram of employee performance

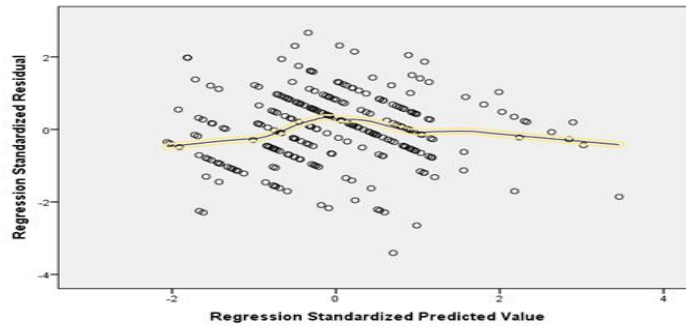


Figure 5.6 Loess curve of employee performance

## 5.5 IMPACT OF TQM PRACTICES ON OPERATING PERFORMANCE

As depicted in Table 5.7, the coefficient of determination,  $R^2$  was 0.412, representing that 41.2 percent of operating performance was explained by thirteen TQM practices. From Tables 5.7 and 5.8 as well as Figure 5.7 and 5.8, it can be concluded that data meet all the assumptions to ensure the validity of the significance test. The F-statistics  $\{F(13,246) = 13.242\}$  was significant at the percent level ( $p < 0.01$ ). The findings revealed that significant predictors of TQM in operating performance were leadership and top management commitment, customer focus, quality citizenship, quality culture and knowledge management which corroborate the hypotheses  $H_{41}$ ,  $H_{42}$ ,  $H_{49}$ ,  $H_{410}$ , and  $H_{413}$ .

Table 5.7 Operating performance – Regression model summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
0.642	<b>0.412</b>	<b>0.381</b>	0.390	1.641

Table 5.8 Multiple regression analysis of TQM practices on operating performance

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics		Results
	B	Std. Error	Beta			Tolerance	VIF	
(Constant)	.689	.632		1.090	.277			
<b>LTMC</b>	<b>.249</b>	<b>.068</b>	<b>.209</b>	<b>3.662</b>	<b>.000</b>	<b>.734</b>	<b>1.362</b>	<b>ACCEPT H4<sub>1</sub></b>
<b>CF</b>	<b>-.190</b>	<b>.072</b>	<b>-.177</b>	<b>-2.634</b>	<b>.009</b>	<b>.532</b>	<b>1.881</b>	<b>ACCEPT H4<sub>2</sub></b>
SQM	.065	.054	.079	1.213	.226	.559	1.790	
CI	.016	.048	.020	.328	.743	.612	1.633	
EE	-.061	.039	-.087	-1.581	.115	.784	1.275	
ET	.064	.033	.112	1.960	.051	.734	1.362	
QIA	.028	.035	.053	.799	.425	.544	1.839	
QA	.089	.059	.108	1.507	.133	.466	2.144	
<b>QCZ</b>	<b>.281</b>	<b>.050</b>	<b>.297</b>	<b>5.643</b>	<b>.000</b>	<b>.864</b>	<b>1.157</b>	<b>ACCEPT H4<sub>9</sub></b>
<b>QC</b>	<b>.226</b>	<b>.056</b>	<b>.242</b>	<b>4.015</b>	<b>.000</b>	<b>.656</b>	<b>1.525</b>	<b>ACCEPT H4<sub>10</sub></b>
PM	.040	.035	.060	1.148	.252	.872	1.147	
PI	-.022	.035	-.038	-.626	.532	.656	1.525	
<b>KM</b>	<b>.113</b>	<b>.028</b>	<b>.251</b>	<b>4.053</b>	<b>.000</b>	<b>.624</b>	<b>1.604</b>	<b>ACCEPT H4<sub>13</sub></b>

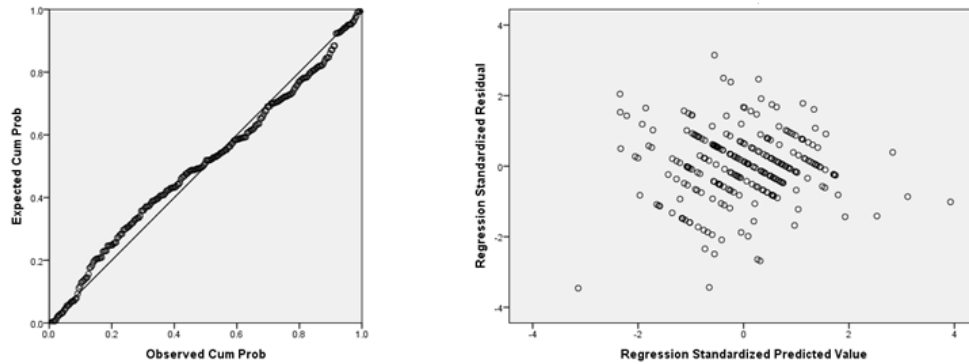


Figure 5.7 Normal P-P Plot and Scatter diagram of operating performance

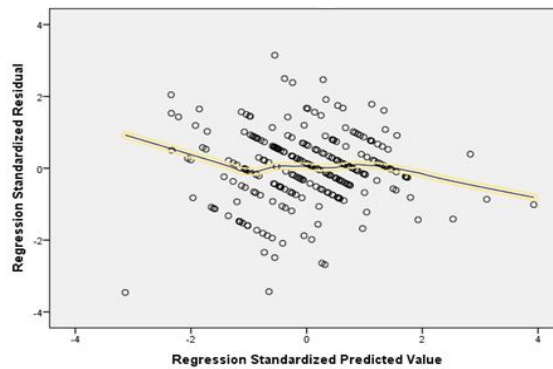


Figure 5.8 Loess curve of operating performance

## 5.6 IMPACT OF TQM PRACTICES ON INNOVATION PERFORMANCE

As evidenced by the regression analysis presented in Table 5.9, the coefficient of determination,  $R^2$  was 0.365, indicating that that 36.5 percent of innovation performance was explained by thirteen TQM practices. From Tables 5.9 and 5.10 as well as Figure 5.9 and 5.10, it can be concluded that data meet all the assumptions to ensure the validity of the significance test. The F- statistics  $\{F(13,246) = 10.867\}$  was significant at the percent level ( $p < 0.01$ ). The findings revealed that significant predictors of TQM in innovation performance were customer focus, employee empowerment, education and training and quality culture and knowledge management. Thus hypotheses H5<sub>2</sub>, H5<sub>5</sub>, H5<sub>6</sub>, H5<sub>10</sub>, and H5<sub>13</sub> were empirically supported.

Table 5.9 Innovation performance – Regression model summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
0.604	0.365	0.331	0.744	1.889

Table 5.10 Multiple regression analysis of TQM practices on innovation performance

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics		Results
	B	Std. Error	Beta			Tolerance	VIF	
(Constant)	-3.565	1.204		-2.961	.003			
LTMC	.254	.130	.116	1.964	.051	.734	1.362	
<b>CF</b>	<b>.446</b>	<b>.137</b>	<b>.227</b>	<b>3.250</b>	<b>.001</b>	<b>.532</b>	<b>1.881</b>	<b>ACCEPT H5<sub>2</sub></b>
SQM	.001	.103	.001	.009	.993	.559	1.790	
CI	.124	.092	.088	1.352	.178	.612	1.633	
<b>EE</b>	<b>-.346</b>	<b>.073</b>	<b>-.271</b>	<b>-4.717</b>	<b>.000</b>	<b>.784</b>	<b>1.275</b>	<b>ACCEPT H5<sub>5</sub></b>
<b>ET</b>	<b>.308</b>	<b>.062</b>	<b>.295</b>	<b>4.968</b>	<b>.000</b>	<b>.734</b>	<b>1.362</b>	<b>ACCEPT H5<sub>6</sub></b>
QIA	.078	.066	.082	1.184	.238	.544	1.839	
QA	-.048	.112	-.032	-.430	.667	.466	2.144	
QCZ	.092	.095	.053	.970	.333	.864	1.157	
<b>QC</b>	<b>.638</b>	<b>.107</b>	<b>.373</b>	<b>5.950</b>	<b>.000</b>	<b>.656</b>	<b>1.525</b>	<b>ACCEPT H5<sub>10</sub></b>
PM	-.005	.066	-.004	-.080	.937	.872	1.147	
PI	.009	.066	.009	.138	.891	.656	1.525	
KM	-.040	.053	-.048	-.743	.458	.624	1.604	

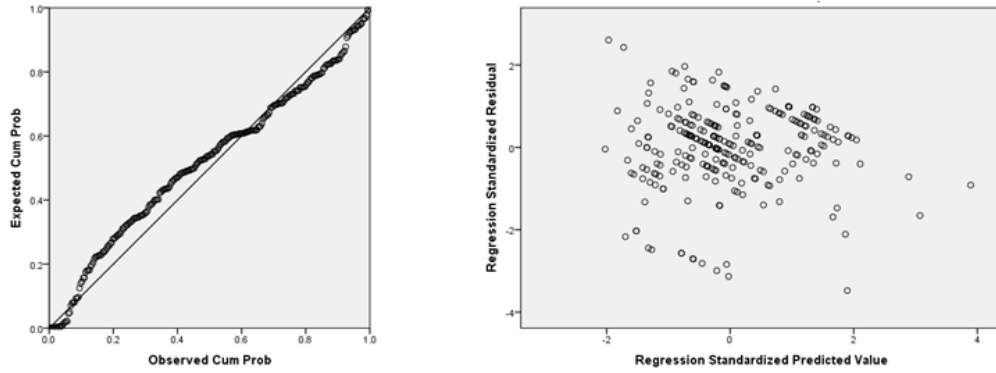


Figure 5.9 Normal P-P Plot and Scatter diagram of innovation performance

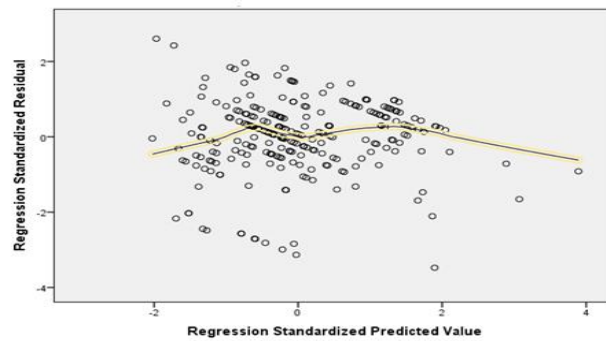


Figure 5.10 Loess curve of innovation performance

## 5.7 IMPACT OF TQM PRACTICES ON SOCIETY RESULTS

As shown in Table 5.11, the coefficient of determination,  $R^2$  was 0.182, implying that 18.2 percent of society results were explained by thirteen TQM practices. From Tables 5.11 and 5.12 as well as Figure 5.11 and 5.12, it can be concluded that data meet all the assumptions to ensure the validity of the significance test. The proposed model was valid as the F- statistics  $\{F(13,246) = 4.215\}$  was significant at the percent level ( $p < 0.01$ ). Quality culture and knowledge management were significant and positively related TQM practices concerning society results support the hypotheses  $H_{610}$  and  $H_{613}$ .

Table 5.11 Society results – Regression model summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
0.427	<b>.182</b>	<b>.139</b>	.556	1.982

Table 5.12 Multiple regression analysis of TQM practices on society results

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics		Results
	B	Std. Error	Beta			Tolerance	VIF	
(Constant)	4.313	.900		4.789	.000			
LTMC	-.096	.097	-.067	-.988	.324	.734	1.362	
CF	.161	.103	.124	1.573	.117	.532	1.881	
SQM	.075	.077	.076	.979	.329	.559	1.790	
CI	-.007	.068	-.008	-.108	.914	.612	1.633	
EE	-.057	.055	-.067	-1.031	.304	.784	1.275	
ET	.014	.046	.020	.302	.763	.734	1.362	
QIA	-.093	.049	-.147	-1.882	.061	.544	1.839	
QA	.010	.084	.010	.116	.908	.466	2.144	
QCZ	-.053	.071	-.046	-.747	.456	.864	1.157	
<b>QC</b>	<b>.160</b>	<b>.080</b>	<b>.142</b>	<b>1.991</b>	<b>.048</b>	<b>.656</b>	<b>1.525</b>	<b>ACCEPT H<sub>610</sub></b>
PM	.046	.050	.057	.930	.353	.872	1.147	
PI	.007	.050	.010	.143	.886	.656	1.525	
<b>KM</b>	<b>.135</b>	<b>.040</b>	<b>.247</b>	<b>3.381</b>	<b>.001</b>	<b>.624</b>	<b>1.604</b>	<b>ACCEPT H<sub>613</sub></b>

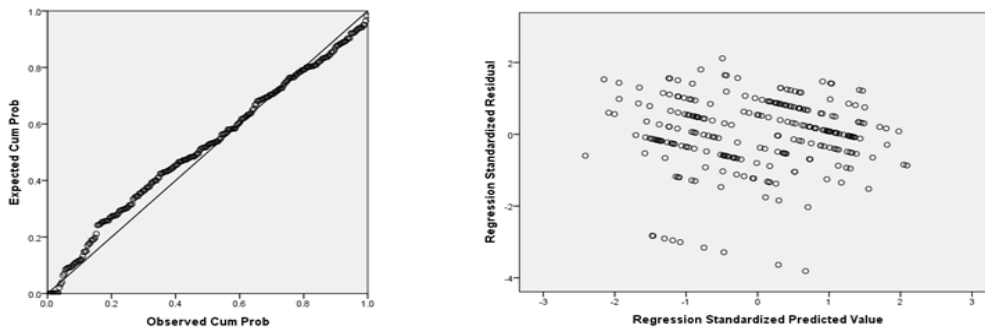


Figure 5.11 Normal P-P Plot and Scatter diagram of society results

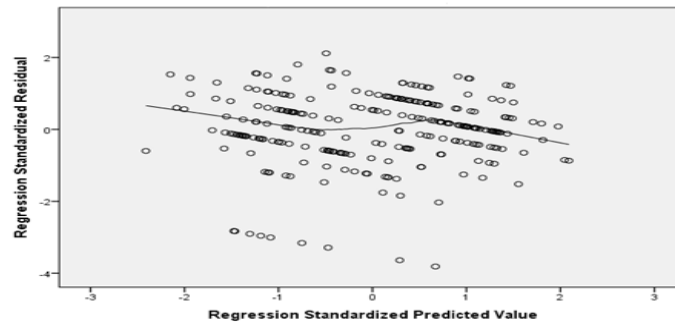


Figure 5.12 Loess curve of society results

## 5.8 IMPACT OF TQM PRACTICES ON FINANCIAL PERFORMANCE

From Table 5.13, it can be observed that coefficient of determination,  $R^2$  was 0.366, representing that 36.6 percent of financial performance can be explained by the 13 independent variables. This expresses that TQM can significantly account for 36.6 percent in financial performance. From Tables 5.13 and 5.14 as well as Figure 5.13 and 5.14, it can be concluded that data meet all the assumptions to ensure the validity of the significance test. The F-statistics  $\{F(13,246) = 10.922\}$  was significant at 1 percent level ( $p < 0.01$ ). This indicated that the overall model was statistically significant and positive relationship between TQM practices and financial performance. The results shown in Table 5.14 revealed that there are five practices of TQM, namely: supplier quality management, education and training, quality citizenship, quality culture and knowledge management which are positively associated with financial performance. Therefore, the hypotheses  $H7_3$ ,  $H7_6$ ,  $H7_9$ ,  $H7_{10}$ , and  $H7_{13}$  were supported.

Table 5.13 Financial performance – Regression model summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
0.605	<b>.366</b>	<b>.332</b>	.482	1.927

Table 5.14 Multiple regression analysis of TQM practices on financial performance

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics		Results
	B	Std. Error	Beta			Tolerance	VIF	
(Constant)	.332	.781		.425	.671			
LTMC	-.003	.084	-.002	-.034	.973	.734	1.362	
CF	-.174	.089	-.136	-1.956	.052	.532	1.881	
<b>SQM</b>	<b>.299</b>	<b>.067</b>	<b>.304</b>	<b>4.477</b>	<b>.000</b>	<b>.559</b>	<b>1.790</b>	<b>ACCEPT <math>H7_3</math></b>
CI	-.103	.059	-.113	-1.737	.084	.612	1.633	
EE	-.009	.048	-.011	-.183	.855	.784	1.275	
<b>ET</b>	<b>.105</b>	<b>.040</b>	<b>.155</b>	<b>2.616</b>	<b>.009</b>	<b>.734</b>	<b>1.362</b>	<b>ACCEPT <math>H7_6</math></b>
QIA	.047	.043	.075	1.096	.274	.544	1.839	
QA	-.098	.073	-.100	-1.342	.181	.466	2.144	
<b>QCZ</b>	<b>.301</b>	<b>.062</b>	<b>.267</b>	<b>4.888</b>	<b>.000</b>	<b>.864</b>	<b>1.157</b>	<b>ACCEPT <math>H7_9</math></b>
<b>QC</b>	<b>.284</b>	<b>.070</b>	<b>.256</b>	<b>4.082</b>	<b>.000</b>	<b>.656</b>	<b>1.525</b>	<b>ACCEPT <math>H7_{10}</math></b>
<b>PM</b>	<b>.108</b>	<b>.043</b>	<b>.137</b>	<b>2.520</b>	<b>.012</b>	<b>.872</b>	<b>1.147</b>	<b>ACCEPT <math>H7_{11}</math></b>
PI	.052	.043	.076	1.217	.225	.656	1.525	
<b>KM</b>	<b>.134</b>	<b>.035</b>	<b>.250</b>	<b>3.883</b>	<b>.000</b>	<b>.624</b>	<b>1.604</b>	<b>ACCEPT <math>H7_{13}</math></b>

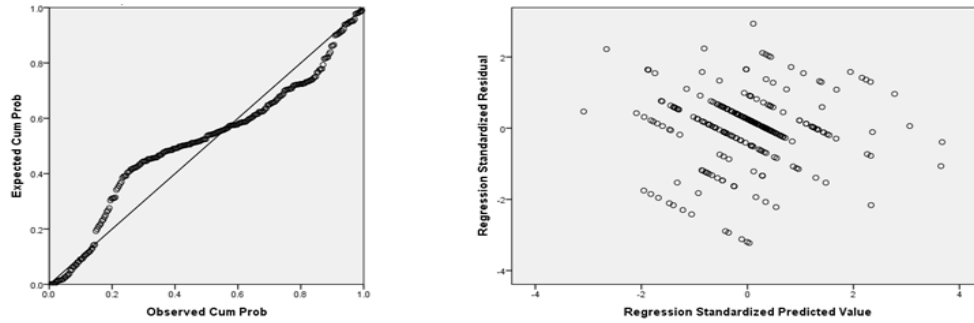


Figure 5.13 Normal P-P Plot and Scatter diagram of financial performance

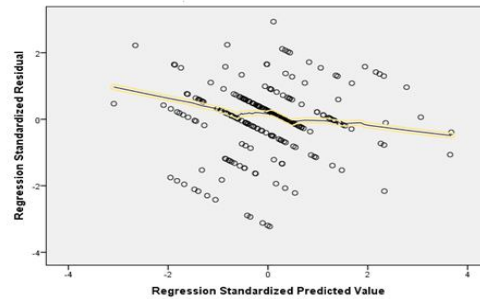


Figure 5.14 Loess curve of financial performance

As previously underlined, the main focus of this section was to examine the impact of TQM practices on multiple performance indicators. Besides that special emphasis was placed to identify the prominent practices which impel those linkages. Overall, the findings indicated that the TQM practices were found to be positively associated with all the performance indicators in this study. Most of the performance indicators barring society results are strongly explained by the identified 13 TQM practices. It also reveals that different TQM practices significantly affect different performance indicators which are summarized in Table 5.15.

Table 5.15 Impact of TQM practices on performance indicators

No	Performance indicators	R <sup>2</sup>	Adj.R <sup>2</sup>	Dominant Factors
1	QP	0.706	0.690	LTMC,ET,EE,QA,QC,PI and KM
2	CSL	0.784	0.773	LTMC,SQM,QC,PM,PI and KM
3	EP	0.472	0.444	CF,SQM,EE,QIA,QC,PI,KM
4	OP	0.412	0.381	LTMC,CF,QCZ,QC and KM
5	IP	0.365	0.331	CF,ET,EE,QC
6	SR	0.182	0.139	QC and KM
7	FP	0.366	0.332	SQM,ET,QCZ,QC and KM

Financial performance has been considered by various researchers previously as the ultimate goal of an organization. However, other performance indicators may be equally weighty in implementing TQM principles, as they may be having a mediating effect on organizational performance. It is thus imperative that this issue is subject to further investigation, and it is discussed in the next chapter which explores all the possible mediation effects.



## **CHAPTER 6**

### **MEDIATION EFFECT OF PERFORMANCE INDICATORS**

The empirical support for the significant and positive association between TQM practices and multiple performance indicators were discussed in the previous chapter. As already mentioned, financial performance was considered as the ultimate goal of an organization to outperform in this competitive scenario. It became evident that effective implementation of TQM practices assists in reaping benefits in every facet of an organization. Therefore it is logical to examine whether the organizations excelling in one area are likely to perform in other areas as well. From the literature analysis, it has been identified that there is no plausible research model for identifying the mediating effects of TQM practices on various performance indicators. Apart from analyzing the direct relationship between constructs, the main purpose of this work is also to identify, all the possible mediation effects of performance indicators on others using structural equation modeling (SEM), which is discussed in this chapter.

#### **6.1 STRUCTURAL EQUATION MODELING**

SEM is used to analyze the relationship between the exogenous and endogenous variables. Nowadays SEM is highly recommended by researchers because, in a single analysis, it helps to estimate the multiple and interrelated dependence. Structural equation models (SEM) (Bollen, 1989; Kaplan, 2000) include a number of statistical methodologies meant to estimate a network of causal relationships, defined according to a theoretical model, linking two or more latent complex concepts, each measured through some observable indicators. The basic idea is that complexity inside a system can be studied by taking into account a causality network among latent concepts, called latent variables (LV), which measured by several observed indicators usually defined as manifest variables (MV). It is in this sense that structural equation models represent a joint-point between path analysis (Alwin & Hauser, 1975; Tukey, 1954) and confirmatory factor analysis (CFA).

SEM consists of two models, a measurement model, and a structural model. Measurement model represents how the measured variables come together to represent the theory whereas the structural model demonstrates how the

interrelationships between the constructs. In this approach, a two step approach is adopted. First confirmatory factor analysis was carried out to ensure that all indicator variables used to measure the construct are reliable and valid. A test of goodness of fit of the SEM is conducted to determine whether specified variable provides the adequate fit of the model. If the statistical indices such as the goodness of fit index (GFI), comparative fit index (CFI), and root mean square error of approximation (RMSEA) are within the recommended level, the model is considered to be a reasonable representation of data. The summary of fit indices with recommended value is given in Table 6.1.

Table 6.1 Summary of fit indices with recommended value

Goodness of fit statistics	Recommended value for satisfactory fit of a model to data
$\chi^2/df$	< 3.0 (Kline ,1998)
Goodness-of-fit Index (GFI)	>0.90 (Kline, 2005; Hu and Bentler, 1999)
Comparative Fit Index (CFI)	>0.90 (Kline, 2005; Hu and Bentler, 1999)
Root mean square error of approximation (RMSEA)	<0.08 (MacCallum et al., 1996)

## 6.2 MEDIATION ANALYSIS USING BOOTSTRAPPING METHOD

Mediation is one of several different relationships that can occur when a third construct Z (called the mediator) is included in the analysis between two other constructs (X-Y, where X is the independent construct and Y the dependent construct) in such a way that X is the cause of Z which, in turn, is the cause of Y. Mediation can be full or partial. In the case of full mediation, the direct effect between X and Y is no longer significant when the mediating variable (Z) is introduced. In partial mediation, the direct effect diminishes but does not disappear altogether, and a direct effect (X-Y) and an indirect effect (X-Z-Y) exist alongside each other with the full effect being the sum of the direct and indirect effects. An alternative situation to mediation may also occur: suppression. In suppression, the direct and indirect effects have opposite arithmetic signs.

While considering the Figure 6.1 given below, whether performance indicator A (PI A) having a mediating effect on the relationship between TQM practices and

performance indicator (PI B) has to be checked. To determine the mediating effect of performance indicator PI A, the following hypothesis is proposed:

H<sub>tab</sub>: TQM practices have an indirect and positive effect on PI B through PI A.

One of the general approaches to test the significance of the indirect effect currently—bootstrap methods (sometimes called "nonparametric resampling"). In this work, bootstrapping procedure with 1000 iterations recommended by Crowson (2009) is used. The bootstrapping procedures via AMOS 20.0 provide upper and lower levels 95% bias-corrected confidence interval and associated p-value for each path.

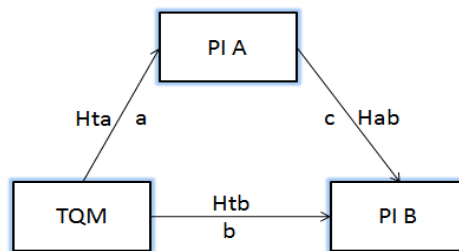


Figure 6.1 Representation of mediation effect

The mediation occurs if zero is not included in the interval. In this approach, if the p-value associated with direct (b), indirect (a\*c) and total effect (b + a\*c) is significant then it indicates partial mediation; If the direct effect is not significant, it represents full mediation. Also, the SEM analysis approach provides model fit information about the consistency of the hypothesized mediation model to the data.

### 6.3 EMPLOYEE PERFORMANCE AS A MEDIATOR

As previously stated, employee performance has a mediating effect on the linkage between TQM practices and other performance indicators. This section examines the formulated hypotheses using SEM.

Before structural equation modeling (SEM), the validity of measurement model was tested using AMOS 20 to ensure the fitness of the measurement model. To reduce the complexity of the model, TQM construct is treated as a latent factor with thirteen observable indicators (one corresponding to the mean value of each critical factor). During the estimation of the measurement models for TQM and perceived

performance constructs, an examination of the modification indices and standardized residuals revealed redundant items in some scales. These redundant items were eliminated, which resulted in better-fitted models. If the indices were in the range of the recommended value, it could be concluded that the model provides a very fine fit for the data. After the measurement model was validated, SEM was used to test the hypothesized relationships. Then the bootstrapping method is used to examine the mediation effect of performance indicators which provide upper and lower levels at 95 percent confidence interval and associated p-value for each path. The mediation occurs if zero is not included in the interval.

### 6.3.1 EFFECT OF TQM PRACTICES ON CUSTOMER SATISFACTION THROUGH EMPLOYEE PERFORMANCE

The fit indices of the measurement model and structural model with the recommended value are shown in Table 6.2 which demonstrates a reasonable good fit. The standardized path coefficients on the structural model along with their statistical significance are provided in Table 6.3 the bias-corrected confidence interval for each path is shown in Table 6.4 respectively.

Table 6.2 Test results of the measurement model and structural model (EP on CSL)

Goodness of fit statistics	Measurement model	Structural model
$\chi^2/df$	2.186	2.159
Goodness-of-fit Index (GFI)	0.91	0.913
Comparative Fit Index (CFI)	0.939	0.942
Root mean square error of approximation (RMSEA)	0.068	0.067

Table 6.3 Construct Structural Model (EP on CSL)

Links in the model	Standardized parameter estimate	t value	p-value (p<0.05)	Result
TQM-EP	0.693	8.584	***	Supported
TQM-CSL	0.524	5.54	***	Supported
EP-CSL	0.252	2.721	0.007	Supported

\*\*\* p<0.001

Table 6.4 EP mediates TQM to CSL

Paths	Lower bound	Upper bound	p-value (p<0.05)	Conclusion
<b>Hec: EP mediates TQM to CSL</b>				
<i>Total effect</i>				Positive and indirect effect Partial mediation
TQM – CSL	0.572	0.79	0.002	
<i>Direct effect</i>				
TQM – CSL	0.32	0.734	0.002	
Indirect effect				
TQM- CSL through EP	0.041	0.361	0.024	

The findings indicate that employee performance partially mediates the relationship between TQM and CSL. Effective knowledge management activities, proper dissemination of quality data, adequate implementation of assurance activities are the dominant TQM practices which assist this relationship. From the results, it is established that successful implementation of TQM practices improves customer satisfaction indirectly through employee performance.

### 6.3.2 EFFECT OF TQM PRACTICES ON INNOVATION PERFORMANCE THROUGH EMPLOYEE PERFORMANCE

The fit indices of the measurement model and structural model with the recommended value are shown in Table 6.5 which demonstrates a reasonable good fit. The standardized path coefficients on the structural model along with their statistical significance are provided in Table 6.6 and the bias-corrected confidence interval for each path is shown in Table 6.7 respectively.

Table 6.5 Test results of the measurement model and structural model (EP on IP)

Goodness of fit statistics	Measurement model	Structural model
$\chi^2/df$	2.265	2.221
Goodness-of-fit Index (GFI)	0.937	0.939
Comparative Fit Index (CFI)	0.927	0.931
Root mean square error of approximation (RMSEA)	0.07	0.069

Table 6.6 Construct Structural Model (EP on IP)

Links in the model	Standardized parameter estimate	t value	p-value (p<0.05)	Result
TQM-EP	0.206	1.985	0.047	Supported
TQM-IP	0.479	2.743	0.006	Supported
EP-IP	-0.305	-3.857	***	Supported

\*\*\* p<0.001

Table 6.7 EP mediates TQM to IP

Paths	Lower bound	Upper bound	p-value (p<0.05)	Conclusion
<b>Hei: EP mediates TQM to IP</b>				Negative and indirect effect Inconsistent relationship
<i>Total effect</i>				
TQM – IP	0.261	0.54	0.004	
<i>Direct effect</i>				
TQM – IP	0.311	0.617	0.003	
<i>Indirect effect</i>				
TQM- IP through EP	-0.159	-0.012	0.011	

The findings indicate that employee performance has an inconsistent relationship concerning innovation performance.

### 6.3.3 EFFECT OF TQM PRACTICES ON SOCIETY RESULTS THROUGH EMPLOYEE PERFORMANCE

The fit indices of the measurement model and structural model with the recommended value are shown in Table 6.8 which demonstrates a reasonable good fit. The standardized path coefficients on the structural model along with their statistical significance are provided in Table 6.9. The bias-corrected confidence interval for each path is shown in Table 6.10.

Table 6.8 Test results of the measurement model and structural model (EP on SR)

Goodness of fit statistics	Measurement model	Structural model
$\chi^2/df$	2.186	2.392
Goodness-of-fit Index (GFI)	0.91	0.923
Comparative Fit Index (CFI)	0.939	0.904
Root mean square error of approximation (RMSEA)	0.068	0.073

Table 6.9 Construct Structural Model (EP on SR)

Links in the model	Standardized parameter estimate	t value	p-value (p<0.05)	Result
TQM-EP	0.311	3.383	***	Supported
TQM-SR	0.032	0.399	0.69	Not Supported
EP-SR	0.481	5.4	***	Supported

\*\*\* p<0.001

Table 6.10 EP mediates TQM to SR

Paths	Lower bound	Upper bound	p-value (p<0.05)	Conclusion
<b>Hef: EP mediates TQM to SR</b>				Positive and indirect effect Full mediation
<i>Total effect</i>				
TQM - SR	0.014	0.324	0.004	
<i>Direct effect</i>				
TQM – SR	-0.136	0.195	0.673	
<i>Indirect effect</i>				
TQM- SR through EP	0.055	0.288	0.001	

The findings indicate that employee performance fully mediates the relationship between TQM practices and SR. The result reveals the importance of focusing employee performance in the organization for achieving social impact result.

### 6.3.4 EFFECT OF TQM PRACTICES ON FINANCIAL PERFORMANCE THROUGH EMPLOYEE PERFORMANCE

The Table 6.11 represents the fit indices of the measurement model and structural model with the recommended value which demonstrate adequate fitness. The standardized path coefficients on the structural model along with their statistical significance are provided in Table 6.12. The bias-corrected confidence interval for each path is shown in Table 6.13. From the results, it is clear that employee performance fully mediates the relationship between TQM practices and financial performance.

Table 6.11 Test results of the measurement model and structural model (EP on FP)

Goodness of fit statistics	Measurement model	Structural model
$\chi^2/df$	2.441	2.257
Goodness-of-fit Index (GFI)	0.943	0.948
Comparative Fit Index (CFI)	0.91	0.924
Root mean square error of approximation (RMSEA)	0.075	0.07

Table 6.12 Construct Structural Model (EP on FP)

Links in the model	Standardized parameter estimate	t value	p-value (p<0.05)	Result
TQM-EP	0.504	3.084	0.002	Supported
TQM-FP	0.021	0.199	0.842	Not Supported
EP-FP	0.61	4.285	***	Supported

\*\*\* p<0.001

Table 6.13 EP mediates TQM to FP

Paths	Lower bound	Upper bound	p-value (p<0.05)	Conclusion
<b>Hef: EP mediates TQM to FP</b>				Positive and indirect effect Full mediation
<i>Total effect</i>				
TQM – FP	0.085	0.568	0.013	
<i>Direct effect</i>				
TQM – FP	-0.26	0.31	0.896	
<i>Indirect effect</i>				
TQM- FP through EP	0.145	0.593	0.001	

The findings indicate that employee performance fully mediates the linkage between TQM practices and financial performance. But the results couldn't explain any significant relationship between employee performance and quality as well as operating performance. This might be due to the presence of any mediators or moderators, which can be explored.

#### 6.4 INNOVATION PERFORMANCE AS A MEDIATOR

Specifically, this section addresses the research question underpinning the effectiveness of TQM practices, on multiple performance indicators through the mediating effect of innovation performance, that has not been much addressed in previous studies. Similar to employee performance as analyzed earlier, a three step approach was carried out to conduct mediation analysis. Initially, the measurement model was validated, then fitness of the structural model was verified and finally bootstrapping was undertaken to determine the mediating effect.

##### 6.4.1 EFFECT OF TQM PRACTICES ON CUSTOMER SATISFACTION LEVEL THROUGH INNOVATION PERFORMANCE

The overall fit of the measurement and structural relationship model was supported by the fitness indices as shown in Table 6.14. The path coefficients shown in Table 6.15 indicate that TQM practices have a stronger relationship on customer satisfaction than innovation performance. At the same time Table 6.16, which shows the presence of positive partial mediation, indicate that the achievement of innovation will lead to improve the satisfaction level of customers.



Table 6.14 Test results of the measurement model and structural model (IP on CSL)

Goodness of fit statistics	Measurement model	Structural model
$\chi^2/df$	2.255	2.227
Goodness-of-fit Index (GFI)	0.924	0.925
Comparative Fit Index (CFI)	0.95	0.951
Root mean square error of approximation (RMSEA)	0.07	0.069

Table 6.15 Construct Structural Model (IP on CSL)

Links in the model	Standardized parameter estimate	t value	p- value (p<0.05)	Result
TQM-IP	0.355	4.964	***	Supported
TQM-CSL	0.616	8.278	***	Supported
IP-CSL	0.129	2.236	0.025	Supported

\*\*\* p<0.001

Table 6.16 IP mediates TQM to CSL

Paths	Lower bound	Upper bound	p-value (p<0.05)	Conclusion
<b>Hic: IP mediates TQM to CSL</b>				Positive and indirect effect Partial mediation
<i>Total effect</i>				
TQM - CSL	0.548	0.76	0.002	
<i>Direct effect</i>				
TQM – CSL	0.501	0.736	0.001	
<i>Indirect effect</i>				
TQM- CSL through IP	0.005	0.107	0.03	

#### 6.4.2 EFFECT OF TQM PRACTICES ON OPERATING PERFORMANCE THROUGH INNOVATION PERFORMANCE

The Table 6.17 presents the summary of fit indices of measurement and structural model which justify the robustness of the overall model. The results of the analysis presented in Table 6.18 and Table 6.19 showed that TQM practices have an indirect effect on operating performance through innovation performance.

Table 6.17 Test results of the measurement model and structural model (IP on OP)

Goodness of fit statistics	Measurement model	Structural model
$\chi^2/df$	2.511	2.511
Goodness-of-fit Index (GFI)	0.913	0.913
Comparative Fit Index (CFI)	0.9	0.9
Root mean square error of approximation (RMSEA)	0.076	0.076

Table 6.18 Construct Structural Model (IP on OP)

Links in the model	Standardized parameter estimate	t value	p-value (p<0.05)	Result
TQM-IP	0.386	4.572	***	Supported
TQM-OP	0.365	3.85	***	Supported
IP-OP	0.197	2.342	0.019	Supported

\*\*\* p<0.001

Table 6.19 IP mediates TQM to OP

Paths	Lower bound	Upper bound	p-value (p<0.05)	Conclusion
<b>Hio: IP mediates TQM – OP</b>				Positive and indirect effect  Partial mediation
<i>Total effect</i>				
TQM – OP	0.252	0.663	0.002	
<i>Direct effect</i>				
TQM – OP	0.171	0.638	0.003	
<i>Indirect effect</i>				
TQM- OP through IP	0.004	0.159	0.045	

### 6.4.3 EFFECT OF TQM PRACTICES ON SOCIETY RESULTS THROUGH INNOVATION PERFORMANCE

The overall fit of the measurement and structural relationship model was supported by the fitness indices are shown in Table 6.20. As depicted in Table 6.21 and Table 6.22 respectively, there exists an inconsistent relationship between innovation performance and society results.

Table 6.20 Test results of the measurement model and structural model (IP on SR)

Goodness of fit statistics	Measurement model	Structural model
$\chi^2/df$	2.256	2.256
Goodness-of-fit Index (GFI)	0.941	0.941
Comparative Fit Index (CFI)	0.94	0.94
Root mean square error of approximation (RMSEA)	0.07	0.07

Table 6.21 Construct Structural Model (IP on SR)

Links in the model	Standardized parameter estimate	t value	p-value (p<0.05)	Result
TQM-IP	0.479	4.113	***	Supported
TQM-SR	0.475	3.572	***	Supported
IP-SR	-0.203	-2.36	0.018	Supported

\*\*\* p<0.001

Table 6.22 IP mediates TQM to SR

Paths	Lower bound	Upper bound	p-value (p<0.05)	Conclusion
<b>His: IP mediates TQM to SR</b>				Negative and indirect effect Inconsistent relationship
<i>Total effect</i>				
TQM – SR	0.244	0.516	0.001	
<i>Direct effect</i>				
TQM – SR	0.308	0.693	0.001	
<i>Indirect effect</i>				
TQM- SR through IP	-0.213	-0.003	0.039	

#### 6.4.4 EFFECT OF TQM PRACTICES ON FINANCIAL PERFORMANCE THROUGH INNOVATION PERFORMANCE

The overall fit of the measurement and structural relationship model was supported by the fitness indices as shown in Table 6.23. The results of the analysis presented in Table 6.24 and Table 6.25 show that successful TQM efforts improve financial performance indirectly through innovation performance.

Table 6.23 Test results of the measurement model and structural model (IP on FP)

Goodness of fit statistics	Measurement model	Structural model
$\chi^2/df$	2.602	2.568
Goodness-of-fit Index (GFI)	0.924	0.925
Comparative Fit Index (CFI)	0.9	0.904
Root mean square error of approximation (RMSEA)	0.079	0.078

Table 6.24 Construct Structural Model (IP on FP)

Links in the model	Standardized parameter estimate	t value	p-value (p<0.05)	Result
TQM-IP	0.352	4.717	***	Supported
TQM-FP	0.404	4.158	***	Supported
IP-FP	0.27	3.139	0.002	Supported

\*\*\* p<0.001

Table 6.25 IP mediates TQM to FP

Paths	Lower bound	Upper bound	p-value (p<0.05)	Conclusion
<b>H1f: IP mediates TQM - FP</b>				Positive and indirect effect Partial mediation
<i>Total effect</i>				
TQM – FP	0.293	0.661	0.002	
<i>Direct effect</i>				
TQM – FP	0.206	0.589	0.002	
<i>Indirect effect</i>				
TQM- FP through IP	0.03	0.199	0.003	

From the results, it is evident that innovation performance act as a mediator in the linkage between TQM practices and customer satisfaction level, operating and financial performance but an inconsistent relationship with society results. However, the results couldn't explain any significant relationship between innovation performance and quality performance.

## 6.5 OPERATING PERFORMANCE AS A MEDIATOR

The mediating effect of operating performance on quality performance, customer satisfaction level, society results and financial performance was discussed in this section. Similar to employee and innovation performance, a three step approach was carried out to conduct mediation analysis. Initially, the measurement model was validated, then fitness of the structural model was verified and finally bootstrapping was carried out to determine the mediating effect.

### 6.5.1 EFFECT OF TQM PRACTICES ON CUSTOMER SATISFACTION LEVEL THROUGH OPERATING PERFORMANCE

The results of the measurement model and structural model with the recommended value of fit indices for the satisfactory fit of a model to data are shown in Table 6.26. The result supports the intervening effect of operating performance in the relationship between TQM practices and customer satisfaction level is depicted in Table 6.27 and Table 6.28.

Table 6.26 Test results of the measurement model and structural model (OP on CSL)

Goodness of fit statistics	Measurement model	Structural model
$\chi^2/df$	2.167	2.167
Goodness-of-fit Index (GFI)	0.902	0.902
Comparative Fit Index (CFI)	0.933	0.933
Root mean square error of approximation (RMSEA)	0.067	0.067

Table 6.27 Construct Structural Model (OP on CSL)

Links in the model	Standardized parameter estimate	t value	p-value (p<0.05)	Result
TQM-OP	0.512	5.217	***	Supported
TQM-CSL	0.639	8.605	***	Supported
OP-CSL	0.172	2.613	0.009	Supported

\*\*\* p<0.001

Table 6.28 OP mediates TQM to CSL

Paths	Lower bound	Upper bound	p-value (p<0.05)	Conclusion
<b>Hoc: OP mediates TQM - CSL</b>				Positive and indirect effect Partial mediation
<i>Total effect</i>				
TQM – CSL	0.642	0.807	0.002	
<i>Direct effect</i>				
TQM – CSL	0.523	0.771	0.002	
<i>Indirect effect</i>				
TQM- CSL through OP	0.017	0.166	0.018	

## 6.5.2 EFFECT OF TQM PRACTICES ON FINANCIAL PERFORMANCE THROUGH OPERATING PERFORMANCE

The fit indices of measurement and structural model are presented in Table 6.29 which shows adequate model fit. It is established from Table 6.30 and Table 6.31, that TQM practices have an indirect effect on financial performance through operating performance.

Table 6.29 Test results of the measurement model and structural model (OP on FP)

Goodness of fit statistics	Measurement model	Structural model
$\chi^2/df$	2.154	2.154
Goodness-of-fit Index (GFI)	0.938	0.938
Comparative Fit Index (CFI)	0.907	0.907
Root mean square error of approximation (RMSEA)	0.067	0.067

Table 6.30: Construct Structural Model (OP on FP)

Links in the model	Standardized parameter estimate	t value	p-value (p<0.05)	Result
TQM-OP	0.597	4.385	***	Supported
TQM-FP	0.386	2.785	0.005	Supported
OP-FP	0.418	3.43	***	Supported

\*\*\* p<0.001

Table 6.31: OP mediates TQM to FP

Paths	Lower bound	Upper bound	p-value (p<0.05)	Conclusion
<b>Hof: OP mediates TQM - FP</b>				Positive and indirect effect Partial mediation
<i>Total effect</i>				
TQM – FP	0.379	0.856	0.002	
<i>Direct effect</i>				
TQM – FP	0.037	0.71	0.029	
<i>Indirect effect</i>				
TQM- FP through OP	0.117	0.4910.004	0.011	

The results couldn't explain any significant relationship between operating performance and quality operating performance. This might be due to the presence of any mediators or moderators, which has to explore later. Operating performance mainly refers to technical competitiveness rather than social responsibility issues

## 6.6 QUALITY PERFORMANCE AS A MEDIATOR

As indicated earlier, quality performance mediates the linkage between TQM practices and customer satisfaction level, society results as well as financial performance. The proposed hypotheses regarding the mediation effect were tested using bootstrapping method, as discussed.

### 6.6.1 EFFECT OF TQM PRACTICES ON CUSTOMER SATISFACTION LEVEL THROUGH QUALITY PERFORMANCE

The fit indices of the structural model and measurement model are presented in Table 6.32 reveals the adequate fit of the model to the data. The SEM results of the relationship between TQM practices and performance indicators that is the estimates of coefficients and t values are given in Table 6.33. The findings indicate that quality

performance partially mediates the relationship between TQM and CSL is shown in Table 6.34.

Table 6.32 Test results of the measurement model and structural model (QP on CSL)

Goodness of fit statistics	Measurement model	Structural model
$\chi^2/df$	2.548	2.504
Goodness-of-fit Index (GFI)	0.912	0.915
Comparative Fit Index (CFI)	0.939	0.942
Root mean square error of approximation (RMSEA)	0.077	0.076

Table 6.33 Construct Structural Model (QP on CSL)

Links in the model	Standardized parameter estimate	t value	p-value (p<0.05)	Result
TQM-QP	0.679	8.955	***	Supported
TQM-CSL	0.264	3.186	0.001	Supported
QP-CSL	0.413	4.826	***	Supported

\*\*\* p<0.001

Table 6.34 QP mediates TQM to CSL

Paths	Lower bound	Upper bound	p-value (p<0.05)	Conclusion
<b>Hqc: QP mediates TQM to CSL</b>				Positive and indirect effect Partial mediation
<i>Total effect</i>				
TQM – CSL	0.388	0.673	0.002	
<i>Direct effect</i>				
TQM – CSL	0.065	0.509	0.012	
<i>Indirect effect</i>				
TQM- CSL through QP	0.147	0.388	0.003	

### 6.6.2 Effect of TQM practices on financial performance through quality performance

The fit indices of both measurement model and structural model are shown in Table 6.35 which recommends adequate model fit. The direct and meditational analysis results are depicted in Table 6.36 and Table 6.37 respectively.

Table 6.35 Test results of the measurement model and structural model (QP on FP)

Goodness of fit statistics	Measurement model	Structural model
$\chi^2/df$	2.673	2.673
Goodness-of-fit Index (GFI)	0.961	0.961
Comparative Fit Index (CFI)	0.957	0.957
Root mean square error of approximation (RMSEA)	0.08	0.08

Table 6.36 Construct Structural Model (QP on FP)

Links in the model	Standardized parameter estimate	t value	p-value (p<0.05)	Result
TQM-QP	0.545	5.664	***	Supported
TQM-FP	0.267	2.157	0.031	Supported
QP-FP	0.338	3.084	0.002	Supported

\*\*\* p<0.001

Table 6.37 QP mediates TQM to FP

Paths	Lower bound	Upper bound	p-value (p<0.05)	Conclusion
<b>Hqf: QP mediates TQM to FP</b>				Positive and indirect effect Full mediation
<i>Total effect</i>				
TQM - FP	0.127	0.71	0.006	
<i>Direct effect</i>				
TQM - FP	-0.039	0.662	0.1	
<i>Indirect effect</i>				
TQM- FP through QP	0.064	0.308	0.012	

From the result, it is evident that quality performance fully mediates the relationship between TQM practices and financial performance. But the results can't significantly support the mediation effect of quality performance on society results.

## 6.7 SOCIETY RESULTS AS A MEDIATOR

As previously indicated, society results mediate the linkage between TQM practices and customer satisfaction level as well as financial performance. The proposed hypotheses regarding the mediation effect were tested using bootstrapping method, as discussed.

### 6.7.1 EFFECT OF TQM PRACTICES ON FINANCIAL PERFORMANCE THROUGH SOCIETY RESULTS

The fit indices of the structural model and measurement model with the recommended values are presented in Table 6.38 reveals the adequate fit of the model to the data. The SEM results of the relationship between TQM practices and performance indicators that is the estimates of coefficients and t values are given in Table 6.39. The findings indicate that society results partially mediate the relationship between TQM and FP is shown in Table 6.40.



Table 6.38 Test results of the measurement model and structural model (SR on FP)

Goodness of fit statistics	Measurement model	Structural model
$\chi^2/df$	2.305	2.305
Goodness-of-fit Index (GFI)	0.944	0.944
Comparative Fit Index (CFI)	0.92	0.92
Root mean square error of approximation (RMSEA)	0.071	0.071

Table 6.39 Construct Structural Model (SR on FP)

Links in the model	Standardized parameter estimate	t value	p value (p<0.05)	Result
TQM – SR	0.316	3.645	***	Supported
TQM – FP	0.351	3.626	***	Supported
SR – FP	0.363	4.08	***	Supported

\*\*\* p<0.001

Table 6.40 SR mediates TQM to FP

Paths	Lower bound	Upper bound	p-value (p<0.05)	Conclusion
<b>Hsf: QP mediates TQM to FP</b>				Positive and indirect effect Partial mediation
<i>Total effect</i>				
TQM – FP	0.236	0.653	0.002	
<i>Direct effect</i>				
TQM – FP	0.119	0.542	0.004	
<i>Indirect effect</i>				
TQM- FP through SR	0.053	0.214	0.001	

The findings indicate that society results partially mediate the linkage between TQM practices and financial performance. The significant empirical support for the mediation of society results on customer satisfaction level was not obtained.

## 6.8 CUSTOMER SATISFACTION LEVEL AS A MEDIATOR

The proposed hypotheses regarding the mediation effect of customer satisfaction level on financial performance were tested using bootstrapping method, and it is discussed below.

### 6.8.1 EFFECT OF TQM PRACTICES ON FINANCIAL PERFORMANCE THROUGH CUSTOMER SATISFACTION LEVEL

The fit indices of the structural model and measurement model with the recommended values are presented in Table 6.41 reveals the adequate fit of the model to the data.

The SEM results of the relationship between TQM practices and performance indicators that is the estimates of coefficients and t values are given in Table 6.42, and the mediation analysis is presented in Table 6.43.

Table 6.41 Test results of the measurement model and structural model (CSL on FP)

Goodness of fit statistics	Measurement model	Structural model
$\chi^2/df$	2.145	2.145
Goodness-of-fit Index (GFI)	0.914	0.914
Comparative Fit Index (CFI)	0.944	0.944
Root mean square error of approximation (RMSEA)	0.066	0.066

Table 6.42 Construct Structural Model (CSL on FP)

Links in the model	Standardized parameter estimate	t value	p-value (p<0.05)	Result
TQM – CSL	0.605	7.025	***	Supported
TQM – FP	0.227	2.207	0.027	Supported
CSL – FP	0.313	3.728	0.001	Supported

\*\*\* p<0.001

Table 6.43 CSL mediates TQM to FP

Paths	Lower bound	Upper bound	p-value (p<0.05)	Conclusion
<b>H<sub>0</sub>: CSL mediates TQM to FP</b>				Positive and indirect effect Full mediation
<i>Total effect</i>				
TQM – FP	0.166	0.597	0.006	
<i>Direct effect</i>				
TQM – FP	-0.064	0.466	0.107	
<i>Indirect effect</i>				
TQM- FP through SR	0.08	0.363	0.001	

From the results, it is clear that customer satisfaction level mediates the relationship between TQM practices and financial performance.

The proposed twenty one set of distinct hypotheses exhibits the mediating effect of performance indicators was tested and the significant results obtained is summarized in the following Table 6.44.

Table 6.44 Summary of results of mediation effects of multiple performance indicators

No	Linkage	Contributed TQM factors	Results
1	TQM-EP-CSL	LTMC,CF,SQM,CI,ET,EE,QIA,QA,PM,KM	Positive Partial mediation
2	TQM-EP-IP	LTMC,CF,SQM,CI,ET,QA,PM	Inconsistent relationship
3	TQM-EP-SR	LTMC,SQM,CI,ET,EE,QA,PM	Full mediation
4	TQM-EP-FP	LTMC,CI,ET,QA,PM	Full mediation
5	TQM-IP-CSL	LTMC,CF,CI,SQM,QIA,PI,QA	Positive Partial mediation
6	TQM-IP-OP	SQM,QIA,QA,KM,CI,PM,PI	Positive Partial mediation
7	TQM-IP-SR	CF,SQM,CI,ET,QA,PI	Inconsistent relationship
8	TQM-IP-FP	LTMC,SQM,CI,QIA,QA,PM,PI,KM	Positive Partial mediation
9	TQM-OP-CSL	LTM,CF,SQM,CI,ET,QIA,QA,PM,PI,KM	Positive Partial mediation
10	TQM-OP-FP	LTMC,SQM,ET,PM,KM,CI	Positive Partial mediation
11	TQM-QP-CSL	LTMC,CF,SQM,CI,EE,ET,QIA,QA	Positive Partial mediation
12	TQM-QP-FP	LTMC,SQM,CI,PM	Full mediation
13	TQM-SR-FP	LTMC,CF,QIA,ET,KM,CI	Positive Partial mediation
14	TQM-CSL-FP	LTMC,CF,SQM,ET,QIA,QA,CI,PM	Full mediation

It is evident from results that there exist 14 significant mediation effects of various performance indicators. Most of them are partially or fully mediating the TQM-performance effects. Apart from that, there obtain two inconsistent relationships also.

Based on the analysis in Chapter 5 and Chapter 6, it can be concluded that TQM practices have direct and indirect effect on performance indicators and it is depicted in Figure 6.2. So it necessitates the development of an integrated model which shows the interrelationships between TQM core practices and performance

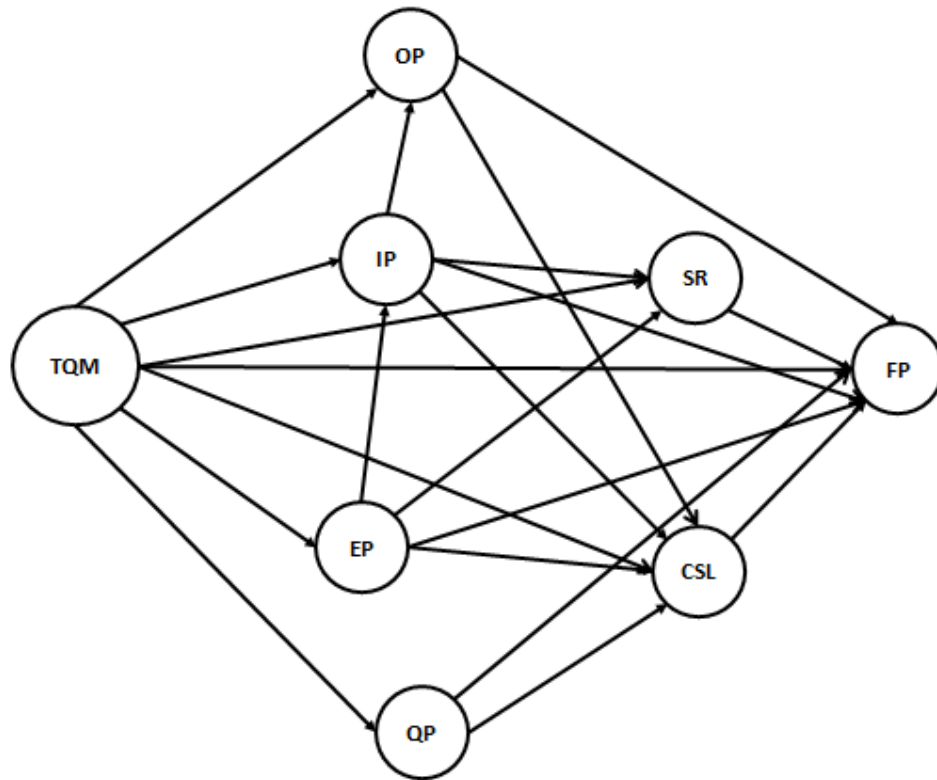


Figure 6.2 Direct and Indirect effect of TQM practices on multiple performance indicators

## **CHAPTER 7**

### **TQM PRACTICES AND ITS PERFORMANCE EFFECTS: AN INTEGRATED MODEL**

As indicated earlier, the results of the previous TQM literature was inconsistent; it was not possible to develop a model which exhibits the direct and indirect linkages between TQM practices and performance dimensions. From the previous chapter, it is evident that performance indicators act as a mediator in the relationship between TQM practices and financial performance. This section focuses on developing an integrated model encompassing significant structural relations showing the linkage between TQM practices and performance indicators. Thereby helps the organization to follow a guideline to improve the overall performance.

#### **7.1 INTEGRATED MODEL**

Based on the significant relations obtained as shown in Figure 6.1, an integrated model was developed and analyzed using SEM. As it provides concurrent estimates of each construct, direct and indirect effect, it is, therefore, suitable for testing the proposed integrated model. Likewise in earlier chapters, a three- step procedure of analysis was carried out. Initially building the measurement model (i.e., confirmatory factor analysis), subsequently building the structural model and bootstrapping, that is concerned with the direct and indirect relations among the latent constructs respectively. During the estimation of the measurement model, an examination of the modification indices and standardized residuals revealed redundant items in some scales. According to Byrne (1998), for better model fit, the redundant items has to be eliminated. If the indices were in the range of the recommended value, it could be concluded that the model provides a very fine fit for the data. After the measurement model was validated, SEM was used to test the hypothesized relationships. Then the bootstrapping method is used to examine the mediation effect of performance indicators which provide upper and lower levels at 95 percent confidence interval and associated p-value for each path. The mediation occurs if zero is not included in the interval.

Table 7.1 shows the comparison of fit indices of the measurement model and structural model with the recommended value, which reveals a reasonable good fit.

The standardized path coefficients on the structural model along with their statistical significance are provided in Figure 7.1.

Table 7.1 Test results of the measurement model and structural model

Goodness of fit statistics	Measurement model	Structural model	Recommended value for satisfactory fit of a model to data
$\chi^2/df$	2.303	2.288	< 3.0 (Kline ,1998)
Goodness-of-fit Index (GFI)	0.906	0.900	>0.90 (Kline, 2005; Hu and Bentler, 1999)
Comparative Fit Index (CFI)	0.916	0.907	>0.90 (Kline, 2005; Hu and Bentler, 1999)
Root mean square error of approximation (RMSEA)	0.071	0.071	<0.08 (MacCallum et al, 1996)

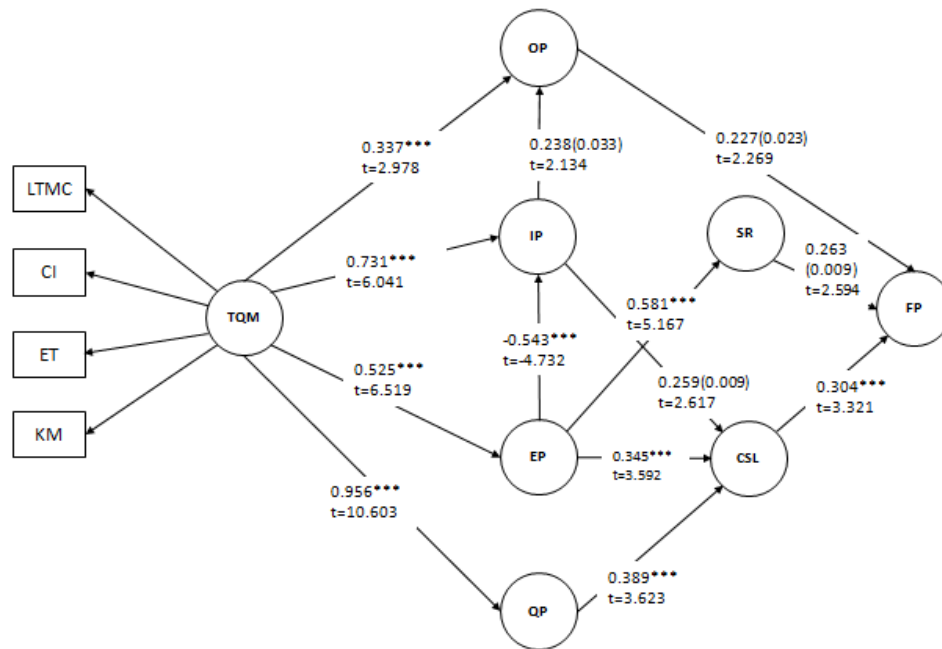


Figure 7.1 Structural model of the relationship between TQM practices and performance indicators (\*\*\*) p<0.001

Table 7.2 Indirect effects of TQM practices on performance indicators

Paths	Lower bound	Upper bound	p-value	Conclusion
TQM to IP through EP	-0.782	-0.078	0.001	Negative and indirect effect Inconsistent relationship
TQM to SR through EP	0.187	0.437	0.002	Positive and indirect effect
TQM to CSL through EP,IP and QP	0.526	0.792	0.014	Positive and indirect effect
TQM to FP through OP,SR and CSL	0.234	0.533	0.002	Positive and indirect effect

An adequate fit model which shows the interrelationship between TQM practices and performance indicators was developed and validated. The results revealed that leadership and top management commitment, education and training, continuous improvement and knowledge management as the dominant factors which have an impact on all the seven performance indicators selected in this study. In addition, the results also revealed that TQM practices have direct effect on employee, innovation, operating and quality performance respectively. Conversely, it has only indirect effect on society results, customer satisfaction level and financial performance through the combined effect of multiple performance indicators. On the other hand, the results also revealed the interrelationships between TQM practices.

Apart from this, the study also examines the influence of contextual factors such as x ISO 9001 certification and organization size on TQM practices and its performance effects. The detailed analysis is carried out in the subsequent chapter.

## **CHAPTER 8**

### **EFFECT OF CONTEXTUAL FACTORS ON TQM PRACTICES AND PERFORMANCE INDICATORS**

Although TQM is extensively discussed in measurement studies, the interest towards the potential effects of contextual factors on TQM and TQM – performance relationships is comparatively scarce. ISO 9001 implementation and organization size were the two contextual factors used in this study. It is thus indispensable that this issue is subject to further investigation, as differences in characteristics between large, medium and small sized organizations as well as ISO 9001 and Non ISO certification may influence the use and impacts of TQM practices. The objective of this chapter was to examine the influence of the contextual factors on TQM practices and performance indicators, in the case of the Indian manufacturing industry.

#### **8.1 EFFECT OF ISO 9001 IMPLEMENTATION ON TQM PRACTICES AND PERFORMANCE INDICATORS**

With reference to the literature, ISO certified organizations probably would have more effective TQM practices and performance in place rather than non ISO certified organizations because of their efforts. This section makes a comparison between organizations with and without ISO 9001 certification to determine which practices of total quality management implemented in organizations with certification were better than those without certification. Mann- Whitney U test is conducted to verify the statistical significance of the differences between the ISO 9001 certified and Non-ISO 9001 certified organizations for the TQM practices and performance indicators. In the database out of 260 organizations, 88 organizations have ISO 9001 certification and rest were not certified.

The Mann-Whitney U test was developed as a test of stochastic equality (Mann and Whitney, 1947). It is a non-parametric test used to assess for significant differences in a scale or ordinal dependent variable by a single dichotomous independent variable. This means that the test does not assume any properties regarding the distribution of the dependent variable in the analysis. As a non- parametric test, it compares median scores of two samples. Thus, it is much more robust against outliers and heavy tail



distributions. This makes the Mann-Whitney U-test the appropriate analysis to use when the data is approximately normal.

For each attribute, the p-value for the hypotheses test using U-test was summarized in Table 8.1. The p-value indicates that ISO certified organizations execute four TQM practices – leadership and top management commitment (U=6081.000, p=0.006), education and training (U=5531.500, p=0.000), quality information analysis (U=5541.500, p=0.000) and quality assurance (U=6142.500, p=0.010) more rigorously than non certified organizations. As a result of the better implementation of quality practices, ISO certified organizations have better financial performance (U=6177.000, p=0.012) compared to non ISO certified organizations.

Table 8.1 Mann-Whitney U-test results of TQM practices and performance indicators

No	Variables	Mean rank (Non ISO 9001)	Mean rank (ISO 9001)	p- value	Result
<b>1</b>	<b>Leadership and top management commitment (LTMC)</b>	<b>121.85</b>	<b>147.40</b>	<b>0.006</b>	<b>Significant difference</b>
2	Customer focus (CF)	129.79	131.89	0.821	
3	Supplier quality management (SQM)	128.67	134.07	0.575	
4	Continuous improvement (CI)	127.85	135.67	0.420	
5	Employees empowerment (EE)	126.58	138.16	0.234	
<b>6</b>	<b>Education and training (ET)</b>	<b>118.66</b>	<b>153.64</b>	<b>0.000</b>	<b>Significant difference</b>
<b>7</b>	<b>Quality information analysis (QIA)</b>	<b>118.72</b>	<b>153.53</b>	<b>0.000</b>	<b>Significant difference</b>
<b>8</b>	<b>Quality assurance (QA)</b>	<b>122.21</b>	<b>146.70</b>	<b>0.010</b>	<b>Significant difference</b>
9	Quality citizenship(QCZ)	128.78	133.86	0.538	
10	Quality culture (QC)	130.41	130.68	0.975	
11	Process management (PM)	124.76	141.73	0.082	
12	Product innovation (PI)	131.55	128.45	0.749	
13	Knowledge management (KM)	125.15	140.96	0.106	
14	Quality performance (QP)	126.47	138.37	0.226	
15	Customer satisfaction level (CSL)	124.64	141.95	0.079	
16	Employee performance (EP)	126.28	138.74	0.201	
17	Operating performance (OP)	125.11	141.03	0.102	
18	Innovation performance (IP)	126.44	138.44	0.221	
19	Society results (SR)	133.83	123.99	0.313	
<b>20</b>	<b>Financial performance (FP)</b>	<b>122.41</b>	<b>146.31</b>	<b>0.012</b>	<b>Significant difference</b>

p < 0.05

## **8.2 EFFECT OF ORGANIZATION SIZE ON TQM PRACTICES AND PERFORMANCE INDICATORS**

The influence of organization size on the TQM practices and performance indicators are analyzed in this section. In the database, out of 260 organizations, 31 were large scale organizations, 76 were medium scale organizations, and 153 were small scale organization. Kruskal-Wallis H test was conducted to check whether there is any difference in the performance among small, medium and large scale organizations. This study also makes a comparison to determine whether the organization size have any significant impact on TQM practices and multiple performance indicators.

The Kruskal-Wallis H test (sometimes also called the "one-way analysis of variance on ranks") is a rank-based nonparametric test that can be used to determine if there are statistically significant differences between two or more groups of an independent variable on a continuous or ordinal dependent variable. A significant Kruskal-Wallis test indicates that at least one sample stochastically dominates one other sample. The test does not identify where this stochastic dominance occurs or for how many pairs of groups stochastic dominance obtains. Dunn's test would help to analyze the specific sample pairs for stochastic dominance in post hoc tests.

Since it is a non-parametric method, the Kruskal–Wallis test does not assume a normal distribution of the residuals and is much less sensitive to outliers unlike the analogous one-way analysis of variance. Thus it makes appropriate for the approximately normal data. Here Dunn-Bonferroni approach was used for pair wise comparisons between the three groups. The four assumptions that the data should meet to conduct this test were

- Dependent variable should be measured at the ordinal or continuous level.
- Independent variable should consist of two or more categorical, independent groups.
- There is no relationship between the observations in each group or between the groups themselves.
- The distributions in each group have the same shape (which also means the same variability).

As we selected a seven point likert scale for measuring our dependent variables, independent variable was ‘type of organization’ which consists of three independent

groups as small, medium and large and the distributions in each group were also found to be approximately same shape which means all the four assumptions were met.

From the results shown in Table 8.2 it is clear that, out of 20 variables (13 TQM practices & 7 performance indicators) leadership and top management commitment ( $\chi^2(2) = 10.317, p = 0.006$ ); quality information analysis ( $\chi^2(2) = 15.089, p = 0.001$ ); process management ( $\chi^2(2) = 12.540, p = 0.002$ ); operating performance ( $\chi^2(2) = 9.348, p = 0.009$ ); and financial performance ( $\chi^2(2) = 11.932, p = 0.003$ ) are having significant difference between small, medium and large scale organizations ( $p < 0.05$ ).

Table 8.2 Kruskal–Wallis H-test results of TQM practices and performance indicators

No	Variables	Mean Rank			p-value	Result
		<u>Large</u>	<u>Medium</u>	<u>Small</u>		
<b>1</b>	<b>Leadership and top management commitment (LTMC)</b>	<b>169.02</b>	<b>126.13</b>	<b>124.87</b>	<b>0.006</b>	<b>Significant Difference</b>
2	Customer focus (CF)	121.13	134.13	130.60	0.691	
3	Supplier quality management (SQM)	157.24	126.84	126.90	0.098	
4	Continuous improvement (CI)	153.15	124.47	128.91	0.175	
5	Employees empowerment (EE)	154.61	129.16	126.28	0.151	
6	Education and training (ET)	152.24	139.40	121.67	0.053	
<b>7</b>	<b>Quality information analysis (QIA)</b>	<b>177.52</b>	<b>131.90</b>	<b>120.28</b>	<b>0.001</b>	<b>Significant difference</b>
8	Quality assurance (QA)	151.26	130.33	126.38	0.222	
9	Quality citizenship(QCZ)	151.08	120.97	131.06	0.080	
10	Quality culture (QC)	143.40	133.72	126.28	0.359	
<b>11</b>	<b>Process management (PM)</b>	<b>174.00</b>	<b>119.51</b>	<b>127.14</b>	<b>0.002</b>	<b>Significant difference</b>
12	Product innovation (PI)	144.68	127.80	128.97	0.518	
13	Knowledge management (KM)	129.26	132.72	129.65	0.953	
14	Quality performance (QP)	146.73	134.95	125.00	0.280	
15	Customer satisfaction level (CSL)	154.24	131.72	125.08	0.141	
16	Employee performance (EP)	156.52	126.14	127.39	0.115	
<b>17</b>	<b>Operating performance (OP)</b>	<b>168.56</b>	<b>122.93</b>	<b>126.55</b>	<b>0.009</b>	<b>Significant difference</b>
18	Innovation performance (IP)	147.94	134.59	124.93	0.252	
19	Society results (SR)	126.13	132.56	130.36	0.920	
<b>20</b>	<b>Financial performance (FP)</b>	<b>171.56</b>	<b>130.36</b>	<b>122.25</b>	<b>0.003</b>	<b>Significant difference</b>

$p < 0.05$

Then pair wise comparison test was conducted for the five variables which were found to have significant differences. From the results, it has been found large scale organizations was significantly different to medium and small scale organizations for all the five variables [ LTMC (p=0.014 to medium, p=0.005 to small), QIA (p=0.013 to medium, p=0.000 to small), PM (p=0.004 to medium, p=0.002 to small), OP (p=0.012 to medium, p=0.012 to small) and FP (p=0.023 to medium, p=0.002 to small)].From the pair wise comparison results, it has been found that large scale manufacturing organizations implement TQM practices more rigorously than others because of the resource availability and other advantages that came with the sheer size of a large organization.

## CHAPTER 9

### RESULTS AND DISCUSSIONS

The primary objective of this study was to investigate the direct and indirect effect of TQM practices on various performance indicators specifically in Indian manufacturing context. An in – depth literature review was conducted to identify the key practices for the successful implementation of TQM in an organization as well as to explore TQM-performance effects. As a result, thirteen TQM practices and seven performance indicators were identified. Through testing the proposed hypothesized structural model, the direct and indirect effects of TQM practices have been examined. Moreover this work developed an integrated model showing the interrelationships between TQM practices and performance indicators identified. In addition, special emphasis has been placed to identify the influence of contextual factors such as ISO 9001 certification and organization size. The detailed discussion of results obtained and its validation is presented in the following subsections.

#### 9.1 IMPACT OF TQM PRACTICES ON MULTIPLE PERFORMANCE INDICATORS

As previously underlined, the main focus of the study was to examine the impact of TQM practices on various performance indicators. Besides that special emphasis was placed to identify the prominent practices which impel those linkages. Overall, the findings indicated that the TQM practices were found to be partially associated with almost all the performance indicators in this study. Moreover, the results reveals that different TQM practices significantly affect different performance indicators. It is also important to note that results also indicate the strength of association between TQM practices and multiple performance indicators are different. Customer satisfaction level was found to be the highly contributed and society results as the least contributed performance dimension by the identified TQM practices.

Quality culture was perceived as a dominant TQM practice which has impact on all performance indicators in manufacturing industries in India. The result implies that the organization recognize and emphasize, the importance of quality culture to monitor organizational mores and to evolve better TQM practices in order to harvest the benefits associated herewith. Besides, deployment of this practice also creates an

environment that foster legal and ethical behavior. In addition hereof, this could also impact knowledge sharing as well as employee attitude. It is thus imperative that deploying quality culture is a requisite to excel in every facets of performance.

From the results generated by multiple regression analysis, knowledge management was the next dominant TQM practice which is positively and significantly related to all performance indicators except innovation performance. As documented in literature, knowledge is an intangible asset which is impossible to imitate and an organization can use it as a competitive instrument to excel in this market. Firstly it is vital that the organization acquire knowledge from suppliers, employees and customers consistently to get a better understanding regarding the current financial status, skills and experience of employees and also about the customer preferences. Subsequently the employees have to disseminate the acquired knowledge and apply it properly. Effective knowledge management practices leads to an insight regarding customer needs and expectations which in turn are translated to internal requirements. Thus, this will help to achieve customer satisfaction. Internal databases which share practices and knowledge can assist the employees to improve their skills continuously. Thereby applying the acquired knowledge properly, will aid to design robust process which enhance operating and quality performance of an organization, and finally lead to improved financial status. In addition, knowledge about the environmental impacts of the products/services or processes, can be incorporate in the design stage such as eliminating or reducing the harmful parts/components in the products or services with respect to the environment or health of the society which upgrades the social image. Even though there is no significant association between knowledge management and innovation performance, the possibility of mediating effect of other TQM practices can't be ruled out.

One of the vital practice, leadership and top management commitment was positively and directly involved in improvement of quality performance, operating performance and customer satisfaction level. It is thus found that top management has to communicate quality objectives clearly throughout the organization, and allocate resources suitably for incorporating quality in internal production process, as well as in devising strategic plans for the organization, to enhance quality and operating performance, which can lead to improved customer satisfaction.

As previously mentioned an organization's success depends on the knowledge, skills and creativity of employees, so top management has to demonstrate their commitment to employees by providing opportunities for development and growth, share knowledge, encourage them to take challenges beyond normal compensation system. Intensive and concentrated efforts of management create quality focused organizational culture which might enhance other performance indicators also.

From the results, it became evident that management is goal oriented and customer focused. Customer focus activities play a vital role in propelling organization performance. A thorough understanding about the product and service attribute aids to meet customer needs and requirements which finally lead to satisfaction and loyalty. An effectual customer focused practice can introduce innovative products frequently, which help to retain customers and achieve customer loyalty.

Supplier quality management was discovered significant enough to influence the customer satisfaction level. An organization cannot contribute to the customers effectively without the collaboration among the supply chain partners. The findings suggested that the level of supplier participation and involvement in products and processes through strategic partnership, was comparatively good enough to improve the satisfaction level, which also directs to improve financial performance.

Conversely, it was found that continuous improvement is not directly associated with any performance indicators. But it might mediate other TQM practices, the possibility of this fact can't be ruled out.

## **9.2 MEDIATION EFFECTS OF PERFORMANCE INDICATORS**

One of the main objectives was to identify the mediating effect of performance indicators on others. The following sub sections discuss it in detail.

### **9.2.1 EMPLOYEE PERFORMANCE AS A MEDIATOR**

The outcome of the research and the corresponding discussions and reflections on each of the findings on mediation effects of employee performance are detailed one by one below.

- In Indian manufacturing sector, TQM practices have an indirect effect on customer satisfaction level, society results and financial performance of an

organization through employee performance. Thus it may be necessary for the organization's management to enhance the overall employee satisfaction levels and in turn lessen the prevalent human resource problems. Conversely employee performance has an inconsistent relationship with innovation performance.

- Among the TQM practices investigated, employee empowerment as well as education and training have a positive impact on employee performance. The strongest effect on employee performance stems from quality assurance and continuous improvement. Hence both these TQM practices require standardization in order to establish control, standards and routine which restrict the innovational change.
- Leadership and top management commitment also have significant effect on these relationships. Management leadership create an environment and culture that motivates employees and aids them feel pride in their work, which leads to improve employees loyalty, thereby up gradation in social image, enhance customer satisfaction and gain financial stability. In general, management in manufacturing sector places its priority on product conformance, rather than product innovation. But to be competitive in future, management should also incorporate innovation in their strategies.
- It seems that if the employees work to improve current system by focusing on quality initiatives rather than developing new ideas can lead to curtailment of innovative solutions. Continuous improvement focuses incremental change, which leads to standardization in order to establish control, subsequently standards and routines prevent people becoming innovative. Likewise the management's emphasis on product conformance, constrains the organizations ability to innovate.
- The findings indicate that employee performance fully mediates the relationship between TQM practices and society results. In the future, socially responsible behavior is not only required for attaining competitive advantage, but it becomes a necessity also. The result shows the importance of focusing employee performance in organization for achieving social impact result.
- Quality assurance and continuous improvement were found to contribute more on financial performance through employee performance. Effective



deployment of these practices, like regular inspection of work procedures as well as maintaining quality based improvements by the organization, forces the employees to strictly follow the instructions and procedures to ensure error free operations. Thereby reducing process variations, defect rate, operating and quality cost, which leads to better financial status.

### **9.2.2 INNOVATION PERFORMANCE AS A MEDIATOR**

The outcome of the research and the corresponding discussions and reflections on each of the findings on mediation effects of innovation performance are detailed one by one below.

- The importance to focus on innovation performance in manufacturing sector is established. As it positively directs the organization to excel in operating performance, customer satisfaction level and financial performance, the management has to provide resources for fostering an innovative culture.
- By proper dissemination of information collected from stakeholders in new product design with effective innovative practices, lead to minimization of cost, rework, delivery time, thereby improving operating performance. In addition, introduction of new products which meet the changing demands and expectations make satisfied and loyal customers and ultimately to gain financial benefits.
- Innovation performance has an inconsistent relationship with society performance. The literature shows that currently investors are more likely to invest in organizations that are committed to socially responsible activities. The management should incorporate the promotion of innovation activities which is leading to society results.
- Customer focus, supplier quality management and quality information and analysis practices helps the organization to ascertain the customer's current and changing needs and expectations, benchmark the suppliers and competitors. By employing product innovation and quality assurance techniques, they can introduce new products and services to retain and delight their customers.

- Technological updation and automations lead to improve effectiveness of organizational process which leads to reducing waste and higher efficiency. Proper sharing of knowledge within the organization pilot them to be innovative in quality assurance practices, consequently defects and wastes get reduced which improve operating performance. So based on this it can be concluded that the above mentioned practices need to be focused more and treated carefully in order to attain good operating performance in Indian manufacturing organizations.
- From the results, it is certain that if the management orient towards an innovative culture, their focus goes beyond the genuine nature of doing things right to challenging facets of technological updation and automations, which didn't give much emphasis in addressing the issues related to social responsibility.
- But the results couldn't explain any significant relationship between innovation performance and quality performance. Even though TQM practices have significant impact on innovation and quality performance respectively, it has not obtained empirical support to establish the mediating effect. If an organization orient towards an innovative culture to a large extent, they mould the employees to face challenges and risk as well as implementing large or radical changes which may not intervene to better quality performance.

### **9.2.3 OPERATING PERFORMANCE AS A MEDIATOR**

The outcome of the research and the corresponding discussions and reflections on each of the findings on mediation effects of operating performance are detailed one by one below.

- Here the findings gave empirical support for the managers in manufacturing sector to focus on operating performance, since it plays an intervening role to achieve the major goals such as financial stability and customer satisfaction.
- Furthermore, the direct effect of operating performance to customer satisfaction level shows that improvements in productivity, on-time delivery and defect rate reduction, partially helps to retain customers. It is not possible to point out the dominance of any few TQM practices in this relationship

because each practice has its own vital role. Hence all together, successful TQM efforts orient towards satisfaction of customers through operating performance.

- Providing proper training on design and development of product and processes which meet the current demand of market will mould the employees skills and consistency of their efforts which stabilize the process, minimize rework as well as scraps, increase output uniformity thereby reduce the production cost and ultimately to gain profits. Moreover successful supplier management practices will improve delivery performance and productivity, lead to cost minimization consequently direct to high financial status.

#### **9.2.4 QUALITY PERFORMANCE AS A MEDIATOR**

The outcome of the research and the corresponding discussions and reflections on each of the findings on mediation effects of quality performance are detailed one by one below.

- A continuous approach for implementing TQM practices in an organization can embrace quality which lead to achieve customer satisfaction and improved financial performance. If an organization gives more focus to quality results, it indirectly leads to satisfaction and retention of customer and consequently move towards financial stability.
- But there is no sufficient evidence regarding the presence of mediation linkage between quality performance and society results. As this research considered different dimensions of organization performance, quality performance indicator was devised mainly focusing the specification of the product. It might be due to this focus, mediation effect on society results cannot be excavated.

#### **9.2.5 SOCIETY RESULT AND CUSTOMER SATISFACTION LEVEL AS A MEDIATOR**

The outcome of the research and the corresponding discussions and reflections on each of the findings on mediation effects of society results and customer satisfaction level are detailed one by one below.

- Even though, TQM practices have a less impact on society results, it mediates TQM – financial performance link. Thus it is required to adopt any proven methodologies to improve society results.
- From the results, it is clear that TQM practices have an indirect effect on financial performance through customer satisfaction. Thereby it reinforces the existing knowledge.

### **9.3 AN INTEGRATED MODEL OF TQM PRACTICES AND ITS PERFORMANCE EFFECTS**

The literature review and the existing global scenario highly necessitate the need for developing a model which shows the interrelationships between TQM practices and over all organization performance. This study contributes an integrated model where leadership and top management commitment, continuous improvement, education and training as well as knowledge management, were found to be the dominant TQM practices. By implementing these practices effectively, organizations can accomplish improvement in all these performance areas. The detailed analysis of this model points out that TQM practices have only indirect effect on financial performance through combined mediating effect of customer satisfaction, operating performance and society results. Akin to financial performance, TQM practices only have indirect effect on customer satisfaction through the combined effect of quality, employee and innovation performance.

### **9.4 EFFECT OF CONTEXTUAL FACTORS ON TQM PRACTICES AND PERFORMANCE INDICATORS**

The results showed that there were a few statistically significant differences across the subgroups of contextual factors. This provided more support for the universal applicability of TQM and their effect on performance. From the results, it is conceivable that if medium and small scale organizations model themselves after large scale sector, then they can develop capabilities to successfully compete in the global economy. Such an evolution of medium and small scale organizations could then significantly contribute to the continued emergence of the Indian economy.

Intensive management leadership and effective practices for collecting and disseminating quality data throughout the organization in a timely manner is

necessary to realize improvements in process management. As a result of effective TQM practices, large scale organizations improve the operating and financial performance.

From the detailed analysis of comparison of individual TQM practices, it is established that non ISO 9001 certified organizations can learn from the experience of top quality ISO 9001 certified organizations. As a result, they can achieve higher level of quality competitiveness and better financial status. This leads to the conclusion that ISO 9001 certification represents a good strategy to execute quality practices in an integrated manner.

## **9.5 VALIDATION OF FRAMEWORKS**

This section presents the validation of the frameworks developed in this study. For this purpose, the data was collected from few manufacturing organizations other than the sample chosen for this study. A cross comparison method and t-test was conducted to test the validity of the models.

### **9.5.1 CROSS COMPARISON METHOD**

In this approach, TQM practices and its effect on performance indicators of the organizations selected for validation purpose as above was compared with the results obtained from the original research work, to assure its significance and applicability. In the sample selected for validation, if an organization implement predicted TQM practices effectively corresponding to each performance, then it is likely to excel in that area. Hence we can generalize the obtained results.

From the results, it is evident that leadership and top management commitment, education and training, employee empowerment, quality assurance, quality culture, product innovation and knowledge management are the significant TQM practices associated with quality performance. Here the organizations with better quality performance are cross checked, whether they implement corresponding TQM practices effectively. The cross comparison analysis of quality performance framework was shown in Table 9.1 where P represents highly implemented and N represents least implemented.

Table 9.1 Validation of QP framework

Organizations which excel QP	LTMC	ET	EE	QA	QC	PI	KM	Score of effective TQM implementation
II	P	P	P	P	P	N	P	6
III	P	P	P	P	P	N	N	5
IV	P	P	P	N	P	N	N	4
VI	P	P	P	P	P	N	N	5
VII	P	P	N	N	N	N	N	2
IX	P	N	N	P	P	N	N	3
X	P	P	P	P	P	P	P	7

Similarly cross comparison analysis of customer satisfaction level, employee performance, operating performance, innovation performance, society results and financial performance are shown below in Table 9.2 to 9.7 respectively.

Table 9.2 Validation of CSL framework

Organizations which excel CSL	LTMC	SQM	QC	PM	PI	KM	Score of effective TQM implementation
III	P	P	P	N	N	N	3
X	P	P	P	P	P	P	6

Table 9.3 Validation of EP framework

Organizations which excel EP	CF	SQM	EE	QIA	QC	PI	KM	Score of effective TQM implementation
II	P	N	P	N	P	N	P	4
III	P	P	P	N	P	N	N	4
IV	P	P	P	N	P	N	N	4
X	P	P	P	P	P	P	P	7

Table 9.4 Validation of OP framework

Organizations which excel OP	LTMC	CF	QCZ	QC	KM	Score of effective TQM implementation
II	P	P	P	P	P	5
III	P	P	P	P	N	4
IV	P	P	P	P	N	4
VI	P	P	P	P	N	4
VII	P	P	P	P	N	4
IX	P	N	P	P	N	3
X	P	P	P	P	P	5
XI	P	P	P	P	N	4

Table 9.5 Validation of IP framework

Organizations which excel IP	CF	ET	EE	QC	Score of effective TQM implementation
IV	P	P	P	P	4
VII	P	P	N	N	2
IX	N	N	N	P	1
X	P	P	P	P	4

Table 9.6 Validation of SR framework

Organizations which excel SR	QC	KM	Score of effective TQM implementation`
IV	P	N	1
VIII	P	N	1
IX	P	N	1
X	P	P	2

Table 9.7 Validation of FP framework

Organizations which excel FP	SQM	ET	QCZ	QC	PM	KM	Score of effective TQM implementation
IV	P	P	P	P	N	N	4
VI	P	P	P	P	N	N	4
VIII	P	P	P	P	N	N	4
IX	N	N	P	P	N	N	2
X	P	P	P	P	P	P	6
XI	N	P	P	P	N	N	3

The results are satisfactory to a large extent through this approach of validation. From this analysis, it is apparent that significant TQM practices explored in this study have association with respective performance indicators. The findings of this study strongly support the linkage between TQM practices and multiple performance indicators.

### 9.5.2 VALIDATION USING T-TEST

To validate the models showing the relationship between TQM practices and performance indicators, t-test was used. For this approach two sets of data from the sample were randomly selected, and conducted t-test with the validation data set. The result is shown in Table 9.8.

Table 9.8 Validation results using t-test

SL.No	Variables	p-value of first set	p-value for the second test
1	LTMC	0.445	0.844
2	CF	0.484	0.382
3	SQM	0.746	0.513
4	CI	0.927	0.754
5	EE	0.367	0.320
6	ET	0.933	0.084
7	QIA	0.478	1.000
8	QA	0.073	0.088
9	QCZ	0.063	0.063
10	QC	0.247	0.508
11	PM	0.353	0.202
12	PI	0.192	0.184
13	KM	0.784	0.696
14	QP	0.061	0.423
15	CSL	0.128	0.234
16	EP	0.707	0.275
17	OP	0.337	0.230
18	IP	0.215	0.400
19	SR	0.012	0.000
20	FP	0.521	0.180

$p < 0.05$

All the TQM practices and multiple performance indicators were not significant except society results in both cases at probability level 0.05. It gave the empirical evidence for the fact that both the data sets were not significantly different. Consequently, the results are not ruling out the original findings of this research and they are satisfactory to a larger extend.



## **CHAPTER 10**

### **CONCLUSIONS**

As there is no one stop solution to survive in this competitive scenario, Indian manufacturing organizations are forced to adopt different or any proven management approaches to sustain and realize improvement. The results of the study illustrate the importance of implementing TQM practices by revealing its positive and significant impact on various facets of organization's performance. The research contributed an integrated model which shows the interrelationships between TQM core practices and multiple performance indicators, which can be used by an organization as a guideline as well as an empirical support for adopting TQM practices. Intensive leadership and management commitment, proper education and training, effective continuous improvement practices and knowledge sharing mechanisms are found to be the most dominant TQM practices. Additionally, this study identifies significant TQM key practices corresponding to each performance indicators. Thus that practices can be highly focused for the enrichment of particular performance indicator if required. Moreover the results indicate the presence of mediating effects between the performance indicators. Even though the TQM practices have different extend of association with respect to various performance dimensions, the empirical evidence regarding the mediation effect accentuate the adoption of selected TQM practices, which are positively mediating as obtained through this research. In response to the research objective regarding the contextual factors, the results highlighted the universal applicability of TQM practices irrespective of the size of the organization, as well as emphasized the relevance of implementing ISO 9001 as primary step towards the quality path. From the results, it can be concluded that continuous efforts towards implementing TQM practices in an organization can attain quality which ultimately lead to achieve overall organization performance.

#### **10.1 MANAGERIAL AND RESEARCH IMPLICATIONS**

The findings of the research offer some potentially valuable insight about the relevance of TQM practices and its strong linkage on various performance indicators, through which the overall organization performance can be enhanced. By implementing these practices effectively, managers can expect to realize improvement in all these performance areas. Hence the managers can adopt this approach to assess

their organization's level in the quality path and as a guideline in implementing TQM practices. They can also measure the impacts of TQM practices on multiple performance measures in order to evaluate their TQM initiatives. Especially deployment of quality culture is a requisite to excel in every facets of performance. The positive relationship between TQM practices and various performance indicators, can motivate the managers to allocate resources in time, effort and capital for TQM implementation in pursuing quality, leading to customer retention and competitiveness. It may be necessary for an organization's management to enhance the employee satisfaction and in turn lessen the existing human resource problems. To be competitive in future, the management should incorporate innovation and social responsibility while developing strategies. The findings of the study strongly suggest the need for holistic implementation of TQM practices for the survival of the organization. To successfully compete in this global scenario, medium and small scale organizations has to transform themselves by developing the capabilities like large scale sector. Better quality practices and performance effects of ISO 9001 certified organizations exemplify the relevance of implementing ISO 9001 certification by others.

This study contributes to the TQM literature by validating the effects of TQM practices on organization performance. It also sheds more light to the mediating effect of performance indicators on the relationship between TQM practices and financial performance. The research outcome is evidenced for the universal applicability of TQM practices irrespective of the organization size as well as the importance of ISO 9001 certification in Indian manufacturing context.

## **10.2 RESEARCH LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH**

This study is subject to certain limitations. Even if all variables were found to be reliable, valid and satisfactory non response bias test results, the remote possibility of bias in the data might not be fully ruled out.

There is a probability of occurrence of common method variance and common method bias since the data for both dependent and independent variable were collected from same respondents in the organization. Additionally data on

performance indicators were based on the respondent's assessment and awareness only.

The mediating relationship between individual TQM practice and performance indicators can be investigated in future studies. Since society results are a necessity in future, the direct and indirect practices focusing towards this can be explored. In addition, there is a research scope to identify the moderating effect of contextual factors such as degree of TQM implementation, scope of operation and type of organization.

This concluding chapter provides an overall summary of the research work. The contribution of the study to the existing knowledge and managerial as well as research implications are highlighted. In addition, the limitation of the study is presented and also the direction for future research is also recommended.

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**ANNEXURE 1**  
**A SURVEY TO IDENTIFY THE RELATIONSHIP BETWEEN TQM PRACTICES AND ORGANIZATION PERFORMANCE**  
 DEPARTMENT OF MECHANICAL ENGINEERING  
 GOVERNMENT ENGINEERING COLLEGE, THRISSUR

**Give brief details about your organization:**

- Name of the organization:
- Name and designation of respondent :
- Contact No:
- ISO 9001 certified : YES/NO
- Large/medium/small/micro organization :
- Type of organization (eg: Automobile, textiles, mining.....):
- Other quality management practices in the organization :
- Quality awards won by the organization :
- Challenges faced by organization in implementing TQM practices :

Please, indicate the level of implementation of each of the following elements in your organization in a scale from **1 (strongly disagree) to 7 (strongly agree)**.

1(Strongly disagree), 2 (Disagree), 3 (Somewhat disagree), 4 (Neutral), 5 (Somewhat agree), 6 (Agree), 7 (Strongly agree).

Questionnaire (With summary of responses, Total no of responses 260)

**A. Leadership and top management commitment**

No	Items underlying each construct	7	6	5	4	3	2	1
1	The top management able to establish a long term vision for the organization.	33	180	47	0	0	0	0
2	Higher management actively directs the quality management program.	38	191	31	0	0	0	0
3	Top management communicates the company's philosophy to the employees.	38	176	46	0	0	0	0
4	Importance given by the top managers for allocation of sufficient resources and time for quality improvement initiatives.	31	188	41	0	0	0	0

## B. Customer focus

No	Items underlying each construct	7	6	5	4	3	2	1
1	The organization is totally committed to create satisfied customers.	56	165	39	0	0	0	0
2	The data collected from the customers is used in designing new products and services.	15	157	83	5	0	0	0
3	The organization monitors complaints from the customers and quality related customer complaints with top priority.	11	172	77	0	0	0	0
4	Obtain fast and reliable feedback from the customers about the organization performance.	15	169	72	4	0	0	0

## C. Supplier quality management

No	Items underlying each construct	7	6	5	4	3	2	1
1	Organization builds long term and cooperative relationship with your suppliers.	23	102	126	9	0	0	0
2	Organization takes action to assist and improve the quality and responsiveness of the suppliers.	18	104	125	13	0	0	0
3	Suppliers are selected based on quality rather than price.	24	127	102	7	0	0	0
4	Clarity of specifications given to suppliers.	18	111	124	7	0	0	0
5	Level of technical support to suppliers.	20	102	126	12	0	0	0

## D. Continuous improvement

No	Items underlying each construct	7	6	5	4	3	2	1
1	Program aimed at finding time and cost losses in all internal processes.	18	92	139	9	2	0	0
2	The organization reinforces continuous study and improvement of all its products, services and processes.	60	126	72	0	2	0	0
3	Use of specific organizational structures (quality committee, work teams) to support quality improvement.	52	109	73	24	2	0	0
4	Development of zero defect mentality.	46	132	73	7	2	0	0
5	The organization has an accurate and efficient database that provides information on internal operations.	26	105	95	28	6	0	0

### E. Employee empowerment

No	Items underlying each construct	7	6	5	4	3	2	1
1	Employees are recognized for superior quality performance.	24	98	108	21	9	0	0
2	Employees' rewards and penalties are clear.	31	110	102	13	4	0	0
3	Excellent suggestions are financially rewarded.	34	113	92	16	5	0	0
4	Recognition and reward activities effectively stimulate employee commitment to quality improvement.	27	98	115	15	5	0	0

### F. Education and training

No	Items underlying each construct	7	6	5	4	3	2	1
1	Employees are encouraged to accept education and training in the organization.	19	107	96	35	2	1	0
2	Most employees in the organization are trained on how to use quality management methods and tools.	29	83	84	54	6	4	0
3	Higher management has developed an environment helping towards on-the-job training.	25	87	90	39	18	1	0
4	Employees are trained in teamwork and problem solving skills.	32	73	84	45	19	7	0

### G. Quality information analysis

No	Items underlying each construct	7	6	5	4	3	2	1
1	Use of statistical control charts to control processes.	7	9	27	59	63	58	37
2	Quality data (cost of quality, rejections rate, errors rate, etc.) are used as tools to manage quality.	23	58	70	46	27	35	1
3	Departmental meetings are conducted at regular intervals to plan, implement and monitor the effectiveness of quality improvement programs.	34	92	90	44	0	0	0
4	Quality data are used by top and middle management in decision making, planning and controlling.	34	97	82	47	0	0	0



## H. Quality assurance

No	Items underlying each construct	7	6	5	4	3	2	1
1	The new product/service design is reviewed before the product/service is produced.	36	120	91	13	0	0	0
2	High clarity of product/service procedures.	42	166	46	6	0	0	0
3	Amount of inspection, review, or checking for in-process quality.	49	151	53	7	0	0	0
4	Amount of inspection, review, or checking for final quality.	52	166	42	0	0	0	0
5	The process design minimizes the chances of employee errors.	32	105	110	13	0	0	0

## I. Quality citizenship

No	Items underlying each construct	7	6	5	4	3	2	1
1	Public health issues are considered as a company responsibility.	67	174	18	1	0	0	0
2	Environmental issues are considered as a company responsibility.	30	152	77	1	0	0	0
3	The organization extends its quality leadership to the external community.	68	175	16	1	0	0	0
4	Working conditions such as social and sporting clubs, minimum safety standards.	76	166	17	1	0	0	0
5	Organization concerned about green issues such as energy conservation.	59	136	64	1	0	0	0

## J. Quality culture

No	Items underlying each construct	7	6	5	4	3	2	1
1	The management and employees accepts quality as a strategic weapon in strengthening the company and to gain competitive advantage.	49	131	78	2	0	0	0
2	The employees at all levels accept the motto “service to customers” as the real purpose of their existence.	48	178	33	1	0	0	0
3	The employees believe in doing things “right the first time and every time”.	76	116	65	3	0	0	0
4	Level of prevalence among employees, feeling such as “my company” or “my organization” and “we work together to achieve common goals”.	47	179	34	0	0	0	0
5	Level of appearance of employees having a pleasant and professional look.	52	176	31	1	0	0	0

### **K. Process management**

No	Items underlying each construct	7	6	5	4	3	2	1
1	Continuous control and improvement of key processes.	18	95	98	42	7	0	0
2	Preventing faulty products/services is a strong practice in this organization.	29	81	95	46	9	0	0
3	Clarity of work or process instructions given to employees.	26	96	94	35	9	0	0
4	Stability of work schedules is implemented.	24	92	94	40	10	0	0

### **L. Product innovation**

No	Items underlying each construct	7	6	5	4	3	2	1
1	The customer requirements are thoroughly considered in new product design.	2	33	106	89	29	1	0
2	Various departments participate in new product development.	5	18	75	109	42	11	0
3	Experimental design is used extensively in product design.	2	12	22	92	96	28	8
4	Developing new products with technical specifications and functionalities totally differing from the current ones.	2	27	100	98	32	1	0
5	Quality function deployment is used extensively in product design.	2	33	89	91	44	1	0

### **M. Knowledge management**

No	Items underlying each construct	7	6	5	4	3	2	1
1	Employees in the organization are frequently encouraged by knowledge sharing mechanisms.	10	44	63	48	61	30	4
2	Organization is facilitated by IT systems invested for knowledge sharing.	10	64	83	67	25	11	0
3	People in the organization frequently share and collect knowledge based on expertise.	1	36	90	88	44	1	0

## PERFORMANCE INDICATORS

### N. Quality performance

No	Items underlying each construct	7	6	5	4	3	2	1
1	Products meets or exceed customer's demand	13	22	96	69	46	14	0
2	Cost of rework reduced	13	38	82	101	1	25	0
3	Reliability of our product increased	44	144	70	1	1	0	0
4	Competitive position increased	44	152	63	1	0	0	0
5	Steady decline in no. of products litigation claims and warranty claims.	6	19	67	95	51	22	0

### O. Customer satisfaction level

No	Items underlying each construct	7	6	5	4	3	2	1
1	Customer complaints and grievances reduced.	0	11	87	154	8	0	0
2	Level of customer satisfaction improved.	1	14	91	146	8	0	0
3	Customer retention has improved.	3	23	89	135	10	0	0
4	Communication with customer has improved.	3	24	103	122	8	0	0
5	Customer complaints are resolved quickly.	1	15	89	147	8	0	0

### P. Employee performance

No	Items underlying each construct	7	6	5	4	3	2	1
1	Level of employee satisfaction improved.	36	111	87	21	5	0	0
2	Level of absenteeism got reduced.	23	90	83	42	22	0	0
3	Employee skills improved	14	72	151	21	2	0	0
4	Communication with employees has improved.	32	111	75	37	5	0	0
5	Employee turnover ratio reduced.	18	56	91	24	46	25	0

### Q. Operating performance

No	Items underlying each construct	7	6	5	4	3	2	1
1	Delivers the products on time to customers.	57	152	49	1	1	0	0
2	Cycle time got reduced.	60	140	58	2	0	0	0
3	Defect rate of products reduced.	50	138	70	2	0	0	0
4	Productivity of the firm improved.	22	191	46	1	0	0	0
5	Machine breakdown time got reduced.	43	154	58	4	1	0	0

**R. Innovation performance**

No	Items underlying each construct	7	6	5	4	3	2	1
1	No. of new products in our organization has increased in the last 3 years.	67	50	89	30	21	3	0
2	Speed of new product introducing to market in our organization is high.	60	52	81	47	16	4	0
3	Use of latest technological innovations in a new product is high.	44	71	98	30	14	3	0
4	Innovations are introduced to work processes and methods.	51	79	99	18	13	0	0
5	Technological Competitiveness of our organization is high.	7	79	126	37	11	0	0

**S. Society results**

No	Items underlying each construct	7	6	5	4	3	2	1
1	Improved social image or positive impact on society	55	156	46	3	0	0	0
2	Improved safety and No. of accidents got lowered.	70	114	67	9	0	0	0
3	Protection of environment has improved.	74	124	57	9	0	0	0
4	Pollution level has decreased.	66	128	57	9	0	0	0
5	Noise level has decreased.	51	136	63	10	0	0	0

**T. Financial performance**

No	Items underlying each construct	7	6	5	4	3	2	1
1	Return on assets of our firm has increased.	50	134	63	13	0	0	0
2	Sales of our firm have grown.	4	58	178	20	0	0	0
3	Growth in revenue has increased.	20	143	84	13	0	0	0
4	Operating expenses got reduced.	11	131	90	28	0	0	0
5	Gross profit margin has improved.	24	102	113	21	0	0	0