Soft TQM for Sustainability: An Empirical Study on Indian Cement Industry and Its Impact on Organizational Performance

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Abstract Firms gained advantage dramatically from the quality revolution, such as Toyota and Motorola, treated quality as an opportunity for process improvements rather than as a cost (Fust and Walker, Corporate sustainability initiatives: the next TQM [white paper]. Executive Insight, pp 1–8. Available at: http://www.kornferryinstitute.com/about_us/by_industry/industrial/publication/620/Corporate_Sustainability_Initiatives_The_Next_TQM, 2007). However, to survive in intense worse era, companies are beginning to embrace sustainability as an opportunity to gain competitive advantage. As we embark into new era which has witnessed global slowdown and intense competition to survive, it is quite appropriate to revisit the role of total quality management (TQM) in enabling and supporting firm to sustain superior performance. This chapter is concerned with soft dimensions of TQM which not only help it in successful implementation but also provide sustainable competitive advantage. Sustainability can perhaps be correlated with the principle of excellence which is now gaining wider acceptance in the business community (Zairi, TQM sustainability: how to maintain it gains through transformational change. Unpublished manuscript, School of Management, University of Bradford, 2005). The present research proposes a soft TQM framework and empirically tested the impact of soft dimensions of TQM on its performance in context to Indian cement industry to understand how soft TQM can help Indian cement industry to sustain competitive advantage in long term. The chapter concludes with a statement that soft dimensions of TQM are critical for sustainability which enable cement firms to achieve superior performance.

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1 Introduction

TQM is considered as a strategy, and therefore, much more than terminology and tools, TQM provides a unifying framework that brings a range of "good management practices" to bear simultaneously (Reed et al. 1996). TQM is simply the process of building quality into goods and services from the beginning and making quality everyone's concern and responsibility. The success of TQM depends on the genuine commitment to quality by every member of the organization. According to Ho and Fung (1994), TQM is a way of managing to improve the effectiveness, flexibility, and competitiveness of a business as a whole. It is also a method of removing waste, by involving everyone in improving the way things are done. According to Vuppalapati et al. (1995), TQM is an integrative philosophy of management for continuously improving the quality of products and processes to achieve customer satisfaction. According to Kanji and Asher (1993), TQM is a continuous process of improvement for individuals, groups of people, and whole firms; it encompasses a set of four principles (delight the customer, management by fact, people-based management, and continuous improvement) and eight core concepts (customer satisfaction, internal customers are real, all work is process, measurement, teamwork, people make quality, continuous improvement cycle, and prevention) (Kanji 1998). Currently there is lot of discussions or awareness about the quality of the manufacturing industries in India particularly among automotive sectors and its ancillary manufacturing units, steel manufacturing units, cement manufacturing units, etc. It can be presumed that this is due to double-digit growth of manufacturing sector in India.

India is the second largest producer of cement on the globe after China. In total, India manufactures over 251.2 million tonnes of cement per year (CMIE 2011). The cement industry in India has received a great impetus from a number of infrastructure projects taken up by the Government of India like road networks and housing facilities. While the Indian cement industry enjoys a phenomenal phase of growth, experts reveal that it is poised toward a highly prosperous future. Most of the Indian cement companies have now adopted TQM as their guiding philosophy, and most of the plants of Ultratech (formerly Grasim Cements) have acquired ISO 9001, ISO 14001, and QHSAS. Similarly other players like ACC Limited, Ambuja Cement, Century Cement, Lafarge Cement, Heidelberg, and other big players have also implemented Quality Management System comparable to any plants in other developing and developed nation. Beside this Indian cement companies are also adopting quality tools like 5 S, TPM, BPR, and KAIZEN besides other statistical tools like control charts, run chart, and Ishikawa diagram. However, key quality issues identified by the researcher are:

- *Green Management*: Air and dust emissions and solid waste generated from the kiln in the heating process pose major threat to environment. There is always possibility that source of drinking water can get contaminated with heavy metals present in waste generated during cement production (Salim and Salem 2010). In order to protect the environment, Government has enforced strict regulations related to carbon emissions and environmental protection (Loreti Group 2008; ACC 2008, 2009; Selim and Salem 2010). Future sustainability of cement production and cement firms lies in the efficient *Green Management* practice.
- *Use of Alternative Fuel*: Cement industry is high intensively of raw materials and energy with fuel accounting for 30–40% of the production costs. Owing to such high impact of fuel cost on cost of finished product, the effective use of alternative fuel has become a serious concern among cement companies engaged in cement production (Steinweg 2008; Miller 2009; Selim 2009; Selim and Salem 2010).
- *Warehousing and Packaging*: Warehouse is either public owned or private owned but the conditions of cement warehouse in India are very poor in comparison to other countries like China, Thailand, Vietnam, Malaysia, and Sri Lanka. According to a senior official of Ultratech Cement, it is estimated that 0.5–1 metric tonne of cement gets wasted during loading and unloading of cement bags from a wagon carrying load ranges between 56 and 61 tonne at plant site and at railway siding. The maximum wastages occur at railway siding because in entire country, loading or unloading of cement bags from wagon or truck is mostly manual process using steel hook which causes puncture in HDPE (high-density polyethylene) cement bag.
- *Transportation and Distribution Losses During Transit and Storage*: During transportation wastages result due to bursting of cement bags due to extreme rough handling, poor condition of wagon, untrained labor uses steel hook with sharp edge, wrong delivery of product to the customer site, or most of the times due to lack of proper coordination among sales team, sales unit logistics (outbound logistics), and plant logistics (inbound logistics). This results in huge inventory level in warehouses which further leads to operational problems within warehouses which are:
  - Improper stacking
  - Frequent accidents inside storage house
  - Violation of FIFO (first in, first out) practice
  - Lower layer bags get solidified due to column pressure

  From above we can infer that quality of the finished goods critically depends upon transportation, storage and handling, and distribution (warehousing) activities.

1.1 Research Aim and Objectives

The central problem of the study is how we can make TQM implementation effective in an organization through soft dimensions for sustainability. It further leads toward identification of research objectives of the study as given below:

- To study the role of soft dimensions of TQM for sustainability of firm.
- To propose and validate a research model testing soft dimensions of TQM and firm performance.
- TQM and firm performance.

2 Literature Review

Exhaustive literature review was done through available secondary sources like books, journals, monographs, reports, magazines, newspapers, and online sources. The aim of the literature review is to understand total quality management (TQM), its origin, conceptual development, definition, its present status, and quality practices. The various quality tools and award model are studied in detail to assess the dimensions that lead to effective implementation of TQM and its relationship with firm performance.

In this section Indian cement industry is discussed in detail to provide a clear picture about the industry and the importance of TQM practices in cement industry. The objectives of literature review are:

- To define TQM
- TQM and sustainability
- To review quality tools
- To understand hard and soft dimensions of TQM.

2.1 Definitions of TQM

Numerous definitions have been given on TQM by quality gurus, practitioners, and academicians. Berry (1991) defined TQM process as a total corporate focus on meeting and exceeding customer's expectations and significantly reducing costs resulting from poor quality by adopting a new management system and corporate culture (Yusof 1999). Wolkins (1996) outlined TQM as a tool to integrate fundamental management techniques, existing improvement efforts, and technical tools under a disciplined approach focused on continuous improvement. TQM can be defined as a set of techniques and procedures used to reduce or eliminate variation from a production process or service-delivery system in order to improve efficiency, reliability, and quality (Steingard and Fitzgibbons 1993). From various definitions as reported in literature, that TQM can be viewed as a tool for sustaining competitive advantage by improving profitability and reducing cost (Feigenbaum 1983; Pike and Barnes 1996; Oakland 1989; Taddese and Osada 2011; Kristianto et al. 2012).

2.2 TQM and Sustainability

Sustainability here can be termed as "the ability of an organization to adapt to change and respond to global demands and meet customers demand to achieve and maintain superior competitive performance" (Zairi and Liburd 2001). In another literature sustainability is termed as the development that meets present needs without compromising with the ability of future generations to meet their own needs. In intense competitive era when the operating cost is increasing, the cost of input materials and energy is increasing with much higher pace, and uncertainty atmosphere in terms of supply and demands has now forced Indian manufacturers to reformulate strategies to achieve sustainability in performance. TQM can help a firm to achieve sustainability (Curry and Kadasah 2002; Schonoberger 1986). In one of the study in Saudi Arabia, many manufacturers started copying the tools and techniques in hope that they will reap the benefits of TQM, but unfortunately story turned out to be bad investment (Ahmed and Schroeder 2002). The reason was quite simple that most of the TQM implementation project failed because of poor understanding of cultural and social dynamics of the organizations and place. This has prompted researchers to investigate how soft dimensions of TQM can help organizations to achieve sustainability.

2.3 Review of Quality Tools

Quality tools are graphical techniques employed to assess, to appraise, and to provide solutions to quality issues. They are helpful in troubleshooting issues related to quality. They are very simple because they are suitable for people with little formal training in statistics and because they can be used to solve the vast majority of quality-related issues. The tools most commonly used in Indian firms are the cause-and-effect or Ishikawa diagram or fish-bone diagram (FBD), check sheet, control chart, histogram, Pareto chart, scatter diagram, stratification (alternately flow chart or run chart), brainstorming, suggestion scheme, PERT/CPM, PDCA cycle, KAIZEN activities, total productive maintenance (TPM), business process reengineering, and 5 S (Khanna et al. 2003; Khanna 2009; Tripathi 2010; Ando and Kumar 2009; Natarajan and Senthil 2011).

2.4 Understanding Hard and Soft Dimensions of TQM

However, while TQM has been much talked up by gurus/consultants and practitioners promoting their companies, there is growing evidence of its spreading influence if not of its effectiveness. Almost half of corporate respondents and over one-third

of individual managers agreed that of the suggested techniques and managerial changes, the biggest impact on the future would be TQM (Wheatley 1991). Yet there is increasing evidence that TQM has not fulfilled its promise (Kearney 1992; Miller 1992; Cruise O'Brien and Voss 1992; The Economist Intelligence Unit 1992; Wilkinson et al. 1993). Furthermore many of the problems arising appear to have been those relating to human resource (HR) issues such as management style, attitudes, and culture. One possible explanation for this is that TQM has developed from a quality assurance ideology and consequently focuses on the "hard" measurable aspects such as costs and production/operation performance to the relative neglect of the so-called soft aspects.

For the most part, however, the principal contributions to the analysis of TQM and its operation have come from people in the Operations Management area (e.g., Oakland 1989; Dale and Plunkett 1990; Dale 1994). Arguably, this has led to a preoccupation with the so-called hard production-orientated aspects of TQM as opposed to its "softer" human resource management (HRM) characteristics. This means that less attention has been focused on people-management issues such as appropriate supervisory styles, compensation/payment systems, teamwork, industrial relations, and the implications for different managerial functions.

Thus, the limitations of TQM can be at least partially attributed to the neglect of human resource policies in the organization and a failure to align the HR policies with TQM to ensure integration. These critical "soft" issues are apparent from most reports, and research yet remains relatively unexplored in comparison with the use of quality management tools and techniques and quality systems (Wilkinson et al. 1992). In recent years, TQM has been taken up by a number of HR writers who have seen it as an opportunity for the function to play a strategic role.

Ho and Fung (1994) identified ten TQM elements: leadership, commitment, total customer satisfaction, continuous improvement, total involvement, training and education, ownership, reward and recognition, error prevention, and cooperation and teamwork. Waldman (1994) identified eight key TQM elements as the following: top management commitment to place quality as a top priority, a broad definition of quality as meeting customers' expectations, TQM values and vision, development of a quality culture, involvement and empowerment of all organizational members in cooperative efforts to achieve quality improvements, an orientation toward managing by fact, the commitment to continuously improve employees' capabilities and work processes through training and benchmarking, and attempts to get external suppliers and customers involved in TQM efforts. Mann and Kehoe (1994) divided TQM into ten elements. They are supplier improvement, process control and improvement, internal customer focus, measurement and reporting, leadership, quality system, participation, recognition, education and training, and external customer focus. In Powell's (1995) study, the following elements were identified as TQM framework: executive commitment, adopting the philosophy, closer to customers, closer to suppliers, benchmarking, training, open organization, employee empowerment, zero-defects mentality, flexible manufacturing, process improvement, and measurement. Black and Porter (1996) identified ten critical factors of TQM: people and customer management, supplier partnership, communication

of improvement information, customer satisfaction orientation, external interface management, strategic quality management, teamwork structure for improvement, operational quality planning, quality improvement measurement systems, and corporate quality culture. Choi and Eboch (1998) studied the TQM paradox using management of process quality, human resources management, strategic quality planning, and information and analysis as the constructs of TQM implementation.

The key dimensions of TQM identified are leadership, human resource focus, relationship with partners, culture, customer focus and satisfaction, and tool and techniques (Saylor 1992; Oschman 2002; Anderson et al. 1994; Chinese Quality Awards 2001; Gunasekaran 1999; EFQM 2003).

After thorough analysis of the content and available researches and literature, these soft dimensions were further listed. An overlapping of concepts, systems, and functions is found out. Some of the important observations that can be drawn are as follows:

- Due to origin of TQM from Operations Management stream, there has been an obsession of hard dimensions, i.e., Statistical Quality Control, Quality Function Deployment, and Six Sigma.
- The following dimensions are important for successful implementation, i.e., leadership, human resource focus, relationship with partners, and quality culture.

2.4.1 Soft Dimensions of TQM

Keeping the research objectives in mind, the focus is on soft dimensions of TQM which are critical success factors for implementation of TQM. The conceptual definitions of the Identified Soft Dimensions that support TQM implementation are presented in the tabulated form as below in Table 1.

Thus, some of the important points that can be concluded from this section are:

- There is an increasing role of management and the people behind it for successful implementation of TQM.
- The following soft dimensions are critical for successful implementation of TQM, viz., the role of leadership, quality culture, role of HR functions, and relationship with partners.
- The role of leadership and management is an important aspect for successful implementation of TQM.
- Human resource functions of an organization have an important role in successful implementation of TQM. It includes the planning function, recruitment and selection, training and development, performance appraisal, compensation management, and communications.
- The role of partners and their relationship with the organization is an important aspect for successful implementation of TQM. Partners would consist of internal and external customers, associated companies, suppliers, and the stakeholders including community and society.

Table 1 Soft dimensions for successful implementation of TQM

Constructs	Sources	Definition(s)
Leadership	Juran and Gryna (1997), Karaszewski (2010), and Rui et al. (2010)	Leadership helps to establish quality policies and goals, to provide resources and problem-oriented training, and to stimulate improvement which is vital to TQM implementation and its effect on firm performance
	Anderson et al. (1994) and Choi and Behling (1997)	Leadership is the ability of top management to establish practices and lead a long-term vision for the firm, driven by changing customer requirements as opposed to an internal management control role
	European Quality Award (1994) and Malcom Baldridge National Quality Award (1997)	Leadership is crucial in creating the goals, values, and systems that guide the pursuit of continuous performance improvement
	Minjoon et al. (2006)	Leaders through *leadership* are expected to set quality as a priority while allocating adequate resources to continuous quality improvement and evaluating employees based on their performance
Customer needs	Deming (1986) and Flynn et al. (1995)	*Customer satisfaction* is the result of offering product, keeping the needs of customer
	Feigenbaum (1983)	Customer satisfaction is the output of the customer focus initiative. The customer complaints should therefore be treated with top priority
	Juran and Gryna (1997)	Customer satisfaction is the result of implementation of the customer feedbacks to improve the quality of the product offered to the customer
	EFQM (2003)	Customer satisfaction measures are used to drive improvement and better understand the factors that drive market
People results management	Tenner and Detoro (1992)	People results management is the work based on the skills and participation of every employee and his or her understanding of what is required. Educating and training of employees provides the knowledge required for the mission, vision, direction, and strategy of the organization as well as the skills they need, to secure quality improvement and resolve problems
	Pace (1989) as cited by Bergman and Klefsjo (1994), and Tenner and DeToro (1992)	People result is a process designed to empower members of an organization to make decisions and to solve problems related to their level in the organization
	Irianto (2005)	People results management from quality perspective attempts to achieve two objectives, i.e., to realize the potential of working capability and to engender communication, participation, trust, teamwork, empowerment, personal development, and pride

Partnership and resources	Hong and Satit (2005)	Partnership and resources is how the organization plans and manages its external partnerships and internal resources in order to support its policy and strategy and the effective operation of its processes. Internal and external partnership resources should seek to develop long-term objectives, thereby creating basis for mutual investment. Partners and resources should address the key requirements for success of the partnership, means of regular communication, approaches to evaluating progress, and means for adapting to changing conditions
	EFQM (2003)	External partnerships and finances are managed, and performance requirements are carefully defined and used to select suppliers and partnerships
Human resource focus Empowerment	Lee et al. (2003), Mahour and Lester (2007), and Haffer and Kristensen (2010)	Human resource focus is an initiative which has positive impact on final quality of the product
	Parast et al. (2006)	Human resource focus is the important component of TQM which has positive impact on business performance
	Karia and Asaari (2006)	Human resource focus is an effort in which company need to invest in training to improve the overall performance of the company
	EFQM(2003)	Human resource focus is characterized as work and jobs carefully designed, organized, and managed to provide opportunities for individual initiative and self-directed responsibility
	Bowen and Lawler (1992)	Empowerment is defined as sharing with frontline employee information about organizations' performance, information about rewards based on organization performance, and knowledge that enables employees to understand and contribute to the organizational performance
Training	Cherrington (1995)	Training refers to the acquisition of specific skills or knowledge, to perform particular activities or a specific job
	Brown (1994)	Training addresses issues of awareness, cultural change to develop appropriate attitudes and quality-related values, equipping employees with tools and techniques for quality improvement, and training in job roles
	Hackman and Wagemann (1995)	Training is the second most commonly used TQM implementation practice in the United States. Firms that implement TQM invest heavily in training for employees at different levels
	Karia and Asaari (2006)	Training and education have a significant positive effect on job involvement, job satisfaction, and organizational commitment

(continued)

Table 1 (continued)

Constructs	Sources	Definition(s)
Communication	Karia and Asaari (2006), Thiagarajan and Zairi (1998), and Oschman (2002)	Communication is for the development of awareness and building commitment toward quality in an organizations' environment
	Thiagarajan and Zairi (1998)	Communication helps to foster good employee and employer relationship
Quality culture	Oschman 2002	Quality culture is defined as feeling of togetherness, empowered employees, and no compromise with success
	Reid and Crisp (2007)	Quality culture is about sticking to core value, i.e., excellence, integrity, teamwork, innovation

Table 2 List of benefits of TQM

Benefits	Authors
Better product or service quality	Deming (1986), Oakland (1989), Holloway et al. (1995), James (1996), Reed et al. (1996), and Mohanty and Lakhe (1998)
Promoting continuous improvement	Spencer (1994), Reed et al. (1996), Waldman (1994), James (1996), and Bounds et al. (1994)
Enhances firm's profitability/ productivity	Waldman (1994), Ahire and Kiran (1995), James (1996), Oakland (1989), Mohanty and Lakhe (1998), Sun (2000), Fotopoulos and Psomas (2009a), and Desai (2012)
Improvement in market share	Buzzel and Gale (1987), Reed et al. (1996), and Mohanty and Lakhe (1998)
Increases flexibility	James (1996) and Reed et al. (1996)
Customer satisfaction	Jarrod and Chester (2008) and Kristianto et al. (2012)
Waste reduction	Talib et al. (2011)
Improvement in revenue	Wisner and Eakins (1994), Mehmet et al. (2006), Fotopoulos and Psomas (2009a, b), and Raja et al. (2011)
Reduces cost	Mehmet et al. (2006), Fotopoulus and Posmas (2009a, b), and Raja et al. (2011)
ROI (return on investment)	Cole (1992) and GAO/NSIAD-91-190 (1991)

- The role of HR philosophy/strategy related to quality is an important dimension for successful implementation of TQM. It includes human resource strategy, process, control systems, and statistical techniques for quality management.

2.5 TQM and Firm Performance

It is equally important to understand how TQM implementation affects a firm performance. What tangible and intangible benefits occur that define effective and efficient implementation of TQM of a firm?

In brief researcher can conclude the benefits of TQM in tabulated form in Table 2 as:

2.6 Indian Cement Industry

The demand and supply of cement have undergone a phenomenal growth in India. On the whole, the fact that India is a fast developing nation presents an enormous scope for the development of cement industry. The present section deals with the production status of Indian cement industry, its potential, the level of technology, scope, FDI, and future prospects for the industry.

Production Capacity: Demand in the cement industry has seen enormous growth due to the growth of infrastructure, residential and commercial projects. Cement

production in India is anticipated to increase to 315–320 million tonne (MT) by the end of the fiscal year (2011) from the current 300 MT.

Technology Upgradation: At present, the cement industry in the country is undergoing a technological change on account of upgradation and assimilation witnessed in the sector. Presently, not less than 93% of the total capacity is wholly based on manufacturing under the modern dry process, which is deemed more environment-friendly, while the remaining rest 7% employs old wet and semidry process technology. The cement industry in India has developed its technical capabilities to produce a range of cement types including Ordinary Portland Cement (OPC), Portland Pozzolana Cement (PPC), Portland Blast Furnace Slag Cement (PBFS), Oil Well Cement, Rapid Hardening Portland Cement, Sulphate Resisting Portland Cement, and White Cement.

FDI and Future Prospects: Progressive liberalization and easing of foreign direct investment (FDI) norms in various sectors paved the way for growth in FDI, which led to growing demand for office space from multinational companies (MNCs) and other foreign investors. Total FDI in the cement sector between April 2000 and August 2010 stood at US$ 1.9 billion (source: CMA report 2011). The cement industry in India is known for its linkages with other sectors. The Government of India has taken various steps to provide the required impetus to the industry. At present 100% FDI is allowed in this industry. Both the state and export policies promote cement production. Exporters can claim duty drawbacks on imports of coal and furnace oil up to 20% of the total value of imports. Most state governments offer fiscal incentives in the form of sales tax exemptions/deferrals in order to attract investment. According to a recent research report titled *"Indian Cement Industry Forecast to 2012"* published by research firm RNCOS in the year 2011 highlights that cement industry in India has witnessed massive growth on the back of various industrial developments and pro-economic policies of the Union Government. This has helped attracting the attention of various global cement giants, thereby sparking off a wave of mergers and acquisitions in several states. The report has estimated India's cement consumption to grow at a compound annual growth rate (CAGR) of 11%, between 2011–2012 and 2013–2014. The research which focused on the demand-supply outlook and the cement pricing in various regions of the country revealed that Andhra Pradesh topped the chart in 2008–2009 in terms of large plants and its installed capacity in India. Fast-growing economy and the regulatory support are expected to further encourage the industry players to embark on expansion plans. Furthermore, it is estimated that the Government's assistance to several infrastructure projects, road networks, and housing facilities will boost the growth in cement consumption in the near future (Indian Cement Review 2008).

Highlights of the Indian cement industry as shown in Table 3 are given below.

The number of large cement plants in India is approximately 42 and mini and white cement plants are 365, with installed capacity of 234.30 (MT) and 11.10

Table 3 Cement industry profile in India

Companies nos.	42
Numbers of cement plants	139
Installed capacity (MT)	234.30
Cement production (MT) in the year 2009–2010	168.29
Plants with capacity of one MT and above	97
Manpower employed	120,000
Annual turnover in Mn.$ in the FY 2010	18,000
Statistics: mini and white cement plants	
Cement plants (nos.) approx.	365
Installed capacity (MT)	11.10
Cement production (MT) 2010–2011	6.00

Source: Cement Manufacturers Association of India (2011)

Table 4 Profile of top Indian cement companies

Companies	Production capacity ('000) MT	Installed capacity ('000) MT
ACC Limited	17,902	18,640
Gujarat Ambuja Cements Limited	15,094	16,860
Ultratech	13,707	17,000
Grasim	14,649	14,115
India Cements	8,434	8,810
JK Cements Limited	6,174	6,680
Jaypee Cements	6,316	6,531
Century Cements	6,636	6,300
Heidelberg (Madras Cement)	4,550	5,457
Birla Corp	5,150	5,113

Source: Cement Manufacturers Association of India (2009)

(MT), respectively, as per publication of Cement Manufacturers Association of India, 2011. The annual turnover was over Rs. 18,000 crore in the financial year 2010. This above statistics shows that large cement industry has provided direct employment opportunities to more than 120,000 people and indirect employment to more than 3.6 lakhs people. It also provides clinker to other mini cement plants so that available clinker can be fully utilized. However, there is an immense opportunity to increase the installed production capacity from 1 million tonne to 2 million and above to take advantage of economy of scale provided that nearest market within a radius of 200 km can support the plant.

2.6.1 Major Cement Plants in India

In India over 70% of cement production is primarily contributed by top 10 companies. The list of top 10 companies is presented in Table 4.

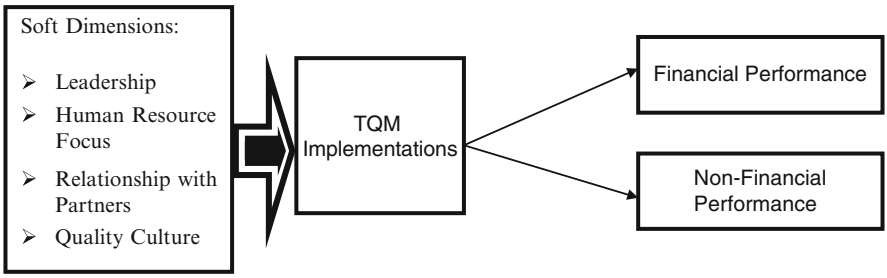

Fig. 1 A conceptual model of the relationship between TQM implementations for sustainability

3 Research Design

This section deals with methodology used to carry out research study as a systematic and scientific investigation. In order to further validate the theoretical concepts, an empirical research is undertaken. This section establishes a research framework or research design which is given below as:

- Specifying the research objective of study.
- Refining and redefining the research framework, hypotheses, sampling plan, questionnaire design, questionnaire administration, and quantitative techniques to be used for the purpose of the study.
- Understanding interrelationship between theoretical concepts and principles in a conceptual framework.
- Hypotheses development.

3.1 Proposed Theoretical Framework

The present study integrates several soft dimensions of TQM and impacts of these soft dimensions on successful implementation of TQM in Indian cement industry. On the basis of the preceding discussion and the synthesis of the existing literature, a proposed conceptual framework for the current research is shown in Fig. 1. The two main components that constitute the conceptual framework include the soft dimensions of TQM and successful implementation of TQM which will be measured in terms of firm performance variables.

3.1.1 Assumptions of the Study

The hypotheses to be tested in this study are developed on the basis of the research objectives and questions; the theoretical framework also serves as a basis for hypotheses development. The overall research hypotheses are that there is a positive association

of leadership, HR focus, relationship management with partners, and quality culture with firm performance. These hypotheses are strongly supported by many studies both theoretically and empirically in a variety of fields as it is clearly reflected in literature review.

3.1.2 Hypotheses of the Study

- *Hypothesis 1*: There is a positive relationship between the leadership and successful TQM implementation.
- *Hypothesis 2*: There is a positive relationship between the human resource function and successful TQM implementation.
- *Hypothesis 3*: There is a positive relationship between the relationship management with partners and successful TQM implementation.
- *Hypothesis 4*: There is a positive relationship between the quality culture and successful TQM implementation.

3.2 Sampling Plan

This study focused on the cement manufacturing companies in India. The cement manufacturing companies in India were identified through database of Cement Manufacturers Association. It provides the list of companies operating in India, their contact address, their type of business, and their type of ownership. The study was carried out in 28 cement manufacturing firms where 275 usable questionnaires were used for data analysis.

4 Data Analysis and Findings

This section presents the analysis of the data collected for study and the findings related to it. Data exploration as a step prior to analysis is carried out. After coding the data, all necessary assumptions of parametric test are checked, and then multivariate data analysis is conducted. It is analyzed by using statistical software package SPSS 16.

4.1 Instrument Reliability and Validity

According to Hair (1995), reliability of a variable reflects the extent to which a variable or a set of variables is consistent in what it is intended to measure where validity of the variable reflects the extent that differences in scores among objectives reflect

the objects' true differences related to the construct that is sought to be measured (Hair et al. 1999). The reliability of a variable is a necessary but not a sufficient condition for its validity. Validity can never be established unequivocally, but can only be inferred either by direct assessment or indirectly by assessing reliability.

Rules of thumb suggest that the item-to-total correlations exceed 0.5 and that the inter-item correlations exceed 0.3. For the second type of diagnostic measure, the generally agreed upon lower limit for Chronbach's Alpha is 0.7, although may decrease to 0.6 in exploratory research (Hair et al. 1999; Nunnally 1978). In order to assess the reliability of the measures in this study, item-to-total correlations and Chronbach's Alpha were employed. And as suggested by Nunnally (1978), the criteria for retaining a scale item include an item-to-total correlation of at least 0.35 (Nunnally 1978) and a Chronbach's Alpha for the scale of at least 0.7. The Chronbach's Alpha was calculated for each soft dimensions and TQM implementation constructs. It presents item-to-total correlations for four functional constructs (leadership, human resource focus, relationship management with partners, and culture). The Chronbach's Alpha for various constructs are as follows 0.733 (leadership), 0.831 (human resource functions), 0.882 (relationship management with partners), and 0.822 (culture), respectively, which indicates that they meet the requirement by Nunnally (1978).

4.2 Regression Analysis and Hypotheses Testing

In statistics, *linear regression* is an approach to modeling the relationship between a scalar variable *y or dependent variable or endogenous variable* and one or more explanatory variables or independent variables or exogenous variables denoted with *X*. The case of one explanatory variable is called *simple regression*. Given a data set $\{y_i, x_{i1}, \ldots, x_{ip}\}_{i=1}^{n}$ of n statistical units, a linear regression model assumes that the relationship between the dependent variable y_i and the p-vector of regressors x_i is linear. This relationship is modeled through a so-called disturbance term ε_i – an unobserved random variable that adds noise to the linear relationship between the dependent variable and regressors. Thus, the model takes the form

$$Y = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 \ldots + \text{Error}$$

where $'$ denotes the transpose, so that $x_i'\beta$ is the inner product between vectors x_i and β.

Often these n equations are stacked together and written in vector form as

$$Y = \beta X + €,$$

The basic assumptions of the use of regression are:

1. All predictor and outcome variables must be quantitative, i.e., to be measured at the interval level.
2. Ratio of cases to independent variables: In order to empirically test a model, the minimum sample size is $(50+8K)$, where K is the no. of predictors (Field 2005).

Table 5 Summary of linear multiple regression analysis of five models

Model	*R*	Square *R*	Durbin-Watson value	*F*	Sig	+ Beta	– Beta
Model 1 ROI	0.787	**0.620**	1.630	21.443	0.000	L, HR, QC	**RM**
Model 2 QPS	0.609	0.371	1.775	10.976	0.000	L, QC	HR, RM
Model 3 WROSM	0.643	0.414	1.598	8.716	0.000	L, HR, QC	HR, RM
Model 4 WRDM	0.644	0.414	2.032	4.7332	0.000	L, QC	HR, RM
Model 5 EBIDTA	**0.725**	**0.525**	**1.558**	**1.6332**	**0.166**	**L, HR, RM**	**QC**

In our research there are 25 predictors and sample size is 275 which satisfy the assumption.

Variables should be free from multicollinearity. High multicollinearity increases the complexity due to interrelationships of variables. It is to be checked in regression analysis itself.

Simple multiple regression analysis with four soft dimensions of TQM as independent variables and the five performance factors as dependent variables were conducted. A total five models were run individually to understand how the predictor variables predict the outcome.

Model 1: Return on investment (ROI).
Model 2: Improvement of quality of product of product and services (QPS).
Model 3: Waste reduction due to defects management (WRDM).
Model 4: Waste reduction due to successful management of overstocks (WROSM).
Model 5: EBIDTA.

The tables below show the result of the regression. It includes value of model R^2, the two-tail *t*-value for the significance of beta (or the regression itself), and the estimate and the intercept. The estimates of the understandardized and standardized slope (beta) are also presented in Table 5 as shown:

From the above comparative Table 5, we conclude that Model 1 explains 62% of the total variance. Thus, the same has been further taken as a basis of further testing of hypotheses.

4.2.1 Research Hypotheses Testing

- *Hypothesis 1*: There is a positive relationship between the leadership and successful TQM implementation.

There is significant association between leadership and performance of a firm ($R=0.312$) as shown in Appendix 1. The beta coefficient of leadership is 0.210

Table 6 Summary of hypothesis testing

Hypothesis	Description	Result of hypothesis
H1	There is a positive relationship between the leadership and successful TQM implementation	Supported
H2	There is a positive relationship between the human resource function and successful TQM implementation	Supported
H3	There is a positive relationship between the relationship management with partners and successful TQM implementation	Not supported
H4	There is a positive relationship between the culture and successful TQM implementation	Supported

which is statistically significant at 0.000 as shown in Appendix 1. Thus, *Hypothesis 1* is supported (Table 6).

- *Hypothesis 2*: There is a positive relationship between the human resource function and successful TQM implementation.

There is significant association between human resource function and performance of a firm ($R = 0.136$) as shown in Appendix 1. The beta coefficient of human resource function is 0.187 which is statistically significant at 0.015, which is within ±0.05 as shown in Appendix 1. Thus, *Hypothesis 2* is supported.

- *Hypothesis 3:* There is a positive relationship between the relationship management with partners and successful TQM implementation.

There is significant association between relationship management and performance of a firm ($R = 0.030$) as shown in Appendix 1 but the value of R is very small. The beta coefficient of relationship management is −0.246 which is statistically significant at 0.001, which is within ±0.05 as shown in Appendix 1. However, the beta coefficient is negative, hence the *Hypothesis 3* is not supported.

- *Hypothesis 4:* There is a positive relationship between the culture and successful TQM implementation.

There is significant association between culture and performance of a firm ($R = 0.401$). The beta coefficient of culture is 0.393 which is statistically significant at 0.000. Thus, *Hypothesis 4* is supported.

5 Conclusions, Recommendations, and Further Scope of the Study

This section presents conclusions and recommendations drawn from quantitative and qualitative analysis. Conclusions are drawn on the basis of literature review and reference available in the area. The framework concluded from hypotheses testing is also presented in this section. Observations and insight of the researcher

are also duly incorporated in this section. Subsequently recommendations based on the same are listed below. At the end, unique contributions of the research, managerial implications, limitations of the research, and some future research directions are given.

5.1 Conclusions from Literature Review Section

- TQM is an integrated philosophy as well as many firms consider it as a strategic tool to gain competitive advantage for sustainability.
- A management philosophy and company practices which aim to harness the human and material resources of an organization in the most effective way to achieve the objectives of the organization.
- The quality tools most commonly used in Indian firms are the cause-and-effect or Ishikawa diagram or fish-bone diagram (FBD), check sheet, control chart, histogram, Pareto chart, scatter diagram, stratification (alternately flow chart or run chart), brainstorming, suggestion scheme, PERT/CPM, PDCA cycle, KAIZEN activities, total productive maintenance (TPM), business process reengineering, and 5 S.
- TQM can be analyzed from microperspective which is made up of important components which can be further classified into two broad categories as hard dimensions and soft dimensions.
- Literature available on soft dimensions of TQM in Indian context is not adequate, and none of the model present in literature deals with Indian cement industry.
- Due to origin of TQM from Operations Management stream, there has been an obsession of hard dimensions, i.e., Statistical Quality Control, Quality Function Deployment, and Six Sigma.
- The following dimensions are important for successful implementation, i.e., leadership, human resource focus, relationship with partners, and quality culture.
- The following soft dimensions are critical for successful implementation of TQM, viz., the role of leadership, quality culture, role of HR functions, and relationship with partners.
- TQM implementation leads to financial and nonfinancial benefits.
- TQM creates various strategic advantages to firm and improves competitiveness, revenues, market share, ROI, and firms' profitability and productivity.
- It motivates employees leading to greater commitment and satisfaction.
- It improves product quality, delivering higher value to customer and enhances customer satisfaction.
- Most of the big cement manufacturers in the India have implemented Quality Management System comparable to any plants in other developing and developed nation.
- Indian cement companies are also adopting quality tools like 5 S, TPM, BPR, and KAIZEN besides other statistical tools like control charts, run chart, and Ishikawa diagram.

- Poor packaging quality results in high wastages during transit. Most of the times while loading or unloading, cement bags get damaged. Warehouse is either public owned or private owned but the conditions of warehouse are very poor, and use of conventional material handling results in wastages.
- Resource constraints like depleting limestone mines in India, lack of availability of high-quality coal, high carbon content in slag, or quality fly ash.
- Green manufacturing and compliance to strict environmental norm will define the sustainability of cement industry in future, and TQM implementation can really help company to meet high-quality demand in *green way*.

5.2 Conclusions from Data Analysis Section

- The Chronbach's Alpha for various constructs are as follows: 0.733 (leadership), 0.831 (human resource functions), 0.882 (relationship management with partners), and 0.822 (culture), respectively, which indicates that they meet the requirement by Nunnally (1978). This clearly concludes that constructs chosen for study are reliable.
- The value of KMO is 0.644 which is greater than 0.5 and significant at 0.000 which means that the variables are highly correlated enough to provide reasonable basis of factor analysis.
- The communalities' matrix of all variables used is quite high, which indicates that the extracted components represent the variable well. There is significant association between leadership and ROI of a firm ($R = 0.312$). The beta coefficient of leadership is 0.210 which is statistically significant at 0.000. Thus, *Hypothesis 1* is supported.
- There is significant association between human resource function and ROI of a firm ($R = 0.136$). The beta coefficient of human resource function is 0.187 which is statistically significant at 0.015, which is within ±0.05. *Hypothesis 2* is supported.
- There is significant association between relationship management and ROI of a firm ($R = 0.030$) but the value of R is very small. The beta coefficient of relationship management is −0.246 which is statistically significant at 0.001, which is within ±0.05. *Hypothesis 3* is not supported.
- There is significant association between culture and ROI of a firm ($R = 0.401$). The beta coefficient of culture is 0.393 which is statistically significant at 0.000. *Hypothesis 4* is supported.

Simple multiple regression analysis with four soft dimensions of TQM as independent variables and the five performance factors as dependent variables were conducted using SPSS 16. A total five models were run individually to understand how the predictor variables predict the outcome of the ROI, improvement of quality of product of product and services, waste reduction due to defects management, waste reduction due to successful management of overstocks, and EBIDTA. The result of hypothesis testing shows that out of four hypotheses, three hypotheses are supported

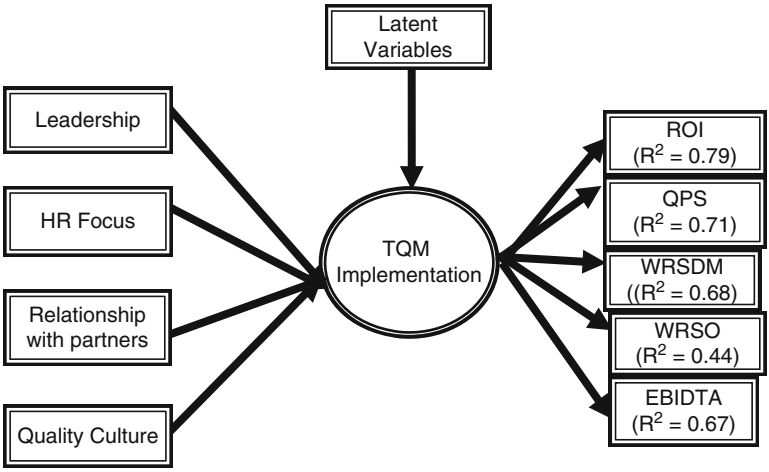

Fig. 2 Conclusive research framework

except one hypothesis (i.e., third hypothesis). Based on the result, researcher proposes a new model as shown in Fig. 2 as:

The colored portion does not support hypotheses.

Here variable relationship with partners does not support the model whereas EBIDTA is not statistically significant.

5.3 Recommendations

- Relationship management is the area which has been ignored. The suppliers, transporters, CFA's, and customers are not yet involved in decision-making process, except few companies like ACC Limited, Ultratech, and Ambuja Cement have recently adopted this practice. But on large scale this area needed to be built up.
- Indian cement companies must make action plan to adopt and implement TQM for effectiveness and efficiency, including processes for continuous improvement and implementation of the quality system and procedures to satisfy the customers' needs, in compliance with the cement industry requirement. This is to ensure and enhance the level of business performance management of firms in the Indian cement industry.
- Update and development of new instrumentation standards of acceptability for all features and requirement (if necessary) and monitoring information about customer satisfaction as a performance metric.
- Establishing measurement and monitoring methods to ensure the compatibility of the design, product, and process requirements are attained.
- An effort must be initiated to reduce shipping cycle time in order to improve transporters' satisfaction level.

- Training for drivers and labors working for industry must be provided due treatment, and particularly Indian cement industry must ensure minimum quality of work life for these indirect labors that play vital role in the growth of the industry.
- There must be proper liasioning between Indian railway and cement industry as most of the time due to poor infrastructure like poor lighting facility at railway sidings or poor conditions of wagons result in huge demurrages or wastages of finished goods.
- Improve reliability of delivery. Most of the time due to poor reliability, dealers/retailers fails to serve their customers.
- Companies need to inculcate green practices.
- Companies are very much driven by Hard TQM dimensions, and soft dimensions are ignored most of the time which is only major reason behind poor EBIDTA or high inventory stock or huge wastage which arises during transportation or handling.

It must be understood that in order to sustain competitive advantage, firms need to ensure that each partners across the supply chain network, right from the suppliers till final delivery, must be covered under TQM umbrella as any failure in any link can derail entire supply chain. In such situations the role of leadership and human touch, involving partners and by sowing the seeds of quality culture which is driven toward achieving excellence is characterized by ten attributes, i.e., a bias for action, close to the customer, autonomy and entrepreneurship, productivity through people, hands on, value driven, stick to knitting, simple form, lean staff, and simultaneous loose-tight properties (Peters and Austin 1985).

5.4 Future Research Directions

While this study was able to provide additional insight into four soft dimensions of TQM and its relationship with firm performance, it also revealed areas that would benefit from further research. First, this study focused only on four soft dimensions of TQM in cement industry. Future research could thus focus on the other dimensions such as hard dimensions, ethics and values, and SCM. By doing so, a better and fuller understanding on the effects of TQM on firm performance may be achieved. Second, there is a strong need for longitudinal research. A longitudinal analysis of companies over time would provide data to address at least two research questions: (1) is there a time lag between investing in TQM and achieving an expected performance, and (2) is there a particular order in which these investments should be made? Third, this study failed to support one of the proposed hypotheses related to the relationship with partners and firm performance. Hence, there is a need for further study on the influence of different external variables on firm performance. It certainly takes time to undertake any change from the past. So there is an important need to investigate the differences in the future when managers had enough time to change their management styles. Finally, to be able to generalize the results of this study, future research might be extended to other industries like service and to other countries both developing and industrialized.

Appendix 1: Regression Coefficients

Model		Unstandardized coefficients		Standardized coefficients			Correlations			Collinearity statistics	
		B	Std. error	Beta	*t*	Sig.	Zero-order	Partial	Part	Tolerance	VIF
Constant		**.781**	.462		1.691	.0092					
	L	.357	.097	**.210**	3.686	.000	.312	.219	.195	.864	1.157
	HR	.182	.074	**.187**	2.455	.015	.136	.148	.130	.484	2.065
	RM	−.213	.066	**−.246**	−3.239	.001	.030	−.193	−.172	.488	2.049
	QC	.501	.072	**.393**	6.950	.000	.401	.390	.368	.878	1.139

Source: SPSS16 output table

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