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Total Quality Management in Indian Manufacturing SMEs

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Abstract

In operation literature, the effect of total quality management on firm performance has been investigated in many studies. Compared to large manufacturing firms, most small and medium sized firms are slow and often reluctant to adopt quality management practices. This paper aims to examine the relationship between quality management dimensions and firm performance, considering manufacturing SMEs as focal point of research. Furthermore, the intention is to identify the major barriers to adoption of quality management practices in manufacturing SMEs. Empirical data were drawn from a sample of 127 manufacturing SMEs in India to address the research objective. The test of the structural model supports the proposed hypotheses, that total quality management is positively related to manufacturing performance.

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Keywords: Total quality management; SMEs; firm performance.

1. Introduction

Small and medium-sized manufacturing firms nowadays, are under severe competitive pressure due to increased global competition and customer requirement. These challenges along with higher materials and energy costs in recent years have forced many small-medium manufacturing firms to continuously modify and optimize their operations both at the strategic and tactical levels [1]. Quality has been considered as significant driver for success for manufacturing SMEs in the era of global competition [2]. The majority of successful manufacturing companies have embraced total quality management (TQM) strategy and realized its invaluable contribution [3, 4, 5, 6, 7]. TQM philosophy is mainly dominated by large firms [8] but the fear of losing contracts from large manufacturing firms prompt SMEs to bring quality into their system [9], to enhance firm's efficiency and competitiveness. Compared to large organizations, manufacturing SMEs in India have been slow to adopt TQM [10], without sufficient conviction, as they consider implementation of the quality management practices to be a daunting and expensive prospect, with high on-going operational costs. However, based upon current production system of manufacturing SME, implementation of a quality management system could be low cost and low maintenance with little documentation needed [11]. Also, owners-managers of Indian SMEs often do not have enough managerial insights and organizational capabilities resulting in misapplication of TQM practices [10], which may result in product quality failure and increased expenditure. According to a research study considering manufacturing SMEs in United Kingdom as sample, the success rate of quality management implementation in SMEs was found to be low since it reaches only 10% [12]. Quality management practices in SMEs has been fairly discussed by very few

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researchers in the context of Indian small and medium sized manufacturing sector, and lot of important issues and areas are largely untouched in academic research [1]. With more and more manufacturing firms striving to remain competitive, it is being more difficult for a small-medium manufacturing unit to exceed their rivals and outperform. With ever increasing demand on manufacturing small and medium sized firms on quality, price and delivery, the most effective way to enhance the confidence of customers is through a structured certified quality management system [11]. Many SMEs in India have become important players in large manufacturing supply chain networks and they either voluntarily or have been forced to apply quality management practices to gain and sustain competitive advantage. Given the importance of quality management practices, more exploration into the relationship between TQM and firm performance in context of manufacturing SMEs is needed to provide further theoretical insights and practical guidance. Also, the adoption and implementation of TQM strategy in any firm, like any other productivity improvement program, is believed to harbor enormous difficulties [13]. Naturally, manufacturing SMEs by virtue of their size are likely to struggle with financial, technical and time constraints which are further amplified by a number of obstacles such as lack of technical and managerial expertise as well as human resources deficiencies [14]. Hence motivated by the research gap, the research paper makes an empirical attempt to examine the relationship between TQM and SMEs performance. Also, the paper provides evidences regarding major TQM implementation barriers that are encountered by SMEs in India. The practical implications of this study will be important for lean practitioners and entrepreneurs of small and medium sized enterprises. Such insights on quality management practices and issues reported here could start as a starting point and may be crucial, so as to facilitate strong entrepreneurial culture in SMEs, by enabling them better understand the technical-management aspect of superior grade manufacturing and benchmark their progress to sustain themselves in a long run in such competitive manufacturing environment.

2. Literature review

In developing economies, SMEs play an important role as they represent a major source of employment and generate significant revenue and export earnings. On a paper on SMEs, it is essential to understand how SMEs are defined. SMEs in both developed and developing economies are defined by a number of factors and criteria, such as location, size, age, structure, organization, number of employees, sales volume, worth of assets, ownership through innovation and technology etc. [15]. Indian manufacturing sector are classified by worth of assets, based on their investment in plant and machinery (original cost excluding land and building and the items specified by the ministry of small scale industries). Enterprises with investment between twenty-five lakh rupees and five crore rupees are categorized as small enterprises, while the enterprises with investment between five crore and ten crore rupees are categorized as medium enterprises. Indian SMEs contribution to GDP is about 17 percent, with a share of almost 40-45 percent manufactured output and exports. [16]. After the globalization of market in early 1980s, Indian SMEs have got many opportunities to work in integration with large scale MNCs. Hence SMEs are important in the setting of most developing economies like India, as they are highly flexible and responsive suppliers to large firms, customers of large firms and suppliers to end-user customers in their own right [17, 18]. Any compromise in quality by SMEs could jeopardize the whole manufacturing supply chain, resulting in raising costs because of poor quality [17, 19, 18]. TQM practices in SMEs have a relatively short history, and a lot of important issues and areas are largely undebated in academic research [1]. There are less research assessing the impact of TQM implementation on SMEs performance, considering developing economies like India as focal point of research. Also, there has been paucity of research that reports evidence regarding major TQM impeding factors that are encountered by SMEs in India.

Based on the objective of the paper, a literature review was conducted aiming to collect and analyze all relevant papers in the operation research field by means of structured search for literature. The same is presented under various focused themes. The first section deals with relationship between TQM and firm performance. As we seek to understand the TQM-performance relationship, we also review literature that have reported major barriers to adoption and implementation of TQM in SMEs, that has been extensively discussed in second section.

2.1. Total quality management and firm performance

TQM is a management approach which started in Japan in the early 1980s, that seeks to enhance quality and productivity in business firms. In 1990s, TQM gained popularity among firms, who started adopting this management philosophy which focuses upon customer satisfaction and improves firm's performance [20]. In TQM research literature, most firms claim positive relationship between TQM and performance [21, 22, 23, 24, 25] and yet some firms also report less than optimal results [26, 27, 28, 29]. Very few researchers have conducted empirical studies to understand TQM-performance relationship in the context of SMEs. Some studies found that TQM could be adopted by SMEs with considerable success [6, 5, 30, 31, 15]. However other studies have also reported adverse impact of TQM on SMEs performance [32, 33]. These inconsistent findings in literature calls for further scholarly examination of the relationship between TQM and SMEs performance, which leads to the hypothesis "TQM positively affects firm performance".

2.2. Obstacles to implementation of total quality management practices by SMEs

A TQM movement cannot succeed unless employees are involved at various business processes and they are being trained to become more competent [34]. Most researchers suppose that human resources (people) are essential to the implementation of quality management practices, since people are often the key elements in operations [1]. In order to succinctly implement the philosophy of quality management within SMEs, the recipient firm should harbor strong leadership traits capable of exhibiting excellent project management styles [14]. Senior management and culture is also considered an essential area and it is crucial for top management to understand and provide ample support to apply TQM in the organization. Many SMEs, by default, reflect in their culture, the personality of senior management personnel and are constrained by this in terms of changes they may be able to make [14, 35]. The challenge before senior management is to cultivate an organizational culture that supports quality control and management philosophy. Flat organizational structure of SMEs and fewer departmental interfaces normally results in a more flexible work environment. Also, Indian SMEs has its own very special problem. The workmen employed in these manufacturing SMEs come from poor and uneducated background. They learn their work by the informal apprenticeship route, and they grow in their skills by mistakes and practice [36]. Such workmen with low education background shows an inherent resistance to change and adapting to new organized work practices and routines, that seriously affects the speed of TQM implementation [37, 38]. Such an informal climate with flexible work planning could harm the standardization of processes [39, 40]. Adding up, a survey by Lean Enterprise Institute(LEI), revealed that most manufacturing firms employing maintenance and quality management practices had a tendency to backslide to old style of traditional practices, thereby further harming the standardization process [41], which may put their current state of production at risk [42, 36, 1].

Some manufacturing firms misapply the quality management practices and the main reason for this scenario lies in their internal issues such as lack of knowledge and their understanding of quality management practices, cultures, skills and so on, leading to ‘use of wrong tool to solve a problem’, ‘use of same tool to solve all of the problem’, and ‘use of same set of tools on each problem’ [43, 44]. Insufficient technical expertise, unfortunately often result in ad hoc adoption of individual practices, but failure to establish the system-wide philosophy and culture necessary to support such practices [36]. This lack of expertise could be overcome through use of external consulting, but this option is often not a possibility as these manufacturing SMEs would require financial resources to hire consultants, as well as to aid the actual implementation of such ideas [14]. Most SMEs are financially inept and harbor poor financing arrangements. Another complication in most SMEs, as they add new capacity and their product design evolve, to cope up manufacturing SMEs give quality management initiatives short time horizons than they have elsewhere and implement them more swiftly [45]. Training of people to utilize the TQM tools and techniques also requires adequate financial resources. Hence, poor training and resource availability are some of major impeding factor encountered during deployment of TQM programme in SMEs [30].

Total quality management practices for manufacturing industry are resource intensive and yield fruitful results in a long run [46]. In light of these divergent view, manufacturing SMEs’s entrepreneurs in India are unclear about the potential benefits of quality management practices [1]. Since scope of improvement through deployment of TQM within the manufacturing firm is improving, organizations could think of newer alternatives of integrating the business activities beyond the organizations boundary. Particularly when dealing with such external relationships, firms do face a challenge of influencing and convincing business associates to restructure their business practices to adopt quality management philosophy [1, 47]. Also, SMEs may lack the market power to influence business associates networks, particularly suppliers to adopt quality control and management practices [48].

3. Research design & methodology

3.1. Research model

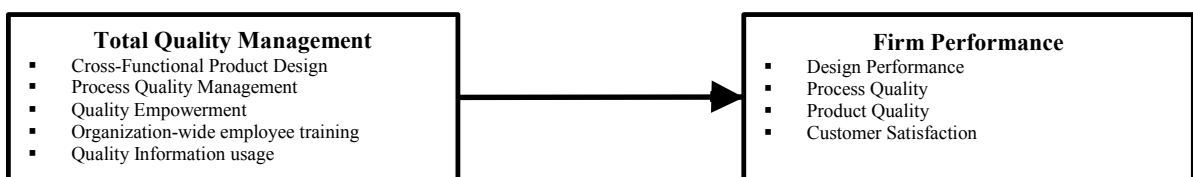


Figure 1 Research model

A conceptual model is shown in Figure 1, that aims to examine the relationship between total quality management practices and firm performance. The elements in this model are based on an extensive review of TQM literature and with consultation within the industry, lean consultants and academic community. The contention of this model is that total quality management practices

positively affects SMEs business performance. To test the hypothesized TQM – firm performance relationship, structural equation modeling (SEM) was used.

3.2. Sample and data collection

The focal point of this research is on SMEs, which constitute the vast majority of enterprises in India, as in most Asian countries. The pool of business owners contacted was selected randomly from different industries in India. Survey data were collected from 127 small and medium sized manufacturing firms in India, referring to database, that was obtained from the 2016 SME business directory (manufacturing) of small and medium business development chamber of India. Snowball sampling technique was also used for identification of respondents. The data were collected by visiting the manufacturing firms and interviewing entrepreneurs and managers at different organizational level. Table 1 shows general background of the respondent companies. Responses on the survey questionnaire were collected personally through verbal interaction and personal meeting with the respondent, explaining them the context of present research work, its significance and to clarify any doubt/queries, such as to facilitate comprehensive and clear-cut responses.

Table 1. Demographics of the sample

Sample Characteristics	Classification	No.	Sample Characteristics	Classifications	No.
Respondent position	Director/Owner	24	Sector(s)	Automobile	12
	Quality Manager	29		Electrical & Electronics	36
	Production Manager	42		Chemical	14
	Expert/Consultant	12		Packaging	5
	Others	20		Food	16
Firm Employees	<50	37		Metal Components	8
	50-100	26		Polymer Products	11
	101-150	29		Building Components	6
	151-200	14		Industrial equipment	16
	>200	21		Others	3
Respondent's years of experience with firm	0-3 years	14	Firm Sales (in Indian Rupees)	< 25 Lakhs	14
	4-9 years	29		25-100 Lakhs	29
	10-15 years	26		1-5 Crores	60
	16-20 years	26		5-10 Crores	13
	21-48 years	32		10 Crores	11

3.3. Measures – validity and reliability

In this study, pre-tested constructs from past empirical studies were adopted to ensure validity and reliability. Measurement for total quality management and firm performance scales has been adopted from Jayaram et al. (2010). The summary of the reliability and validity analysis of both independent and dependent construct is presented in Table 2. We used Cronbach's coefficient α to evaluate the reliability of the construct. Since all α values were considerably higher than the acceptable level of 0.70 [49], all constructs exhibit a high degree of reliability. In the validity test, the KMO values of each construct are varying from 0.673 to 0.777, all exceeding the minimum score of 0.50 [50], demonstrating that all these constructs are valid and reliable.

Table 2. Reliability and validity analysis.

Construct	Factor/dimension	Items	Cronbach α	KMO
Total Quality Management	Cross-functional product design	6	.785	.777
	Process quality management	6	.739	.759
	Quality empowerment	4	.711	.721
	Organization wide employee training	4	.722	.741
	Quality information usage	5	.843	.754
Firm Performance	Design Process	3	.725	.673
	Process Quality	4	.706	.740
	Product Quality	4	.744	.767
	Customer Satisfaction	4	.779	.762

4. Analysis and results

4.1. Structural equation modeling output

Table 3 contains a correlation matrix of both constructs to illustrate the inter-relationships among these constructs. In this table, there are significant positive correlations among TQM and firm performance constructs. Nevertheless, these are only bivariate relationships. To test the hypothesized relationship between TQM and firm performance, SEM using AMOS 20.0 with maximum likelihood estimation method was used. For assessment of overall model quality, most considered indices recommended by some authors [22, 49] were used. Our SEM model with an acceptable model fit ($\chi^2/df = 1.93$, GFI = 0.91, NFI = 0.90, CFI = 0.93, RMR = 0.04 and RMSEA = 0.05), permits TQM to positively influence firm performance. As scholars, have postulated, small and medium sized manufacturing firms may be served better by adopting TQM practices, which was found to be significantly enhancing firm performance. Therefore, our hypothesis ($\beta = 0.803$, $t = 14.923$, $p < 0.001$) is supported.

Table 3. Bivariate correlation analysis.

Construct	Total Quality Management					Firm Performance			
	1	2	3	4	5	6	7	8	9
Mean	3.80	3.78	3.53	3.75	3.69	3.74	3.79	3.72	3.78
Standard Deviation	0.58	0.54	0.59	0.63	0.71	0.64	0.54	0.60	0.53
CORRELATIONS									
1. Cross functional product design	1								
2. Process quality management	0.694*	1							
3. Quality empowerment	0.481*	0.502*	1						
4. Employee training	0.562*	0.559*	0.586*	1					
5. Quality information usage	0.548*	0.577*	0.562*	0.727*	1				
6. Design performance	0.380*	0.441*	0.369*	0.459*	0.584*	1			
7. Process quality	0.539*	0.582*	0.419*	0.486*	0.627*	0.619*	1		
8. Product quality	0.411*	0.519*	0.401*	0.451*	0.550*	0.734*	0.643*	1	
9. Customer satisfaction	0.465*	0.551*	0.373*	0.483*	0.603*	0.621*	0.728*	0.602*	1

* Correlation is significant at the 0.01 level (2-tailed)

4.2. Barriers to TQM implementation in SMEs

To implement quality control and management practices is not an easy task. For any change in organization to take hold and success, the impeding factors or barriers need to be identified and understood. To accurately identify the factors impeding TQM implementation, a list of eleven impeding factor identified from literature review were included in the survey. Respondents were asked to rate the factors that were considered as barrier to TQM implementation in their organization on a five-point scale, with 1 referring to 'not challenging at all' and 5 as 'very challenging'. Those TQM impeding factors (shown in Table 4) having mean score higher than 3.0, indicate significant barriers to TQM adoption in Indian manufacturing SMEs. The reasons for their significance needs to be examined further by conducting qualitative study in form of case study or action research.

Table 4. Challenges of TQM implementation faced in Indian SMEs.

Challenges	Rank	Usage mean rating	Standard deviation	Most frequent rating	Not applicable (% Respondent)
Inadequate knowledge and know-how	1	3.86	1.03	5	3.30
Lack of willingness from management	2	3.82	1.14	5	8.26
Backsliding to old ways of working	3	3.53	1.24	4	0
Lack of budget	4	3.36	1.18	4	0.80
Risk of disruption in operations	5	3.23	1.06	3	4.13
Employee resistance	6	3.13	1.01	3	0
Company cultural changes	7	2.99	0.90	3	6.61
Lack of time	8	2.85	0.98	3	9.09
Poor training	9	2.73	1.15	3	4.95
Difficult to quantify the benefits of TQM	10	2.70	0.73	3	12.39
Need to integrate other organizations	11	2.62	1.17	2	16.52

5. Conclusion

The findings of this study contribute to the operation research literature by validating the positive impact of TQM on firm performance. Also, the findings show a positive correlation between quality management dimensions and firm performance. The

study contributes to practical insights in several ways. First, our study calls on entrepreneurs and managers of manufacturing SMEs to be aware of the importance of quality management practices, i.e. SMEs must know themselves and what TQM really means for them before they start the TQM journey. The success of any TQM initiative depends largely upon leadership style of entrepreneur/senior managers, who should primarily focus upon creating an organizational culture that is conducive to support TQM implementation. Second, critical analysis of the factors that are capable to hinder or delay the process of TQM adoption has provided important insights into the related implementation issues. The study confirms direct relationship between quality management practices and firm performance, and small-medium business manufacturing entrepreneurs could envisage sustainable productive growth by eliminating the barriers that were identified and that oppose to the continuous improvement of the manufacturing operations by better understanding/implementing the following concepts associated with TQM:

- 1) **Management Leadership:** Entrepreneurs/Managers should better understand the components of quality management systems by attending international/national level TQM workshops/seminars to gain insights about managerial training, quality objective setting, benefits of commitment to quality, active championing and systematic business planning. Managerial attitudes and behavior is necessary to facilitate utilization of TQM strategy to enhance firm's market focus, manufacturing productivity, human resource management practices and competitive advantage creation [2]. Senior leaders and managers must execute sufficient competence to influence a group of individuals by appropriate mean to become willing followers in the achievement of organizational goals and ensuring better performance through better understanding the concepts and issues associated with TQM and then be able to communicate to the employees [31]. Management commitment speeds up total quality management implementation.
- 2) **Strategic Planning:** Top management should formulate a strategic written action plan that includes the following components: an organizational vision, an organizational mission, guiding principles, broad strategic objectives and specific tactics, projects or activities for achieving the broad objectives. The essential idea behind strategic planning is that the product is a customer value rather than a physical product and formulate a quality policy and control measures to allocate the resources to enhance business productivity in order to achieve a sustainable competitive advantage. Entrepreneur/manager should responsibly allocate budget and time for quality management system at the beginning of every financial year, and strategize a continuous improvement system dealing with making decisions based on data, looking for root causes of problems [31] and seeking permanent solution even at minor risk of disruption in manufacturing operations. Also, TQM implementation is not complete until SMEs design effective action plans to evaluate and identify suppliers expressing interest to integrate into firms' quality management system.
- 3) **Employee empowerment and involvement:** Motivating and encouraging employees in SMEs is critical. Employee empowerment refers to the activity of the organization to provide more authority and freedom to its employee regarding making decisions, suggestions and undertake the activity which is in the favor of the organization. By empowering employees, the top management can not only enhance skills of employees but it also makes its employee more engaged with the organization. Therefore, it is imperative for SMEs to focus on a training and incentive system which influence employee engagement to overcome the issue of internal employee resistance.
- 4) **Quality education and training:** Since availability of skilled labour and experience manager in India is an issue cornering TQM implementation, investment in training and education of employees and investment in improving the work culture/conditions should be adequately planned by top management focusing on long-term competitive potential rather than short-term profitability. Effective training emphasizing on problem solving approach focusing on quality tools & techniques would help employees to monitor quality variations and to take appropriate measure for subsequent improvement. The issue of reverting to old ways of working by operators/labours may be due to the reason that TQM initiatives need additional work and responsibilities, which can be overcome by forming quality circles, rewards through quality awards & monetary incentives and creating quality sensitization programs aimed at changing the behavior and attitude of organizational members, thereby developing a quality sensitive culture.

Apart from its practical implications, the evidence reported here could be used nationwide by policy-makers to design support programs and initiatives of entrepreneurship and quality management for manufacturing SMEs, that widens these key customer oriented concepts beyond the notion of traditional cost-cutting manufacturing practices. Mechanisms that equip more and more Indian SMEs to sustain a more proactive orientation along with relevant training on enhancing uniqueness in product offering through quality management, could be set up by establishing a national level institution as a knowledge-exchange community of small-medium sized business entrepreneurs. Taking it further, they could create an ecosystem to disseminate best practices through technical consultation and financial support to manufacturing SMEs, as there is a need to raise the global competitiveness of the Indian manufacturing sector which is a key imperative for the country's long-term growth.

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