

IDENTIFICATION OF VARIABLES IN TOTAL QUALITY MANAGEMENT PRINCIPLES: CASE STUDY OF INDIAN GAS INDUSTRY:

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The Indian gas sector is one of the core industries in India and has very significant forward linkages with the entire economy due to the rise in Total Quality Management (TQM) principles and practices initiatives taken by them. India has been growing at a decent rate annually and is committed to accelerate the growth momentum in the years to come. This paper identifies a set of macro variables for Total Quality Management principles in terms of Customers Focus, Leadership Commitment, Continual Improvement, Team Work, Management Structure and supplier Support and micro variables for the TQM practices in terms of Top Management, Employee Empowerment, quality and performance. These are then grouped into different categories for three major players of Indian gas industry. Based on a detailed analysis of extant literature, nine (9) micro variables were identified and a structured questionnaire was developed and distributed to the various managers ranging from middle level to senior level belonging to the different entities of the Indian gas industry. A total of 180 valid responses were received and they were evaluated on a five point Likert scale ranging from unimportant to most important. Statistical analysis was used to establish the reliability and validity of the questionnaire. Factor analysis identified five factors each as TQM Practices and TQM Principles. Further descriptive statistics was used to find their importance in Indian oil and gas context. This work can help Indian gas managers and practitioners to understand the importance of these variables and their role in TQM principles in terms of Customers Focus, Leadership Commitment, Continual Improvement and Team Work.

Keywords: Service Total Quality Management Principles, Total quality Management Practices, Team work, Practices, Indian oil and gas Industries, Continual improvement.

1. Introduction

TQM is an integrative management philosophy aimed at continuously improving the quality of products and processes to achieve customer satisfaction (Joseph et al., 1999). It mandates the participation of individuals at all levels and functions of an organization (Pfau, 1989) and affirms a management philosophy based on process improvement through use of relevant data. TQM focuses on customer orientation, comprehensive quality monitoring, and supportivemanagement systems (Smith et al., 1989). It makes itself evident through an organization-wideshared belief in total customer satisfaction (Hall, 2004). To be competitive in this world, organizations need a higher level of effectiveness across all functions and processes and Total quality management (TQM) has emerged as a strategy to achieve a niche

in the market (Baidoun, 2003). Implementation of TQM has results in improved productivity, enhanced quality, increased customer satisfaction, reduced costs and increased competitive advantage (Hasan and Kerr, 2003). A number of companies have revitalized their businesses and have thereby restored their market shares and profits by adopting TQM principles (Samson and Terziovski, 1999).

The remainder of the paper is organized as follows: The next section briefly covers the TQM Principles, Practices and relevant critical success factors. Then, Section 3 describes the research methodologies used in this study. Results are discussed in section 4. Finally, the concluding section summarizes the findings of the study and suggests few directions for further research.

2. Literature Survey

Although TQM is a proven approach for success in manufacturing, services and the public Sector, several organizations failed in their campaigns because of many reasons like lack of Top management commitment, ignoring customers etc. (Seetharaman et al., 2006). They reviewed the literature to identify the common problems that lead to the failure of TQM implementation. They argued that the understanding of the factors that cause failure to the TQM implementation can help companies in their long term continuous improvement efforts.

2.1 Total Quality Management Principles:

TQM can be defined as a holistic management philosophy that strives for continuous improvement in all functions of an organization, and it can be achieved only if the total quality concept is utilized from the acquisition of resources to customer service after the sale (Kaynak, 2003). The TQM approach integrates the fundamental techniques and principles of quality function deployment, statistical control, and existing management tools in a structured manner. The aim of TQM is to reduce the errors produced during the supplying service process, enhance customer satisfaction, streamline supply chain operations, and have workers having the highest level of training.

2.2 Total Quality Management Practices:

Total Quality Management (TQM) is both a philosophy and a set of principles that represents the foundation of a continuously improving organization (Calingo, 1995). It involves everyone in the organization and extends to suppliers as well as customers. In a TQM environment the customer is the focal point and customer satisfaction is the driving force (Stevenson, 1993). Total Quality Management (TQM) is a management strategy aimed at embedding awareness of quality in all organizational processes. Customer focus, process improvement and total involvement are the three fundamental principles of TQM (Tenner and de Toro, 1992). At organization level, however (House, et al., 1998) suggests that empowerment could be achieved through employee selection and training programs designed to provide required technical skills together with a culture that encourages self-determination and collaboration instead of competition. (Schlesinger, Zomitsky & Heskett, 1991) found that employee's perception of service quality positively relates to job satisfaction, job commitment, and pride of workmanship. Related findings reported by (Tornow & Wiley, 1991) are employee attitudes—measured by feelings about reward for performance, work itself, management practices, satisfaction with the company, work group climate, and a culture for success are related to customer satisfaction.

After TQM has been in use, it's very common for parts to be redesigned so that critical measurements either cease to exist, or become much wider. The last decade has witnessed the increased acceptance and use of TQM in the service sector (Milakovich, 1995), with service quality being an important factor for growth, survival and success (Donaldson et al., 1995). Hosein Fallah (1993) reviews quality system models, introduces AT&T's Total Quality Approach (TQA), and describes the TQA implementation strategy.

2.3 Gas Scenario:

Very few industries can benefit more from maximizing supply chain efficiencies than the oil and gas companies (Chima et al., 2007). In this sector, there is a need to ensure that each entity along the supply chain can respond quickly to the exact needs of its customers. On the other hand, one of its weaknesses is that each entity is likely to act in its best interests to optimize its own profit. Oil supply chain management is intrinsically associated with integrated planning. First, it is concerned with functional integration of acquisition of raw material (crude oil), manufacturing (refining), transportation, and warehousing activities (Shapiro JF, 2006.). The steadily increasing global demand for oil and its derivatives such as petrochemicals has enabled companies providing these products to reach more customers and increase their market share and profitability. This boom in global demand along with the ease of international trade and the inflexibility involved in the petroleum industry's supply chain has made its management more complex and more challenging (Coia, 1999; Morton, 2003). Despite the importance of supply chain management and its growing complexity, the petroleum industry is still in the development stage of efficiently managing their supply chains. The various gas sources and their contribution is shown in figure 1.

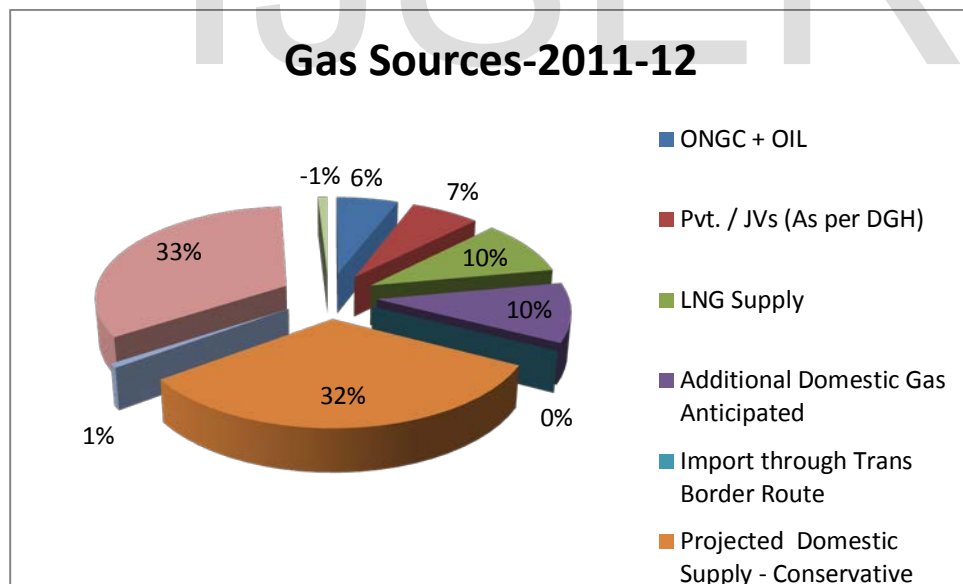


Figure 1: Contribution of Various Gas Sources

The oil and petrochemical industry's insight into the supply chain is still in its infancy (Schwartz, 2000). However, even with the inflexibility and complexity involved in the industry's supply chain, there is a lot of room for improvement and cost reduction, specifically in its logistics area.

3. Research Methodology

Thirteen micro variables are extracted from literature and a structured questionnaire was developed and is available for review from the authors. 5-point Likert scale is used to measure the responses (1= Strongly Agree, 5 = Strongly Disagree). Pre-testing of questionnaire was done to measure its reliability and content validity. Questionnaire with cover letter indicating the need of study was used to collect data. Initially using convenience sampling, questionnaire was administered to the participants of oil sector and then gas sector in NCR region. To avoid biases of convenience sampling, survey was completed through mail survey. A total 450 questionnaire were mailed out to randomly selected firms in National Capital Region., Initial mail survey was followed two week later by phone calls to the concerned persons that did not answer. 180 Valid responses were returned, representing a response rate of 48.7 %. Total 230 responses were received. All the respondents were middle level managers from a range of gas sectors. These managers were involved with activities related to total quality management practices, Total quality management principles and Total quality management practices in their organisation. Distribution of respondents by gas sector is presented in Table 2.1 below. Reliability is a measure of internal consistency of construct across time and across the various items that measure the same concept (Sekaran, 2003) and is measured using Cronbach's alpha value which is found well above the recommended value of 0.5 (Nunnally, 1978) shown in Table 3.

Table2.1: Distribution of survey respondent by gas industry

Industry	Total	Percentage
	139	44.98%
GAIL	44	31.65%
IGL	42	24.70%
EIL	44	31.65%
OTHERS	09	6.47%

4. Results Analysis and Discussion

Data analysis was performed using exploratory factor analysis for establishing the construct validity and grouping of micro variables from survey data. Both KMO statistics (recommended level is 0.5) and Bartlett's test sphericity shows that the sample is adequate for exploratory factor analysis. Factors were extracted using principal component analysis followed by varimax (orthogonal) rotation. The Kaiser criterion (eigenvalues > 1) was employed in conjunction with an evaluation of scree plots. Both the screen test and initial eigenvalue test suggested the presence of three significant factors for each micro variable that were retained for rotation. Convergent validity was evidenced by the strong factor loadings (>0.50, in both cases). Five identified factors for micro variables explain 71.42 % of inherent variance and shown in Table 3 as: Customer focus, Leadership commitment, continual improvement, Team work and Management Structure.

Further descriptive statistics were calculated for all the variables of micro variables. The variables mean score and standard deviations are shown in Table 4. It shows that TQM practices are the most important macro variable category for total quality management principles implementation, with mean value of 3.94. With the growing number of employee empowerment and top management and active participation of team work in the organizations, firms are under top management to consider the total quality impact of their products and processes throughout the total quality management practices. Total quality management practices are ranked as the most important category with a mean of 4.067. Top management and employee empowerment, job performance are three important reasons for firms to adopt Total quality management practices. Customer’s focus and leadership commitment and team work also providing motivations for the total quality management principles in India.

5. Conclusion and Implications

Overall findings of this paper suggest that there is growing awareness about TQM Principles and TQM Practices issues in Indian oil and gas industries. While some of them have already taken lead in this direction, others are also gearing up to deal with the problem. Total quality principles approach towards customer’s focus, leadership commitment and team work appeared to be a dominating factor for total quality management practices. Haleem et.al., (2009) had highlighted the relation between the TQM practices and TQM principles in India as a macro variables in the study, the findings of this paper reinforced the findings of these researchers.

Table3: Factor analysis- Micro Variables

Items	Factor 1 Customers Focus	Factor 2 Leadership Commitment	Factor 3 Continual Improvement	Factor 4 Supplier support	Factor 5 Management Structure
Top management views as quality Being more important than cost.	0.990				
Employee empowerment encourage To develop new ways to provide better products & services.	0.921				
Employee empowerment is provided Sufficient information.	0.886				
Team works are effective in producing quality goods.	0.785				
The quality of work is an important Factor.	0.716				

Pay encourages improving the quality.	0.720				
Executives are responsible for profit and quality	0.725				
Employees have the needed authority to resolve customers related problem	0.754				
Employee monetary rewards for QI ideas	0.603				
Team interaction skill training					
TQM implementation attempted	0.624				
Variance explained (percent)	17.66	13.17	10.99	9.07	7.55
Cumulative variance (percent)	17.66	30.841	41.834	50.90	60.127
Eigenvalue	3.697	2.296	1.712	1.429	1.179
Cronbach's α	0.667	0.665	0.705	0.715	0.812
Overall Cronbach's α for SCM practices = 0.712					
Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.709					
Bartlett's Test of Sphericity: $\chi^2 = 4.697E3$					
Significance <0.001					

Extraction Method: Principal Component Analysis, Rotation Method: Varimax with Kaiser Normalization

Table4: Descriptive Statistics- Micro variables

Items	Mean	Std. Dev.	Average Mean
TQM Principles			
Customers Focus	4.124	0.8284	
Leadership Commitment	4.100	0.7386	
Continual Improvement	3.856	0.8610	
Team work	3.990	0.7512	
Human resource focus	3.824	0.8242	3.94
Management Structure	3.893	0.8592	
Quality tools	3.899	0.8051	
Supplier support	3.834	0.9123	
TQM Practices			
Top Management	4.212	0.8535	
Employee Empowerment Encouragement	4.100	0.7024	
Employee Empowerment Improvement	3.901	0.7871	
Effective team work in producing quality goods	4.029	0.7702	4.067
Job performance	4.092	0.8321	

These are large companies and they strongly believe in customers focus. The second important factor is leadership commitment have motivated the firms to TQM practices. The third major category of micro variables is team work based variables. Number of firms are asking their suppliers for ISO 14000 certification particularly in the oil and gas sector. Human resource focus micro variables and supplier support rate the lowest among the micro variables categories. Large corporations have human resource focus as part of their corporate social responsibility and quality tools mandate to be as highlighted by Haleemet. al., (2009) prove to be a major barrier. Through this research micro variables for the adoption of total quality management practices are identified from literature and validated through statistical analysis in Indian context. Haleemet. al., (2012) looked primarily at the oil and gas sector in India. This research has analyzed the micro variables across multiple sectors in Indian oil and gas industries. This paper will help researchers and practitioners in understanding the importance of various micro variables for total quality management practices in Indian oil and gas context.

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