

Development of Performance Measures for the Implementation of Total Quality Management in Indian Industry

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Abstract—Total Quality Management (TQM) refers to management methods used to enhance quality and productivity in business organizations. Total Quality Management (TQM) has become a frequently used term in discussions concerning quality. Total Quality management has brought rise in demands on the organizations policy and the customers have gained more importance in the organizations focus. TQM is considered as an important management tool, which helps the organizations to satisfy their customers. In present research critical success factors includes management commitment, customer satisfaction, continuous improvement, work culture and environment, supplier quality management, training and development, employee satisfaction and product/process design are studied. A questionnaire is developed to implement these critical success factors in implementation of total quality management in Indian industry. Questionnaires filled by consulting different industrial organizations. Data collected from questionnaires is analyzed by descriptive and importance indexes.

Keywords—Total quality management, critical success factor, employee satisfaction.

I. INTRODUCTION

TQM is a management philosophy, which emphasizes a number of concepts such as customer focus, continuous improvement, defect prevention, and recognition that all the organization's members share quality responsibility. TQM is regarded as a combination of various processes characterizing the behavioral dynamics of an organization. An organization is referred to as a total system, where all the activities carried out are geared towards meeting the requirements of customers effectively. TQM has been regarded as the tool for progress and continuous improvement in aspects of cost, reliability, quality, innovative efficiency and business effectiveness. We can say TQM is an integration of two basic functions: total quality control and quality management.

Top management commitment, customer satisfaction, training and education employee satisfaction, and product or service quality assurance in all its stages, and continuous improvement and supplier quality management are the critical factors for implementation total quality management. Total quality management is a way of planning, organizing and directing, that will help to improve the capabilities of all

employees for continuous improvement of services and products in an organization to attain optimal quality. Thus, TQM is a philosophy that brings all members of an organization together to ensure product and Service quality, improve organizational environment and attain customer's needs.

II. LITERATURE REVIEW

Various research papers studied about the implementation of critical success factors of total quality management. This section presents a review of the critical success factors of total quality management developed by researchers. Ahire, Golhar and Waller [1] defined constructs as latent variables, which cannot be measured directly. However, critical factors or constructs can be measured indirectly from their manifestations. For example, customer focus is a critical factor that cannot be measured directly. However, when a company is customer-focused, manufacturing managers will be aware of the results of customer satisfaction surveys. Thus, manufacturing managers being aware of customer satisfaction surveys can be one of the manifestations of the critical factor customer focus.

The development and validation of critical success factors of quality management have been reported by established international researchers— [1]-[7].

According to [8], the critical factors of quality management were first utilized by [2]. Saraph [2] developed a quality management instrument, identifying 8 critical factors of quality management. These factors are top management support, quality reporting (which includes quality information availability and quality information usage), employee training, employee involvement, product design, supplier quality, process management and role of quality department. Sila and Ebrahimpour [8] highlighted that the same critical factors were later used by [9] and [10]. These researchers had reported the instrument used by [2], [9] and [8] as valid and reliable.

Flynn et al. [3] developed 7 critical factors of quality management while [1] developed 12 critical factors. In addition, [4] developed 8 critical factors of quality management; [5] developed 7, whereas [6] developed 10. Rao et al. [7] made a significant contribution by developing and validating a measurement instrument for international quality management research that consisted of 13 critical factors of quality management.

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A total of 27 different critical factors of quality management were developed and utilized by the 7 groups of established researchers who conducted research in different parts of the world [11]-[15]. However, researchers in the field

are unable to make a good comparison of the research findings in various countries due to the disparity in the critical factors used in the research instruments.

TABLE I
LIST OF CSFS AS RECOMMENDED BY VARIOUS AUTHORS

Authors	1 "TMC"	2 "SQM"	3 "CF&S"	4 "QI&M"	5 "BM"	6 "T&E"	7 "QS&P"	8 "ES&I"	9 "ZD"	10 "COM"	11 "CI"	12 "WC&E"
Zeitz G et. al [5]	X	X		X		X		X				
Joseph, et. al [6]	X	X		x		X	X	X				X
Rao, S et. al [7]	X			X		X	X	X	X			X
Arawati et. al [14]	X	X		X		X	X	X				X
Black &Portar [4]	X	X	X	X			X			X		X
Sila, I et. al [8]	X	X	X			X	X	X		X	X	
Abdussalam et. al [15]	X		X	X		X		X			X	
Flynn et. al [3]	X	X		X			X					
Ahire et. al [1]	X	X	X	X	X	X		X				
Motwani et. al [9]				X		X						X
Badri et. al [10]	X	X		X			X	X				
ArashShahin et. al [13]	X	X				X		X				X
Adeoti et. al [11]	X	X	X				X	X				
Alireza et. al [12]	X	X	X	X	X	X	X	X	X	X	X	X
Saraph et al [2]	X	X				X	X	X				

TMC (Top Management Commitment), SQM (Supplier Quality Management), CF&S (Customer Focus), QI&M (Quality Information and Measurement), BM (Benchmarking), T&E (Training and Education), QS&P (Quality Systems and Process), ES&I (Employee Satisfaction and Involvement), ZD (Zero Defect), COM (Communication), CI (Continuous Improvement) and WC&E (Work Culture and Environment).

Each researcher, in his or her notion, discussed the properties of each critical factor. Out of the 27 different critical factors developed by the researchers, 7 were found to be the most popular critical factors; that is, 4 or more than 4 groups of researchers developed and utilized these critical factors in their research. These 7 critical factors, ranked from the highest level of popularity to the lowest level of popularity are:

- Top management commitment
- Employee Training and Education
- Employee satisfaction
- Product/process design
- Supplier quality Management
- Work culture and Environment
- Customer satisfaction

A Questionnaire is prepared on basis of these seven CSFs

TABLE II
DISTRIBUTION OF TYPE OF ORGANIZATION

Type of organization	Total response	% Response
Tiny/Micro	1	3
Small-scale	8	24
Medium-scale	4	12
Large-scale	21	61

III. PROCEDURE AND EXPERIMENTATION

Questionnaire prepared is pretexted by consulting experts from industrial organizations. Out of all questionnaires filled 34 are considered. A large number of respondents belong to large scale (61%) and another 24% to small scale. More than half of respondents are from large scale. 12% of respondents are from medium scale industry and another 3% from

tiny/micro segment [15]. It clearly shows that collected data is relevant to all type of organizations.

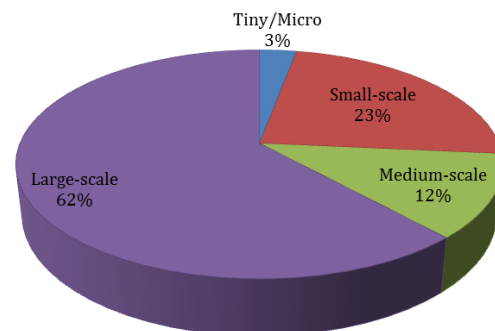


Fig. 1 Distribution of type of organization

Data collected from questionnaires is analysed using Importance Index Analysis. The numerical scores from the questionnaire provided a measure of strength of opinion of the effect of each item on the success of project. These are subsequently transformed into relative importance index using [8]

$$\text{Importance Index of item/variable } x (I_x) = \frac{\sum_{i=1}^5 a_i x_i}{\sum_{i=1}^5 x_i}$$

where; A_x = Constant expressing weight given to I ; X_i = Variable expressing frequency of response for I ; $i = 1, 2, 3, 4, 5$.

Results obtained are discussed below. Importance index analysis results thus carried are presented in Table III. The analysis was carried out for tiny/micro industry, small scale and medium scale industry, large scale and finally on entire

sample (all sectors together). The various variables for each performance measure have been ranked for their importance within the performance measure and variables with the same importance index are ranked same as shown in Table III.

TABLE III
IMPORTANCE INDEX ANALYSES

SN	Item code	Item description	Importance Index	Rank
Management Commitment				
1	MGC1	Top management ensures that every employee knows the company's mission and business objectives	0.888	2
2	MGC2	Top management strongly promotes staff involvement in quality management and improvement activities	0.864	4
3	MGC3	Managers and supervisors empower employees	0.823	7
4	MGC4	Communication links are established between employees and top management	0.829	6
5	MGC5	Top management takes care of employee well-being.	0.811	8
6	MGC6	Company fulfils its social responsibilities	0.858	5
7	MGC7	Top management commitment level towards quality, productivity and customer satisfaction	0.900	1
8	MGC8	Company manages its material and human resources effectively	0.882	3
Customer satisfaction				
1	CSF1	Customers see high standard of quality in the service you render	0.859	6
2	CSF2	In spite of complaint there is increase in customer base	0.847	7
3	CSF3	Customers recommend your services to others	0.864	5
4	CSF4	The defection of customers is as a result of poor service	0.794	8
5	CSF5	Customer satisfaction levels are measured and monitored	0.888	1
6	CSF6	Employee feedback is valued and remedies taken	0.882	2
7	CSF7	Market information and feedback system is established	0.870	4
8	CSF8	The employees involved in different processes know how to evaluate them	0.876	3
Education and Training				
1	EAT1	Top management always updates their knowledge	0.864	4
2	EAT2	Employees are trained for job related skills	0.870	3
3	EAT3	Employees are trained on total quality concepts	0.905	1
4	EAT4	Continuous learning is provided through education and training	0.859	5
5	EAT5	Management commitment to employee training	0.900	2
Work environment and culture				
1	WEC1	A pleasant environment exists in all working areas	0.888	4
2	WEC2	Management fosters positive values such as trust, honesty, hardworking	0.941	1
3	WEC3	Teamwork and involvement are normal practices in the company	0.935	2
4	WEC4	The company employs enough employees to operate productively	0.858	7
5	WEC5	The company provides adequate training	0.864	6
6	WEC6	Company benefits are fair and competitive	0.870	5
7	WEC7	Company provides job security and stability	0.923	3
Systems and Processes				
1	SAP1	Systems and procedures for quality assurances are implemented	0.894	3
2	SAP2	Internal data collections systems is established	0.917	2
3	SAP3	The employees involved in different processes know how to evaluate them	0.870	4
4	SAP4	Market information and feedback system is established	0.923	1
Supplier Quality Management				
1	SQM1	Suppliers are selected on the basis of quality aspects	0.858	7
2	SQM2	Company ensures that suppliers can maintain high technical standards and meets quality specifications	0.894	4
3	SQM3	Company regularly conducts suppliers' quality audits	0.852	8
4	SQM4	Company works closely with suppliers toward long term partnership and improvement	0.888	5
5	SQM5	There is a quality improvement coordinating body (e.g. quality steering committee)	0.882	6
6	SQM6	Improvement teams are active in all departments	0.905	2
7	SQM7	Quality improvement tools and techniques are widely used	0.900	3
8	SQM8	The company practices continuous improvement of all its products, services, and processes	0.929	1
Employee Satisfaction				
1	ESF1	There is good team Spirit and co-operation in the company	0.905	1
2	ESF2	Employees training and skills are fully utilized	0.888	4
3	ESF3	Management encourages and recognize team-work effort	0.900	2
4	ESF4	Management recognizes your suggestions	0.894	3
5	ESF5	Individual effort is recognized in delivering quality service	0.882	5
6	ESF6	Salary is a means of motivation in the company	0.876	6
7	ESF7	Whether employees satisfied with the authority	0.870	7
8	ESF8	Employees are involved in decision making	0.858	8

From the table we find that respondents rate most of the factors as very important i.e. $0.8 < I_x < 1.0$ and considered remaining as important. In case of Management Commitment MGC7 is placed at first rank i.e. Top management commitment gives more attention towards quality,

productivity and customer satisfaction. Experts from industry rank MGC1, MGC8 and MGC2 at place 2, 3, 4 respectively. In Case of Employee satisfaction, team spirit and cooperation among employees is given highest priority by respondents and

ESF2, ESF3 and ESF4 factors are among four top ranks rated by respondents.

In terms of education and training factor EAT3 is rated at the top i.e. employees are trained on total quality concepts and EAT5 i.e. management commitment towards employee training at second place. When we talk about supplier quality management, factor SQM8 i.e. Employees are involved in decision making, is at top rated by experts followed by SQM6, SQM7, SQM2 AT 2,3,4 rank respectively. Improvement teams in all departments are quality departments placed at rank second in supplier quality management. According to the rating of experts, systems and process SAP4 i.e. market information and feedback is at first place followed by SAP2 that is related to internal data collection. Work environment and culture factor WEC2 means Management fosters positive values such as trust, honesty, and hard work is rated at top by experts. WEC2, WEC7 and WEC1 are among four top factors in case of work environment and culture. The last factor Customer satisfaction CSF5 i.e. Customer satisfaction levels are measured and monitored, is ranked highest by respondents and CSF6, CSF8 and CSF7 are among top 4 factors according to experts.

IV. CONCLUSION

This paper analysis the data collected from different industrial organizations by means of questionnaire on performance measures of total quality management (TQM). The data has been analyzed by using importance index analysis. The objective of importance index analysis is to determine the numerical scores of each item. Performance measures investigated are Management commitment, training and education, customer satisfaction, employee satisfaction, work culture & environment, supplier quality management etc. Factors like Management commitment, Customer satisfaction is given more importance among seven performance measures.

V.SCOPE FOR FUTURE WORK

The present work can be extended to large number and type of industrial organizations by considering more performance measures/critical success factors for implementation of total quality management studied by different authors. Further studies can be carried out to investigate performance measures for successful implementation of total quality management by different statistical methods and design softwares.

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