Development of an Integrated Model for Evaluation of TQM in Organizations

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***Abstract* -Total Quality Management has become essential in all industries in this competitive and ever growing industrial world. TQM has to be implemented with at most care else it can lead to failure and the desired results will not be obtained. Based on the literature survey, a questionnaire instrument to collect data from organizations was developed and its reliability and validity accessed. After ensuring the reliability and validity, the questionnaire was administered to organizations. SPSS software is used to determine the reliability and validity of the questionnaire.**

Key words: Total Quality Management, Reliability, Validity.

I.INTRODUCTION

TQM is the integration of functions and processes within an organization in order to achieve continuous improvement of the quality of goods and services. The goal is customer satisfaction. During the Second World War, British Prime Minister Sir Winston Churchill, once said: "There is nothing wrong with change if it is in the right direction. To improve is to change, so to be perfect is to have changed often". To strive constantly for change and create a willingness among people to participate in this change is to practice TQM. TQM can thus be defined as a co-operative endeavor which relies on the skills and capabilities of the human system for continually striving to improve quality of products and services. TQM leads to better human relations, greater intimacy with customers, higher productivity and profitability and increased market share. The most appealing aspect of TQM is that it promises the opportunity to achieve better outcomes with fewer resources. Quality paradigm is seemingly at fullest maturity. Many recent tools are developed to boost up the quality endeavors. All the developments through the decades are encompassed by the newly coined term "Total Quality Management".

However, the policy of globalization and liberalization adopted by the Indian Government five years ago, has thrown open new avenues and challenges to companies in India. The new policy has resulted in open doors through which global corporate players have entered the Indian markets, and are threatening the domestic manufacturers and suppliers, using quality as a weapon. This has compelled the managers of local companies to look for those tools and techniques, proven and tested, which would help them to maintain and improve their strategies and positions in the market. One such policy or philosophy that has captured the attention of industry and the business community is TQM. Particularly, in the recent years TQM is even regarded as absolutely essential for growth, stability, and prosperity.

There are various attributes related to TQM Evaluation which are Leadership, Customer satisfaction, Employee Empowerment, Rewards and Recognition, Product Design, Process Control and Improvement, Quality Systems Improvement , Supplier Involvement and Strategic Planning. This paper has the main intention of presenting an overview on identifying the various attributes of TQM and checking the reliability and validity of the questionnaire prepared.

II.TQM ATTRIBUTES

Every organization should identify the critical TQM attributes relevant to their business. There are various attributes related to TQM performance. In order to study the overall TQM performance in an organization, each attribute relevant to the organization has to be evaluated in detail. The various attributes relevant to TQM is been listed in the quality awards criteria. With the help of the quality award criteria (Deming Prize etc) and the extensive literature review, nine TQM attributes and 74 items stating each attributes is devised in the form of a questionnaire instrument.

TABLE 1 TQM Attributes

Attributes	Significance of Attributes
Leadership	Top management actively participates in quality management and improvement process; they pursues long term business success; empowers employees to solve quality issues; their focus on product quality than yields.
Strategic Planning	Company should have clear quality policy and quality goal; measure progress against them and have quality improvement plans.
Supplier Involvement	How Suppliers work in the Supply chain and also the relation with suppliers in order to find the quality specifications demanded by the firm.
Employee Empowerment	Employees are committed to the success of company; they are encouraged to fix problems they find; delegate authority in all levels of organization; employee suggestion are implemented after

	evaluation; reporting work problems encouraged.
Customer satisfaction	Customers play active role in supply chain; collect complaint information from customers; quality related complaints treated with priority; customer satisfaction survey conducted; warranty given to increase customer satisfaction; measure percentage increase in customers to know the customer satisfaction.
Process Control and Improvement	Process capability can meet production requirements; production equipment maintained according to maintenance plan; 7 QC tools are used; "fool proof" is used; PDCA cycle used.
Quality System Improvement	ISO used as guideline for quality; company has clear quality manual; has clear procedure documents; conducts regular quality audits; implemented continuous improvement methods and six-sigma.
Product Design	Design engineers should have shop floor experience; design engineers should have marketing experience; customer requirements considered in product design; QFD used in product design; design reviewed before production; experimental design used; cost considered; various departments participate in product design.
Rewards and Recognition	Employees should be made aware of the reward and penalty system; good suggestions are financially rewarded; salary promotion scheme for encouraging employees.

III.DATA COLLECTION

Methodology- The questionnaire was prepared with the help of google docs.

Based on the extensive review on literature and also on the basis of quality award criteria, nine TQM attributes were identified and with the help of 74 items each attribute was well explained. These 74 items were made to a questionnaire covering questions related to the organization name, domain, sector to which organization belong, size of the organization and also the name of the respondent. . Following the methodology adopted in similar studies (Ahire et al., 1996), a five-point Likert scale was used for all items to ensure higher statistical variability among survey responses. Items of all the constructs were measured as: 1 – strongly disagree, 2 – disagree, 3 – neutral, 4 – agree, 5– strongly agree. Expert opinion was considered to check the suitability of the questions and its importance. The questionnaire was sent to few selected organization for pilot test data in order to determine the reliability and validity of the questionnaire made. Sixteen organizations were considered for pilot survey. After this was done, the final draft of the questionnaire was made by modifying and eliminating few items that did not meet the requirement. The final questionnaires with 71 items were sent across different organizations (attached in appendix).

The questionnaire was filled by experts from the quality domain in the organizations. Sixteen organizations were considered for pilot study and the spilt up of the organizations into manufacturing/service and private/public are shown below.

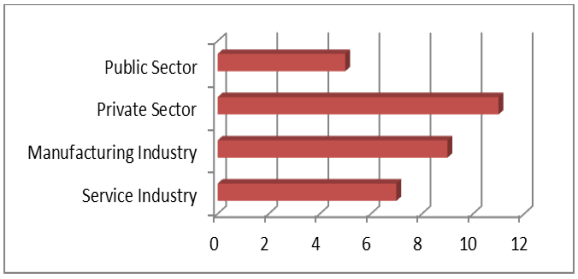

Fig 1 into manufacturing/service and private/public

IV.RELIABILITY

Methodology: Reliability is determined using Internal Consistency Method by determing the Cronbach alpha coefficient using SPSS software.

Reliability means the extent to which an experiment, test, or any measuring procedure yields the same results on repeated trials. It is a statistical measure of how reproducible the data of the survey instrument are. There are various methods to measure reliability. The method adopted here is Internal Consistency Method as it is widely used.

Internal consistency is an indicator of how well the different items measure the same concept. Under the Internal Consistency method, there are two methodologies that can be used viz. cronbach coefficient alpha method and KR-20 method. Here ,method adopted is Cronbach Coefficient alpha as in this reliability can be tested for any combination of item types. Whereas in KR-20, it was developed for use with assessments where each item/task is scored right/wrong (right = 1 point, wrong = 0 points).

Coefficient alpha measures internal consistency reliability among a group of items combined to form a single scale. It is a statistic that reflects the homogeneity of the scale. Cronbach's alpha measures the internal consistency of a group of items by measuring the homogeneity of the group of items—"it is an indication of how well the different items complement each other in their measurement of different aspects of the same variable or quality" (Litwin, 2003, p. 22). Cronbach's alpha ranges in value between zero and one. Values closer to one indicate a higher internal consistency; values closer to zero indicate a lower internal consistency. McMillan and Schumacher (2001) suggest that groups of items with an alpha below .70 should be used with caution. The Items under those attributes should be taken care either modified or eliminated to increase the alpha value above .70. The internal consistency of a scale can also be examined with item-to-scale correlations and intercorrelations of items within a scale (DeVellis, 2003).

The Cronbach Coefficient alpha value for all nine attribute was determined using SPSS software. Table II shows the individual alpha value of each attribute:

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Attributes	No.of Items	Deleted Items	Alpha Value
Leadership	8	NO	0.7999
Strategic Planning	10	1	0.7152
Supplier Involvement	8	2	0.7187
Employee Empowerment	9	NO	0.839
Customer Satisfaction	8	NO	0.7787
Process Control and Improvement	8	NO	0.8268
Quality Systems Improvement	9	NO	0.8225
Product design	8	NO	0.8062
Rewards and Recognition	6	NO	0.8763

V.VALIDITY

Methodology- The Content Validity was determined through literature review and expert opinions and Construct Validity using Multi-Trait Multi Method Matrix(MTMM).

Validity refers to whether the data actually represent what we think is being measured. It is a data reduction tool and removes redundancy or duplication from a set of correlated variables. The general purpose of checking validity is to find a way of condensing or summarizing the information into a smaller set of new composite dimensions with a minimum loss of information.

Content Validity

This validity is determined through literature reviews. In this, through review of literature and opinions of experts in the field of quality, each item's importance in defining the respective attribute is ensured.

Construct Validity

There are various methods used to determine construct validity viz. factor analysis, MTMM etc. Here, the methodology used is MTMM. The MTMM is a matrix or table having correlations values between the various attributes arranged to facilitate the interpretation of the assessment of construct validity. The basic principle of MTMM matrix is coefficients in the reliability diagonal should consistently be the highest in the matrix. The intra-attribute correlation (correlation between items of same attributes) are to be higher than the inter attribute correlation (correlation between items of different attributes). The average inter attribute and intra attribute correlation is given in the Table III below. Hence the questionnaire instrument is proved to be valid.

TABLE IIIcorrelation

Intra-Correlation	**Inter-correlation**
0.491647711	0.280000271
0.305325259	0.191898025
0.360849952	0.228661598
0.523365297	0.26405035
0.435833762	0.264195183
0.516592632	0.29541873
0.503553011	0.28453542
0.48626273	0.28379933
0.681164534	0.354080556

VI.CONCLUSION

After the reliability and validity test is performed on the instrument developed, the final questionnaire is prepared by eliminating and modifying items not relevant to the context. This was circulated to various organizations irrespective of the sector, size and manufacturing/service organizations. This tool can be used by mangers of any organizations to evaluate the TQM performance in their organizations and improve the areas where they are lagging.

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