

IDENTIFICATION OF STRENGTH AND WEAKNESSES OF INDIAN MANUFACTURING SMES USING AHP APPROACH

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Abstract: This paper empirically determines the extent to which the criteria of total quality management (TQM) are achieved in small- and medium-sized enterprises (SMEs) in Vidharbha region of state Maharashtra in India. These criteria represent the attributes of TQM and as such one can equate these to the benefits of TQM that are achieved in SME. In addition, weaknesses are highlighted to which scarce resources could be parsimoniously allocated.

The analytic hierarchy process (AHP) methodology is used to determine the percent weightings of five categories of performance criteria that were identified via a review of quality management literature. An empirical analysis of the criteria of each stage using the AHP methodology and the expert opinion of the top management of SMEs operating in Vidharbha region are used to evaluate the percent weightings of the criteria that are synonymous with TQM implementation

The findings of this study suggest that the SMEs were focused on UCN, but were least able to effectively determine their strategic direction. In addition, the potential benefits that could be derived from TQM criteria were lacking in the areas of EUD. Having compliance requirements that deal directly with these areas would help SMEs align their quality management practices with quality culture and strategic process changes towards TQM.

Keywords: Total quality management; Small to medium-sized enterprises; Vidharbha, Analytical hierarchy process

1. INTRODUCTION

The Literature (Lascelles and Dale 1990) shows that different approaches are being used in managing quality. The common approaches are traditional approach- Inspection, ISO 9000 certification, System Approach, Problem Solving Internal Diffusion and Organization Change, Technique Reactive Approach etc.

The literature shows that, SMEs are using different approaches to achieve TQM. One most commonly used approach is ISO 9000 series registration (Maheshwari, *et al.*, 1993; 1994; TQM Centre, 1996). This certification is act as a bridge between the traditional management of SMEs and a more sophisticated one. It plays a catalytic role in the adoption of new management tools. The department of Trade and Industry (1995) commented, "The ISO standard is viewed as a good foundation on which to build."

In today's dynamic business scenario, concentrating only on product quality is no longer an economical position. An organization has to produce products and services that are competitive and are of better perceived quality. Both ISO 9001 and TQM are

suitable to achieve the expected quality level of the output of an organization, but the systems differ in their systematic approach to keep the system in order and to manage continuous improvement. Total quality management, as the word already explains is not only dedicated to the production process or services provision only, but also to the other parts of the organization. Total quality management is rising above the system-oriented approach and makes the connection to the needs of the customers in the society and the improvement of the quality of the product and the organization as a whole (Rao and Tang, 1996). After ISO 9000 and TQM the self assessment of quality system of organization against a recognized quality award model is considered a more useful tool for identifying area of quality improvement.

Quality Management Self-assessment (QMSA) is a periodic, comprehensive, systematic and regular view of organizations systems, producers and results against recognized TQM models. QMSA is being increasingly viewed by quality fraternity worldwide, as the latest panacea. After ISO 9000 and TQM the self assessment of quality system of an organization against a recognized quality award model is considered as a more

useful tool for identifying areas for quality improvement and TQM benefits.

Literature shows that SMEs play important role in the development of the economy. For Example, in UK alone more than 70% of all business employs fewer than 100 people (Huxtable, 1995). Also 18% of UK gross output (Manufacturing) is generated by business with fewer than 100 employees (Ghobadian and Gallear, 1997).

In the changing scenario of globalization and liberalization, it is crucial to take a long and hard look at the small scale sector in India. It accounts for nearly 40% of our industrial output, nearly 6% of GDP, 35 % of national exports, while employing nearly 30 million people, the second largest after agriculture. The small scale sector in India is very diverse producing over 8000 products, from traditional handicraft to high end technical instruments. Owing to the feeling that the small scale sector was an important tool in employment generation, value creation and poverty alleviation, small-scale units were given further protection. Small scale units were given the reservation of over 800 products exclusive production in the small-scale sector, reservation of some of the products produced in the sector for purchase preference by government agencies, supply of scarce materials, input price concessions like lower interest rates and numerous fiscal measures such as excise duty exemptions and other tax concessions (Mohan, 2002). Even after 138,000 sick units within the sector in India (Business Today, 2006). The survey report shows that small sector has been growing rapidly, even in the face of growing competition, internally and globally (<http://ssm.com>). However this is not to say that there are no shortcomings within the industry. There are numerous problems that small scale units face today like maintaining quality standards, access to credit, over regulation etc. To counter competition in the long run and to be economically viable, the small scale sector needs to improve its productivity and quality, reduce cost (given the higher qualities) and innovate.

Although Maharashtra is a highly industrialized state of India and is a industrial backbone of the country. State contributes around 21% in country's industrial output. It is a most preferred investment destination in the country and one of the major sources of Indian exports. The industrial growth rate has averaged to around 10% and efforts should be made by the state to increase the growth rate by creating and efficient infrastructure for facilitating sustained industrial production (Economic Survey, 2006). State has announced SEZ policy and having highest number of approved SEZ.

It has thirty-five revenue districts, which have five main regions viz Vidharbha, Marathwada, Northern Maharashtra, Western Maharashtra and Konkan. Out of which Vidharbha region having natural wealth and minerals like coal, manganese ore, limestone, chromite, bauxite, iron ore etc. are found in this region. Vidharbha

is industrially backward than Western Maharashtra. Some of the causes may are lack of industrial culture, lack of awareness of quality, lack of knowledge of industrial management, lack of risk taking attitude etc. So the said region is taken for the study as a target market.

2. TQM in SMEs

In spite of success stories of TQM, still the concept has not been really adopted by SMEs (Dale and Duncalf, 1984). The main reason for low use of TQM in SMEs are, First, cost constraints and lack of sources (Wilkson, 1994); Second, lack of information on TQM, Specially oriented to SMEs; Third, lower level of awareness and understanding (Taylor, 1996).

Some SMEs have implemented TQM and they are enjoying the benefits from TQM (Ahire et al., 1996). Survey report of Gobeil and Shea, found that stated reasons for adopting TQM in SMEs are promotion of growth, (TQM as a marketing tool) changing customer expectations, consistent with management style, improving poor company performance (Gobeil and Shea, 1995). It is found that (Ahire *et al.*) TQM implementation in SMEs "represents a good strategy to execute quality management practice in an integrated manner". It was found that TQM business reported better product quality than non- TQM business despite a lack of market clout, capital and managerial expertise, they can and do implement TQM elements as effectively as large businesses and in turn achieve high product quality. The survey report shows that higher quality products, improved business performance, customer satisfaction, improved people, improved policy deployment, development of quality culture and improved training were the main benefits achieved by introducing TQM in SMEs (Ahire et al., 1996; Deming, 1986; Luzan, 1993)

3. DEVELOPMENT OF MODEL

Researcher (Hewitt, 1996; Wilkes and Dale, 1998; Kaye and Dyason, 1999) have found that the contemporary quality award model (MBNQA & EFQM) are not ideal for SMEs in the present form. Some of the short comings with the award models of today's are:

- i. They are too extensive for the reality of small organizations;
- ii. The model provide a good framework for TQM in large scale industries, but take no accounts of the need of small organizations;
- iii. The language used is too difficult to understand;

The models are often written in large company

language and not with the small business in mind. Literature review show that very few TQM implementation model are developed for SMEs. Considering the versatility of “S-P Model of TQM”, it was selected as a base for developing ‘Proposed TQM Model’ for SMEs (Saunders and Preston, 1994).

The Analytic hierarchy process (Satty, 1980; Satty, 1987) has been well received in literature. Applications of this methodology have been reported in numerous fields. The general approach of the AHP is to decompose the problem and to make pair-wise comparison of all elements on a given level with respect to the related elements in the level just above.

4. DESCRIPTION OF THE MODEL

Sila and Ebrahimpour (2002) content that; criteria relating to the implementation of TQM are country dependant (e.g. culture) and firm specific (e.g. size and type of firms). Corporate strategies, characteristic of entrepreneurs and employees are employees are components that constitute the framework for TQM implementation of any organization. These components are largely dependent on the alignment of a firm’s inherent characteristic (Lewis et al., 2005). An attempt was made to consolidate a list of five attributes and 15 sub attributes affecting TQM implementation that are derived from a review of a existing literature and empirical evidence based on practitioner’s reflections. The relative importance of these attributes is mapped to the findings of researcher’s recent studies reported in the literature. The attributes and sub attributes which were advocated by these studies are:-

a. Use of Team Process (UTP): A team is a group of individual each with specific skills and knowledge of interests that enable the member to contribute to the accomplishment of common purpose. A team may be composed of people from the same local organizational unit or formed within a given function. The sub attributes of UTP are:

1. NTA- Number of team activities;
2. PET- Perceived effectiveness of team process;
3. OTA- Outcomes of team activities.

b. Focus on internal customers (FIC): In broad sense, a customer can defined a person who uses the service provided by other. Internal customers of a work team are the next receiver of the product or service, who in turn has their customers. All individual and department gets input from the source (Suppliers); take these inputs and process them, adding value to the inputs, they received and provide their customers with a product or service (Gilbert, 1990). The sub attributes of FIC are:

1. AIC- Percentage of staff, aware of the concept of internal customer;

2. SQC- Percentage of staff, satisfied with the quality service received from their internal suppliers;

3. APC- Average number of awareness program conducted.

c. Common understanding of quality as satisfying the needs of external customers (CUQ): To achieve vision of the company, every employee must know the concept of quality. There should not be any variation among the employee regarding concept of quality. Quality awareness can also be improved by involving all employees to enable company to make products of quality which could complete successfully in the market. The sub attributes of CUQ are:

1. ACQ- Percentage of the staff, aware of the concept of quality;
2. AEC- Ability of employees to understand and express customer needs;
3. TPC- Number of training programs conducted.

d. Emphasis on the use of data and understanding of variation in decision making (EUD): Data helps to collect sufficient background information to translate the engineering problem statement into a specific statement that can be evaluated by statistical method. While decision making, sufficient and accurate information/data is needed. Management information programs provide the precise relevant quality data as a guideline to managerial to managerial and technical action. The sub attributes of EUD are:

1. ETU-Extent of training in use of data;
2. EAD- Extent of application of data;
3. EIV- Evidence of impact of variation on decision mode.

e. Understanding of customer need (UCN) : the need of all customers have to be met, and the product/ service features should be responsive to those needs. This applies to both external and internal customers. The sub attributes of UCN are-

1. AEC- Ability to express customer needs in terms of internal activities;
2. BSI- Percentage of budget on identifying customer needs;
3. NTP-Average No. of training program conducted to know customer needs.

Although exploratory in nature, these findings provide some indication of the importance of the attributes that would affect the success and subsequent benefits of TQM implementation in SMEs.

5. THE AHP- BASED STUDY IN SMES

The authors conducted a recent study on TQM criteria and related sub-criteria in SMEs of Vidharbha region of Maharashtra. The aim of the study was to collect empirical evidence and consolidate a breadth of credible options on criteria and related potential benefits

that would determine the organizational practices towards TQM implementation in SMEs. It adopted an ethnographic research approach, and used the AHP methodology to determine the extent to which the performance criteria of TQM implementation had been obtained in these firms. The AHP methodology involves the decomposition of a complex problem into a multi-level hierarchical structure of characteristic and criteria with the last hierarchical level constituting the decision alternatives. These alternatives are compared to determine the objectives of the problem (Crowe *et al.*, 1998; Saaty, 1980, 2000). AHP can accommodate both objective and subjective judgments of the evaluators

involved in order to make a trade-off and to determine priorities. The steps involved in the AHP study are outlined in Fig-1. After the TQM goal had been established, relevant and important performance criteria of TQM were identified via steps 1 and 2. These criteria were then structured into a hierarchy descending from the overall goal to the various stages and related sub-criteria in successive levels (i.e. step 3). Saaty (2000) suggests the guidelines for selection of the different levels of criteria and construction of the hierarchy. Using these guidelines, an AHP framework was developed for facilitating the study, as shown in Fig- 2.

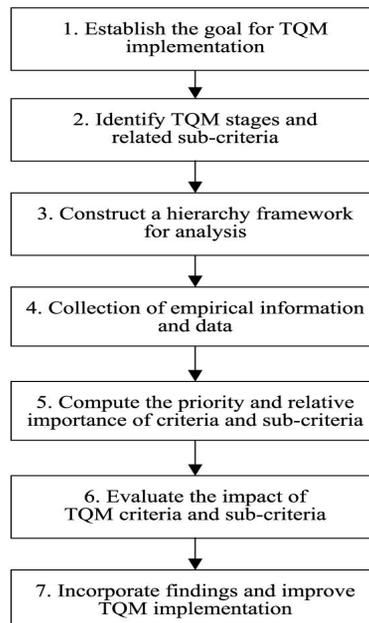


Fig.1. Stages of the AHP study

Level I Goal	Assessment of TQM Components in SMEs				
Level-II Attributes	Use of Team Processes (UTP)	Focus on Internal Customers (FIC)	Common Understanding of Quality (CUQ)	Emphasis on the Use of Data (EUD)	Understanding of Customer Needs (UCN)
Level-III Sub-Attributes	1. No. of Team Activities (NTA)	1. Awareness in Internal Customer (AIC)	1. Awareness of Concept of Quality (AQC)	1. Extend of Training in Use of Data (ETU)	1. Ability to Express Customer Need (AEC)
	2. Perceived Effectiveness of Team (PET)	2. Satisfaction with Quality Service (SQS)	2. Ability of Employee to Understand Customer Need (AEC)	2. Extent of Application of Data (EAD)	2. Budget Spent on Identifying Customer Need (BSI)
	3. Outcomes of Team Activities (OTA)	3. Awareness Programme Conducted (APC)	3. Training Programmes Conducted (TPC)	3. Evidence of Impact of Variation (BSI)	3. No. of Training Programme Conducted (NTP)

Fig.2 An analytical framework for AHP analysis

Step 4 is concerned with the collection of empirical information and data through the combined judgments

of individual evaluators from specially chosen SMEs in Vidharbha region. Invited evaluators in each SME under

study were asked to carefully evaluate the criteria of each hierarchy level by assigning relative scales in a pair-wise fashion with respect to the goal of the model. With a set of semi-structured questions, the evaluators were asked to assess a pair-wise comparison among four stages and related 15 sub-criteria.

A nine-point scale was used to assign the relative scales and priority of weights of criteria (Saaty, 2000). Experience has confirmed that the scaling mechanism reflects the degree to which one could distinguish the intensity of relationships among the levels of decision criteria and elements (Saaty, 1996, 2000).

After the acquisition of evaluators' views, step 5 followed with the computation of normalized weight priorities of the different hierarchies of criteria of the AHP model.

The relative importance of each factor was rated to provide numerical judgments corresponding to verbal judgments. Priority means the relative importance or strength of influence of a criterion in relation to other criteria that is placed above it in the hierarchy.

The normalized Eigen values method is recommended when the data is not entirely consistent (Saaty, 1996; Crowe *et al.*, 1998). Since different levels or hierarchies were interrelated, a single composite vector of normalized weights for the entire hierarchy was determined, using the vector of weights of the successive hierarchy.

The geometric mean of evaluators' scores then combined the pair-wise comparison judgment matrices. These were represented by total and sub-total of priority scores (i.e. step 6). Each set of comparative judgments

were entered into a separate matrix to derive the "local priority" (i.e. the preferences with respect to the specific criterion). The weights of the criteria and its sub-criteria were derived in a similar fashion.

The process was continued until all comparison judgment matrices were obtained. All acquired data and information were then computed and analyzed. Step 7 incorporates the findings for the improvement of TQM implementation.

6. DATA ANALYSIS AND FINDINGS

The selective fifteen SMEs of Vidharbha region were studied and interviews were conducted with senior personnel including chief executive officers, general managers, production managers and customer service managers of these SMEs.

In all cases, management was in close contact with the main customers and had direct input and contact with the key suppliers.

In each SME the interviewed personnel are responsible for and/or involved in quality management practices and performance measures in their organizations. Their views provided a wide spectrum of experience and expertise within their organizations and across various industry sectors in the said region.

The average priority weightage of TQM components for effective benefits among fifteen SMEs are shown in Table-I

Table: 1 Average priority Weightage of TQM attributes in SMEs

Summary of Weightage of Attributes																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Avg. Weights
UTP	0.1752	0.1669	0.1714	0.1309	0.1828	0.2060	0.1756	0.1634	0.1602	0.1593	0.1345	0.1631	0.1397	0.1397	0.2086	0.1651
FIC	0.0749	0.1065	0.0839	0.0940	0.0783	0.0898	0.0757	0.0796	0.0770	0.0952	0.0785	0.0830	0.0820	0.0820	0.0713	0.0835
CUQ	0.3147	0.2885	0.2507	0.2443	0.2559	0.2569	0.2967	0.2652	0.2808	0.2439	0.2929	0.2648	0.3077	0.3077	0.2858	0.2758
EUD	0.0451	0.0443	0.0516	0.0501	0.0442	0.0386	0.0428	0.0462	0.0453	0.0531	0.0445	0.0443	0.0462	0.0462	0.0403	0.0455
UCN	0.3900	0.4137	0.4424	0.4807	0.4387	0.4087	0.4092	0.4456	0.4368	0.4485	0.4496	0.4448	0.4244	0.4244	0.3941	0.4301
Total	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table: 2 Sub attribute Weightage

Level-II	Level-III	Priority Weightage of SMEs															Avg Weightage of Sub Attribute	Overall Weightage of Sub Attribute	Rank
Attributes	Sub Attributes	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15			
UTP	NTA	0.0726	0.056	0.0658	0.058	0.069	0.075	0.058	0.06	0.105	0.091	0.06	0.0719	0.062	0.064	0.0544922	0.0684	0.0113	13
	PET	0.7612	0.701	0.7171	0.663	0.582	0.567	0.559	0.709	0.637	0.691	0.709	0.6491	0.653	0.699	0.5712398	0.6578	0.1086	4
	OTA	0.1662	0.243	0.2172	0.278	0.348	0.357	0.383	0.231	0.258	0.218	0.231	0.279	0.285	0.237	0.374268	0.2738	0.0452	7
FIC	AIC	0.0562	0.064	0.0643	0.07	0.067	0.099	0.067	0.072	0.069	0.062	0.067	0.0702	0.061	0.078	0.07050567	0.0695	0.0058	14
	SQS	0.7009	0.699	0.6986	0.604	0.661	0.537	0.661	0.649	0.582	0.653	0.661	0.7071	0.586	0.717	0.5917274	0.6472	0.0540	6
	APC	0.243	0.237	0.326	0.272	0.364	0.272	0.279	0.348	0.285	0.272	0.2227	0.353	0.205	0.3332159	0.2833	0.0236	10	
CUQ	ACQ	0.0603	0.085	0.0953	0.073	0.095	0.081	0.079	0.078	0.109	0.062	0.082	0.0953	0.094	0.085	0.093616	0.0845	0.0233	11
	AEC	0.7085	0.644	0.6548	0.671	0.655	0.577	0.659	0.635	0.547	0.653	0.682	0.6548	0.627	0.644	0.6266965	0.6425	0.1772	2
	TPC	0.2311	0.271	0.2499	0.256	0.25	0.342	0.263	0.287	0.345	0.285	0.236	0.2499	0.28	0.271	0.2796875	0.2730	0.0753	5
EUD	ETU	0.067	0.067	0.0719	0.067	0.091	0.088	0.065	0.065	0.056	0.058	0.069	0.065	0.055	0.067	0.0719274	0.0683	0.0031	15
	EAD	0.6612	0.641	0.6491	0.641	0.758	0.669	0.574	0.574	0.701	0.645	0.582	0.5736	0.655	0.641	0.649118	0.6409	0.0292	9
	EIV	0.2718	0.293	0.279	0.293	0.151	0.243	0.361	0.361	0.243	0.297	0.348	0.3614	0.29	0.293	0.2789546	0.2909	0.0132	12
UCN	AEC	0.0629	0.082	0.078	0.072	0.075	0.082	0.075	0.093	0.054	0.067	0.14	0.0545	0.058	0.068	0.064343	0.0750	0.0323	8
	BSI	0.6716	0.55	0.6348	0.649	0.696	0.682	0.592	0.615	0.589	0.661	0.528	0.5712	0.645	0.733	0.6986153	0.6344	0.2729	1
	NTP	0.2654	0.368	0.2872	0.279	0.229	0.236	0.333	0.292	0.357	0.272	0.333	0.3743	0.297	0.199	0.2370417	0.2906	0.1250	3

Table-I shows the final weightage of each attributes. It was found that for enjoying the benefits of TQM implementation the component 'Understanding of Customer Needs' (UCN) has got highest weightage i.e. 0.4301 and ranked first.

The component 'Common Understanding of Quality' (CUQ) as satisfying the needs of external customer having second rank and 'Emphasis on the use of data and Understanding of variation in Decision making' (EUD) has ranked as last as it has got lowest weightage i.e. 0.0455.

Resultant CR values higher than 0.10(or 10%) warrants a re-evaluation of the pair-wise comparisons. The sub-attributes of each criterion are analyzed and the consistency ratios (CR) of AHP analysis of studied SMEs fall within the acceptable level of 0.10 as recommended by Saaty (1996). This indicated that the evaluators assigned their weights consistently on examining the priorities of decision criteria and assessing the effectiveness of TQM implementation.

The AHP findings show the extent to which each stages sub-attributes and respective benefits of TQM are implemented in the studied SMEs. Table 2 shows that SMEs put higher emphasis on UCN and CUQ at level-II.

The closer examination of the percent priorities helped to identified specific area of strengths and weaknesses in SMEs. At level-III, BSI and NTP (i.e. BSI=0.2729; NTP=0.125) under attribute UCN, AEC (i.e. AEC=0.1772) under attribute CUQ and PET (i.e. PET=0.1086) under attribute UTP were the leading sub attributes for the stages of TQM criteria. The lowest ranked sub attributes was ETU (i.e. ETU=0.0031) under attribute EUD. The other two lowly ranked criteria were AIC (i.e. AIC=0.0058) under attribute FIC and NTA (i.e. NTA=0.0113) under attribute UTP.

7. CONCLUSION

SMEs play an essential role in sustaining a developing nation's survival and growth. Many have used the ISO 9001:2000 Standard as a means of implementing TQM and gaining competitive advantages. The aim of this study was to investigate the extent to which the criteria of TQM have been attained in SMEs with particular reference to the selected companies operating in Vidharbha region, Maharashtra. It proposed a process model and employed the AHP methodology to acquire and analyze industry practitioners' opinions among the stages and related sub-criteria that would determine the success of TQM implementation. The empirical data was collated and practitioners' opinions were analyzed to determine the percent weightings of performance criteria, sub-criteria and benefits of TQM implementation in SMEs.

Potential benefits could be derived from the successful implementation of each stage and levels of the TQM. It was found from the AHP analysis that the stages with the least percent weightings were EUD and FIC. The findings revealed that, UCN and CUQ are the two leading performance criteria. A ranking of the level-III sub-criteria indicated that the four highest ranked sub-criteria are all from these two stages. These are BSI, NTP, AEC and TPC. On the other hand, ETU, AIC and NTA represent the least weightage sub attributes. This reflects that there is a deficiency in SMEs in addressing these issues. Having compliance requirements that deal directly with them would help SMEs align their QMS practice with extent of training in use of data i.e. and aware of the concept of internal customer i.e. AIC towards TQM. Future research could for the other criteria and sub criteria for benefits of SMEs of different natures in the said industrial region.

REFERENCES:

- [1] Ahire, S., Waller, M.A., Golhar, D.Y. , 1996, Quality management in TQM versus non-TQM firms: an empirical investigation, *Production and Inventory Management Journal*, Vol. 37 No.1, pp. 18-23.
- [2] Business Today, India, September 10, 2006.
- [3] Dale, B.G., Duncalf, A. J., 1984, A Study Of Quality Assurance In Small Business, *Proceeding of the Institute of Mechanical Engineering*, 1984, PP 135-139
- [4] Deming, W.E., 1986, *Out of Crises*, Cambridge, MA: MIT Center for Advance Engineering
- [5] Economic Survey Report of Maharashtra 2006-07
- [6] Ghobadian, A., Gallear, D., 1997, TQM and organization size, *International Journal of Quality and Reliability Management*, Vol. 17 No.3, pp.121-63.
- [7] Gobell, D., Shea, J., 1995, TQM: The Experience of 10 Small Business, *Business Horizons*, Vol. 2, pp. 125-135.
- [8] <http://ssrn.com/abstract=950252>
- [9] Huxtable, N., 1995, *Small Business*, TQM Landon, Chapman and Hall
- [10] Lewis, W.G., Pun, K.F., Lalla, T.R.M., 2005, "Case Study: An AHP-based study of TQM benefits in ISO 9000 certified SMEs in Trinidad and Tobago, *The TQM Magazine*, Vol.17 No. 6, pp.558-572.
- [11] Luzan, M., 1993, Can total quality management make small business competitive?, *Journal of Total Quality Management*, Vol. 4 No. 2, pp.105-181.

- [12] Maheshwari, S.K. et al., 1994, Benchmarking Quality Management, *Benchmarking for Quality Management & Technology*, MCB University Press, U.K., Vol. 1 No. 2, pp. 5-23.
- [13] Mohan, Rakesh, 2002, Small- Scale Industry Policy in India: A Critical Evaluation, in Anne O. Krueger, ed., *Economic Policy Reforms and the Indian Economy*, Chicago: University of Chicago Press, pp. 213-297.
- [14] Motwani, J. et al., 1993, Quality Assurance Practice of Indian Manufacturing Organization: An exploratory study, Working paper, *Grand Valley State University, MI, U.S.A.*
- [15] Rao, V. M., Tang, C.L., 1996, Strategic quality management, Malcolm Baldrige and European quality awards and ISO 9000 certification, *International Journal of Quality & Reliability Management*, Vol. 13, pp. 8-38.
- [16] Satty, T.L., 1980, *Analytic Hierarchy Process*, McGraw-Hill, New York.
- [17] Satty, T.L., 1987, Concept, theory and techniques: Rank Generation, preservation and reversal in the analytic hierarchy process, *Decision Science*, Vol.18, pp. 157-172
- [18] Saunder, I. W., Preston, A.P., 1994, A Model and a Research Agenda for TQM, *Total Quality Management*, Vol. 5 No. 4, pp. 185-200.
- [19] Sila, I., Ebrahimpour, M., 2002, An investigation of the total quality management survey based research published between 1989 and 2000, *International Journal of Quality & Reliability Management*, Vol. 19 No.7, pp 902-70.
- [20] TQM Centre, 1996, *Survey of ISO 9000 Certified Companies in India. Directory of ISO 9000 certified companies in India*, New Delhi, ASSOCHAM.

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