

# Effective Implementation of Quality Management System (QMS) in Small Scale Manufacturing Firms

T. Varun kumar, R. Jerin Ahino, N.Dhayalan, V. Kathiresan, V. Shalini

**Abstract:** *Small scale manufacturing firms forms an important part of Indian economy. Even large scale industries depend on small scale manufacturing firms. These Small Scale manufacturing firms need to overcome their backwardness by improving the quality. The aim of this research is to implement the Quality Management System (QMS) to increase the quality and performances in small scale manufacturing firms. Initially the literature survey is carried out to identify the requirements. From these requirements SWOT analysis is made .From these analysis the factors affecting the implementation of quality management system is identified. By using quality management model the gap is identified and rectified.*

**Keywords:** *Quality Management System, Quality management model, Total Quality Management and SWOT analysis.*

## I. INTRODUCTION

Small Scale manufacturing firms are considered to be the main driving force behind economic and employment growth of economy. Most of the Small Scale manufacturing firms are giving more importance to the activities regarding the development of product. In Small Scale Industries, the importance is given to maintain the product quality with reduced the manufacturing cost and also to improve the satisfaction of the customer [2]. Quality management system (QMS) improves the products of these organizations to meet the requirements of customer [15]. Initially, by literature survey the quality requirements are identified as factors. The two sets of questionnaire are framed. By this the analysis are made my using SWOT (Strength, Weakness, Opportunities, Threat) Analysis. Thus quality management practices are the techniques for achieving objectives related to both customer satisfaction and continuous improvement. In general, quality is fitness for the use of the customer. The concept was extended by integrating quality into all of the different functional areas that may be associated with the production process, including suppliers, sales, production and services [1]. Producing a high-quality product itself is not sufficient if

the consumer does not want the product.

## II. QUALITY MANAGEMENT EVOLUTION

The concept of quality management system has evolved over the past eight decades. First, quality started with inspection-oriented quality assurance for the final products. By this root Quality inspection does not eliminate the root causes other words the customer not only need good product they need right product. Quality assurance emphasizes new product development, in which quality is defined as identifying the root cause for the product. The concept of quality is not limited to products it also includes the production, organizational and design functions. Quality is a management function because it needs to be planned, implemented, monitored and improved. There was little use of these techniques in industries until the late 1940's.

Japanese quality improved by some quality gurus - Juran, Deming [8], Crosby and Feigenbaum. In the early 1950's, quality Management system practices developed in Japanese plants, by 1960, quality control and management had become a national occupation. In 1969 Feigenbaum, coined the term "total quality" and referred to issues such as planning and management responsibility [3]. Ishikawa explained "total quality control" that was different, with "company quality control", involving all employees [6]. In early 1980's, companies introduced their own quality programs to find the success of Japanese. The aim was to bring to the attention of industry and the importance of quality for competitiveness and survival in the world market. ISO 9000 has become the internationally recognized standard for quality [7]. TQM addresses overall organizational performance and recognizes the importance of quality management. There is also further research evidence that demonstrates the benefits of this approach. Primary objective of QMS is to fulfill the requirements of customers. Hence, research starts with the identification of the customer requirements which are as follows,

- To identify quality management requirements of small scale manufacturing firms,
- To identify strengths and weaknesses of small scale manufacturing firms that helpful or hindrances in fulfilling requirements,
- Implementation methodology appropriate For small scale manufacturing firms, and
- Develop simple and easy to understand performance measures, to demonstrate quantifiable benefits of quality management system (QMS) in small scale manufacturing firms for which, data can be made easily available.

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### III. LITERATURE REVIEW

Ghobadian and Gallear suggests the model for TQM implementation recommends stages as pre implementation to prepare and create awareness by planned implementation to develop the internal improvement capability and evolutionary implementation in industries to use and maintain internal improvement capability [11]. From this, Model explains what to do but not how to do it. Implementation is possible in large scale industries. But however in small scale manufacturing firms it is exigent [1].

Bounds G. Proposed steps of Input (preliminary control) and Transformation (concurrent control). Model uses feedback from the customer to improve the existing quality management system. It can be used in ancillaries [2]. Dalu Model provides weights for the attributes. Attributes are team processes, internal customers focus, use of data, common understanding of quality, quality improvement, understanding of processes, supplier partnership, understanding of customer needs, ability to control and improve processes and products, reduced waste, less variation, and better quality. Model is developed by studying small scale manufacturing firms working in different fields from small industrially backward area. Recommendation of considerations of strengths and weaknesses of the organization based on situational analysis will be useful while implementing Quality management system (QMS) [3].

Khond and Dabhade suggests the steps for implementing quality assurance system are mostly an activity flow chart for implementing ISO 9000. Based on literature survey, interviews and questionnaire survey of Small scale manufacturing firms located in limited geographical area from India [4].

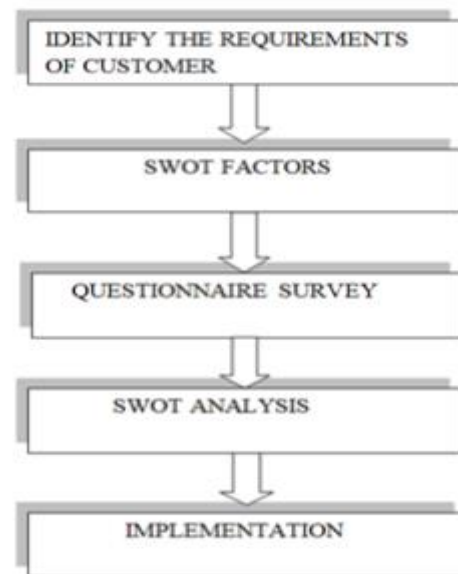
Yusof and Aspinwall, suggests the framework consists of three main dimensions. The three dimensions are Quality initiatives/tools, General methodology, and the management coordinating committee. Model is based on the case study in only one organization. It does not provide implementation methodology and hence is not directly implemental [5]. Following gaps in the literature are found:

1. It is a common agreement with the researchers that smaller organizations need Simplified approach. Very small organizations having single tier management do not have any reference available for implementing quality management.
2. Available quality models and methodologies are not suitable for implementation in small scale manufacturing firms.

Therefore, a fresh attempt to device quality management approach that is resource efficient, easy to implement, having longer sustainability and that is flexible enough to accommodate changes without losing its relevance may prove useful.

### IV. RESEARCH METHODOLOGY

The research methodologies, initially the requirements of customer are identified from the literature review and from the quality experts as shown in figure 4.1.



**Fig. 4.1 Research Methodology**

The SWOT factors are finalized by the quality experts in large scale industries. For those SWOT factors questionnaire is prepared. Totally two sets of questionnaire is prepared. Two sets contain organizational structure questionnaire and the SWOT factors questionnaire. By the data collected in the questionnaire survey the final data is analyzed. The strength and weakness of the organization is found. By this final implementation of quality management system (QMS) is carried out. The above diagram represents the flow chart for the research methodology.

### V. IDENTIFICATION OF REQUIREMENTS

As this research work is primarily carried out for the industries of small scale manufacturing firms [7] in mechanical sector are largely involved in providing components to large scale industries, large scale industries are assumed to be customers. Hence quality management system (QMS) for In other words, before deciding quality management system (QMS) for small scale manufacturing firms, it is necessary small scale manufacturing firms should be based on expectations of large scale manufacturing firms as regards to the quality. to know as to what is expected from them by large scale manufacturing firms. The requirements are identified as follows

- Literature review
- Quality experts

#### 5.1 SWOT Analysis

SWOT analysis is a tool recommended by Ghobadian and Gallear for developing quality management system (QMS). It helps in recognition of the internal strengths, weakness, external opportunities and threats. Observations during the study of present practices indicate that small scale manufacturing firms have certain strengths and weaknesses affecting implementation of QMS. Therefore, an in-depth SWOT analysis is carried out. Finally the parameter that affects the implementation of quality management system (QMS) is found. Every organization is functioning amid its unique strengths and weaknesses.



In order to take participation of small scale manufacturing firms in SWOT analysis, it is decided to adopt questionnaire survey. The procedure for the same is as given below.

- Questionnaire preparation
- Questionnaire administration
- Data analysis

The questionnaire is an instrument used for collecting the information when the population is large. For this study a questionnaire is divided in two parts; first part is dedicated for organizational information and second part contains SWOT factors Respondents are asked to rate every factor on one to five scale (importance of strengths and opportunities as well as severity of weaknesses and threats are rated in ascending order). A draft questionnaire is prepared with the participation of Quality Assurance Managers of large scale manufacturing firms and representatives of small scale manufacturing firms. After pretesting by owners of small scale manufacturing firms, the final questionnaire is framed. The responses received are indicating how many respondents are marking a particular scale point for each of the SWOT factor are answered in Table 5.1.

**Table 5.1: SWOT FACTORS**

STRENGTH	WEAKNESS	OPPORTUNITIES	THREATS
A)Performance B)Co-operation from employees C)Fast Communication within the Organization. D)Degree of Motivation E)Fast Decision F)Flexibility	A)Dependent on one person B)Lack of Quality C)Absenteeism D)Lack of finance E)Diversified activities	A)Mutual Help B)Working as Ancillary to large scale industries C)Increased outsourcing D)easy access new Technology E)Government support	A)High input prices B)High cost of Electricity c)Frequent price cut demand D) Cost based competition among the competitors E)competition from medium scale industries F)Rise in expectation of customer G)Lack of Industrial training

Average of individual SWOT factor shall indicate the extent of its presence. Such average is calculated by

$$\text{Average of factor} = \frac{\sum (\text{value} \times \text{Frequency})}{\text{Total number of responds}}$$

For example for strength factor 'Flexibility'

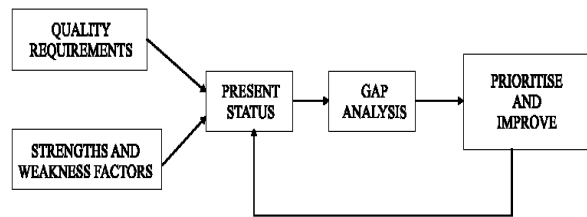
$$= \frac{(1 \times 3) + (2 \times 15) + (3 \times 59) + (4 \times 99) + (5 \times 4)}{173}$$

$$= 3.705$$

The critical analysis of organizational information received through questionnaire has also been carried out. It reveals that,

1. 35.9% employees have no formal education whereas 28.02% have just up to 10th standard. This indicates lack of trained and technical workers.
2. Maximum employees are found having experience of less than two years indicating the lack of experience.
3. 51.08% organizations work only for one shift and 41.2% for two shifts. Underutilization of people capacity is found.
4. Reported rejection rates are more. They are a matter of concern and indicate lack of quality consciousness in the manufacturing firms [5].
5. It is found that the industrial training is negligible.121 industries do not conduct training activity, in spite of the fact that the employees are less qualified and experienced.

The owners have mentioned negligence towards industrial training as less severe while organizational information indicates that 121 industries out of 182 do not conduct training program. Based on questionnaire survey the final list is prepared by considering these factors that have mean ratings more than three. Negligence towards industrial training is also included in the list of SWOT factors. The list of SWOT factors arranged in descending order is presented as Table 5.1



**Figure 5.1 Quality Management Model**

Small scale manufacturing firms has to fulfill the requirements by showing consideration to strengths and weaknesses [13]. The recognized strengths and weaknesses that affect the requirements of customer related to quality. It is to be accepted that neither strengths can be built over nor weaknesses can be reduced. Hence fulfillment of all the requirements also is not possible at a time. It is therefore important to decide the priority for implementation. Weight of the requirement specify its relative importance; hence, can be used to decide priority. Therefore, the quality management model for small manufacturing firms (based on customer requirements, strengths and weaknesses) is proposed to prioritize the quality requirements. The proposed quality management system (QMS) model necessitates organization to identify its current status of fulfillment of requirements in quality and also strengths and weaknesses of the organization [12].

The figure 5.1 represents the quality management model. The gap analysis and prioritization for the improvement in requirements of the customer is proposed to be done by using an instrument. The instrument is called as an analysis sheet for quality management model.



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Gap = Maximum possible weight – actual weight

For example,

Refer table 6.1 a gap difference is 72 for a cleanliness of shop.

## VI. IMPLEMENTATION METHODOLOGY

The quality management model described prioritizes customer requirements to be fulfilled and suggests strengths and weaknesses for implementation [4]. A careful observation reveals that for fulfilling customer requirements, Small scale manufacturing firms has to carry out certain activities and maintain records of the same. These records, which essentially should be in the form of formats, shall help to ensure that the action has been taken and further are useful for analyzing performance of Small scale manufacturing firms. In other words records are necessary to check the fulfillment of Requirements of customer and ensure effectiveness. For designing the relevant document formats experience and expertise of quality assurance managers from large scale manufacturing firms may prove helpful. Hence exhaustive discussion sessions are conducted with such managers and the activities required to be carried out for fulfilling each customer requirement are identified. It reveals that a requirement may involve more than one activity and one activity may contribute in fulfilling many requirements. Small scale manufacturing firms may develop document formats based on activities identified.

The below table 6.1 shows the improvement in percentage. The number of employees working in the organization is 30 out of these 22 have qualification up to 10th standard and one (supervisor) up to 12th standard. All the workers have acquired skill through their experience in industries. The experience of the workers in the organization ranges from 01-02 years. Total numbers of machines in the organization are 18. Organization works in three shifts and does not subcontract any production activity. Average turnover of the company for last three years is around 23 lakhs. The rejection level ranges between 0.1 to 1%.

It is quite natural that the industry should target to fulfill such requirements which have more gaps and hence become higher priorities. However, organization should understand its capability while working on these targets. It is identified by SWOT analysis [9]. In order to finalize the priorities for targeting customer requirements, it is necessary to identify significant strengths that can help in fulfilling customer requirements and a rating of strength and weakness factors done by owner.

Results shows that an independent assessor in once again requested to assess the status three months after implementation through analysis sheet. The analysis sheet is prepared. To analyze the effect of implementation, the gaps estimated for each requirement before and after implementation are compared and percentage improvements for each quality requirement are calculated. Comparison of gaps before and after implementation the improvement in percentage in shown in table 6.1. Overall improvement can also be calculated by averaging percentage improvement observed in applicable requirements [10].

**Table 6.1: Improvement Percentage**

Sl. no	QMS requirement	Max. weight	Gap			Improvement %
			Before	After	Difference	
	Ensure					

1	Cleanliness of Shop	144	108	36	72	50
2	planning	136	68	34	34	25
3	Prepare in Process quality plan	132	99	66	33	25
4	Final Inspection	128	64	32	32	25
5	Analysis of defects	128	64	32	32	25
6	Prepare process flow chart and work instructions	124	62	31	31	25
7	Product handling methods	120	60	30	30	25
8	Storage management	116	87	29	58	50
9	Checking of incoming material	116	116	58	58	50
10	Display process flow chart	116	87	58	29	25
11	Comprehensive training program	112	84	56	28	25
12	Maintaining system register	108	81	54	27	25
13	Maintain record of customer complaints	108	108	54	54	50
14	Maintain system for defect analysis	108	54	27	27	25
15	Process inspection record	100	100	50	50	50
16	Internal quality audit	100	100	50	50	50
17	Maintain test certificate	96	NA	NA	NA	NA
18	Maintain history card and calibration record	88	88	44	44	50
19	Get incoming material tested from approved	84	NA	NA	NA	NA
20	Provide unique identification for material s	84	84	63	21	25
21	Maintain setup approval system	84	84	63	21	25
22	Maintain pre-dispatch report	84	42	21	21	25
23	Schedule for preventive maintenance	84	42	21	21	25

24	Corrective action is planned and maintain record	76	76	38	38	50
25	Calibrate gauges	76	38	19	19	25
26	Maintaining and analyzing process	76	76	76	0	0
27	Prepare master list of all gauges	72	72	18	54	75
28	Tooling and equipment	72	54	36	18	25
29	Actions taken on the complaints	68	34	17	17	25
30	Maintain master list off all documents	64	64	16	48	75
31	Process capability study	64	64	64	0	0
32	Update documents and issue at required location	60	60	30	30	50
33	Provide master sample during final inspection	60	60	15	45	75
34	Define quality policy	60	60	30	30	50
35	Carry out vendor rating	56	NA	NA	NA	NA
36	Prepare work instructions	56	NA	NA	NA	NA
37	Review preventive maintenance program	56	28	28	0	0
38	Evaluating the need of training	48	48	24	24	50
39	Review the results of audit	48	48	24	24	50
40	Implement feedback mechanism	48	48	24	24	50

## VII. CONCLUSIONS

An exhaustive list of requirements presented in this work can be useful information for large scale manufacturing firms to design supplier quality system assessment effectively. Methodology for SWOT analysis proposed in this work is easy to understand and simple to adapt to any small scale manufacturing firms for overcoming their weaknesses. Proposed quality management approach is easy for understanding. It is flexible, and can be adopted by any small scale manufacturing firms in shorter time. It guides the organization for a longer period and it provides small and continuous improvement. Improvements in individual customer requirements are in the range 20% to 75%. Hence the proposed research assures in improving the quality after implementation. Small scale manufacturing firms desirous of implementing QMS, but is in a fix from where to start, how to Start, and what to do, the analysis sheet for quality management model is a simple instrument to decide improvement priorities Though proposed quality management approach is useful for every organization, it is

more effective for organizations that are not ISO certified. Various performance measures are also proposed for assessment of QMS. The performance measures are easy to understand

## VIII. SCOPE FOR TFUTURE WORK

Ten point scales for rating and by extending the scales of customer requirements may help in estimating improvements more precisely. Proposed quality management approach is for Indian small scale manufacturing firms. However this methodology can be applied to various sectors in different countries.

## REFERENCES

- Ahire, S.L., Dreyfus, P., "The impact of design management and process management on quality: an empirical examination", Journal of Operations Management, Vol. 18, (2000), pp. 549–575.
- Ahire, S.L., & Golhar, D.Y. (2001). Quality management in large versus small firms. Journal of Small Business Management, 27, 1–13.
- Besterfield, D. H., Besterfield-Michna, C., Besterfield, G.H., Besterfield-Sacre, M., "Total quality Management", Pearson Education (Singapore) Pte. Ltd., New Delhi, India, 2nd Edition, (2001).
- Buranjarukom P., "Human aspects of quality management in developing countries: A case study and model development for Thai manufacturing SMEs", Ph.D. thesis, University of Wollongong (2006).
- Conca, F. J., Llopis, J. and Tari, J. J., "Development of a measure to assess quality management in the certified firms", European Journal of operational research (OR), Volume. 156, (2004), pp. 683–697.
- Chang, G., "Total quality management in supply chain", International business research, Vol. 2, No. 2, (2009), pp. 82-85.
- Civisa G. Share of small and medium-sized enterprises with certified ISO 9001 quality management systems (QMS) in Latvia. publication (2010)1:56-67.
- Deming, E. "Out of crisis", Cambridge University Press, Cambridge, (1986)
- Dana, B. G., "SWOT analysis for the improvement of quality management in production", Procedia - Social and Behavioral Sciences 62, pp. 319 – 324, 2012.
- Feigenbaum, A. V., "Quality and business growth today", Quality progress, Vol. 15, No. 11, (1983), pp. 22-25.66
- Ghobadian, A., and Gallear, D., "TQM implementation: An empirical examination and proposed generic model", Omega, International Journal of management science, Vol. 29, (2001), pp. 343-359.
- Jolly, S.S., " Total quality management an Emerging Necessity for Small Scale Industry", Vol. 2, Issue 1, pp. 36-37, 2013.
- Kureshi N. I, Mann R., Khan M. R. and Qureshi M. F., "Quality management practices of Small and medium enterprises in developing countries: A survey of manufacturing SME in Pakistan", Journal of quality and technology management, Vol. V, Issue I, (2009), pp. 63-89.
- Varun Kumar, M.T.V., Babu, B.G., Saravanan, M., (2016): A framework for assessing the awareness of the agile manufacturing environment in indian SMEs. Int. J. Adv. Eng. Tech. 7(2), 201-210.
- T. Varun Kumar et al., (2014), "Effective Performance of a User Friendly Dynamic Tool Design in Small and Medium Scale Enterprises", Applied Mechanics and Materials, Vol. 591, pp. 215-218.

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