

Journey of Quality Management Practices Towards 21st Century

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Abstract

The twenty first century is known as century of quality. The survival of manufacturing and service organizations in globalization and competitive scenario depend on quality management practices. This paper critically examines the existing literature review about the quality management practices of manufacturing and service organizations from nineteenth century to twenty first century. Application of Total Quality Management (TQM) and Six Sigma by different researchers are also emphasized. The review paper has been segmented into two sections such as significance of TQM, and finally focusing on the Six Sigma for customer satisfaction. This paper is a guideline for the future decision makers of the manufacturing and service industries towards a improve productivity.

Keywords

Quality Management Practices, Total Quality Management (TQM), Six Sigma, DMAIC, DMADV

I. Introduction

Concept of Quality existed for many years but in recent years the word itself has changed its meaning because of its essentiality for survival of the product. Definition of "Quality" varies with the person defining it. According to Deming, Father of Quality Revolution defined quality as an improvement process and it is only for customer satisfaction rather than for products. Quality is "conformance to specification" cited by Crosby and "Fitness for Use" defined by Quality guru Juran and others defined as "value for price paid". Quality management not only ensures superior quality products and services but also consistent products and services and provides means to achieve the goal. Evolution of Quality management takes place in four phases- Planning and inspection of Quality, Control through various charts, assurance whether specifications are met or not and further improvement. During 1900 Planning and Inspection of Quality were done by skilled craftsmen and remedies were made right at workbench purpose was to separate poor quality products from acceptable quality products then scrapped, reworked and sold as lower quality, which was found in Ford motor company but it was sufficient only for those organizations having lower volume of production. Taylor published "Principles of Scientific Management" in 1911 to bring a revolution in the concept of Quality. In 1920 Dr. Walter Shewhart introduced modern charts to eliminate both the types of variations due to random and special causes. To separate good products from bad specifications were measured and then compared with standard one rather relying upon craftsmen skill. During 1950 third stage of development emphasis was given upon prevention of bad qualities rather detection. Assurance of Quality took place by considering various cost of Quality like- Prevention cost, Appraisal cost, Internal and External cost and auditing of quality systems. Due to increase level of Globalization and Competition to gain competitive advantage there was need to focus on world class standard in terms of Quality by implementing quality systems. From 1950 onwards three Quality gurus Deming, Juran and

Crosby developed Total Quality Management (TQM) which is an integrated organizational effort designed to improve quality at each level and seek to attain the following goals such as continuous Improvement, defect prevention, customer satisfaction, reduced variation, and employee involvement

Six principles must be considered while implementing TQM those are- 1. Customer focus: here customer refers to external customers who place orders and receive goods. So every employee must know the needs of customers and serve accordingly. 2. Process focus: continuous improvement should be in those processes which don't meet or exceed customer expectation. 3. Prevention focus: TQM focus on prevention rather than detection to stop producing defective items and problems were identified early in the production cycle so that there will be less rework. 4. Work force mobilization focus: it changes the way in which management view the workforce. 5. Fact based decision making focus: In this principle problem is fixed first then use continuous improvement and multifunctional team to analyze, document and find the solution. 6. Continuous feedback focus: successful implementation depends upon open communication from top to bottom of the organization.

Below steps iterated infinitely for continuous improvement of organization to fulfill customer need.

- Company reviews the needs of customers through market research and if these are delivered by organization at right place, at right time.
- Further company plans the long term action to fulfill the needs.
- Company establish and stabilize process to deliver products.
- Implement system to improve process product and service.

Then in 1987 Motorola started SIX SIGMA a process improvement methodology. It is the concept of Quality improvement and business strategy which commits customer to achieve desired level performance. In statistical term Six Sigma is the abbreviated form of six standard deviations from the mean signifying 3.4 defects per million opportunities. It is a great Quality improvement and control tool to minimize variations in input to produce more consistent product or service. It uses process analysis techniques and statistics to determine process inputs which produce undesired outputs. Six sigma has garnered significant amount of credibility because of its wide acceptance across the world in the Industries like- General Electric, Ericsson, Sony.

Table 1:

Sigma Level	Defects Per Million Opportunities	Rate of Improvement
1 σ	690,000	
2 σ	308,000	2 times
3 σ	66,800	5 times
4 σ	6,210	11 times
5 σ	230	27 times
6 σ	3.4	68 times

Phases of Six Sigma are (a) Define the specific goal to achieve (b) Measure reduction of defects (c) Analyze problem where causes and effects are considered (d) Improve process (e) Control process to minimize variations.

Hence the increasing globalization and competition force Indian firms to gain competitive advantage by producing products and service of high quality standard and reducing defects to minimum by adapting different Quality practices. Purpose of the study is to define different QM practices that Indian firms adapting in its journey towards 21st century. The framework for quality management practices journey in manufacturing and service organizations is shown in fig. 1.

The structure of the paper is as follows: Section II summarizes the literature review in a tabular form, the conclusions drawn from the past works on different factors affecting quality management practices in manufacturing and service organizations. The first subsection of literature review illustrates the importance of TQM whereas second part presents the significance of six sigma concept. Section III discusses the conclusions drawn based on the critical literature review.

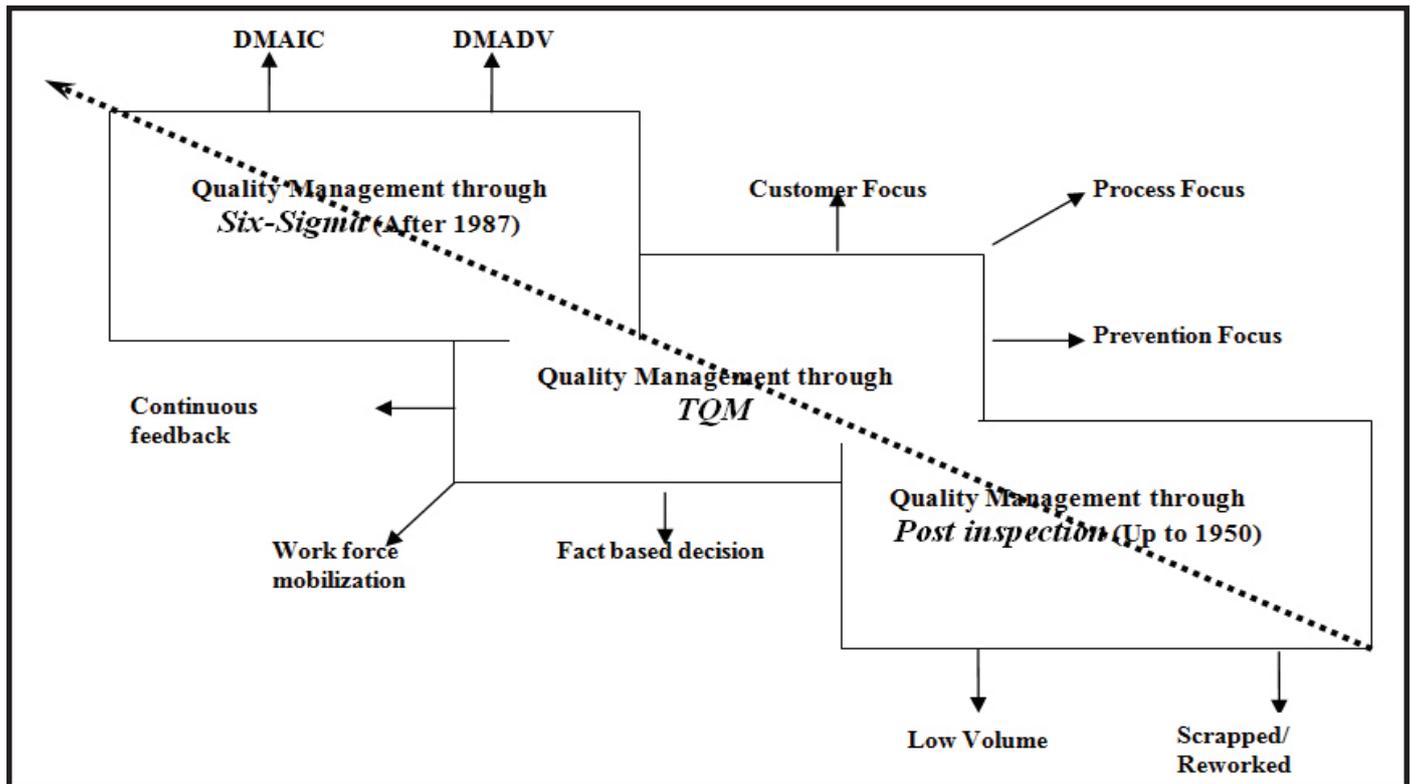


Fig. 1: Framework for Quality Management Practices Journey in Manufacturing and Service Organization

II. Literature Review

Considerable amount of research in the area of quality management practices has been reported. In this paper, we extend a critical review of research exercised on the different generations of quality management practices which has been shown in Table 1 and Table 2. Table 1 depicts the idea of quality management practices during the period of 1990 to 1987 considering TQM as an important factor. In Table 2, the classification is done from 1987 onwards on the basis of six-sigma performance in different sectors.

A. Total Quality Management (TQM)

Total Quality Management (TQM) is an approach improving the competitiveness, effectiveness, and flexibility of a whole organization. It is essentially a way of planning, organizing and understanding each activity, and depends on each individual at each level. Total quality management is a holistic quality improvement approach to firms for the purpose of improving performance in terms of quality and innovation for the last two decades.

Table 2:

AUTHOR	FOCUS	FINDINGS
Talib et al [1] 2011	TQM practices in manufacturing and service sector	Although most of the practices were similar like- Top-management commitment, customer focus and satisfaction, training and education practices but some inconsistencies also there.

Khanna et al [2] 2010	Current quality management practices in Indian manufacturing organisation	50 Organisations participated in this survey, findings indicates that weakness lies in lack of implementation of tools and techniques like- the use of six sigma is very less than other quality improvement techniques.
Hassan et al [3]2012	Performance of TQM practices in Pakistan manufacturing organisation	Greater the degree of implementation of TQM practices resulted in 13.3% increase in quality, 12.7% in business and 26.4% improvement in organisation's performance
Dr.Sukhwinder Singh Jolly [4] (2013)	TQM in SMEs	Key aim of TQM is to improve productivity, reduce cost and customer satisfaction through competitiveness.
Boca Gratiela Dana (2012) [5]	Effect of Quality practices in Organisation	Organisation should be directed towards continuous improvement of service, customer satisfaction, and company compliance requirements.
Gupta A. [6] 2000	Statistical difference between ISO 9000 registered and nonregistered companies considering different categories	Four categories are taken to compare between both organisations. It is concluded that ISO companies are more focused and committed to quality practices and put more emphasis on training than non ISO.
Wad Rajiv P. and K.N. Vijaya Kumar [7]	Performance measure of TQM in manufacturing organisation.	Customer Satisfaction is more focused. Scrap, rework, wastage, warranty costs, customer complaints reduced to minimum. Productivity, capacity gets the deserved importance. Safety and Accidents, and After Sales Service aspects are taken care.
Romodan Mohammed[8] (2005)	TQM in SMEs	Crucial areas where successful implementation of TQM could not be held, are focused and highlighted.
Kucerova et al [9] 2009	Continuous quality improvement, Quality management principle	Research carried out in implementation of Continuous improvement in different Industry sectors of Slovakia through enhancement of process and activity for better profit and achieving goals remaining competitive.
Venkataiah Ch. And Sagi S. [10], IJMBS , Vol-2, 2012	Implementation of Kaizen event in automobile manufacturing company	Kaizen event detect weak areas of automobile company ie- Quality Performance and customer satisfaction. Hence company should implement TQM to minimise defects.
Ibrahim O. [11] Vol-3, 2013	Applying TQM, Baldrige Model	Researchers found that in spite of different approaches to implement TQM top management should be involved in the application of quality and all functions, all employees should participate in the improvement process to achieve excellence.
Talib F. and Rahman Z. [12] Vol-4, 2012	Applying TQM in both manufacturing and service sectors	QIPM, PM, QS are the areas where manufacturing sector shows higher frequency of occurrence. In service industries TQM practices affected by continuous improvement, innovation and bench marking
Hoang et al [13] Vol-21, 2010	Effect of degree of TQM implementation in manufacturing and service industry of Vietnam possessing different organisational characteristic using MANOVA.	Result showed that In manufacturing companies customer focus and top management commitment TQM practices have heavy influence further large size and high innovative companies have high degree of influence of TQM practices except team work and open organisation
Talib et al [14] 2011	TQM practices, service organisation, interpretive structural modelling(ISM)	ISM analyse interaction between different TQM practices develop a hierarchy model based upon driving power and dependency which would be beneficial for top management.
Talib et al [15] 2010	Identification of TQM critical success factors	Study is carried out to sort 21 CSFS out of 60 listed in descending order of their frequency using Pareto analysis tool.

In the above table (Table-1), most of the researchers have been focused the different factors affecting TQM are top management commitment, customer focus, continuous improvement, innovation, knowledge management, effective training, leadership and employee involvement [1, 4,5,10,12, 14,17, 20,21,23,26]. Some of the authors also prioritized different techniques such as pareto analysis, six-sigma, Kaizen, Poka yoke, KANBAN, TPM, AND SPC for the betterment of quality [10,15,22,24]

2:2 Six- Sigma Six –Sigma is a quality matrix that counts the number of defects per million opportunities (DPMO) at six levels. Higher the sigma level, better the quality of the product with lower DPMO.

Table 3:

AUTHOR	FOCUS	FINDINGS
Valles A. etal [27] 2009	Implementation of Six sigma in a Catridges circuit manufacturing company to reduce defects.	To identify electrical failures tests were conducted in the final stage found 50%. Six sigma identified critical factors through which reduction of failure and improvement could be possible were: abrasive pressure, height of the tool and cycle time.
Sokovic et al [28] 2006	DMAIC methodology in an automotive parts producing company	Significant Results achieved through this project were tools expense reduced to 40% while labour expenses reduced to 59%. Further % reduction of cost of poor quality and production time were 55 and 38.
Guarraia et al [29]	Lean six sigma , Manufacturing company	Through the combine approach of lean manufacturing and six sigma Opportunity of cost saving, waste reduction and revenue generation, rapid as well as sustain growth were achieved.
Taneja and Manchanda [30] 2013	Productivity improvement through six sigma in SMEs	This paper proved the importance of Six sigma for SMEs where it is difficult to train and educate employees through programs.
Kapadia and Sharda[31] 2003	Turning of Tata YazakiAutocomp an Automobile shop towards six sigma methodology	Quality is improved as well as better delivery and financial performances could be achieved.
Donovan S. [32] 2006	Improving performance of CRC industry using cost of Quality	It is concluded that productivity improved by 65% and order shipping improved by 20%
Thakore et al [33] 2014	Key strategy of six sigma to be applied in manufacturing sector	This paper inspires manufacturing sector to use correct methodology and best combination of tools and techniques to have significant benefits
Kessler and Padula[34] 2005	Survey of six different organisations which have already implemented six sigma	Excellent results obtained from survey exceeded expectations. Organisations adopted this methodology as high quality didn't cost much, being a complex statistical tool it explained the results obtained and easily transmitted to other areas for reference, also the best training program which promote learning.
Jacobsen J. [35]	Siemens VDO an international supplier of automobile electronics optimizes performance using Six sigma	Results obtained are new way to measure and change chimney gates and establish relation between solder height and chimney gates to improve performance.
Jacobsen J. [36] 2001	After loss of 72% in business Cummins a diesel engine manufacturer implemented six sigma to gain and sustain customers	17% failures during the warranty period before implementation. DMAIC methodology identified it was due to vibration in the pump which saved \$900,000 and retain customers.
Camacho Daniel Clavo [37] 2015	Boston Scientific company of medical device adapt DMAIC methodology	Overall there were improvement in efficiency, safety, Quality and Cost. Annual saving was \$114,600, Efficiency improved by 15% and production capacity increased by 63%

Here (Table 2), many researchers have been discussed the benefits of implementing of six-sigma with respect to defects, costs, time, and finally the quality [27-28,32,36-37]. A number of authors also focused the factors responsible for implementation of six-sigma such as training & development, financial and delivery performance [29-31].

III. Conclusion

The Paper successfully reviewed how the style of Quality has changed in its journey towards 21st Century. Study not only put emphasis on the importance of Quality but also on the Quality Management practices to improve performance of both manufacturing and service sectors. The first segment of this review paper described the six principles leading to implementation of TQM, the different factors acting as barriers to focus on and findings of research papers by different authors to achieve continuous Improvement, defect prevention, reduced variation, and employee involvement. In the second segment Six Sigma the highly disciplined tool, its wide acceptance and its DMAIC, DMADV Methodology to reduce variations and production of consistent products and services are depicted through different papers in the form of a table.

Despite of all the Improvements through Quality Management practices to achieve the ultimate goal of world class quality and customer satisfaction there is still opportunities for further research study to develop QM practices and model to compare them.

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