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Paradigm shift in Manufacturing Industries TQM Implementation Approach for Future Generations

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ABSTRACT

Total Quality Management (TQM) is accepted as an imperative key for enhancing Business performance and creating unique differentiator to leap-frog the competition. TQM is adopted as a strategic tool across different business houses throughout the world and demonstrated evidences for tangible improvements have been presented over a long period of time. The objective of this research study is to review the effectiveness of TQM implementation based on published Literatures for the period between 1980 and 2016 and identify core TQM related areas for future research. This study has covered the extent of TQM implementation in manufacturing industries over three decades. TQM related Research in Manufacturing Sectors have predominantly conducted to reflect usefulness in areas such as TQM Effectiveness, Critical Success Factors for TQM, impact of TQM on Financial and Non-financial performance, Relationship between successful TQM implementation and Customer Satisfaction, TQM as a catalyst for Revenue Maximization, TQM contribution on organizational Profitability, correlation between Effectiveness of TQM and Employee involvement, adoption of 7 QC tools for continuous improvements and impact of TQM on Productivity improvements. This research study has identified Knowledge Management System for future generations implementing TQM, Executive Management declining involvement in TQM and quantitative assessment of business Process Maturity are the areas for further research. It was evident from the research that application of modern Information Technology framework in Manufacturing Industries is completely missing for accumulating the knowledge and experience gained during real-life TQM implementation.

Key Words: TQM, Manufacturing Industries, Critical Success Factors, Knowledge Management Systems, Top Management Involvement.

Introduction

TQM is the art of managing the whole to achieve excellence. TQM is defined as both a philosophy and a set of guiding principles that represent the foundation of a continuously improving organization. It is the application of quantitative methods and human resources to improve all the processes within an organization and exceed customer needs (Dale, 2005). The basic principles of TQM encompasses management active participation, focus on customer, pursuing it as an organization wide challenge, continual strive to improve all business processes

and establishing clear measure of performances across the organization. The evolution of TQM is shown in Diagram 1 indicated below:

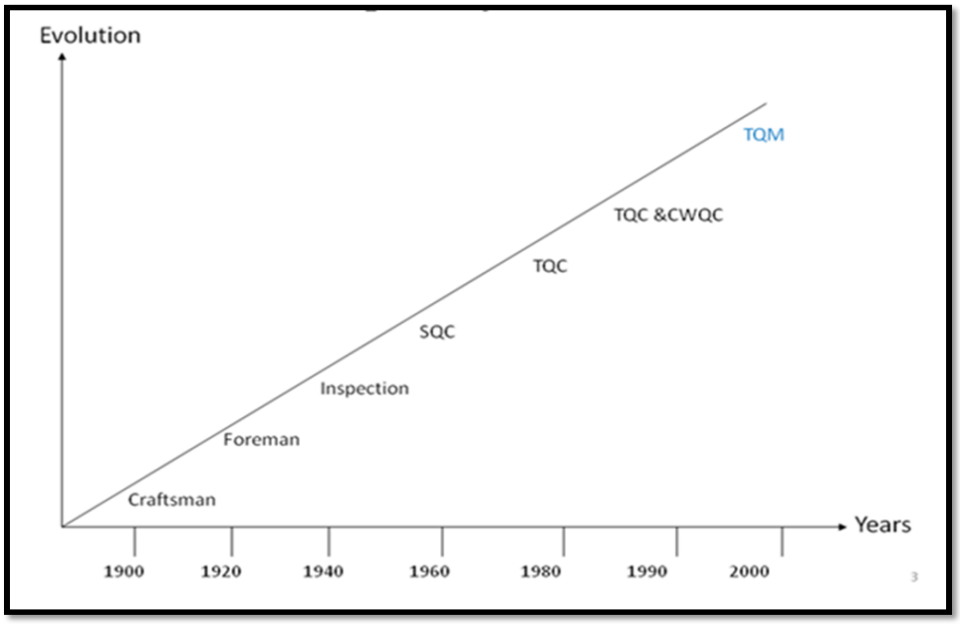

Diagram 1: Evolution of TQM

Though manufacturing industries are the early adopters of TQM, the penetration has significantly reached in other industries as well. TQM has changed completely the way Quality is looked at from "quality by inspection" to "multiple dimensions for quality" focusing performance, features, conformance, reliability, durability, service, response, aesthetics and reputation. However, the implementation of TQM in most of the industries starts well with ISO 9000 standard and certification by third party. It has been more than 40 years since TQM journey started, the researchers have identified the need for reviewing the extent of implementation of TQM and imminent areas for research through a detailed review on research journals, articles and published information for the period between 1980 and 2016 in manufacturing, Health care (Hospitals and Diagnostic Centers) and Medical devices assembling and servicing industries.

Objectives

The primary objective of this study is "**to explore the extent of penetration of TQM in Manufacturing Industries**" from published research journals and articles and identifying areas needing further research.

The secondary objectives are:

- To study the effectiveness of TQM in continuous manufacturing industries, bottlenecks experienced in implementation and explore further research areas in the current context for enabling future generations taking up TQM related research.
- To study the adoption of information technology for creating Knowledge Base in order to transform swift implementation of TQM by future generations.

Literature Review

A detailed literature survey was conducted in search of identifying the research problem using research papers published for the period between 1980 and 2016. "TQM", "Quality Improvement", Manufacturing Industries", "Health Care", "Process Maturity", "Quality Tools", "Barriers to TQM" and "Effectiveness of TQM" are the search criteria used for finding out and extracting research findings and recommendations in the area of TQM. TQM is defined as an approach to improving the effectiveness and flexibility of organizations as a whole. It is essentially a way of organizing and involving the whole organization; every department, every activity, every single person at every level. For an organization to be truly effective, each part of it must work properly together, recognizing that every person and every activity affects, and in turn is affected by, others. TQM is a method for ridding people's lives of wasted effort by involving everyone in the process of improvement; improving the effectiveness of work so that the results are achieved in less time. The methods and techniques used in TQM can be applied throughout the organization. They are equally useful to finance, sales, marketing, distribution, development, manufacturing, public relations, personnel to every one of a company's activities (Oakland, 1989). Also, TQM adoption is found to be widespread in case of Manufacturing and Service Industries across the world. This literature survey has reviewed multiple areas in which researches relating to TQM implementation, factors affecting effectiveness of TQM implementation, Business Process Maturity models, Tools and Techniques deployed and their impact on organizational performance, Top Management Commitment, Critical Success Factors (CSF) for TQM implementation and pitfalls in TQM implementation. The researchers have identified 88 research papers published in indexed journals such as Asian Journal of research in Social Sciences and Humanities, Routledge-Taylor and Francis Group, Emerald Group Publishing Limited, Production and Operations Management Society, International Journal of Health Care Quality Assurance, Total Quality Management, Journal of Management and Accounting Research, International Journal of Production Research and Advances in Decision Sciences. The summary of number of journals reviewed by the researchers on various topics has been tabulated in Table 1.

S. No.	Research Topic Reviewed	Number of journals	Percentage
1	Manufacturing Industries TQM	32	36.36
2	Effectiveness of TQM	19	21.59
3	Relationship between TQM and Organizational Productivity	11	12.50
4	Employee Participation in TQM	10	11.36
5	Tools and Techniques for TQM	7	7.95
6	Productivity in Service	7	7.95
7	Knowledge Management System for TQM	2	2.27
Total		88	100

Table 1: Distribution of Research Journals and articles reviewed

Research Design

In order to identify relevant TQM research works in Manufacturing, Health Care and Medical Devices Service Industries, the researchers have identified Top 10 key words (Table 2) for search.

S. No	Keyword for search
1	Manufacturing TQM
2	Health Care TQM
3	TQM in Service
4	TQM effectiveness
5	Employee Participation
6	Top Management Commitment
7	Productivity in Service
8	Barriers to TQM
9	Knowledge Management System
10	Tools and Techniques

Table 2: Top 10 Keywords for Search

There were 88 samples covering research articles, Journals and write ups extracted for this study. Convenient sampling was used in this study for collection of data from the published research journals. This study was conducted to cover TQM implementation in Manufacturing Industries over a period of 36 years (between 1980 and 2016). This would provide adequate information and knowledge to the researchers on the trend of TQM implementation and bottlenecks experienced.

Analysis & Interpretation

Research on the impact of TQM in organizational overall performance with respect to Profitability, Productivity and Customer Satisfaction (Selladurai, 2002) has pointed out significant impact due to implementation of best practices.

The effect of in-company Quality Awards on the implementation of TQM in Swedish based manufacturing organization (Henrik, 2003) revealed that recognizing and rewarding teams involved in implementation of best practices increases the effectiveness of TQM implementation. Research on Effect of TQM in performance of Small Medium Enterprises in USA covering both manufacturing and service sectors (Hooshang et. al. 2003) has identified remarkable positive impact on the overall performance of the organization.

A case study on assessing workforce perception of Total Quality based performance measurement in customer equipment servicing organization (Chang, 2013) has studied a positive attitude towards performance measurement using TQM and recommended the need of

integrating the individual performance appraisal measures with TQM effectiveness measures. The most critical factors for TQM implementation by implementing organizations were identified and published in a study titled "Towards an Index of Comparative Criticality (CCI) in Palestinian Manufacturing Industries (Smair, 2004). This study has classified the factors influencing TQM into Critical, Important and Minor. Evaluating the relationship and influence of Critical Success Factors (CSF) of TQM on Business Performance in case of Small and Medium Enterprises (Kaur, 2014) focusing on manufacturing industries through research studies have always benefitted the growing organizations.

The relationship between CSF for TQM implementation and its influence on the organizational performance is found to be positive and helped the organizations to grow multi-fold. Moreover, the research on "TQM as a focus for improving overall service performance and Customer Satisfaction" in public sector companies situated in Malaysia (Agus, 2004) has established a positive and significant improvement in the service delivery due to TQM implementation. A digraph approach to TQM evaluation (Sandeep et. al. 2004) has identified factors responsible for building a successful TQM environment. Furthermore, TQM implementation involves multiple project initiatives across the organization and stringent measures are devised by the management to assess ongoing success. This has eventually triggered discussions and research on 'Challenges Posed to Performance Management by TQM Gurus": Contributions of individual employees Vs System level features (Soltani, 2004). The argument of discarding individual performance reviews for reaching higher level of TQM implementation is tested and a mixed performance measure recommended.

The research on relationship between highly committed workforce in successful implementation of TQM and its ultimate implication on (Carlos, 2005) organizational performance has established a high positive impact. This research has also identified high commitment factors such as Employee commitment towards Quality Goals, Top Management Direct involvement and Strategizing plans for successful TQM implementation. In furtherance, TQM and TPM have gained considerable acceptance in Manufacturing Industries.

In a research on "Critical success factors of ISO 9001: 2000 and Organizational performance in Indian Manufacturing Industries" (Dinesh, 2006), the comparative contributions of TPM and TQM was analyzed and inferred that simultaneous implementation of TPM and TQM have much stronger influence on overall performance of the organization. The characteristics of an organization play a vital role in implementation of TQM. A comparative analysis on 'Characteristics of an organization and Critical success factors "for TQM implementation (Padma, 2006) has established positive linkages between these variables.

The road map for implementation of TQM in Small Medium Enterprises (SME's) and a concrete framework (Ramanand, 2015) elucidated formulating Vision and Mission statement, designing implementation road map, ensuring employee involvement and establishing educational program as the key components. There are larger corporate organizations that do not implement TQM and yet registered significant growth. The research study on "An operational and institutional perspective on TQM" in Hong Kong manufacturing industries (Andy, 2006) has revealed that factors influencing successful TQM implementation did not differ much in such organizations where a formal TQM program do not exist. However, the best practices implemented are in line with the recommendations of TQM frame work. There were lots of critiques raised on "What is

the best suited culture for implementation of TQM? The research on "Organizational culture for TQM" (Juan, 2013) revealed that an optimal mixed culture between Adhocratic and Clan is best suited for TQM implementation. Commencing TQM implementation is just one step and sustenance is the key. Research on "Sustenance of TQM in Indonesian's oil and Gas Industry" (Wakhid, 2011) has established positive relationship between TQM critical success factors and organizations performance (both financial and non-financial).

The organizations implementing TQM innovate and learn new best practices that impacts overall performance in areas like Revenue, Customer satisfaction, Lead time reduction, Waste elimination, Profitability, Employee morale and Team work. Though there are scheduled training programs being followed in many organizations to pass on new learning for benefit of other teams, there seems to be no structured approach in designing and maintaining a Knowledge Management System (KMS).

The need for KMS for effectively disseminating TQM best practices learnt by the current generation for building futuristic TQM and the essential ingredients for inducting Knowledge Management Officer (KMO) as a role was explored as a research (Adam et. al. 2006). The interview conducted with some of Knowledge Management Officers in larger corporate and questionnaire approach used by this research has identified lot of scope for Top Management involvement in explicitly defining this role and making it successful.

The current KMO role is not effective and many of them have not even understood this role. So further research on KMO for futuristic TQM implementation will not only help future generations adopting best practices learnt by the harder ways but also help transforming business processes of multiple industries. The study conducted by Ali in 2014 has identified 15 Critical Success factors for TQM implementation and they are listed in table 3. It is expected that companies practicing TQM gradually starts bench marking Global Best Practices (GBP).

The impact of Quality improvement program through TQM on organizational financial performance was studied using Structured Equation Modeling (Adam et. al. 2006). This research included 457 manufacturing companies with a mix of TQM and Non-TQM implementers. This research has identified that there is a significant impact on financial gains by the organization implementing TQM when compared to non-TQM organizations. Hence Benchmarking global best practices produces financial gains and TQM implementation pay-off is almost guaranteed.

Organizational performance is measured as Financial and non-financial terms. Post TQM implementation, plethora of research studies were conducted in understanding the relationship between TQM and Financial gains. A research on "the determinants and performance effect of TQM practices with an integrated approach" (Duh, 2012) was done using archived financial information. This research objective was to establish the relationship between firm size and degree of competition and found to be positively associated.

TQM is found to have a positive impact on financial and non-financial performance parameters of the organization.

S. No.	TQM Critical Success factors
1	Leadership

2	Employee involvement
3	Education and training
4	Process management
5	Top management support
6	Planning
7	Resources
8	Customer focus
9	Information analysis
10	Evaluation
11	Teamwork
12	Customer satisfaction
13	Effective communication
14	Reward and recognition
15	Continuous improvement

Table 3: Top 15 CSF for TQM implementation

A research on 'Exploring TQM's impact on the casual linkage between manufacturing objectives and organizational performance (Chinho, 2006) has identified the pattern of TQM practices and linkages with operational performance. Moreover, a very strong relationship between best TQM practices and Organizational performance was established in this research. A research on "The effects of TQM and Organizational Learning (OL) on business performance" in Taiwanese Insurance Industries was conducted (Lee, 2014).The research has identified significant and highly positive relationship between TQM and OL. It also tested and proved that TQM and OL have a positive impact on Organizational Performance. The three main factors namely Profitability, productivity and Customer satisfaction are analyzed for effectiveness of TQM in multiple industries. A research on "Analysis of TQM power and its effect on Profitability, Productivity and Customer Satisfaction" was conducted using longitudinal data (Kati, 2010) in manufacturing industries specialized in making wooden parts. This research has established a very high positive impact TQM has created on these three parameters.

TQM helps organizations to think and execute beyond boundaries. It inculcates a habit of working differently and not the same way. This brings the need of innovation. Innovative ideas can bring in rapid improvements in operational efficiency and financial gains including profitability. TQM combined with innovation will have a greater impact on operational performance. A research on "have identified seven practices related to TQM (Table 4).

S. No.	**Practices Related to TQM**
1	Visionary Leadership

2	Internal and External Co-operation
3	Learning
4	Process Management
5	Continuous Improvement
6	Employee fulfillment
7	Customer Satisfaction

Table 4: 7 Practices related to TQM

These seven practices related to TQM are found to have stronger positive relationship on operational performance in organizations characterized by high level of innovativeness. The effects of TQM practices on performance and reasons of and barriers to practices in Turkey have been taken up as a research study (Esin, 2014). The research has revealed primary obstacles that the firms in Turkey faced were lack of employee involvement, awareness and commitment of the employees, inappropriate firm structure, and lack of the resources. The statistical inference was "different TQM practices significantly affect different performance outcome" drawn based on exploratory factor analysis and multiple regressions. The role of Top Management is immense in implementation of TQM. The academic literature on "The Role of Top Management: A threat or Opportunity" in Quality improvement program (Soltani, 2014) suggests a fundamental question, "why does the commitment from top management appear to have dropped off so dramatically?'.This literature survey summarizes, "TQM organizations with highly committed Top Management will have better organizational performance than with low committed management". The literature review has identified and proposed further research on declining Top Management involvement for TQM organizations.

Conclusions & Suggestions

TQM implementation must be considered as a very larger program as it encompasses multiple projects across the organization at various levels. One of the Critical Success factor (CSF) of TQM implementation is the extent of involvement by everyone inside the organization. Business process improvements as a part of TQM journey have made organizations to deploy plenty of statistical tools and methodologies. Dale, McQuater and Sabater subsequently identified wide spread application of statistical tools such as "The Seven old QC tools, Seven New Management Tools, benchmarking, control plan, design of experiments (DOE), fault-tree analysis (FTA), force-field analysis, problem-solving methodology, questionnaires, sampling, statistical process control (SPC), brainstorming, departmental purpose analysis, FMEA, flow charts, pokayoke, quality costing, quality function deployment (QFD), and quality-improvement teams (Dale et. al. 2005, McQuater 2005 & Sabater, 2004). The TQM implementation has commenced in Manufacturing sectors and spread in to other industries as well. Moreover, plethora of research has been done on the effectiveness of TQM with multiple parameters such as revenue, profitability, employee involvement, team cohesiveness, sales, operating margin and cost savings. However, there are no adequate researches in the following areas in line with the changing global environment. Hence, future researchers may include the newer tools and conduct a phenomenal research in this area to understand its application effectiveness for

optimization. The following suggestions may be included for strengthening their research perspectives:

Knowledge Management System in TQM implementation for future generations: It is an interesting area for research as the subject embraces Technology adoption for TQM implementation. The review of researches has revealed that organizations who have implemented TQM have not archived the best practices and modes operandi while implementing TQM. This is a bigger gap as absence of Knowledge Management System will make the learning curve very large and cost of learning as well would go high.

Business Process Maturity Levels: Organization rolls out multiple initiatives for achieving desired TQM results and it is expected to increase business process maturity levels. Though there are theoretical models proposed in various research papers for Business Process maturity assessment, no intensive research has been available so far on business process maturity level estimation taking the actual data from manufacturing organizations is another area for research.

Top Management Involvement in TQM implementation: The time spent by Top Management play a major role in successful implementation. The researchers have identified that there is a steep decline in Top Management involvement over a period of time. This opens up lot of avenue for exploring research on "The Reasons for decline in Top Management Involvement" covering Chief Executive Officers.

Continuous Improvement Methodology: Continuous improvement is one of the TQM philosophies which dictate organizations to become more aware of making decisions based on data. The data analysis needs appropriate tools such as 7 QC tools, FMEA, Design of Experiments (DOE) and DMAIC. Researchers have identified that there is a wide spread usage of basic tools in TQM implementing organizations. The scope for further research identified is on the usage of continuous improvement as a project based approach.

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