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AN EMPIRICAL STUDY ON THE ROLE OF TOTAL QUALITY MANAGEMENT (TQM) PRACTICES IN ENHANCING MANUFACTURING PERFORMANCE

Nitish Mansotra
Research Scholar
MTech
Production Engineering
Sri Sai College of Engineering and Technology,
Badhani Pathankot
Saurabh Sharma
Assistant Professor
Mechanical Engineering Department
Email- Saurabh.sharma@srisaigroup.in

ABSTRACT

This is an empirical study that establishes the significance of Total Quality Management practices in improving the performance of manufacturers in various organizations. A stratified random sample of 300 respondents was used in the collection of data using a structured questionnaire under the descriptive analytical research design that entailed research variables in TQM adoption, performance dimensions, employee involvement, and critical success factors. The findings indicate that the fundamental principles like 5S, Kaizen and ISO certifications exhibit maximum adoption rates whereas the more complex tools (like-Six Sigma, benchmarking) possess comparatively reduced rates of utilization. TQM has eminently good contribution on the quality of products, customer satisfaction, productivity and efficient operations and a mixed effect on the reduction of costs. Almost 81 percent of the staff says that they are more or extremely engaged in TQM initiatives hence the need to focus on the workforce. The study concludes that strategic leadership, sufficient resource abundance and highly gripping quality culture are the key elements in yielding the most effect of TQM and generating sustainable competitive advantage to the manufacturing industries.

Keywords: *Total Quality Management, Manufacturing Performance, Employee Involvement, Continuous Improvement, Product Quality, Operational Efficiency.*

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1. INTRODUCTION

The modern world of internationalisation and technological progress constantly puts the manufacturing industry under pressure and forces it to increase the quality of manufactured products, provide higher availability and efficiency of the processes, reduce costs of production and meet the changing needs of the market rapidly. Stricter customer demands and globally established quality requirements have made the conventional manufacturing methods obsolete and thus necessitate the pursuit of more elaborate quality management practices. Total Quality Management (TQM) has appeared to be a total organizational philosophy as it incorporates quality in all the operations of the organization, whether at top-management level or in the shop-floor operations. TQM is not simply a set of the tools but a culture which follows continuous improvements, proactive leadership, customer satisfaction, methodical data analysis, and involvement of all the employees. Operation excellence practices like 5S to organize the work place, Kaizen to make slight improvements, six sigma to reduce process variability, Total Productive Maintenance (TPM) to improve equipment reliability and ISO certifications to use standard quality framework are all strategic tools in achieving operational excellence. To implement TQM successfully in a complex and automatized manufacturing process, it is important to understand that a clear strategic orientation, the commitment of the leadership, the systematic training programme, the culture of accountability and innovation at all organizational levels are obligatory.

Although it is widely proclaimed that such organizations have adopted TQM, the extent to which these programs have significantly influenced manufacture performance varies significantly in most cases. Some companies experience remarkable productivity and quality as well as customer satisfaction, whereas others cannot boast of successful results because of poor implementation, low involvement of employees, or lack of leaders. This gap highlights the necessity to conduct empirical studies that would allow determining which aspects of TQM are the most successful and under what conditions they could contribute the most to the organization. In addition, the determinants of success cited like management commitment, employee involvement, quality of communications and a culture of continuous improvement have been mentioned to be quite critical

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but the relative importance in various manufacturing situations has not been analyzed in depth yet. To analyze the short-term impact of TQM and how the involvement and success factors moderate the effect of the implementation of TQM will help the research provide valuable information to the manufacturing managers, policy maker, and also the academicians to make effective use of quality management to gain sustainable competitive advantage.

1.1 Research Objectives

- To assess adoption levels of key TQM practices in manufacturing.
- To analyze TQM's impact on productivity, quality, efficiency, satisfaction, and cost.
- To evaluate employee involvement in TQM initiatives.
- To examine effects of leadership, training, and resources on TQM success.
- To identify challenges and suggest improvements for TQM implementation.

2. LITERATURE REVIEW

Addis (2020) conducted a sectoral analysis by looking at the facts of the TQM practice in Ethiopian manufacturing sectors. In the process of research, the researchers identified that in the majority of organizations, there has been an official implementation of well-known quality programs such as 5S, Kaizen and ISO certification though not congruent and haploid in actual implementation. Misalignments within an organization, lack of continuous learning and minimal involvement of leaders were discovered to be the key possibilities that delayed the implementation process. Addis points out that TQM tools are not possible to and do not convert to performance improvement unless there is a robust internal ecosystem to assist quality initiatives like a strong leadership and very capable people. This paper can be discussed as a warning intuition and the holes between TQM adoption and successful implementation can be observed as the following ones.

Adem and Virdi (2024) examined how the structural relationship that existed between Total Quality Management (TQM) practices and financial performance was mediated by operation performance. They have found that TQM dimensions such as quality planning, customer focus programs and process management did not have a direct influence on financial measures such as

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profitability or return on investment but had a tremendous impact in increasing operational performance measures. These included efficiency in the processes, reduction of waste and optimising the production cycles. Financial outcomes increased and there is a reciprocating relationship between the two in terms of improved operational efficiency. The study reveals that operational excellence makes the connection between the financial change and TQM. Here this highlights the necessity of the firms who concentrate on internal operations as a midway objective in order to accomplish financial performance enhancement in TQM.

Aichouni et al. (2023) contributed to the literature by analysing the influence of TQM on the OSH performance within Saudi organisations. Their empirical research findings revealed that well-formed firms in terms of TQM systems and especially those that paid attention to employee training, work place risk analysis and maintenance practice experienced fewer cases at work places as they were also better in terms of regulatory compliance as regards to safety measures. The study found that TQM presents a management paradigm that leads to organisational wellbeing, not a quality alteration tool. This strengthens the suggestion that TQM is beneficial not only in efficiency and quality of products but also the welfare and safety of employees, which is key to the sustainability of an economy.

Al-Saffar and Obeidat (2020) looked at the impacts TQM has on the performance of employees in order to enlighten us on their human-focused outcomes. According to the study, TQM principles, especially employee involvement, continuous improvement and customer orientation, contributed positively and significantly to the performance of individuals and groups. They employed the practice of knowledge sharing in consolidating the associations. A knowledge sharing organisation with strong culture of authority improved the levels of teamwork, innovation and the ability of employees to solve problems thereby speeding up TQM efforts. According to this study, the synergetic nature of managerial practices and organisation culture supported the idea that in order to succeed, TQM must be upheld by constant learning and flow of information within the organisation.

Alzoubi, In'airat, and Ahmed (2022) conducted an in depth investigation on how Total Quality Management (TQM) and Six Sigma enhances the product quality and cost of services to the

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manufacturers of the city of Dubai. On their empirical studies, they have noted that although TQM and Six Sigma had been individually introducing huge quality improvement, the combination of the two frameworks proved to escalate the effect. This kind of meaning brought about synergy of operation by simplifying the method of production, decreasing the occurrence of mistakes, and minimising resources utilisation. Above all, the integration minimized rework, scrap and warrant claims, which decreased non-conformance costs. In conclusion, the hybrid quality management approach should enable organisations to possess high-quality and cost-efficient standards which is why it is suitable in competitive industrial complexes.

Anil and KP (2019) came up with multi-dimensional integrated model that measures the effects of TQM on organisational performance. In their model, strategic quality planning, top management involvement, customer focus/perspective and data driven decision making along with continual process improvement were studied. The relationship was supported by achievements registered by organisations that implemented such strategies in measuring better operations and financial performance. Higher output, quicker delivery, reduced costs of operations and increase profits. The paper emphasized that TQM must be articulated within the vision of the company, goals and activities of the company. The collaborative implementation makes quality catalyze long term performance of the organisation.

3. RESEARCH METHODOLOGY

This research used a descriptive-analytical research design to analyse the role that Total Quality Management (TQM) practices play in boosting the manufacturing performance. The descriptive component allowed identifying and evaluating the TQM practice being introduced in the manufacturing organizations existing today, whereas the analytical component allowed analyzing the relations between the above practices and the vital performance indicators.

3.1 Population and Sampling

The population of interest was the employees, supervisors, quality managers, and top executives of manufacturing companies. The stratified random sampling method was used to achieve proportionate representation when it comes to job positions, company departments (production, quality control, maintenance, human resources and management), and company size (small,

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medium and large company). The final sample was 300 respondents and this gave good coverage coverage to ascertain statistical reliability.

3.2 Data Sources and Instrumentation

A structured questionnaire was used as the method of collecting primary data that consisted of five parts:

1. **Demographics -** attraction of the respondents with their attributes like age, designation, experience and the size of the company.
2. **TQM Practices -** determining the level of implementation of practices such as 5S, Kaizen, ISO certifications, Total Productive Maintenance (TPM), Six Sigma and benchmarking.
3. **Performance Dimensions -** quantifying perceived influence on productivity, quality of product, efficiency of operation, customer satisfaction, and costs cut.
4. **Employee Involvement -** measures the participation of the organization in TQM measures like quality circles and continuous improvements schemes.
5. **Challenges and Success Factors -** recording obstacles to TQM adoption and issues like leadership commitment and training that were very important.

Most of the items in the questionnaire employed a five-point Likert scale with higher perception of 1 to lower perception of 5 on the scale, where the perception can be quantified.

3.3 Data Collection Procedure

Data was collected through both physical distribution of the questionnaires as well as online distribution through Google Forms and emailing of the questionnaires, providing more reach and participation. Clarity, relevance, and reliability was checked under pilot test on 30 participants and small changes were done in wordings and sequence. All the respondents gave informed consent and participation was voluntary.

3.4 Data Analysis Techniques

Data gathered was coded and analyzed with SPSS. This was analyzed:

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- Descriptive (mean, percentage, standard deviation) statistics to outline the characteristic of respondents and trend in TQM adoption.
- Pearson correlation in order to determine direction and strength of relationships between practices of TQM and dimensions of performance.
- Simple regressions to conduct hypothesis testing to determine the effects of TQM practices (H1) and involvement of employees (H2) on the manufacturing performance.
- A multiple regression analysis to test the joint influence of critical success factors (H3) on TQM effectiveness.
- ANOVA to compare the perceptions of the various dimensions of the demographic variable and organizations.

3.5 Research Hypotheses

The study tested the following hypotheses:

- **H1:** Adoption of TQM practices positively influences manufacturing performance.
- **H2:** Higher employee involvement in TQM initiatives improves overall performance.
- **H3:** Critical success factors significantly enhance TQM effectiveness.

This methodological framework made data collection to be systematic, the statistics analysis to be strong and results of it to be believable in building theoretical and practical knowledge on TQM as applied in the manufacturing setting.

4. RESULT AND DISCUSSION

The discussion indicates that most organizations will mostly utilize basic TQM principles like 5S, Kaizen, and ISO certifications, which are simpler and are universal in nature, whereas tools like Six Sigma and Benchmarking will have limited implementation in organizations as they are complex and require more resources. TQM has shown its superiority in such impacts as quality of products, customer satisfaction, productivity and operational efficiency but with fewer impacts on reduction of costs. The participation of employees is largely high with more than 80 percent of

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them exhibiting moderate and very high participation rates with very small percentage characterized by low participation rates showing the necessity of constructive communication, motivation and training.

4.1 Adoption of TQM Practices

The rate at which key Total Quality Management (TQM) practices are adopted in the organizations is indicated in Table 1. 5S (Workplace Organization) is the most commonly used practice with 80 percent of institutions applying it; Kaizen (Continuous Improvement) is the next 70 percent, and ISO Certifications, the third at 62 percent of the organizations. The most popular of them is the Total Productive Maintenance (TPM) with 56 percent adoption rate followed by Six Sigma (48 percent); the lowest percentage of adoption is recorded by Benchmarking with 40 percent. Figure 1 shows a graphical representation of such adoption tendencies with core emphasis on the popularity of each practice.

Table 1: Adoption of Key TQM Practices in Organizations

TQM Practice	Frequency	Percentage (%)
5S (Workplace Organization)	240	80%
Kaizen (Continuous Improvement)	210	70%
ISO Certifications	186	62%
Total Productive Maintenance (TPM)	168	56%
Six Sigma	144	48%
Benchmarking	120	40%

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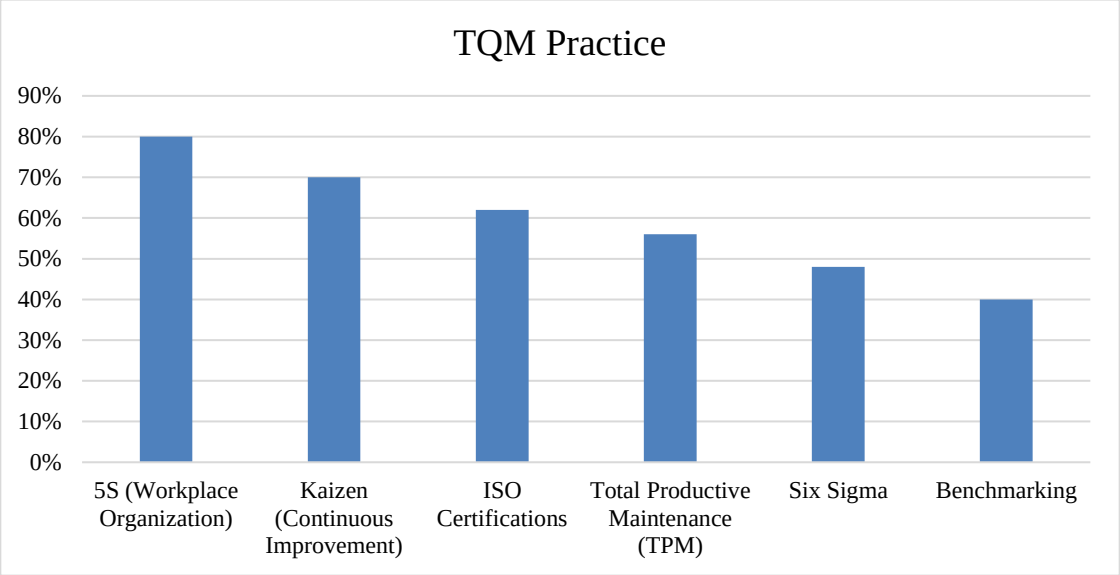

Figure 1: Graphical Representation of Adoption of Key TQM Practices in Organizations

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4.2 Impact on Performance Dimensions

Table 2 provides a summary of the perceived effect of Total Quality Management (TQM) through mean scores on a scale of five that are used to determine the effect on different aspects of performance. Product Quality (4.5-very high impact) has the greatest influence, and then Customer Satisfaction (4.3- high impact), and Productivity (4.2- high impact). The operational Efficiency also is above average at the 4.1 level, whereas the lowest mean value of 3.9 of the Cost Reduction shows that the impact is moderate to high. These ratings have been graphically depicted in Figure 2 highlighting where TQM provides the greatest results.

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Table 2: Impact Ratings of TQM on Performance Dimensions

Performance Area	Mean Score	Interpretation
Productivity	4.2	High impact
Product Quality	4.5	Very high impact
Operational Efficiency	4.1	High impact
Customer Satisfaction	4.3	High impact
Cost Reduction	3.9	Moderate to high impact

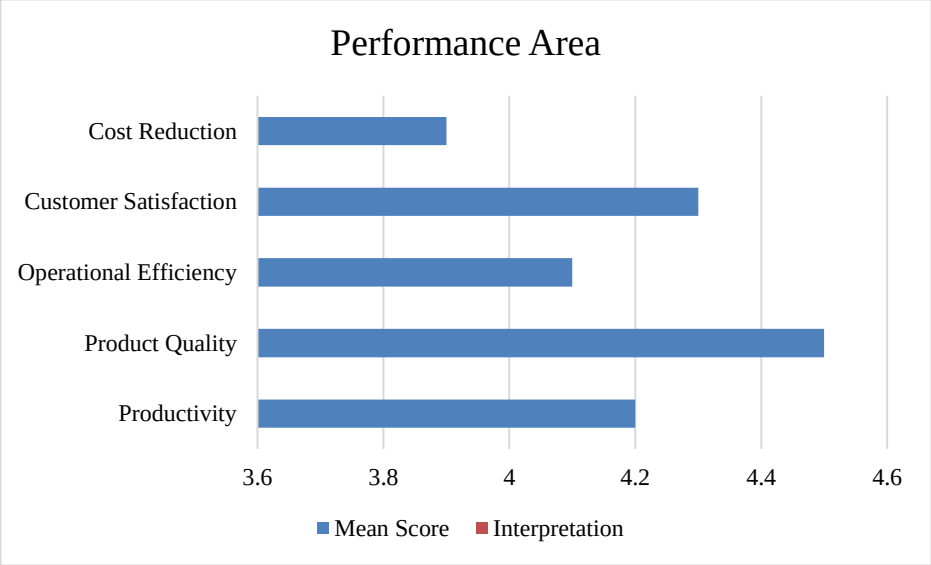

Figure 2: Graphical Representation of Impact Ratings of TQM on Performance Dimensions

The outcomes contend that the practice of TQM is most apt in improving quality outcomes that are qualitative such as the quality of products and customer satisfaction which are significant players in terms of competitiveness over the long term. Productivity and efficiency in operations are very high indices demonstrating the importance of TQM as a way of improving efficiency and simplifying operations as well as making the best guarantee of utilization of resources. The

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comparatively low score of cost reduction portrays the fact that besides the financial savings that TQM is known to bring, the main advantages are on quality improvement and process improvement and probably not on direct cost cuts.

4.3 Employee Involvement

The following (Table 3) summarizes the distribution of the degree of employee engagement in Total Quality Management (TQM) pursuits. A substantial number of employees indicates High (32%) or Moderate involvement (30%) levels and 20 percent has Very High level of participation. There is relatively less prevalence of lower levels of engagement with Low involvement being reported at 12% and Very Low involvement only being reported at 6% as well. This is visually presented in figure 3 above which shows that most of the employees are moderately or highly involved in TQM activities.

Table 3: Levels of Employee Involvement in TQM

Level of Involvement	Frequency	Percentage (%)
Very High	60	20%
High	96	32%
Moderate	90	30%
Low	36	12%
Very Low	18	6%

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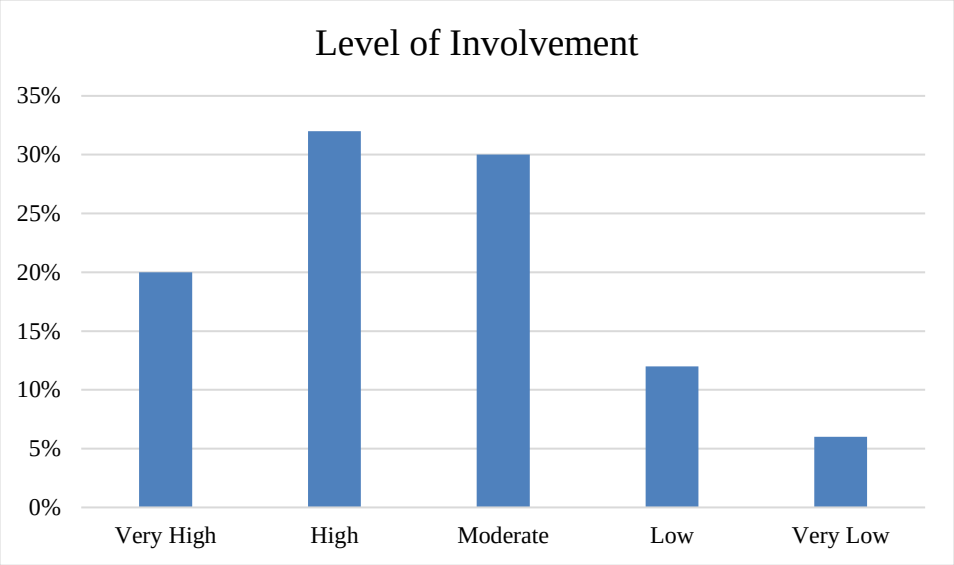

Figure 3: Graphical Representation of Levels of Employee Involvement in TQM

The evidence shows that the majority of the organizations attain a significant level of employee involvement in TQM, of the staff being involved to moderate and very high degrees (over 80%). This indicates a very encouraging climate to quality improvement initiatives, something that is very essential to long term success of TQM. Nevertheless, there are also some employees who have low or very low involvement, which implies that communication, motivation, or training gaps might exist. Filling such gaps would also help increase the organizational.

5. CONCLUSION

The results of this research support that Total Quality Management (TQM) activities have a crucial role to play in accentuating the production performance, yet the most significant effects were felt on the quality of products, customer satisfaction, productivity, and utilization of operations. Two key foundational methods, 5S and Kaizen along with ISO certifications have the highest take up, as they are pragmatic and widely applicable with more idiosyncratic tools such as Six Sigma and benchmarking being less widely used due to the greater resources and expertise needed in these contexts. The fact that employees were extensively engaged in the TQM initiatives reflects that work force involvement is an important element in ensuring that continuous improvement takes place, and that the low rates of cases categorized as low participation area needs more motivation,

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communication and training. The benefits of cost reduction are evident; however, they are not as high as those of the qualitative gains, which implies that TQM should be mainly valued by its ability to develop long-term competitiveness due to improvements in quality and efficiency of the processes. On the whole, the paper supports the idea that strategic leadership commitment, sufficient amount of resources, and quality culture should be emphasized to ensure the level of TQM effectiveness within manufacturing organizations is high.

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