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## IN INDIA, THERE IS A LINK BETWEEN TQM AND TPM IMPLEMENTATION ELEMENTS AND MANUFACTURING SECTOR BUSINESS PERFORMANCE

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### ABSTRACT

*To investigate the strategic implications of TQM and TPM in an Indian manufacturing environment, as well as to conduct detailed literature studies to identify gaps. In an Indian setting, investigate the connection between variables affecting TQM and TPM implementation and company performance for the following three approaches: TQM alone, TPM alone, and both TQM and TPM combined. This is done in order to extract important variables for the three methods mentioned above. Design, technique, and strategy – An empirical survey-based study with a sample size of 108 manufacturing firms was conducted. Using SPSS, extracts important variables using bivariate correlation and multiple regression analysis methods. The research identifies two sets of factors that are critical for TQM and TPM effectiveness: universally significant factors for all three approaches, such as leadership, process management, and strategic planning, and approach-specific factors, such as equipment management and customer satisfaction focus. The research also emphasizes the challenges of combining TQM with TPM implementation. By focusing on extracted variables, businesses will be able to get more advantages from TQM and TPM. This research is particularly significant in a worldwide perspective, since businesses all over the world are attempting to achieve TQM and TPM synergy. Originality/value – The readiness/status of the Indian manufacturing sector for TQM and TPM adoption, since India is becoming a significant sourcing base for the globe and there are few studies on the topic. In the context of poor nations, there hasn't been any research into TQM and TPM in all three modes at the same time. In a global setting, such research is equally essential.*

**KEYWORDS:** India, Operations Management, Productive Maintenance, Total Quality Management, Manufacturing Industries.

## 1. INTRODUCTION

The Indian manufacturing sector faces stiff competition from worldwide companies in order to develop as a major manufacturing base for the global market. Though efforts have been made to promote industrial growth, much more has to be done in terms of cost reduction, quality improvement, and providing a wider range of goods with better services. Indian corporate leaders finally recognized the strategic significance of quality and maintenance to enhance performance in the early 1990s. The two formerly separate shop floor entities these efforts to enhance quality and maintenance are the result of the necessity to ban bad practices in the aftermath of consumers preferring quality competitive goods [1]. Today's robust middle class of approximately 300 million consumers is ready to pay a premium for quality, which the manufacturing sector cannot afford to ignore, particularly in the face of international corporations [2].

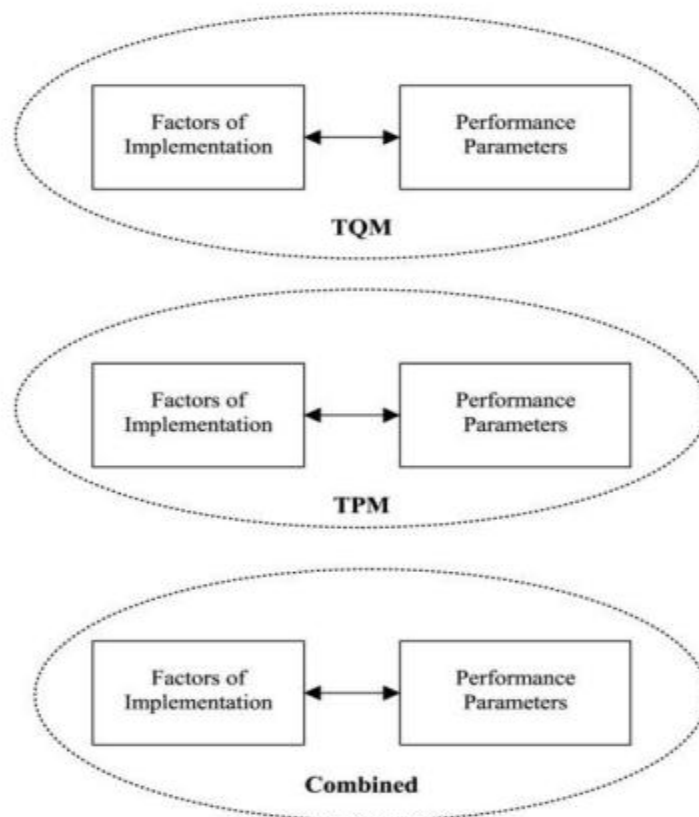
Indian CEOs have begun quality efforts as a result of the need to compete in the local market and a desire to become a global sourcing base. Certification requirements and the institutionalization of quality awards such as the Golden Peacock and Ramakrishna Bajaj awards also support this. These awards, while not as prestigious as the Deming or Malcolm Baldrige awards, have undoubtedly contributed to a culture of awareness and competition in Indian industry. In the same way that significant efforts were made in quality, large initiatives were taken in maintenance, especially after the 1990s. Due to the protected and controlled economy, Indian executives initially paid little attention to equipment failures and losses. Maintenance was viewed as a reactive problem-solving activity and an operating expense that needed to be kept to a minimum. However, increasing customer pressure to reduce costs, defects, and lead time has forced management to focus on maintenance and related issues through improvement initiatives such as TPM [3].

The Indian executives now understand that TPM is not a waste, but rather an investment, similar to TQM. It aids in the elimination of defects and failures in order to ensure quality at a lower cost. This concept has gained traction in the corporate world, with a few notable firms like as Sundram Fasteners and Vikram Cement even receiving the coveted JIPM TPM award. The foundations of Indian culture, which is sensitive to gradual and steady changes, are also at the core of growing acceptance of both TQM and TPM. TQM and TPM have many strands of commonality, such as employee engagement, cross-functional approach, and continuous improvement, since quality and maintenance work hand in hand in a manufacturing setting. TPM, on the other hand, is defined as the application of TQM principles to equipment in order to achieve zero breakdowns and minimum production loss.

Many businesses have combined these two complimentary forces in order to maximize the benefits of both. TQM and TPM adoption may be found in three ways in India: TQM alone, TPM alone, and combination mode. In this article, these modalities are referred to as "approach." The increasing need to improve the efficacy of these impulses in the Indian setting has prompted this kind of study. Though studies on TQM and TPM have been conducted in various countries, research on the simultaneous deployment of two drives has not been properly addressed. As a result, this study is significant from a worldwide viewpoint as well. Its goal is to identify links between implementation elements and company success in the Indian environment for each of the three methods. Because TQM and TPM have a similar foundation, certain characteristics should be shared by all three methods, while others may be unique to each. The difficulties of controlling two drives at the same time may justify putting a premium on certain variables that are otherwise unimportant. Figure 1 shows the research framework [4].

For TPM, the correlation coefficient ( $r$ ) between variables and performance metrics is shown below. Only the factors for which the  $r$  values are significant at  $p < 0.05$  are included. The correlation coefficients ( $r$ ) for each independent variable are given in parentheses next to it: Leadership for improvement (L) has the strongest connections with productivity ( $r = 0.847$ ), quality ( $r = 0.619$ ), cost ( $r = 0.577$ ), delivery ( $r = 0.665$ ), and employee morale ( $r = 0.564$ ), according to the correlation values. Similarly, productivity ( $r = 0.779$ ), cost ( $r = 0.724$ ), and delivery ( $r = 0.723$ ) are all highly associated with strategic planning (SP). Productivity ( $r = 0.656$ ) and quality ( $r = 0.645$ ) are also significantly linked to equipment management (EM). Information architecture (IA), process management (PM), employee engagement and empowerment (EE), education and training (ET), and organization systems and human development (OSHD) are other factors having strong relationships (OS). As a result, H2 is partly supported since certain of the variables show a strong connection with performance metrics.

Table IV shows the results of multiple regression analysis. The findings suggest that process management (PRM) and leadership for improvement (L) are important for productivity (P). It is also discussed how equipment management (EM) affects quality (Q), strategic planning for cost (C) and delivery performance (D), and leadership for improvement (L) affects staff morale (M). Information architecture (IA) and education and training are two additional important aspects (ET).



**Figure 1: The research framework.**

## 2. DISCUSSION

A thorough literature study was conducted to identify all such problems that have an impact on TQM and TPM effectiveness. The main TQM and TPM prizes, such as the Malcolm Baldrige National Quality Award (MBNQA), the European Quality Award (EQA), the JIPM TPM, and

the Deming Prize, were also taken into account. These awards are based on TQM and TPM models. Eleven dimensions have been established based on a thorough study of the literature [4].

- (1) Pay special attention to client satisfaction.
- (2) Improvement via leadership.
- (3) Improvement planning on a strategic level.
- (4) Management of human resources.
- (5) Training and education.

Information architecture is number six.

- (7) A system for measuring performance.
- (8) Materials control.
- (9) Maintenance of equipment.
- (10) Process control.
- (11) Financial resource management.

TQM and TPM believe resource management to be critical to their success. The resources are separated into three groups:

- (1) Supplies.
- (2) Resources.
- (3) The financial situation.

TQM and TPM are both focused on process management, thus this split makes sense. The importance of efficient management of these is highlighted in European Quality Award, Deming Prize, and JIPM TPM award criteria, as well as literature. Table. TQM and TPM may have an impact on both external and internal performance, as measured by goods and services provided to consumers. Productivity (P), quality (Q), cost (C), and delivery (D) as external factors, and safety and hygiene (S) and staff morale (M) as internal environment criteria, were examined for the research. TQM and TPM implementation are thought to provide these internal characteristics (Nakajima, 1988; Steinbacher and Steinbacher, 1993; Ahire and Rana, 1995; Forker, 1996). The progress in these characteristics is measured using 16 indicators[5], which are listed in the Appendix. Respondent profile and survey questions as previously mentioned, the questionnaire utilized for this research includes 11 implementation aspects and six performance indicators. The questions are graded on a five-point scale from one to five. As listed in the Appendix, each dimension and performance parameter is seen as a collection of several linked things. The study's scope is limited to the industrial sector. A total of 460 businesses are listed [6].

### *2.1.Application:*

TQM and TPM were developed using data from reliable sources such as the Confederation of Indian Industry (CII), the Indian Merchant Chambers (IMC), the Federation of Indian Chambers of Commerce and Industries (FICCI), the TPM Club of India, and the Automobile Manufacturers Association of India (AMAI). For monitoring the application of TQM and TPM in their member businesses, these business chambers use models based on leading awards criteria. As a result, one or more of these models are likely to be followed by the responding businesses. The poll

received 121 answers, with 58 using just TQM, 22 implementing solely TPM, and 28 implementing both TQM and TPM [7].

### *2.2. Advantage:*

In India, where businesses have a bureaucratic, function-based, and individualistic work culture, a significant emphasis on employee engagement is essential to TQM. Recognizing the variety of human talents, as well as their innovation and entrepreneurial abilities, can help to strengthen TQM initiatives. The need of a performance measuring system is justified by the high complexity of managing two improvement initiatives as a combined strategy. At different levels, Indian businesses lack well-designed performance indicators to support policies, goals, and cross-functional procedures [8]. TQM and TPM's synergy requires the development of indicators to properly match the two drives toward corporate objectives. This study highlights variables that are important to TQM and TPM, both when used alone and in tandem as a combined strategy. Incorporating these variables into the appropriate context may assist Indian businesses in achieving higher advantages from such development methods. Because many businesses across the world are attempting to achieve TQM and TPM synergy, this research may be very useful to them as well. As a result, both academics and practitioners in India and across the world would benefit from this study. The work has paved the way for further research into the interfacial elements of TQM and TPM. This field has remained mostly unexplored. The current research looked at the manufacturing sector as a whole. Studies on a sector-by-sector basis may also be conducted to expand the knowledge base in this area. This will help us better understand the dynamics of TQM and TPM problems in particular industries. Similarly, extensive case studies on different modalities of TQM and TPM implementation may be conducted. The findings of such research would be very useful to both Indian and international practitioners who wish to concentrate on manufacturing-centric development efforts [9].

### *2.3. Working:*

Internal consistency technique is used to test the instrument's dependability. A measuring instrument's dependability is tested to see whether it can consistently provide accurate results. Internal consistency reliability is the most frequently used psychometric measure in evaluating survey instruments and scales. The fundamental formula for evaluating dependability based on internal consistency is Cronbach alpha ( $\alpha$ ). 0.901, 0.874, 0.904, 0.875, 0.869, 0.856, 0.786, 0.868, 0.927, 0.858, and 0.753 are the alpha ( $\alpha$ ) values found for 11 dimensions. The alpha value for each dimension is much greater than Nunnally's minimal acceptability threshold of 0.6. (1978). As a result, all 11 dimensions are deemed reliable [10].

Validation of the content the adequacy with which a particular domain of content has been sampled, or if the instrument is really a complete assessment of the topic under investigation, is referred to as content validity. Nunnally (1978) describes it as "subjective and judge mental." The questionnaire is based on a thorough literature review and takes into account key award criteria as well as expert views, demonstrating content validity. Factor analysis is a test for concept validity. The degree to which the items on a scale assess the same concept is known as construct validity. Principal component factor analysis and the varimax rotation method are used to establish it. To test construct validity, a component analysis was performed on each scale separately. Earlier quality management measuring devices were also developed using scale wise factor analysis. Only the factors with eigenvalues greater than 1.0 were kept. All factors with eigenvalues less than 1.0 are deemed unimportant and are thus eliminated. With the exception of human resource management, when two factors were found, the study yielded one component for each dimension. The principal component approach was unable to provide an unambiguous



assignment of variables to any of the factors. As a result, the factors were extracted using the varimax rotation method. Employee engagement and empowerment (items 1, 2, 3 and 4 on the human resource management scale) and organizational system and human development (items 5, 6, 7 and 8 on the human resource management scale) are the two elements derived from human resource management [4].

TQM and TPM are both process-oriented and emphasize cross-organizational business processes. However, in India, the tendency has been substantially in the other direction. We have yet to understand the dynamics of a process-based approach, and have succumbed to managerial myopia, suffocating bureaucracy, and compartmentalization of processes. TQM and TPM has a relationship. The information architecture offers the essential infrastructure to let people make the best choices possible. Indians are known for their lack of data literacy and reliance on previous experience. Even with the most reputable businesses, obtaining maintenance data recording records is challenging. Due to a lack of information system, equipment management has been neglected, resulting in low dependability and availability. As a result, the importance of information architecture in the adoption of TPM in Indian business cannot be overstated. The difficulties involved in dispersing two drives simultaneously in companies also need appropriate information architecture for management in the event of a combined strategy [6].

### **3. CONCLUSION**

The statistical analysis resulted in the extraction of variables that are divided into two groups. The first group of variables comprises those that are universally important for performance in the Indian setting, regardless of the method used. Improvement leadership, strategic planning, process management, and education and training are among them. The second group comprises approach-specific variables such as TPM equipment management and customer satisfaction emphasis, as well as TQM staff engagement and empowerment. For the combined method, the performance management system is important, while information architecture is important for both TPM and the combined approach. Because of the realities of the local corporate environment, leadership is unquestionably important for TQM and TPM in India. India's businesses, both professionally managed and family-owned, continue to exemplify the bureaucratic and top-down management approach. Changing the environment to fit TQM and TPM, on the other hand, is much more difficult in the public sector, where, in addition to typical business limitations, managers must cope with stricter government supervision, huge and cumbersome operations, suspicious unions, and bleeding bottom lines. The lack of initiative among status-conscious and hierarchy-bound middle level executives is also a barrier in the improvement process.

As a result, strong leadership is required to shift people's mindsets, particularly when it comes to quality and maintenance. The need of strategic planning is further justified in light of the fact that many top-level executives continue to operate as the company's grand strategists and resource allocators without formal planning or people participation. Frontline managers' responsibilities are restricted to putting what comes from the top into action. The successful implementation of improvement drives requires a shift in mentality, which Indian businesses have inherited through government-owned companies' hierarchical and bureaucratic origins, as well as paternalism-oriented family groupings. Continuous improvement, which is essential to both objectives, is addressed via education and training. Training is still considered a luxury in most Indian businesses. The cost of training is seen as a sign of modernity by upper management, while workers see the programs as the next best thing to a paid vacation. In India, the lower literacy level of the workforce emphasizes the need of education and training.

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