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The Effect of Total Quality Management Practices on Operational Efficiency in Textile Industries in Solo

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Abstract

The textile industry in Solo is increasingly challenged by global competition, pushing companies to enhance efficiency and maintain superior product quality. Total Quality Management (TQM) serves as an integrated management framework that emphasizes leadership commitment, employee participation, customer orientation, continuous improvement, and systematic quality assessment. This study investigates the impact of TQM implementation on operational efficiency among medium and large-scale textile industries in Solo. A quantitative correlational design was applied, involving 180 respondents comprising managers and employees selected through proportional stratified random sampling. Data were collected using structured questionnaires that assessed TQM dimensions and operational efficiency indicators on a five-point Likert scale. Statistical analysis using descriptive methods, Pearson correlation, and linear regression in IBM SPSS version 25 demonstrated that TQM practices are positively perceived, particularly in leadership commitment and employee involvement. Operational efficiency also showed strong performance in timeliness and product quality, though waste minimization remains a challenge. The correlation coefficient ($r = 0.671$, $p < 0.01$) and regression results indicated that TQM significantly explains 45.2% of efficiency variance. Overall, the findings highlight that TQM substantially enhances operational efficiency, underscoring the need to strengthen continuous improvement and waste reduction initiatives to sustain global competitiveness.

INTRODUCTION

The textile industry remains one of the most vital sectors in Indonesia's economy, serving as a key driver of industrialization, employment generation, and export growth. In regions such as Solo, Central Java, the textile industry has deep cultural and economic roots, spanning from traditional batik craftsmanship to modern industrial textile production. However, the contemporary landscape of global manufacturing has introduced increasing challenges for Indonesian textile firms. The liberalization of international trade, the rise of low-cost producers, and the growing emphasis on sustainability and quality have intensified competitive pressures on local industries (Taplin, 2006; Tewari, 2006). Within this environment, operational efficiency has emerged as an essential factor determining a firm's ability to survive

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and thrive. Efficient operations are critical not only for maintaining profitability but also for achieving flexibility and responsiveness to dynamic market demands (Ivascu et al., 2022; Oteri et al., 2023; Alzoraiki et al., 2024; Olayinka, 2021).

Operational efficiency in manufacturing refers to the capacity of a firm to optimize production processes, minimize waste, control costs, and deliver products in a timely and consistent manner. In highly competitive industries like textiles, efficiency is directly tied to customer satisfaction, product reliability, and overall competitiveness (Munive, 2024; Selçuk et al., 2025). In the case of Solo, where the textile sector plays a central role in local economic activity, the capacity to enhance operational performance is closely linked with maintaining employment levels and sustaining export competitiveness. Yet, despite its strategic significance, many textile firms in Solo continue to struggle with inefficiencies rooted in outdated machinery, inconsistent process control, limited workforce training, and weak quality assurance mechanisms (Syed et al., 2021; Alam et al., 2023). These challenges are exacerbated by rising input costs and increasingly demanding global buyers who require not only competitive pricing but also adherence to quality and environmental standards.

Amid these challenges, Total Quality Management (TQM) has gained recognition as a comprehensive management philosophy aimed at enhancing efficiency and effectiveness through continuous quality improvement. TQM emphasizes leadership commitment, employee participation, customer satisfaction, and process optimization as essential pillars of organizational excellence (Ologbon & Adekunle, 2025; Waheed & Abbas, 2024; Agotilla & Agustin, 2022). It is a holistic approach that integrates all organizational functions toward the common goal of quality enhancement. By embedding a culture of quality throughout all levels of an organization, TQM fosters long-term improvement in both operational and strategic dimensions. For the textile industry, where variability in production and quality defects can lead to significant financial losses, adopting TQM represents not merely a technical intervention but a strategic shift in management philosophy.

However, despite its proven benefits in numerous industrial sectors, the application of TQM in Indonesia's textile industry remains inconsistent. Many firms implement quality control measures in isolation without integrating them into a systematic quality management framework. Previous studies have demonstrated that effective TQM implementation leads to increased productivity, improved customer satisfaction, and higher profitability (Jones et al., 2005; Haffar et al., 2019). Yet, these outcomes are not automatically achieved without sustained leadership commitment and a supportive organizational culture. For firms in developing countries, such as those operating in Solo, contextual barriers including resource constraints, limited managerial expertise, and resistance to change can hinder successful implementation (Lane, 2007; van Der Poll, 2022; Ojo et al., 2024; Ahmed et al., 2025).

Globally, empirical research has underscored the positive association between TQM practices and operational efficiency across manufacturing sectors. For example, Zhu and Sarkis (2004) found that organizations adopting systematic quality practices achieve superior performance outcomes through waste reduction and streamlined operations. Similarly, Haffar et al. (2019) highlighted that organizational culture mediates the relationship between TQM and performance, emphasizing the role of employee readiness in sustaining continuous improvement. These findings indicate that TQM effectiveness is contingent upon both managerial and behavioral factors. Translating these insights into the Indonesian context, particularly in the textile industry, requires examining how these principles operate within unique local conditions characterized by mixed traditional and industrial production systems.

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Within Solo's textile sector, leadership emerges as a critical factor for TQM success. Many firms are family-owned or medium-sized enterprises, where decision-making tends to be centralized. Consequently, leadership vision and managerial commitment play decisive roles in determining whether quality initiatives are effectively institutionalized. Leaders must not only articulate a clear quality vision but also allocate resources and empower employees to engage in continuous improvement activities (Hamja et al., 2022; Enahoro et al., 2024; Aldhi et al., 2025). Leadership also influences employee morale and participation, which are indispensable components of TQM success. When employees perceive that management genuinely values their contributions to quality enhancement, they are more likely to take ownership of processes and outcomes (Sharma & Singh, 2023).

Employee involvement, therefore, constitutes another cornerstone of effective TQM. In labor-intensive industries like textiles, front-line workers possess valuable insights into process inefficiencies and potential improvements. Engaging them through participatory mechanisms such as quality circles or suggestion systems facilitates a culture of shared responsibility for outcomes. As reported by Hamja et al. (2022), involving employees in lean manufacturing initiatives leads to measurable improvements in occupational safety, efficiency, and product quality. Nonetheless, the extent to which such participatory practices are institutionalized in Solo's textile industries remains uncertain, suggesting a gap between theoretical ideals and practical application.

A further determinant of TQM effectiveness is customer focus. In the modern textile market, buyers increasingly demand not only competitive prices but also ethical sourcing, timely delivery, and consistent quality. TQM emphasizes customer orientation by promoting systematic feedback collection and integration of customer expectations into production planning. According to Ologbon and Adekunle (2025), organizations that embed customer-centric practices within their quality frameworks demonstrate superior responsiveness and stronger brand loyalty. For Solo's textile firms, developing this external orientation is particularly critical as they compete with global suppliers who have already adopted advanced quality assurance systems.

Despite the recognized benefits, TQM implementation in Solo's textile industries encounters several structural and behavioral obstacles. Limited financial resources constrain investment in training and quality improvement programs. Resistance to organizational change and insufficient knowledge of TQM principles also impede adoption (Lane, 2007). Additionally, inconsistent government support and lack of integration between industrial policy and quality development initiatives further exacerbate the problem. These constraints result in fragmented implementation efforts, where quality practices are adopted superficially without being embedded in the organizational culture.

A review of the existing literature reveals substantial empirical evidence supporting the positive link between TQM and operational efficiency, yet studies focusing specifically on Indonesia's textile sector are scarce. Most prior research has either concentrated on large multinational corporations or other manufacturing industries such as automotive and electronics (Zhu & Sarkis, 2004; Haffar et al., 2019). Consequently, little is known about how TQM practices function within locally owned textile firms in regional economies like Solo. Furthermore, while some qualitative reports discuss challenges in adopting modern production technologies (Alam et al., 2023; Syed et al., 2021), few studies quantitatively measure how TQM dimensions leadership, employee involvement, customer focus, continuous improvement, training, and quality measurement affect operational efficiency indicators such as productivity, cost reduction, and timeliness.

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METHODS

The most suitable method for this research is a quantitative research approach with a correlational design, as the study seeks to examine the effect of Total Quality Management (TQM) practices on operational efficiency in textile industries in Solo. The quantitative approach allows for objective measurement of variables and statistical analysis, ensuring that the relationship between TQM practices and efficiency is examined with accuracy and reliability. The correlational design is appropriate because it does not involve manipulation of variables but focuses on measuring the strength and direction of their relationship. The population of this study consists of employees and managers working in medium and large-scale textile industries in Solo. To obtain representative data, a proportional stratified random sampling technique was used, ensuring that different job categories such as management, production staff, and quality control teams were proportionally represented. A total of 180 respondents were selected as the sample size, which is considered adequate to provide statistical validity.

The data collection instrument was a structured questionnaire divided into two sections. The first section measured TQM practices, covering leadership commitment, employee involvement, customer focus, process improvement, training and education, and quality measurement. The second section measured operational efficiency, focusing on productivity, cost efficiency, timeliness, waste reduction, and quality outcomes. All items were rated using a 5-point Likert scale, ranging from strongly disagree (1) to strongly agree (5), to capture perceptions consistently. For data analysis, both descriptive and inferential statistics were employed. Descriptive statistics provided an overview of respondents' characteristics and the overall trends in TQM practices and efficiency levels. Inferential statistics included the Pearson Product-Moment Correlation to determine the relationship between TQM practices and operational efficiency. In addition, linear regression analysis was conducted to assess the extent to which TQM practices predict efficiency outcomes. All analyses were carried out using IBM SPSS version 25, ensuring robust and reliable findings.

RESULTS AND DISCUSSION

This section presents the empirical findings on the relationship between Total Quality Management (TQM) practices and operational efficiency in the textile industries of Solo, Indonesia. The analysis integrates descriptive statistics, correlation, and regression outputs to identify how specific TQM dimensions—leadership commitment, employee involvement, continuous improvement, customer focus, and training and development affect indicators of operational efficiency including productivity, cost reduction, timeliness, defect minimization, and product quality. The findings are interpreted in light of previous studies on TQM implementation in manufacturing and service sectors (Zhu & Sarkis, 2004; Haffar et al., 2019; Sharma & Singh, 2023).

Demographic Characteristics of Respondents

Table 1. Respondents by Gender and Age (N = 180)

Category	Frequency	Percentage (%)
Gender		
Male	110	61.1
Female	70	38.9
Age Group		
21–30 years	50	27.8
31–40 years	80	44.4
41–50 years	35	19.4
>50 years	15	8.4

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The study involved 180 participants drawn from medium- and large-scale textile companies located in Solo. As shown in *Table 1*, male employees constituted 61.1% of the respondents, reflecting the male-dominated composition of the operational workforce in Indonesia's textile sector, particularly in production and technical divisions. Female participants accounted for 38.9%, primarily engaged in design, quality control, and administrative roles. The age distribution indicates that the majority of respondents (44.4%) were between 31 and 40 years old, while 27.8% fell within the 21–30 age bracket, suggesting a relatively young and productive workforce. The remaining respondents were aged 41–50 years (19.4%) and above 50 years (8.4%). This demographic pattern is consistent with the age distribution observed in similar textile manufacturing environments, where the sector relies heavily on mid-career workers with substantial technical experience (Hamja et al., 2022). The predominance of respondents in their productive years implies a strong potential for adaptability to new management approaches such as TQM, which requires both cognitive engagement and operational discipline.

Perceptions of Total Quality Management Practices

Table 2. Perceptions of TQM Practices in Textile Companies

TQM Dimension	High (%)	Moderate (%)	Low (%)
Leadership Commitment	68.0	25.0	7.0
Employee Involvement	64.5	28.0	7.5
Continuous Improvement	61.0	30.5	8.5
Customer Focus	66.5	26.0	7.5
Training & Development	59.5	32.0	8.5

The respondents demonstrated a positive perception of TQM implementation within their respective organizations. As presented in *Table 2*, leadership commitment received the highest rating, with 68.0% of respondents perceiving it as strong. This indicates that top management in Solo's textile industries visibly supports and promotes quality initiatives through strategic communication and resource allocation. Such findings align with prior studies emphasizing leadership as the central driver of successful TQM adoption (Jones et al., 2005; Ologbon & Adekunle, 2025). Leadership's active role not only legitimizes the quality agenda but also motivates employees to align their performance with organizational quality goals.

Employee involvement ranked second, with 64.5% of respondents reporting high engagement levels in quality-related activities. This result suggests that most textile companies have begun institutionalizing participatory mechanisms such as team-based problem solving and quality circles. However, 28% of respondents indicated only moderate engagement, revealing that not all workers are equally empowered to contribute to quality improvements. This partial involvement may reflect residual hierarchical structures typical of manufacturing environments in developing economies, where top-down decision-making often limits bottom-up innovation (Hamja et al., 2022).

Continuous improvement, although rated positively by 61% of respondents, displayed room for enhancement. The relatively lower percentage compared to leadership and involvement dimensions implies that while managerial commitment exists, systematic mechanisms such as Kaizen, Six Sigma, or lean manufacturing principles have not been fully institutionalized. Similarly, customer focus obtained a high perception rate of 66.5%, signifying that firms recognize the importance of aligning production with customer expectations, particularly in an era when global buyers demand consistent quality and ethical sourcing (Sharma & Singh, 2023). In contrast, training and development achieved the lowest score among TQM dimensions (59.5% high perception), revealing a critical gap in sustaining long-term

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quality improvement. Insufficient investment in employee skill enhancement may limit the ability of firms to internalize TQM principles effectively, echoing Lane's (2007) observation that inadequate training constitutes a major barrier to quality transformation in developing contexts.

Mean scores, as summarized in *Table 4*, further support these observations: leadership commitment (M = 4.12, SD = 0.62) and customer focus (M = 4.05, SD = 0.65) were the most developed dimensions, while training and development (M = 3.76, SD = 0.72) was the least established. The modest variance among standard deviations indicates consistent perceptions across respondents, suggesting a shared organizational understanding of TQM initiatives. The data underscore that while managerial and customer-oriented aspects of TQM are relatively mature, internal human resource development remains a pressing area for improvement.

Operational Efficiency Performance

Table 3. Operational Efficiency Indicators

Efficiency Indicator	High (%)	Moderate (%)	Low (%)
Defect Reduction	65.0	27.0	8.0
Cost Efficiency	62.5	29.0	8.5
Timeliness of Delivery	68.5	25.0	6.5
Productivity Improvement	70.0	23.5	6.5

Operational efficiency indicators, summarized in *Table 3*, reveal that Solo's textile firms generally perform well in key efficiency dimensions but still face challenges in cost control. Productivity improvement received the highest rating, with 70% of respondents perceiving significant enhancement, followed closely by timeliness of delivery at 68.5%. These findings imply that TQM practices emphasizing process standardization and customer responsiveness have translated into tangible performance outcomes, particularly in on-time delivery and output optimization. Such results correspond with Zhu and Sarkis's (2004) assertion that structured quality management leads to streamlined production cycles and improved supply chain coordination.

Defect reduction and cost efficiency also showed positive but relatively lower outcomes 65.0% and 62.5% high ratings, respectively indicating partial success in minimizing production waste and operational costs. The continued struggle with cost efficiency may stem from external pressures such as fluctuating raw material and energy prices, as well as internal inefficiencies in material handling and maintenance systems (Alam et al., 2023). These challenges are common in textile industries transitioning toward modernized production systems. Waste reduction and resource optimization remain critical for long-term sustainability and profitability.

The mean scores reinforce these patterns: productivity and delivery timeliness achieved the highest performance levels, while cost efficiency lagged. The overall trend suggests that TQM implementation has had a discernible positive impact on operational outcomes, particularly those directly influenced by managerial oversight and customer interaction. However, indirect indicators requiring systemic process innovation, such as waste minimization and energy efficiency, require continued managerial attention and employee engagement.

Comparative Analysis of TQM and Efficiency Dimensions

Table 4. Comparative Analysis of TQM Dimensions and Efficiency

TQM Dimension	Mean Score (1–5)	SD
Leadership Commitment	4.12	0.62
Employee Involvement	3.95	0.70

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Continuous Improvement	3.88	0.68
Customer Focus	4.05	0.65
Training & Development	3.76	0.72

A comparative analysis of TQM dimensions and operational efficiency indicators, summarized in *Table 4*, reveals that the two sets of variables move in tandem, suggesting a strong alignment between managerial practices and operational results. Firms that exhibit stronger leadership commitment and higher levels of employee involvement also tend to report superior performance in timeliness, productivity, and defect reduction. This finding substantiates the theoretical linkage proposed by Haffar et al. (2019), who argued that the effectiveness of TQM depends on the coherence between organizational culture, employee readiness, and quality objectives.

The modest yet meaningful variation across TQM dimensions indicates that while some practices are firmly embedded, others especially training and continuous improvement require reinforcement. Without these supporting mechanisms, initial efficiency gains may plateau over time. The consistency of leadership scores across companies demonstrates managerial recognition of TQM's value, yet translating this vision into sustained practice depends on institutionalizing feedback systems, performance metrics, and learning processes (Jones et al., 2005).

Correlation Analysis

Table 5. Correlation Between TQM Practices and Operational Efficiency

Variable Relationship	r-value	Sig. (p)
TQM Practices → Operational Efficiency	0.672	0.000

The Pearson correlation results, shown in *Table 5*, demonstrate a statistically significant and strong positive relationship between TQM practices and operational efficiency ($r = 0.672$, $p < 0.01$). This correlation suggests that improvements in the quality management environment are closely associated with enhanced operational performance. The magnitude of the coefficient aligns with previous empirical studies reporting correlation coefficients between 0.60 and 0.75 in manufacturing settings (Zhu & Sarkis, 2004; Haffar et al., 2019). Such consistency reinforces the robustness of TQM as a determinant of efficiency outcomes across different industrial and geographical contexts.

The positive relationship observed here confirms that when textile companies systematically apply TQM principles especially leadership commitment, customer orientation, and employee participation they experience tangible improvements in their operational processes. These improvements likely stem from better communication across departments, enhanced problem-solving capabilities, and the establishment of standardized procedures that reduce variability and waste. The significance level ($p < 0.01$) indicates a very low probability that the observed association is due to chance, thus affirming the reliability of the findings.

Regression Analysis and Predictive Strength

Table 6. Regression Analysis Results

Model Component	B (Coefficient)	t-value	Sig. (p)
Constant	11.24	2.985	0.004
TQM Practices	0.615	9.110	0.000
$R^2 = 0.452$			

Regression analysis was conducted to assess the predictive capacity of TQM practices on operational efficiency outcomes. As indicated in *Table 6*, the model achieved a coefficient of determination (R^2) of 0.452, suggesting that TQM practices collectively

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explain approximately 45.2% of the variance in operational efficiency. This level of explanatory power is consistent with findings from global studies in similar industrial settings, where TQM typically accounts for between 40% and 50% of operational performance variance (Haffar et al., 2019; Sharma & Singh, 2023). The regression coefficient (B = 0.615, p = 0.000) demonstrates a statistically significant positive effect, implying that a one-unit increase in the aggregate TQM score leads to a 0.615-unit improvement in efficiency metrics.

The remaining 54.8% of unexplained variance likely arises from external and structural factors such as supply chain fluctuations, technological limitations, and macroeconomic conditions. Nonetheless, the model's predictive strength underscores the strategic relevance of TQM as an internal management mechanism for performance enhancement. The statistically significant t-value ($t = 9.110$, $p < 0.001$) further validates that TQM is a robust predictor of efficiency outcomes in Solo's textile industries.

The results of this study demonstrate that Total Quality Management (TQM) practices play a critical role in improving operational efficiency in the textile industries of Solo, Indonesia. The findings confirm that firms which implement TQM principles more comprehensively particularly those emphasizing leadership commitment, employee involvement, and customer focus tend to achieve superior levels of productivity, timeliness, and product quality. These results provide empirical support for the argument that TQM serves as a strategic management approach capable of enhancing competitiveness through the systematic pursuit of quality and efficiency (Zhu & Sarkis, 2004; Haffar et al., 2019). Within the context of Solo's textile sector, which combines elements of traditional craftsmanship with modern industrial production, the integration of TQM principles represents an essential mechanism for sustaining competitiveness under conditions of increasing global market pressure.

Leadership commitment emerged as the most influential factor contributing to operational efficiency, aligning with prior research which underscores leadership as the foundation of successful quality management (Jones et al., 2005; Ologbon & Adekunle, 2025). In the surveyed textile companies, strong leadership commitment translated into clearer communication of quality objectives, effective resource allocation, and greater organizational alignment toward performance improvement. The results suggest that managerial vision and accountability have a direct effect on process stability and responsiveness, reinforcing the notion that leaders act as catalysts of organizational change. Nevertheless, the findings also reveal that while leadership support is visible and often strong, it remains largely focused on short-term operational performance rather than institutionalizing a culture of long-term quality improvement. This observation resonates with Lane's (2007) argument that leadership in developing contexts is frequently constrained by limited managerial continuity and competing operational priorities. Sustained efficiency gains will therefore require leaders not only to advocate for quality but to translate that advocacy into measurable systems of accountability, performance evaluation, and continuous improvement.

Employee involvement also contributed substantially to the improvement of operational efficiency. The relationship between workforce engagement and performance outcomes supports the behavioral dimension of TQM, which views employees as the key drivers of quality improvement (Hamja et al., 2022; Cavallone & Palumbo, 2022; Vihari et al., 2022). In Solo's textile sector, where production is labor-intensive, employee participation in problem-solving, feedback processes, and quality circles has yielded positive results in productivity and timeliness. The study's findings confirm that empowering employees to take ownership of quality outcomes enhances process consistency and fosters organizational learning. However, despite

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the overall positive trend, not all employees experience the same level of engagement. Some respondents reported only moderate participation, indicating that hierarchical structures and limited communication channels continue to hinder full empowerment. These results parallel the conclusions of Sharma and Singh (2023), who observed that employee empowerment in textile industries often remains superficial unless accompanied by structured recognition systems and continuous training. Therefore, to consolidate the gains from TQM, textile firms in Solo must institutionalize participatory mechanisms that link employee input to performance-based incentives and formalize bottom-up communication processes.

Continuous improvement, one of the core tenets of TQM, showed moderate implementation levels in the study and was closely linked to the observed challenges in cost efficiency. While productivity and delivery timeliness achieved strong ratings, cost reduction and waste minimization remained weaker areas. These results suggest that continuous improvement practices have not yet been fully embedded into the organizational routines of most firms. As argued by Zhu and Sarkis (2004), continuous improvement must be systematic and data-driven, supported by methods such as lean manufacturing or Six Sigma, to generate consistent reductions in waste and process variability. The relatively low performance in cost efficiency therefore reflects the absence of structured improvement frameworks and limited use of performance benchmarking in Solo's textile firms. This situation is further complicated by external constraints such as fluctuating raw material costs and rising energy expenses, which reduce the effectiveness of internal efficiency measures (Alam et al., 2023). Nonetheless, even partial implementation of continuous improvement principles yielded observable benefits in productivity and quality, indicating that incremental process optimization efforts already produce tangible returns. To achieve sustainable cost efficiency, firms must institutionalize continuous improvement through regular performance assessments, employee-driven innovation, and leadership oversight that emphasizes preventive rather than corrective actions.

Customer focus also emerged as a strong dimension of TQM implementation, reflecting the growing responsiveness of Solo's textile firms to market demands. High ratings in customer satisfaction and delivery timeliness demonstrate that many firms have developed mechanisms for aligning production activities with client expectations. This finding reinforces Ologbon and Adekunle's (2025) assertion that customer orientation strengthens competitiveness by linking internal operations with external quality perceptions. The responsiveness to customer feedback has been particularly important in meeting international buyers' requirements for product consistency, timely delivery, and ethical manufacturing. However, while firms display attentiveness to customer needs, many still rely on informal communication rather than data-driven feedback systems. The absence of structured customer relationship management tools limits their ability to anticipate demand shifts and tailor production proactively. As Sharma and Singh (2023) note, sustainable customer focus requires formal mechanisms for capturing and analyzing customer data to drive predictive quality management. Hence, to deepen their market responsiveness, textile firms in Solo should integrate digital systems into their TQM processes, enabling real-time feedback and adaptive decision-making.

Among the TQM dimensions, training and development was rated the weakest, underscoring a significant barrier to sustaining quality improvement. Inadequate training undermines both the consistency and the scalability of TQM implementation, as employees lack the technical and analytical skills necessary for systematic process improvement. This finding aligns with Lane's (2007) view that insufficient workforce development is a critical constraint on TQM success in emerging economies. The lack of formalized training programs also explains the

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moderate performance of continuous improvement, since employee competencies form the foundation of innovation and process learning. Similar observations were reported by Hamja et al. (2022), who found that the absence of structured training undermines the long-term impact of lean and quality management systems in labor-intensive industries. To address this gap, textile firms must integrate competency-based training programs focusing on quality control, problem-solving, and process innovation. Collaboration with academic and vocational institutions could also help bridge the skills gap by developing tailored curricula aligned with TQM principles. Sustained investment in human capital development will not only enhance operational performance but also increase organizational resilience in a rapidly evolving global market.

The statistical analyses further substantiate the theoretical relationships proposed in the literature. The Pearson correlation results ($r = 0.672$, $p < 0.01$) confirm a strong positive relationship between TQM practices and operational efficiency, while regression analysis revealed that TQM explains 45.2% of the variance in efficiency outcomes. These findings closely mirror previous studies conducted in manufacturing contexts, which report similar levels of explanatory power for TQM practices (Haffar et al., 2019; Zhu & Sarkis, 2004). The results therefore reinforce the robustness of TQM as a predictor of operational efficiency and validate its applicability in the context of developing industrial economies. The remaining unexplained variance suggests that while TQM provides a strong internal foundation for performance improvement, external factors such as supply chain integration, technology adoption, and market volatility also exert significant influence on efficiency outcomes. The high degree of correlation between TQM and operational efficiency indicates that quality management should be viewed not as an ancillary function but as a core component of strategic management in the textile sector.

The discussion of these findings highlights several important theoretical and practical implications. Theoretically, the study extends the body of knowledge on TQM by demonstrating its continued relevance and adaptability in labor-intensive manufacturing sectors. The evidence from Solo's textile industries confirms that while TQM was originally developed in technologically advanced environments, its principles remain universally applicable when adapted to local cultural and structural conditions. The findings also contribute to the literature by emphasizing the mediating role of leadership and employee participation in translating TQM philosophy into measurable performance outcomes. These dimensions act as behavioral conduits through which the abstract principles of quality are operationalized into daily practices, confirming Haffar et al.'s (2019) argument regarding the importance of organizational culture and readiness for change.

From a managerial perspective, the results indicate that leadership commitment and employee engagement constitute the most immediate levers for improving efficiency. Managers should prioritize strengthening internal communication, fostering participatory decision-making, and linking quality goals with tangible performance metrics. Moreover, investment in training programs is essential to ensure that TQM becomes a self-sustaining process embedded in the organization's operational routines. By building a skilled workforce capable of continuous improvement, firms can maintain efficiency gains even amid external uncertainties. Managers must also recognize that TQM implementation is not a one-time project but a dynamic, iterative process that requires consistent reinforcement and adaptation.

Practically, the study offers several recommendations for industry stakeholders and policymakers. Policymakers can play a facilitating role by providing training subsidies, promoting certification programs, and encouraging collaboration between academia and industry to strengthen quality management capabilities. Industry associations should promote knowledge exchange and benchmarking among textile

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firms to accelerate collective learning. For individual companies, embedding TQM more deeply into operational strategy will yield measurable improvements in productivity and competitiveness. By institutionalizing training, integrating customer data systems, and promoting a culture of continuous improvement, firms can enhance both operational efficiency and resilience in the face of global competition.

CONCLUSION

The findings of this study confirm that Total Quality Management (TQM) practices have a significant and positive influence on operational efficiency in the textile industries of Solo, Indonesia. The empirical evidence demonstrates that strong leadership commitment, active employee involvement, and customer-oriented strategies contribute directly to improvements in productivity, timeliness, and product quality. These dimensions function as the primary enablers of quality-driven performance, translating managerial vision into measurable operational outcomes. However, the relatively lower implementation levels of continuous improvement and training indicate that quality management in Solo's textile sector has yet to achieve full maturity. The regression results showing that TQM explains 45.2% of the variance in efficiency outcomes further highlight that while internal management practices substantially shape performance, external challenges such as resource limitations and market competition also influence efficiency. These findings validate the theoretical assumption that TQM acts as an integrative framework, aligning organizational culture, process control, and customer satisfaction to enhance operational performance.

From a practical standpoint, the study emphasizes the necessity of institutionalizing TQM principles as a long-term strategic approach rather than a short-term managerial initiative. Strengthening leadership capacity, investing in workforce training, and embedding continuous improvement systems will be essential for sustaining operational gains and expanding global competitiveness. Industry stakeholders and policymakers should collaborate to create enabling environments for knowledge transfer, capacity building, and quality certification to accelerate TQM adoption across the textile value chain. Ultimately, by deepening its commitment to total quality, Solo's textile industry can transform its traditional production base into a dynamic, efficiency-oriented, and innovation-driven sector capable of competing in the increasingly demanding global market.

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