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The Role of Green Innovation Capabilities on The Relationship Between Total Quality Management And Sustainability Performance of Small And Medium Manufacturing Industry In Surabaya

Djojo Diharjo[1], Risa Watti[2], Nurul Azizah[3]
[1,2,3] Universitas Wijaya Kusuma Surabaya
Email: djojodiharjo@uwks.ac.id[1], risawati@uwks.ac.id[2], Nurulazizah@uwks.ac.id[3]

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Abstract
This study aims to analyze the structural relationship between Total Quality Management (TQM) and corporate sustainability performance, with green innovation capabilities as a mediating variable, in the manufacturing industry of Small and Medium Enterprises (SMEs) in Surabaya. This study emphasizes the importance of TQM implementation and green innovation capabilities in driving organizational sustainability practices. The research method uses Structural Equation Modeling–Partial Least Squares (SEM-PLS). TQM is measured across four dimensions: product control management, process control management, vendor quality management, and customer relationship improvement. Corporate sustainability performance is measured through three dimensions, namely environmental, economic, and social sustainability, while green innovation capabilities are measured through green product innovation and green process innovation. The results show that TQM practices directly influence corporate sustainability performance across all dimensions and act as an antecedent of green innovation capabilities. Furthermore, green innovation capabilities are shown to mediate the relationship between TQM practices and corporate sustainability performance at both the construct and dimension levels. These findings indicate that TQM can be a holistic approach in improving the sustainability of small and medium industrial companies and building an innovative culture that encourages the creation of a circular social economy.

INTRODUCTION

The globalization of the global economy has intensified business competition and pushed companies to seek more effective management approaches. Deficiencies in current management styles generally stem from outdated management cultures that developed in a less complex business environment. The era of globalization has created a borderless market with increasingly critical and rational consumers, where purchasing decisions are no longer based on patriotic considerations but rather on the search for the best value in terms of quality and on-time delivery (Dihardjo and Ellitan, 2021). Across all business sectors in Indonesia, particularly the manufacturing sector, intense competition in both local and global markets poses a threat to company survival. Manufacturing companies strive to maintain market share, customer loyalty and satisfaction, and competitive advantage. However, within the ASEAN regional context, Indonesian manufacturers' competitiveness lags behind that of other countries in the region (Dihardjo and Ellitan, 2021).

In the increasingly intense global competitive environment, quality has become a key factor in the success and sustainability of the manufacturing industry of Small and Medium Enterprises (SMEs). Total Quality Management (TQM), a management approach that emphasizes comprehensive and continuous quality improvement, is becoming increasingly relevant for SMEs, as it focuses not only on product quality but also on processes, services, and human resources. Surabaya, as one of Indonesia's industrial and trade centers, has a significant population of manufacturing SMEs and plays an important role in the regional and national economy, but still faces challenges in improving quality and competitiveness. The implementation of TQM is seen as a solution to improve product quality, process efficiency, customer satisfaction, and the competitive advantage of manufacturing SMEs in Surabaya. In addition to quality and competitiveness, company sustainability is a crucial issue for the SME manufacturing industry. In the increasingly intense global competitive environment, quality has become a key factor in the success and sustainability of the manufacturing industry of Small and Medium Enterprises (SMEs). Total Quality Management (TQM), a management approach that emphasizes comprehensive and continuous quality improvement, is becoming increasingly relevant for SMEs, as it focuses not only on product quality but also on processes, services, and human resources. Surabaya, as one of Indonesia's industrial and trade centers, has a significant population of manufacturing SMEs and plays an important role in the regional and national economy, but still faces challenges in improving quality and competitiveness. The implementation of TQM is seen as a solution to improve product quality, process efficiency, customer satisfaction, and the competitive advantage of manufacturing SMEs in Surabaya. In addition to quality and competitiveness, company sustainability is a crucial issue for the SME manufacturing industry.

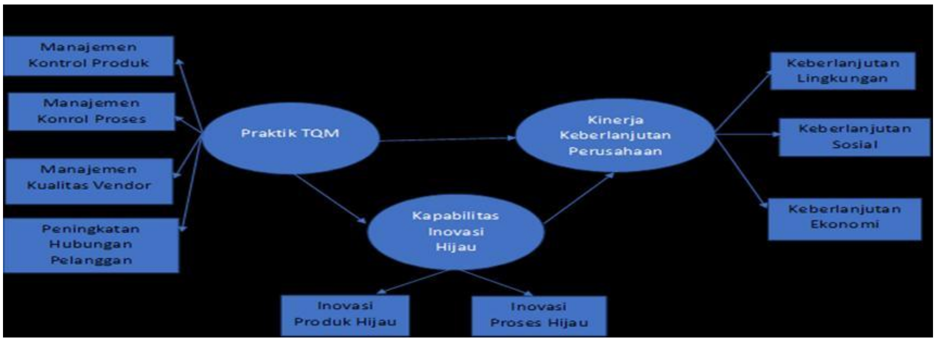
Total Quality Management is essentially realized through continuous improvement of end-to-end processes to achieve customer satisfaction (Vuppalapati et al., 1995) by involving all organizational stakeholders (Mahmood et al., 2015), thus generating competitive advantage (Li et al., 2018) and increasing customer and employee satisfaction (Shafiq et al., 2019). TQM encompasses the principles of customer satisfaction, fact-based management, human-centered management, and continuous improvement (Kanji, 1998). TQM's focus on efficiency and resource optimization encourages environmentally friendly practices (Qasrawi et al., 2017; Yu and Huo, 2019) and has the potential to stimulate innovation, particularly green innovation as an important element of sustainable practices (Li et al., 2018). Although research on the relationship between quality management and company performance is quite extensive, studies linking TQM to company sustainability remain limited, including Albloushi et al. (2023), which shows that green innovation mediates this relationship. TQM and innovation share the same goal: achieving customer satisfaction and competitive advantage (Kaynak, 2003). Both emphasize employee engagement through a culture of continuous improvement, openness, and stakeholder participation (Kim et al., 2012), ultimately enhancing competitive advantage (Abrunhosa and Sá, 2008; Hurmelinna-Laukkanen et al., 2008). However, research on the relationship between TQM and innovation has yielded mixed results, with some finding a positive effect (Abrunhosa and Sá, 2008; López-Mielgo et al., 2009) and others finding no significant relationship (Prajogo and Sohal, 2001). In addition, previous research generally focuses on specific types of innovation, such as technological, product, or service innovation (Abrunhosa and Sá, 2008; Prajogo and Sohal, 2004; Bon and Mustafa, 2013), and highlights only certain dimensions of TQM (Thai Hoang et al., 2006).

Research linking green innovation capabilities to corporate sustainability performance is also limited and generally focuses on technological innovation (Camarinha-Matos, 2011) or business model innovation (Yang et al., 2017). To date, few studies have comprehensively examined the relationship between TQM practices, green innovation capabilities, and corporate sustainability performance, particularly in the manufacturing sector.

Based on this background, this study aims to answer the questions: (1) whether TQM practices have a significant effect on green innovation capabilities and corporate sustainability performance; (2) whether green innovation capabilities have a significant effect on corporate sustainability performance; and (3) whether green innovation capabilities mediate the relationship between TQM practices and corporate sustainability performance.

METHODS

Based on this background, this study aims to answer the questions: (1) whether TQM practices have a significant effect on green innovation capabilities and corporate sustainability performance; (2) whether green innovation capabilities have a significant effect on corporate sustainability performance; and (3) whether green innovation capabilities mediate the relationship between TQM practices and corporate sustainability performanceThis research uses a quantitative approach with a positivist paradigm, with a logico-hypotheco-verifiable nature. The empirical object of the study is the top and middle management of small- and medium-sized manufacturing companies in Surabaya. The data analyzed consists of quantitative and qualitative data, which were quantified and then processed using inferential statistical techniques. This study was designed as an explanatory research study, aiming to test causal relationships among variables. The data used are primary data collected through a questionnaire. The conceptual framework of this study illustrates the role of green innovation capability as a mediating variable, representing a novelty in the study. This framework was developed based on previous research models of TQM practices as antecedents and corporate sustainability performance as a consequence, and was subsequently modified by the author. The conceptual model of the study is shown in Figure 1.



The quantitative approach was chosen because it allows the research to be conducted in a structured manner, with a sample size of 30-500 respondents considered representative of the population. The study population comprised top and middle management from small- and medium-sized manufacturing companies in Surabaya, as listed in the Surabaya Small and Medium Manufacturing Industry Directory published by the Central Statistics Agency in 2024. The study population consisted of 827 active manufacturing companies, so the population of company leaders was also assumed to be 827. The sample size was determined using the Slovin formula because the study population was limited and known. With a 10% margin of error (0.1), a minimum sample size of 89 companies was determined. The sampling method used was non-probability purposive sampling (Cooper and Pamela Schindler, 2015). The study sample comprised manufacturing companies with more than 25 employees, as quality policies and perceptions are assumed to be better developed in such companies. The study respondents were directors, general managers, quality managers, or other functions closest to them, with the consideration that these parties have an adequate understanding of TQM implementation.

RESULTS AND DISCUSSION

Description of research data

This study used a closed-ended questionnaire distributed online (e-survey) through the Google Form application. The study respondents were directors, general managers, quality managers, and the most relevant functions in small and medium-sized manufacturing companies in Surabaya that have implemented Total Quality Management (TQM). The selection of respondents was based on their important role in the management and decision-making related to quality management. Respondents were selected based on the Surabaya Manufacturing Industry Directory. Given the relatively low response rate for survey research in Indonesia, which ranges from 10%–20%, the questionnaire was sent to 89 respondents online from September 29 to October 30, 2025. Prior to questionnaire distribution, a pretest (face validity) was conducted through a pilot study with 10 respondents to ensure the clarity of the statements and estimate the time required to complete the questionnaire.

The number of respondents participating in this study was 53, with the majority being male (44) (83.19%), while 9 were female (16.98%). By position, the majority of respondents were in top management in manufacturing companies, comprising 21 company owners (39.62%), 15 general managers (28.30%), and 9 factory managers (16.98%). Other respondents held positions directly related to operational processes and quality, including PPIC managers, procurement managers, administrative managers, and 8 production supervisors (15.09%).

Based on length of service, respondents were dominated by employees with more than 20 years of experience (25) (47.17%), followed by 17 with 11–20 years of experience (32.07%), 10 with 5–10 years of experience (18.87%), and 1 with less than 5 years of experience (1.88%). The educational level of the respondents was mostly bachelor's degree (S1) as many as 42 people (79.24%), followed by diploma (D3/D4) as many as 7 people (13.21%), master's degree (S2) as many as 2 people (3.77%), and high school as many as 2 people (3.77%). At the same time, there were no respondents with doctoral education (S3).

Based on company characteristics, the majority of respondents' businesses were in the food and beverage industry, with 16 companies (30.19%). Furthermore, the wood processing and wood and cork products industry, as well as the chemical, pharmaceutical, and traditional medicine industry, each had five companies (15.22%). In contrast, the remaining industry categories were spread across other manufacturing sectors. In terms of location, Surabaya's manufacturing sector is dominated by the Surabaya Industrial Estate Rungkut (SIER) with 26 companies (49.06%), followed by the Margomulyo area with 11 companies (20.75%), the Gedangan Industrial Park (GIP) with 2 companies (3.77%), and other Surabaya SMEs with 14 companies (26.42%).

The duration of TQM implementation in the respondent companies was mostly more than 20 years (21 companies (39.62%), followed by a period of 11–20 years (18 companies (33.96%), a period of 5–10 years (12 companies (22.64%), and less than 5 years (2 companies (3.77%). Regarding certification, a small number of companies have ISO 9000 and SNI certifications, namely 4 companies (7.55%) and 19 companies (35.85%), ISO 14000 certifications by 2 companies (3.77%), and other certifications such as HACCP, GMP, and Halal by 16 companies (30.19%).

The results of the questionnaire, distributed online via Google Forms, were tabulated and analyzed in Microsoft Excel to conduct descriptive statistics. Descriptive statistics use measures of central tendency to characterize the collected data; the most common measure is the mean, which is the average value of the data. Standard deviation is also used to determine the spread of data within a sample. The higher the standard deviation, the greater the variation in the data. The descriptive statistical results for the latent variables in this study are as follows: Results of respondents' perceptions of commitment to the research variables in the questionnaire distributed to respondents:

For the exogenous latent research variable (X) on TQM practices, respondents' responses ranged from 4.175 to 4.77, with an average of 4.375. On average, respondents' answers showed the categories agree and strongly agree, indicating an ordinal ranking of high and very high. From the four dimensions of TQM practices, it can be seen that the highest-priority practice is process control management (X2), and the lowest-priority practice is product control management (X1).

For the latent mediating research variable (Z), respondents' responses had the lowest average of 4.176 and the highest of 4.358. On average, respondents strongly agree, indicating a very high ordinal ranking. From the two dimensions of green innovation capability, it can be seen that green process innovation (Z2) has the highest priority, followed by green product innovation (Z1). For the overall latent endogenous research variable (Y), the overall corporate sustainability performance, respondents' responses showed a lowest average score of 3.741 and a highest score of 4.442. On average, respondents' responses are mostly agree and strongly agree, indicating a high and very high ordinal ranking. From the three dimensions of corporate sustainability performance, it can be seen that social sustainability (Y2) and economic sustainability (Y3) have the highest priority, and finally, environmental sustainability (Y1).

Research Model Test Results

This data analysis used the Structural Equation Modeling-Partial Least Squares method to determine the structural relationships among TQM practices, green innovation capabilities, and the sustainability performance of manufacturing SMEs in Surabaya in 2025. Bootstrap resampling was used to estimate the significance of the best model. Using the SEM-Partial Least Squares (PLS) analysis technique, the research model was tested through the measurement model (outer model) and the structural model (inner model). The stages in testing the outer model and inner model are explained as follows:

Outer Model Test Convergent
Validity Convergent

validity is measured by examining the factor loading (outer loading) values of each indicator. An indicator is said to meet convergent validity if its outer loading is ≥ 0.50.

Discriminant Validity

Discriminant validity is measured using cross-loadings. An indicator is said to meet discriminant validity if its cross-loading value for one variable is greater than its cross-loading value for the other variables. Furthermore, to determine discriminant validity, the root of the Average Variance Extracted (AVE) for each variable is compared with the correlations between the variable in question and the other variables in the model. The root of the AVE must be greater than the correlations between the other variables.

Composite Reliability

A construct or variable is said to meet Composite Reliability if its Composite Reliability value is ≥ 0.70. Measurement Model (Outer Model Test Results) Before conducting hypothesis testing to predict relationships among latent variables in a structural model, a measurement model evaluation is conducted to verify the indicators and latent variables that can be tested further. This study uses a conceptual framework in which the entire measurement model is built on a reflective indicator model. Therefore, the criteria for evaluating the measurement model are indicator reliability, composite reliability, convergent validity, and discriminant validity. Indicator reliability indicates how much of an indicator's variance is explained by the latent variables. In indicator reliability, a reflective indicator must be eliminated (removed) from the measurement model when its loading value (λ) is less than 0.5.

Based on the calculation results, all average values of the dimensions that measure each latent variable have loading factors above 0.7. This shows that the dimensions and their indicators can explain all latent variables in this study. In Figure 2, the path diagram is built from 9 sub-construct dimensions, each represented by 50 average indicators, and three latent variables. The figure shows that more than 70% of the variance of each of the four average dimensions, namely product control management (X1), process control management (X2), vendor quality management (X3), and customer relationship improvement (X4), can be explained by the latent variable TQM practices (X). The latent variable green innovation capability (Z) explains the variance in green product innovation (Z1) and green process innovation, with variances above 90% for each. The latent variable corporate sustainability performance (Y) can explain the variance of each of its constituent dimensions, namely environmental sustainability (Y1), social sustainability (Y2), and economic sustainability (Y3), above 90%. Overall, all latent variables have met the general threshold criteria, namely that the latent construct explains 50% of the variance in the dimensions and indicators.

Variabel	Cronbach's alpha	(rho_a)	(rho_c)	AVE
Z	0,816	0,823	0,867	0,521
Y	0,930	0,936	0,940	0,531
X	0,943	0,949	0,950	0,480

Composite reliability indicates how well established indicators measure a construct; indicators are considered reliable if their value is above 0.6. Based on the composite reliability values, the four latent variables have composite reliabilities above 0.6. This means the established indicators have measured each latent variable (construct) well; in other words, the composite reliability values obtained indicate that the four measurement models are reliable. Convergent validity is improving, as indicated by higher correlations among the indicators that make up a construct. In PLS studies, convergent validity is assessed using AVEs. The AVE value indicates the average percentage of variance explained by the construct items. An AVE of 0.5 or higher indicates good convergent validity. Based on the AVE values shown, the four latent variables exceed the minimum criterion of 0.5. This shows that the TQM practice variable accounts for an average of 65.5% of the variance across the four constituent dimensions. The green innovation capability variable explains an average of 82.7% of the variance in the two constituent dimensions. The company's sustainability performance variable explains an average of 84.1% of the variance across the three constituent dimensions. This study shows that the more indicators used to measure a latent variable, the smaller the resulting AVE.

Another criterion for assessing the feasibility of a measurement model is discriminant validity, which is assessed by examining cross-loadings. This measure of discriminant validity will improve as correlations between constructs decrease. The cross-loading measure assesses the correlation of an indicator with its construct and with constructs from other blocks. In addition to cross-loading, testing the discriminant validity criterion can be done by comparing AVEs and correlations among constructs. Where a construct is said to be able to predict the measures in that construct block better than other blocks if the AVE root value is higher than the correlation between constructs or the AVE value is higher than the square of the correlation between constructs. The following table shows the correlation between constructs.

Table 2. Correlation Between Latent Variables

Variabel	**Z**	**Y**	**TQM**
Z	1,000	0,710	0,770
Y	0,710	1,000	0,740
X	0,770	0,740	1,000

The correlation values between the latent variables presented in Table 15 will then be compared with the AVE root values obtained as follows:

Table 3. AVE Root Values and Discriminant Validity for Each Latent Variable

Variabel	**√AVE**	**Diskriminant Validity**
Z	0,722	Fulfil
Y	0,729	Fulfil
X	0,693	Almost fulfilled

Based on the discriminant validity results in Table 16, all latent variables meet the criteria for discriminant validity, as their AVEs are greater than or nearly equal to the correlations between them. This indicates that the latent or construct is good at predicting the size of each measurement model. In addition to these four criteria, the feasibility of a measurement model can also be assessed from the t-statistic values of its loadings, provided that each t-statistic is greater than 1.96 (2-tailed) at a significance level of 0.05. The loading results, along with the t-statistic values obtained from the bootstrapping process using a resampling sample size of 53 and 5000 repetitions.

The results show that the measurement model for each latent variable obtained is very good. This is indicated by a t-statistic value greater than 1.96 (2-tailed) at a significance level of 0.05 or with a p-value less than α = 0.01. Based on the resulting table, each latent variable is related to its dimensions and indicators. The smallest contribution is vendor quality management (X3) with a path coefficient to the latent variable of TQM practices of 0.729. In contrast, the largest contribution is process control management (X2) with a path coefficient of 0.947 to the latent variable of TQM practices. In addition, the smallest contribution is green process innovation (Z2) with a path coefficient to the latent variable of green innovation capability of 0.906. In contrast, the largest contribution is green product innovation (Z1) with a path coefficient of 0.929 to the latent variable of green innovation capability. Furthermore, the smallest contribution is environmental sustainability (Y2) with a path coefficient to the latent variable of corporate sustainability of 0.905. In contrast, the largest contribution is social sustainability (Y2) with a path coefficient of 0.934 to the latent variable of corporate sustainability performance.

Inner Model Test

R-Square on Endogenous Constructs: The R-Square value is the coefficient of determination for endogenous constructs. According to Chin (1998), R-square (R2) values are 0.67 (strong), 0.33 (moderate), and 0.19 (weak). Effect Size (f-square) is used to assess the model's goodness-of-fit. An f2 value of 0.02, 0.15, or 0.35 indicates that the latent variable predictor has a small, medium, or large influence at the structural level (Chin, 1998; Hair et al., 2017). Prediction Relevance (Q-Square) Prediction relevance (Q-square), also known as Stone-Geisser's, is used to determine predictive capability using a blindfolding procedure. The Q-square (Q2) value is expected to be greater than zero (Q2 ≥ 0). A Q2 value of 0.02 indicates small predictive relevance, 0.15 indicates medium, and 0.35 indicates large. A Q2 value less than 0 indicates that the model is not predictive. This can only be done for endogenous constructs with reflective indicators. Hypothesis Testing and Path Coefficient Estimates

Hypothesis testing in PLS modeling is performed using the Inner Weight table. The research hypothesis can be accepted if the calculated t value (t-statistic) ≥ t table at a 5% risk of error (α) level of 1.96 and p values < 0.05. The path coefficient estimate is the magnitude of the relationship/influence of the latent construct.

Structural Model (Structural Model Test Results – Inner Model)
Hypothesis Test Results.

Hypothesis testing was conducted by examining its probability value and t-statistic. The probability value (p-value) for α = 5% was less than 0.05. The t-table value for α = 5% was 1.67 (one-tailed). The criterion for accepting the hypothesis was when the t-statistic (calculated) > the t-table. The results of the t-test for each latent variable and the path coefficient are shown in Table 4 below.

Table 4. Results of the t-Statistic Test on Latent Variables

Hipotesis	Path coefficient	T-statistict	P-Value	Conclusion
H1	0,475	4,027	0,000***	Accepted

H2	0,770	12,799	0,000**	Accepted
H3	0,344	2,507	0,012*	Accepted
H4	0,265	2,515	0,012*	Accepted

The structural model, also called the inner model, describes the relationships among latent variables using path coefficients, R-square, and Effect size f2. The results of the path coefficients and t-statistic values obtained through the bootstrapping process with a sample size of 53 and resampling repetitions of 5000 times. Green innovation capabilities in corporate sustainability performance have a positive influence, with a path coefficient of 0.344, and are significant at the 5% risk of error level. This is indicated by a t-statistic value greater than 1.67 (1-tailed) at a significance level of 5%. Furthermore, TQM practices have a positive effect on green innovation capabilities at a 1% risk of error level, with a path coefficient of 0.770, and also have a significant positive effect on corporate sustainability performance at a 1% risk of error level, with a path coefficient of 0.475.

Table 5. R Square and Adjusted R Square Values

Variabel	R-square	R-square adjusted
Z	0,593	0,585
Y2	0,596	0,580

The next step is to test the model's feasibility using the R-squared value. The R-square value for the endogenous latent variable, namely green innovation capability, is 0.593, indicating a reasonable structural model. This figure shows that the exogenous variables can explain 59.3% of the variability in the endogenous variable. The value for corporate sustainability performance is 0.596, indicating a reasonable structural model. This figure shows that the exogenous variables can explain 59.6% of the variability in the endogenous variable. Based on the effect size (f2) calculation, the influence of green innovation capability, as an exogenous latent variable, on corporate sustainability performance is weak. Meanwhile, the TQM practices variable has a moderate influence on corporate sustainability performance as an endogenous latent variable. Meanwhile, the TQM practices variable has a large and strong influence on green innovation capability.

To validate the overall fit, the Goodness of Fit (GoF) value is obtained from the average communalities value (squared factor loadings) and the average R2 value. The calculation results in an average communalities value, while the average R2 values are 0.593 and 0.596. Because there is only one value, the GoF value is 0.770 (large GoF). This indicates that the model has a strong ability to explain empirical data; thus, overall, the model is good. Meanwhile, to test the model's predictive power, the Stone-Geisser Q2 statistic is examined.

The Stone-Geisser Q2 value obtained is as follows:

Q2 = 1-(1-R2) = 1-(1-0.593) = 1-0.407 = 0.593.

Q2 = 1-(1-R2) = 1-(1-0.596) = 1-0.404 = 0.596.

The Q2 value obtained is 0.593-0.596 (large), which is above 0. This indicates that the structural model fits the data and has relevant predictions. This statement also indicates that the exogenous latent variables effectively explain the endogenous variables in the model.

Analysis of the Mediating Role of Green Innovation Capability

A mediating effect occurs when a third variable indirectly influences the relationship between two other variables (Hair et al., 2017). In this study, green innovation capability (Z) acts as a mediating variable between TQM practices (X) and corporate sustainability performance (Y). According to Hair et al. (2017), there are three types of mediation: complementary, competitive, and pure. Complementary mediation occurs when the direct and indirect effects are equally significant and have the same direction. Mediation testing was conducted using Smart-PLS with a bootstrapping procedure on 5,000 samples. The test results indicated that the direct effect of TQM practices (X) on corporate sustainability performance (Y) was significant, with a t-statistic value of 4.027 > 1.67. In addition, the indirect effect of TQM practices (X) on corporate sustainability performance (Y) through green innovation capabilities (Z) is also significant, with a t-statistic value of 2.515 > 1.67. Based on these results, it can be concluded that green innovation capabilities (Z) significantly mediate and complement the effect of TQM practices (X) on corporate sustainability performance (Y).

DISCUSSION

The Relationship between TQM Practices and Corporate Sustainability Performance.

The results of this study indicate that TQM practices, namely product control management, process control management, vendor quality management, and customer relationship improvement, have a significant positive effect on corporate sustainability performance (economic, social, and environmental). This means that TQM implementation not only improves product quality and efficiency but also strengthens the company's overall sustainability (holistic)

The Role of Green Innovation Capabilities

Green innovation capabilities are proven to be an important antecedent mediating the relationship between TQM practices and corporate sustainability performance. Green product and process innovation strengthen the influence of TQM, enabling companies to reduce environmental impacts, increase energy efficiency, and create social added value

The Complementary Mediating Role of Green Innovation Capabilities

The mediation is complementary: both the direct effect of TQM on sustainability and the indirect effect through green innovation capabilities are equally significant. This study's findings confirm that green innovation capabilities strengthen, rather than replace, the role of TQM. The main priority in TQM practices is process control management, which is the most dominant. Meanwhile, in green innovation capabilities, the green process innovation dimension is more prominent than green product innovation. Furthermore, in corporate sustainability, the social aspect received the highest score. This finding demonstrates the company's strong concern for the well-being of its employees and the surrounding community.

Research Implications

This research enriches theoretical studies by demonstrating that TQM practices are not only related to quality and efficiency, but also to sustainability, particularly when mediated by green innovation capabilities. This strengthens the Resource-Based View (RBV) and Natural Resource-Based View (NRBV) theories.

Practical Implications

For manufacturing SMEs in Surabaya, TQM implementation must be integrated with green innovation strategies to achieve comprehensive sustainability. Managers need to prioritize process control management and improving customer relationships. Government policies can be directed to support manufacturing SMEs in investing in green technology and environmental certification.

Research Limitations

The study sample was very small, comprising only 53 respondents from a population of 827 manufacturing SMEs in Surabaya, making generalization difficult and limiting the study. The online survey method, coupled with a low response rate, could introduce bias. The study's limited variables focused solely on TQM practices, green innovation capabilities, and corporate sustainability performance, without considering external factors such as government regulations, organizational culture, or global market conditions. The location was limited to Surabaya, so results may differ when applied to other cities or regions.

CONCLUSION

The results of the study indicate that all the hypotheses proposed are empirically supported. Total Quality Management (TQM) practices have been shown to have a positive and significant impact on corporate sustainability performance. This finding confirms that consistent implementation of TQM principles can simultaneously improve a company's economic, social, and environmental performance. Furthermore, TQM practices also have a positive and significant impact on green innovation capability. This indicates that a sound quality management system encourages companies to develop environmentally-oriented innovations, both through process innovation and environmentally friendly products. Green innovation capability has also been shown to have a positive and significant impact on corporate sustainability performance, indicating that a company's ability to adopt green innovation plays a critical role in achieving long-term sustainability. Furthermore, the analysis shows that green innovation capability mediates the relationship between TQM practices and corporate sustainability performance. This means that the influence of TQM practices on sustainability performance is not only direct but also strengthened through improvements in green innovation capabilities. Thus, TQM practices and green innovation capabilities are a complementary strategic combination in improving the sustainability of manufacturing SMEs in Surabaya City. For future researchers, it is recommended to expand the research area to other cities or industrial sectors to increase the generalizability of the findings. Future research can also examine external variables, such as government support, organizational culture, regulatory pressure, and technological digitalization, as potential moderators or mediators of the relationship between TQM practices, green innovation capabilities, and corporate sustainability performance. In addition, longitudinal research methods are highly recommended to provide a more comprehensive picture of the long-term impact of TQM implementation and green innovation capabilities on corporate sustainability.

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