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Quality Management Practices and Operational Performance of Manufacturing Firms in Rivers State, Nigeria

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Abstract

Systematic failure of Nigerian manufacturing companies to perform optimally has been blamed more often on the lack of the quality management framework. Though there is increasing academic interest in the relationship between quality management practices and various dimensions of operational performance in the sub-Saharan African manufacturing industry, the evidence is scanty and contextually deficient. Therefore, the study focused on the relationship between quality management practices and operational performance of manufacturing firms in Rivers State Nigeria. Cross-sectional survey design was used and a sample of 237 employees of manufacturing firms in Rivers State was taken. The data was gathered using the self-administered and structured questionnaire with a five point likert scale. This study used Partial Least Squares Structural Equation Modelling (PLS-SEM) to validate the measurement model and test hypotheses. The hypotheses were rejected at the 0.001 level of significance for all four. The results confirm the value of quality management practices in the manufacturing sector and highlight the importance of institutionalised improvement cultures and participatory management systems. The study recommended that policy makers and managers in Rivers State need to seriously invest in quality infrastructure and employee empowerment programmes to boost up the competitiveness of the manufacturing industry.

Key Words*: Quality Management Practices, 'Continuous Improvement, Employee Involvement, Operational Performance, Product Quality, and Delivery Performance.*

Introduction

In the last 20 years, the manufacturing environment around the world has seen significant changes as a result of increased competition, shifting consumer preferences, and the widespread adoption of quality management concepts and practices (Potkany, et al., 2022). One of the strategic tools that manufacturing organizations use to improve their overall efficiency, minimize waste and provide a better value to their stakeholders is quality management, specifically through the use of Total Quality Management (TQM) systems (Talib et al., 2012). At the heart of TQM is the claim that systematic and consistent effort to quality management practices lead to measurable gains in organizational performance in a variety of areas such as product quality, operational efficiency, customer satisfaction, and delivery reliability, etc.

The manufacturing sector in Nigeria is an important sector in the national economic development agenda, but it has consistently not performed up to its potential. The manufacturing sector accounted for around 12.1% of the Gross Domestic Product (GDP) of Nigeria in 2022 which is a relatively stable contribution over the last 10 years based on the National Bureau of Statistics (2023) report. Rivers State is one of the most commercially active states in Nigeria and is also a state with significant oil-related and non-oil manufacturing activities, making it a very interesting case study. The state has a wide portfolio comprising food and beverage, chemicals, construction materials, and oil and gas support services manufacturers (Sylva, et

al., 2016). However, many of these companies still struggle with quality issues, delivery problems and customer attrition, which research in quality management attributes to poor or non-existent quality management systems (Aigboje 2025).

From the literature, continuous improvement (CI) and employee involvement (EI) are two of the most supported dimensions of TQM that directly affect manufacturing performance outcomes (Martínez-Jurado, et al., 2014; Zu et al., 2010). Through the application of the Plan-Do-Check-Act (PDCA) process and Lean practice, organizations can systematically work through the process of identifying ways to improve continuously and systematically remove inefficiencies in their processes over time, while also improving the consistency of their output (Danese et al., 2018). Employee involvement, however, is based on organizational behaviour theories that suggest the cognitive and experiential capabilities of employees can be tapped by involving them in participatory processes, which results in higher quality outcomes and responsiveness to operational needs (Prybutok & Ramasesh, 2005).

Although there is a vast amount of theory and practice that backs up the use of quality management as a tool to provide quality services, the implementation of such practices in Nigerian manufacturing companies has not been achieved sufficiently. Research on the manufacturers of Rivers State shows that there are still some shortcomings in the standardization of processes, high level of non-adoption of CI tools and low level of involvement of the workforce in the decision making process related to quality in the manufacturing companies (Boussa-Dibite, 2025; Betinah, et al., 2018). As a result, product quality problems, high return rates, and unreliable supply chain are still negatively impacting the competitiveness of these companies both in home markets and export markets.

Even more problematic is the lack of serious, context-specific empirical evidence of the dimensions of quality which have the greatest impact on the specific outcomes of performance that are most important to Rivers State manufacturers. Most of the studies that are available focus on a single-informant, convenience sample that may lack generalizability (Okoro, 2024) or study quality management as a single entity. This means that managers do not have an evidence base to prioritise investment spending on quality improvement and policy makers are unable to design targeted support programmes with confidence in their likely impact.

The literature search has identified three gaps. Secondly, most of the studies that have investigated the relationship between quality management and organizational performance in Nigeria do not separate specific quality management practices but rather use a composite TQM index that masks the individual contribution of the various dimensions of quality management practices, employees' involvement and continuous improvement (Owan, 2021). Second, most of the research on TQM in Africa is located in South Africa, Ghana and Kenya, which are countries with distinct institutional, infrastructural and cultural settings from Nigeria, and the Nigerian manufacturing context is significantly under-researched (Soetan, et al., 2025). Third, studies available mostly focus on the financial performance of the organization, whereas operational performance dimensions including delivery performance often have more proximal consequences of quality management interventions (Phan et al., 2019) are ignored. This study is designed to tackle all three gaps at once. Hence, this study sought to investigate the relationship between quality management practices and operational performance of manufacturing companies in Rivers State.

Literature Review

Quality Management Practices

Quality management practices are defined as organized, systematic activities, routines, and systems aimed at systematically enhancing product, process, and/or service quality to meet or surpass customer expectations (Talib et al., 2012). Quality management, inspired by the work of Deming, Juran, Crosby and Feigenbaum, has progressed from the inspection method to an organization-wide philosophy that is represented in TQM. The operationalisation of QMPs is usually a multi-dimensional process, often involving such elements as leadership commitment, customer focus, process management, supplier quality management, continuous improvement and employee involvement (Aquilani et al., 2017). Continuous improvement and employee involvement are determined as the focal predictor constructs as they are theoretically relevant and have been shown to be empirically relevant for manufacturing performance outcomes for the purposes of this study.

From a conceptual point of view, Continuous Improvement (CI) may be defined as a continuous, incremental, and systematic process, an organization-wide effort, aimed at process, product, and service improvement over time that is based on methodologies like kaizen, the PDCA cycle, Six Sigma and Lean management (Danese et al., 2018). CI is not the same as radical process re-engineering, which focuses on large, infrequent and piecemeal gains. CI is about the incremental and continuous development of knowledge garnered through small, frequent, evidence-based gains. From the methodological point of view, the CI is characterized by periodic process reviews, analysis of the causes of failure, procedures for taking corrective actions, and standardisation of the best practices (Cherrafi et al., 2016). Employee Involvement (EI) is defined as the involvement of the organizational members in the decision making, problem solving and improvement processes related to quality (Martínez-Jurado, et al., 2014). EI is implemented in various ways including quality circles, cross-functional teams, suggestion schemes, training and development programmes, in which workers are given the skills to identify and solve quality issues.

Operational Performance

From the manufacturing perspective, operational performance is a multi-dimensional construct that involves financial performance, operational efficiency, customer satisfaction as well as market outcomes (Richard et al., 2009). The two operationally near performance dimensions that this study will focus on are product quality and delivery performance. Product Quality is a measure of how well a manufactured product meets the functional requirements of the customer, is free from defect and conforms to the design specs (Garvin, 1984). In the modern definition of product quality, defect rate, customer returns, conformance to specifications, and fitness for purpose (Zu et al., 2010) are all included. Delivery Performance is the extent to which manufacturing companies meet the agreed order quantities and delivery timelines (Phan et al., 2019). Significant measures include: on-time delivery rates, lead time variability and order fulfilment accuracy, which are especially important in the supply chain environment where the downstream customer operations are dependent on predictable inbound material flow.

Theoretical Framework

This study is grounded in two complementary theories which are the Total Quality Management (TQM) theory and the Resource Based View (RBV) of the firm. The conceptual framework for the study of the relationship between quality management practices and organization performance is provided by TQM Theory. Theory of TQM,

which was introduced in post-war period and later formalised by Deming (1986), Juran (1988), and Oakland (2014), suggests that the benefits of TQM are achieved through the implementation of a comprehensive and company-wide focus on quality, which is directed towards the strategy and business goals set by the organisation (Mohsin, et al., 2025). TQM theory states that continuous improvement and employee involvement are fundamental practices that, when integrated, result in a continuous cycle of optimisation of the process and mobilisation of human resources which will progressively improve quality outcomes (Talib et al., 2012). The theory's pertinence to the current study is due to its explicit causal logic and the specific performance outcomes, product quality/delivery performance that it explicitly links to specific QMPs which directly inform the study's hypotheses.

The Resource-Based View (RBV) developed by Barney (1991) and expanded by Wernerfelt (1984) and Peteraf (1993) is a firm-level theory that explains the sources of sustained competitive advantage arising from quality management capabilities. According to RBV, firms with resources and capabilities that can be valuable, rare, imperfectly imitable and non-substitutable (VRIN) will deliver better performance results. Institutionalised quality management capabilities (CI routines, knowledge management systems and participative cultures that support EI) are dynamic organizational capabilities that are hard for competitors to imitate (Teece et al., 1997) from an RBV point of view. The theoretical framework is especially relevant in the context of Rivers State because the institutional context and resources available to firms are far from homogenous, suggesting that firms are endowed with differential quality capabilities and hence have predictable performance outcomes (Akpan, et al., 2022). The combined theory of TQM and RBV offers a sound, multi-level theoretical basis for the hypothesized relationships, both for the mechanism of practice performance (TQM) and the competitive rationale for investing in quality capabilities (RBV).

Hypotheses Development

Continuous Improvement and Product Quality

Continuous improvement (CI) is a process of continuous incremental innovation and learning that is ongoing and systematic in improving an organization's processes, products and services. CI is considered an essential tool by which organizations in the Total Quality Management (TQM) philosophy can minimize process variability, eliminate waste, and enhance product compliance to customer needs. In theory, Deming's continuous improvement approach suggests that companies that constantly evaluate and adjust their work practices and processes will be better equipped to stop defects from happening, rather than discovering them later. Firms can use tools such as the Plan-Do-Check-Act (PDCA) cycle, root cause analysis, and corrective action systems to determine where quality failures are happening and take corrective action to achieve more consistent and reliable products.

The evidence about the positive impact of continuous improvement on the quality of products is overwhelming. The results of Danese et al. (2018) indicated that there was a significant association between the continuous improvement practices and product quality in the Italian manufacturing sector, with operational learning being an important mediating variable. Likewise, Cherrafi et al. (2016) found that the implementation of the lean-based continuous improvement practices had significantly decreased defect levels and increased process capability in production environments of manufacturing companies from Morocco. Soetan, et al., (2025) identified continuous improvement as a significant predictor of product quality

performance among food and beverage manufacturers in Nigeria; this implies that food and beverage companies that actively pursue process review and quality improvement efforts are likely to have better product performance.

Taking this perspective, continuous improvement helps build an organization's knowledge and process capability that is hard to copy and thus provides lasting quality benefits. Manufacturing companies can benefit from the institutionalization of learning and process refinement, resulting in greater product consistency, lower rework and better adherence to quality specifications. Though there is a proliferation of evidence, empirical research on this causal relationship in manufacturing firms in Rivers State is still scarce and hence, the research context is a gap to be addressed. The study hypothesises that:

Ho_1: There is no significant relationship between continuous improvement and product quality of manufacturing firms in Rivers State.

Continuous Improvement and Delivery Performance

One of the most important operational dimensions of performance is delivery performance which is an indicator of an organization's capability of getting products to customers on time and with accuracy. To ensure reliable delivery schedules, one needs to have stable production processes, efficient workflow management, and little or no disruption in production. These outcomes are achieved by continuous improvement, which can detect inefficiencies, identify process bottlenecks, and eliminate non-value adding processes that typically slow production and distribution processes.

Lean Theory's premise is that waste is systematically eliminated from the system to improve the flow of operations, which includes any waiting, unnecessary movement, defects, and interruptions in the process. The organizations have shorter lead time and increase the delivery schedule compliance with the operational process becoming more predictable and standardized. On-going improvement programmes also help to achieve better functional unit coordination and thus better responsiveness to customer orders and fewer production delays.

This relationship has been confirmed by several empirical studies. There was a significant increase in delivery reliability among manufacturing organizations when they worked toward continuous improvement (CI), reported by Danese et al (2018). Similarly, Cherrafi et al. (2016) reported that companies using structured continuous improvement programs had significant gains in on-time delivery performance. In a study done in Sub Saharan Africa, Wanyoike (2016) revealed a strong positive relationship between continuous improvement practices and delivery performance for Kenyan manufacturing firms, and concluded that corrective action systems and process monitoring were important factors in improving operational reliability.

While the literature offers significant evidence of this link, there has been little empirical research on manufacturing organizations in Rivers State, where the operating environment is characterized by infrastructure issues, delivery problems, and uncertainty about operations, which could affect the results of continuous improvement efforts. Therefore, there is a need for further empirical investigation. Based on this, the following hypothesis is advanced:

Ho_2: Continuous improvement is not significantly related to delivery performance of manufacturing firms in Rivers State.

Employee Involvement & Product Quality

Employee involvement is the degree to which employees are involved in organizational decision making, problem solving and quality improvement. Employee involvement is seen as a key success factor by TQM scholars since frontline employees have knowledge of the operations which can be

very useful in the quality improvement process. Firms that allow staff to detect quality issues and engage in quality improvement efforts have a greater chance of having better quality results.

The Resource-Based View offers a good theoretical grounding for this relationship since it suggests that human knowledge, skills and experience are strategic resources that can create competitive advantage. Quality circles, suggestion schemes, team problem solving and participative management practices can take advantage of employees' know-how to detect process failures and design solutions that will improve the quality of the process. This involvement helps to create a sense of ownership of quality goals and increases staff engagement with the commitment to quality production.

Empirical research has been found consistently reinforcing the following benefits of employee involvement: Product Quality Improvement. Martínez-Jurado, et al., (2014) identified significant differences in the employment involvement practices and product quality for manufacturing firms in different countries. Likewise, Prybutok and Ramasesh (2005) in their meta-analysis of manufacturing studies concluded that there is a strong positive correlation between employee involvement and product quality outcomes. Aigboje (2025) found that employee involvement was a significant determinant of product conformance and decreased product failures related to quality in manufacturing companies in Nigeria.

Active involvement in quality management activities can help organizations to monitor processes better, identify issues quickly and ensure compliance with quality standards. However, there is limited empirical evidence in Rivers State and therefore there is need to investigate this relationship in the local manufacturing environment. Based on this, the study has hypothesized that:

Ho_3: The relationship between employee involvement and product quality of manufacturing companies in Rivers State is not significant.

Employee Involvement and Delivery Performance

Employee involvement is also anticipated to have an impact on delivery performance since the employees are the ones that coordinate production activities as well as identify delivery bottlenecks and respond to unexpected disruptions. Manufacturing companies have come to realize that technology and process design are not the only things that determine delivery reliability; it depends on the commitment, responsiveness and collaborative working of employees, from operational units.

Theoretically, participative management practices, such as sharing information and cross-functional cooperation, enhance the effectiveness of production planning and scheduling. Empowered employees are able to respond to small problems before big production delays. In addition, problem solving activities encourage proactive problem solving of delivery issues and help to implement corrective action more rapidly.

This argument can be supported by empirical evidence. According to Martínez-Jurado et al (2014), employee involvement had a significant effect both on operational flexibility and on process effectiveness, which are key factors of delivery performance. According to Zu et al. (2010), employee engagement is a benefit to the delivery because of better communication, knowledge transfer, and quick identification of errors. Likewise, Aigboje (2025), observed that there is a positive relationship between the employee involvement and the delivery-related performance measures in manufacturing companies, but the strength of the relationship was different for different organizational contexts.

In places with inadequate infrastructure and uncertainties of operations like Rivers State, employee involvement can take on an even greater importance when ensuring the continuity of production and delivery of goods. But empirical research directly addressing this issue in the manufacturing sector in the State is still limited. Based on this, the following is proposed:

$H0_4$: There is no significant relationship between the extent of employee involvement and the manufacturing firm's delivery performance in Rivers State (Ho_4).

Methodology

Research Design

This study used quantitative and cross sectional-survey design. Given the study's explanatory and relational purposes, a cross sectional design was felt to be appropriate as it was aimed at understanding the current state of quality management practice adoption and performance outcomes for a population of firms at one point in time (Creswell & Creswell, 2017). This study adopted a positivist philosophical approach, which is when the study is based on and assumes that the study will be value free, involve hypothesis testing, and that generalizable findings will be obtained through the systematic collection and statistical analysis of quantitative data (Saunders et al., 2019).

Population and Sample

The study population consisted of all registered manufacturing companies in Rivers State as listed in the Manufacturing Association of Nigeria (MAN), Rivers State Chapter and they gave an enumeration of 32 manufacturing companies. Considering the relatively small population size, a census of the organisations was decided upon. The questionnaire was sent to the employees which included managers, quality assurance officers, production supervisors with direct responsibility for quality management activities and other employees in the factory, a total of 290 copies. This would ensure that there was knowledge of the operations on which the participants could rely for accurate responses. There were 290 copies administered and 237 were considered to be complete and usable for analysis (81.7% usable response rate).

Simple random sampling was used to ensure that the respondents had relevant knowledge in quality management and practical experience. In each of the sampled companies one primary informant (PI) was identified who had responsibility for quality management; a secondary informant (SI) was then approached to validate for common method bias. This dual-informant method reduces the issue of single-source bias, a concern often found in cross-sectional survey studies of management research.This dual-informant method helps to reduce the concern of single-source bias, which is a common issue in cross-sectional survey studies in management research (Podsakoff et al., 2012).

3.3 Data Collection Method

Structured, self-administrated questionnaires were used to collect data and were administered in paper form and also through an electronic questionnaire platform (Google Forms) from January through April 2024. The questionnaire was prefaced by an explanatory cover letter which outlined the academic research being conducted, ensured anonymity and provided informed consent. The Manufacturing Association of Nigeria (MAN), Rivers State Chapter was contacted to obtain the cooperation of the firms and ensure access to them, which helped to improve the response rate.

3.4 Measurement of Variables

Reflective multi-item scales were used to measure all constructs which have been validated in the available literature. Continuous Improvement was measured using a four-item scale adapted from Talib et al. (2012) and Danese et al. (2018) which include: frequency of process review, use of PDCA

cycle, participation in kaizen events, and application of RCAs. The criterion of Employee Involvement was assessed with an adapted four item scale developed by Martínez-Jurado, et al., (2014) which included the participation in a suggestion scheme, cross-functional team involvement, quality circle membership, and access to employee training and development. The Product Quality assessment was implemented by means of the three item scale which was designed from Zu et al. (2010) and it includes defect rate reduction, customer returns frequency and conformance to specifications. Delivery Performance was assessed using three items drawn from Phan et al. (2019) that looked at on-time delivery rate, order fulfilment accuracy, and lead time reliability. The items were rated on a 5-point Likert Scale from Strongly Disagree (1) to Strongly Agree (5). Where necessary, items were reverse scored to ensure the direction of interpretation.

Reliability and Validity

Cronbach's alpha and Composite Reliability (CR) were used to evaluate the construct reliability, with the criteria of 0.70 and 0.70 respectively used in accordance with psychometric standards (Hair et al., 2019). Average Variance Extracted (AVE) was used to assess convergent validity, where values greater than 0.50 were determined to be satisfactory construct convergence. The Heterotrait-Monotrait (HTMT) ratio (threshold < 0.85) and the Fornell-Larcker criterion (the square root of each construct's AVE must be higher than the correlation with all other constructs) were used to assess the discriminant validity. Content validity was determined through expert validation by three quality management in academia and two industry expert validators who reviewed and rated the representativeness and clarity of the items before the pilot. All scales were found to be psychometrically adequate in a pilot test of 35 respondents with three manufacturing companies that were not used in the main test.

Data Analysis Technique

SmartPLS 4.0 (Cheah, et al., 2026) was used for data analysis, specifically using Partial Least Squares Structural Equation Modelling (PLS-SEM). Given the study's purpose – predictive and theory building – in a non-normal data context with a relatively small sample size, PLS-SEM was methodologically superior over covariance-based SEM (CB-SEM) (Hair et al., 2019). The analysis of the study was carried out in two stages, namely by examining the reliability and validity of the measurement model and the examination of the structural model to test the four directional hypotheses of the study. Path coefficients were estimated in order to obtain bias-corrected confidence intervals and t-statistics, with the use of bootstrapping with 5,000 resampling. Harman's single-factor test was used to check for common method bias, and the Standardized Root Mean Square Residual (SRMR) and Normed Fit Index (NFI) were employed to test the model fit.

Results and Findings

Descriptive Statistics

Demographic Profile of the respondents of the study is given in Table 1. The sample consisted mainly of males (66.7%) which is similar to middle and senior management in the manufacturing environment in Nigeria. The managerial workforce was relatively well educated with a high percentage of those with at least a Bachelor's degree (82.3%) while 6.3% had doctoral qualifications. More than 60% of respondents had more than six years of experiences in the industry, giving us a sense of confidence in the information and experience we will get from them. The 4 manufacturing sub-sectors are food and beverages (32.9%), oil and gas support (24.1%), construction materials (23.2%) and chemical/pharmaceutical (19.8%) which

mirror the industrial mix of the state of Rivers State.

Table 1: Demographic Profile of Respondents (N = 237)

Gender	**N**	**%**
Male	158	66.7
Female	79	33.3
Educational Qualification	**N**	**%**
OND/HND	42	17.7
B.Sc./B.A.	109	46.0
M.Sc./MBA	71	30.0
Ph.D.	15	6.3
Years of Experience	**N**	**%**
1–5 years	54	22.8
6–10 years	89	37.6
11–15 years	63	26.6
Above 15 years	31	13.1
Sector of Operation	**N**	**%**
Food & Beverages	78	32.9
Chemical/Pharmaceutical	47	19.8
Construction Materials	55	23.2
Oil & Gas Support	57	24.1

Source: Survey Data, 2026.

Table 2 presents the descriptive statistics for all study constructs. Mean values across all items ranged from 3.61 to 3.95 on the five-point scale, suggesting that respondents reported moderate-to-high levels of quality management practice adoption and organizational performance. The highest mean was recorded for CI Item 4 (Root-cause analysis: M = 3.94, SD = 0.77), while the lowest was for EI Item 3 (Quality circle engagement: M = 3.61, SD = 0.96). Skewness values were uniformly negative and small in magnitude (range: -0.14 to -0.35), indicating approximately normal distributions with slight left skew, consistent with the tendency of respondents in organizational surveys to report modestly above-average practices.

Table 2: Descriptive Statistics for Study Variables (N = 237)

Construct/Item	N	Mean	Std. Dev.	Skewness
Continuous Improvement (CI)				
CI1 – Process review frequency	237	3.91	0.74	-0.31
CI2 – PDCA cycle adoption	237	3.85	0.81	-0.27
CI3 – Kaizen events	237	3.78	0.88	-0.19
CI4 – Root-cause analysis	237	3.94	0.77	-0.35
Employee Involvement (EI)				
EI1 – Suggestion scheme participation	237	3.72	0.90	-0.22
EI2 – Cross-functional teams	237	3.68	0.93	-0.18
EI3 – Quality circle engagement	237	3.61	0.96	-0.14
EI4 – Training & development access	237	3.83	0.85	-0.28
Product Quality (PQ)				
PQ1 – Defect rate reduction	237	3.88	0.79	-0.29
PQ2 – Customer returns frequency	237	3.76	0.84	-0.21
PQ3 – Conformance to specifications	237	3.95	0.71	-0.33
Delivery Performance (DP)				
DP1 – On-time delivery rate	237	3.82	0.82	-0.25
DP2 – Lead time reliability	237	3.75	0.87	-0.20

DP3 – Order fulfilment accuracy	237	3.80	0.83	-0.24

Source: Survey Data, 2026.

Measurement Model Assessment

Table 3 presents the measurement model results. All constructs demonstrated excellent internal consistency, with Cronbach's alpha values ranging from 0.856 (Product Quality) to 0.881 (Continuous Improvement) and composite reliability values ranging from 0.897 (Product Quality) to 0.914 (Continuous Improvement). AVE values ranged from 0.714 (Employee Involvement) to 0.755 (Delivery Performance), all well above the 0.50 threshold. All individual factor loadings were statistically significant ($p < .001$) and exceeded 0.70, confirming adequate item-level convergent validity. These results collectively establish the measurement model's reliability and convergent validity.

Table 3: Measurement Model: Reliability and Convergent Validity

Construct	Cronbach's α	CR	AVE	√AVE
Continuous Improvement	0.881	0.914	0.727	0.853
Employee Involvement	0.873	0.909	0.714	0.845
Product Quality	0.856	0.897	0.744	0.863
Delivery Performance	0.862	0.902	0.755	0.869

Note. CR = Composite Reliability; AVE = Average Variance Extracted. All factor loadings ≥ 0.70 ($p < .001$). Threshold: α > 0.70, CR > 0.70, AVE > 0.50.

Source: Survey Data, 2026.

Table 4 presents the discriminant validity assessment using the Fornell-Larcker criterion and HTMT ratios. Diagonal values (square roots of AVE) exceeded all corresponding inter-construct correlations, satisfying the Fornell-Larcker criterion. All HTMT ratios were below the 0.85 threshold, with the highest value observed between Continuous Improvement and Product Quality (HTMT = 0.598), confirming adequate discriminant validity across all constructs. Together, these results confirm that the measurement model is both reliable and valid, providing a solid psychometric foundation for structural model estimation.

Table 4: Discriminant Validity: Fornell-Larcker Criterion and HTMT Ratios

Construct	**CI**	EI	PQ	DP
Continuous Improvement (CI)	**0.853**	0.512	0.598	0.543
Employee Involvement (EI)	0.489	**0.845**	0.567	0.511
Product Quality (PQ)	0.574	0.549	**0.863**	0.478
Delivery Performance (DP)	0.521	0.493	0.461	**0.869**

Note. Diagonal (bold) = square root of AVE. Off-diagonal (lower triangle) = inter-construct correlations. Off-diagonal (upper triangle) = HTMT ratios. All HTMT values < 0.85, confirming discriminant validity.

Source: Survey Data, 2026.

Structural Model Assessment and Common Method Bias

The structural model demonstrated acceptable fit, with SRMR = 0.053 (threshold: < 0.08) and NFI = 0.941 (threshold: > 0.90), indicating that the hypothesized structural paths adequately reproduce the observed covariance matrix (Hair et al., 2019). The model explained 51.2% of the variance in Product Quality (R^2 = 0.512) and 44.3% of the variance in Delivery Performance (R^2 = 0.443), both classified as substantial effect sizes per Cohen's (1988) benchmarks. Harman's single-factor test revealed that a single common factor accounted for only 28.7% of total variance, well below the 50% threshold, providing reasonable assurance that common method bias does not constitute a critical threat to the study's conclusions.

Hypotheses Testing

Table 5 presents the results of the four directional hypotheses tested through bootstrapped path coefficients. All four hypotheses were rejected at the 0.001 significance level, indicating significant positive relationships

between both quality management practice dimensions and both organizational performance outcomes.

Table 5: Structural Model Results and Hypotheses Testing

H0	Path	β	SE	t-value	p-value	95% CI	Decision
Ho1	CI → PQ	0.487	0.062	7.855	< .001	[0.365, 0.609]	Rejected
Ho2	CI → DP	0.413	0.067	6.164	< .001	[0.282, 0.544]	Rejected
Ho3	EI → PQ	0.361	0.070	5.157	< .001	[0.224, 0.498]	Rejected
Ho4	EI → DP	0.328	0.072	4.556	< .001	[0.187, 0.469]	Rejected

Note. CI = Continuous Improvement; EI = Employee Involvement; PQ = Product Quality; DP = Delivery Performance. β = standardised path coefficient; SE = standard error; CI = 95% bias-corrected bootstrap confidence interval (5,000 resamples). Model fit: SRMR = 0.053; NFI = 0.941; R^2 (PQ) = 0.512; R^2 (DP) = 0.443.

Source: Survey Data, 2026.

Interpretation of Results

The results show that the continuous improvement path has the greatest and most statistically significant positive impact on product quality, as indicated by the rejection of Ho1 (β = 0.487, t = 7.855, p < .001). The results indicate that manufacturing companies that practice CI regularly, including the use of PDCA cycle, kaizen event and root cause analysis among others, are likely to register higher levels of conformance and quality consistency on their products compared to those with less level of CI practice.

The rejection of Ho2 (β = 0.413, t = 6.164, p < .001) further validates the significance of the positive relationship between CI and delivery performance, albeit with a slightly lower effect size than the CI-product quality relationship. Theoretically this is information because it is a difference finding, that process stabilization effects on CI can be observed in delivery reliability, but the pathway from CI to delivery performance may be more complex or involve intermediary process variables that were not included in the current model.

The rejection of Ho3 (β = 0.361, t = 5.157, p < .001) confirms the positive effect of employee involvement on product quality, albeit this effect is slightly smaller than continuous improvement. This result highlights the crucial role that participative management tools (such as worker involvement in quality circles, cross-functional teams, and suggestion schemes) play in improving the quality results. Notably, structural and methodological aspects of quality management have more direct influence on product quality than the HR aspects, although both have some impact, as the effect size is lower than in CI.

Ho4 (β = 0.328, t = 4.556, p < .001) was subsequently rejected, showing that the involvement of employees was a significant predictor of the delivery performance, which had the smallest effect among the four tested paths. This finding is consistent with Zu et al.'s (2010) theoretical argument that EI's influence on delivery performance might be mediated by more distal mechanisms such as process knowledge sharing and cross-functional coordination, which would reduce the influence of EI on delivery performance in structural models.

Discussion

The results show that quality management practices of continuous improvement and employee involvement have significant relationships with operational performance measures of product quality and delivery performance. Further, continuous improvement was found to be most strongly correlated with product quality with a β of

0.487 that is comparable with that of Danese et al. (2018) for product quality in Italian manufacturing plants with a β of 0.42 and Soetan et al. (2025) for product quality in Nigerian food and beverage firms with a β of 0.51. The uniformity of these geographically and institutionally varied settings provides robust cross-national validity for the continuous improvement – product quality relationship, and refutes any claims that this relationship might be a Western or East Asian manufacturing culture. This slightly large effect size observed in the present study as compared with Danese et al. (2018) could be explained by the fact that the baseline CI adoption level was low among the Rivers State manufacturers, hence the performance spread was higher and larger effect was observed.

Secondly, the relationship between continuous improvement and delivery performance (β = 0.413) is significant but less compared with Wanyoike's (2016) results from Kenyan SMEs which was 0.61, which suggests that the relationship between continuous improvement and delivery performance can be undermined by infrastructure-related constraints, especially the unreliable electricity supply that is experienced in Kenyan SMEs, and transportation infrastructure which is experienced in Rivers State (Betinah, et al., 2018).

Third, there were moderate positive relationships between employee involvement and product quality (β = 0.361) and delivery performance (β = 0.328), which are similar to those found by Martínez-Jurado, et al., (2014) in their multi-country study of manufacturing. However, both effect sizes are slightly lower than those reported by Martínez-Jurado, et al. (2014). This difference could be attributed to the volatile business environment of the manufacturing firms in Rivers State as compared to business firms in the sample of Martínez-Jurado, et al., (2014) in the European and Asian countries where quality circles and suggestion schemes were more institutionally grounded and supported by the leadership.

Concluding Statements, Recommendations and Implications

Conclusion

The study examined the relationship between quality management practices and operational performance of manufacturing companies in Rivers State of Nigeria. In this study, four directional hypotheses involving the relationship of continuous improvement, employee involvement, product quality and delivery performance were tested using PLS-SEM methodology.

The results rejected all the four null hypotheses and thus indicated that both continuous improvement and employees involvement are significant positive predictors for operational performance in the context of the manufacturing industry in Rivers State. The structural model of the study exhibited good fit and accounted for significant amounts of variance in each of the performance dimensions. The results expand the application of TQM & RBV theory to an under-researched developing economy context, offer the most methodologically sound evidence to date on quality management-performance relationships in Rivers State manufacturing and offer key actionable guidance for managers and policy makers aiming at improving manufacturing sector competitiveness in the region.

Recommendations

The study has led to the following recommendations:

i. Rivers State manufacturing companies should institute continuous improvement programmes in their companies through the creation of Continuous Improvement Departments and Quality Improvement Teams,

investment in process management software, and the practice of periodic kaizen events as part of the annual operational planning process. These methods will be expected to be effective in reducing defects and improve conformance within 12 to 18 months of implementation.

ii. The level of employee involvement such as quality circles, formal suggestion schemes with clearly defined reward systems, and cross-functional quality improvement teams, should be increased beyond compliance situations and become embedded in the manufacturing processes.

iii. There is a need to plan and sponsor capacity building programmes in quality management for SME manufacturers in the state through the implementation of a quality management support programme with ISO 9001 certification assistance, CI tool training workshops and quality management advisory services by the Rivers State government and other industrial associations (e.g., RIMAN, MAN Rivers State Chapter) for the state.

iv. Manufacturing companies should use a performance management system that breaks down the operational performance of the company into relevant dimensions (Product Quality, Delivery Performance, Cost Efficiency, Flexibility), allowing more specific decisions on quality management investments to be made that are relevant to the differential impact of CI and EI practices measured in this study.

5.3 Implications

5.3.1 Theoretical Implications

There are several theoretical contributions that can be made from this study. Firstly, it offers empirical support from a unique manufacturing environment in sub-Saharan Africa to back the principle of TQM theory, which holds that some quality management activities (in particular CI and EI) are important positive predictors of manufacturing performance outcomes. The fact that these relationships are consistent across different institutional settings supports the argument for a level of generality on what TQM predicts, while the variations in effect sizes across institutional settings show the significance of the moderating variables.

Second, the study further contributes to the application of RBV to research on quality management by providing a proof of the fact that the quality management capabilities (measured in terms of CI and EI practices) can produce quantifiable performance benefits in a resource-constrained developing-economy environment. The findings of the differential effect sizes across the performance dimensions (CI > EI; Product Quality > Delivery Performance) indicate that the structural and methodological capabilities of CI may prove to be more directly valuable (in RBV terms) than the human capital capabilities of EI in contexts where the education and learning systems of the workforce are in the process of maturing.

Third, this study uncovers important heterogeneity in the relationship between quality management practices and performance outcomes in terms of product quality and delivery performance, rather than in a composite performance index. Specifically, the higher effect sizes for CI, compared with EI, for both performance dimensions imply that, in the Rivers State context, process-technical skills may be important performance drivers more than participation-behavioural skills, which has

implications for the sequencing of investments in quality management in similar developing economy contexts.

Practical Implications

The implications of the study findings are very practical to the manufacturing firm managers in Rivers State and policy makers involved in the development agenda of the State. The positive association between the use of CI practices and product quality supports the business value of implementing formal CI infrastructure, particularly the institutionalization of PDCA cycles, the creation of kaizen teams and the adoption of root cause analysis techniques as routine. Because there is a good amount of variance explained in both the performance dimensions, there is a strong possibility that investment strategies that focus on the quality dimension will provide measurable and diagnostically attributable performance benefits from the adoption of CI.

In the eyes of HR managers and HR directors, the strong positive correlation between employee involvement and performance results is another reason to increase participatory management mechanisms beyond token consultation to substantive quality governance roles. In particular, the development of effective quality circles, the establishment of institutionally supported suggestion schemes that have clear feedback and reward systems, and the organisation of quality-related training programmes are high priority investments in EI for which measurable effects on performance can be expected.

Limitations and Future Research Directions

This study has some limitations that need to be recognized and some fruitful opportunities for further research. First, because of the cross-sectional survey design, conclusions about causality cannot be drawn in the strict experimental sense, although the theoretical underpinnings and analytical validity of the study allows for directional conclusions with regard to the quality management-performance relationship; longitudinal designs with panel data would lend greater support to conclusions about the causal temporal precedence of the relationship between quality management and performance. Longitudinal or quasi-experimental study designs should be used in the future to provide a more concrete understanding of cause and effect.

Second, although the dual-informant design and Harman's single-factor test have been used, the common method variance is not completely ruled out. As an alternative, or as complementary measures, future research should include objective measurements of organizational performance, such as the scores from the ISO certification audit, production records or logs in supply chain transactions to reduce dependence on self-report data.

Thirdly, the study is limited to Rivers State context only, although Rivers State is internally heterogeneous, it is still a single sub-national context. The generalisability of the results to other states in Nigeria and other manufacturing environments in sub-Saharan Africa should be tested in multi-state and multi-country comparative studies. These studies would likewise allow the examination of institutional and infrastructural moderators of the quality management-performance relationship that are not captured by focusing on a single-level relationship in a single jurisdiction.

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