

**TOTAL QUALITY MANAGEMENT AND PRODUCT INNOVATION OF
MANUFACTURING FIRMS IN RIVERS STATE**

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ABSTRACT

This research looked at how manufacturing companies in Rivers State, Nigeria, were able to innovate their products via the use of Total Quality Management (TQM). The study investigated the potential benefits of employee participation and continuous improvement, two essential TQM components, to improving the capacity for product creation. Based on relevant literature, the research developed two theories. Using a survey tool, information was gathered from 187 industrial companies in Rivers State. To assess the hypotheses, statistical analysis was done using the P-value and Pearson Product Moment Correlation Coefficient. Regarding the examined factors, strong positive associations were discovered. In particular, there were statistically significant positive correlations between employee participation and continuous improvement and product innovation ($\rho = .820$, $p = 0.000$ and $\rho = .776$, $p = 0.000$, respectively). As a result, the null hypothesis was refuted and the findings were in line with previous research demonstrating TQM's positive effects on product innovation. Consequently, it was determined that the results provide convincing empirical proof that staff engagement and continuous improvement are essential for promoting product innovation in Nigerian manufacturing companies. This reaffirmed how important it is to strategically use TQM to improve innovative skills. Based on the research findings, the management of manufacturing firms was advised to strengthen initiatives for continuous improvement by establishing a culture of innovation, regular training, and assessments; increase employee involvement by putting in place formalised structures and processes that encourage staff members to participate in the innovation process; and create an environment that is supportive of departments working together.

Keywords: Continuous improvement, Employee Involvement, Total Quality Management, Product Innovation

Introduction

Innovation is crucial for industrial companies. It enables businesses to acquire or hold onto a competitive edge in both home and foreign markets (Tran, Thanh & Duyt, 2023). According to Chipambwa, Moalosi, Molwane, and Rapitsenyane (2023), there is a favourable correlation between innovation activities and the likelihood of participating in export operations. Moreover, innovation management is essential to a company's success since it enables them to establish a presence in the market, provide value, and attract new clients (Vijayakumar & Chandrasekar, 2022). To promote radical and diverse kinds of innovation, manufacturing companies with historic origins must integrate new generating knowledge in creative ways (Plechero &

Grillitsch, 2022). Thus, for manufacturing companies to spur development, add value, and gain a competitive edge, innovation investment is essential. Numerous forms of innovation, including organisational, process, marketing, and product innovation, have been identified in the literature and have been proven to positively correlate with company success (Ayinaddis, 2023; Mwaifyusi & Dau, 2023). Product innovation has been shown to have the most beneficial impact on business performance of all these forms of innovation (Ayyasamy, Shaikh, Lah, Kalhor, Chinnasamy & Krisnan, 2023).

There are many theoretical connections between product innovation and total quality management, or TQM. First, TQM offers an infrastructure and supportive organisational culture that promotes innovation (Heringer, Carvalho, & Sampaio, 2022). TQM fosters an atmosphere that is favourable to product innovation by integrating staff members in continuous improvement initiatives and giving them the freedom to provide suggestions (Shuaib & He, 2023). According to Ershadi, Najafi, and Soleimani (2019), companies may discover new market trends and consumer requirements by using second TQM concepts like customer focus and data-driven decision making. This process enables the creation of creative goods that address these demands. The focus of Third TQM on waste reduction and process improvement helps the company to optimise its product development processes, which accelerates innovation and reduces time-to-market (Mushtaq & Peng, 2020; Antunes, Mucharreira, Justino, & Quirós, 2021; Bazrkar, Aramoon, Hajimohammadi & Aramoon, 2022; Tajouri, 2023).

Even though TQM and product innovation are acknowledged to be important, there isn't enough study in the literature currently in existence that is especially focused on manufacturing companies in Rivers State, Nigeria. Studies on TQM and product innovation in broad settings have been done, but little is known about the particular difficulties and possibilities encountered by manufacturing companies in Rivers State. This gap in the literature emphasises the need for more study to determine how TQM procedures and product innovation are related, particularly in the context of Rivers State.

Furthermore, the majority of the material now in publication concentrates on established nations, paying little attention to growing areas like Nigeria's Rivers State. The distinct socioeconomic and cultural attributes of Rivers State might potentially impact the execution and efficacy of Total Quality Management (TQM) methodologies and product innovation tactics. Thus, studying this particular setting will provide important insights into the potential and difficulties that manufacturing companies in Rivers State confront when it comes to TQM and product innovation.

Literature Review

Total Quality Management

Customer satisfaction and ongoing improvement are at the centre of the total quality management (TQM) approach to management. To improve productivity and raise product quality, it entails coordinating quality management procedures with Industry 4.0's capabilities (Liu, Liu, Gu & Yang, 2023). Quality as a system objective is introduced by TQM, which encompasses all elements of an organisation (Helmold, 2023). Total Quality Management (TQM) is an essential facet of the manufacturing sector that endeavours to achieve optimal customer satisfaction via the continual improvement of all operations (Thapliyal, 2018). To increase competitiveness and address the problems posed by global marketplaces, TQM is crucial (Chauhan, 2018). Implementing TQM may benefit the manufacturing industry in a number of ways, including increased productivity, reduced costs, and higher-quality products (Prakash, Sharma & Cacal, 2023). Manufacturing industries can establish a favourable work environment that promotes employee satisfaction and facilitates improved performance outcomes by putting TQM practices into practice that are in line with elements like employee involvement, training and development, effective communication, supportive leadership, and teamwork (Ming, 2023).

Product Innovation

A key component of corporate success, product innovation has been extensively researched across several sectors and nations. Product innovation success factors have been found and categorised into four categories: development, market, organisational, and strategic variables (Vy, 2023). The literature has examined product innovation in manufacturing enterprises extensively. Research has shown that the implementation of product innovation strategies has a noteworthy and favourable effect on the operational efficiency of major manufacturing companies (Jiang, Jiang, Sun & Fan, 2023). These tactics include creating new items and refining current ones, which may raise the calibre and effectiveness of manufacturing companies (Vy, 2023). Furthermore, companies that prioritise product innovation have a higher chance of expanding and strengthening their competitive edge (Xiao, Hajar, & Hutahayan, 2022).

Continuous Improvement and Product Innovation

In order to increase organisational performance and competitiveness, two fundamental ideas in management are continuous improvement and product innovation. While some contend that these two ideas have a significant link, others have opposing opinions that imply the relationship may not be definitive (Çetin, 2022). For example, continuous improvement practices have been shown to be positively correlated with improved performance in product innovation (Lizarelli, De Toledo, Gambi, & Gonçalvesa, 2022). Innovation tends to be more prevalent in companies with more developed continuous improvement behaviour levels, which supports investments in continuous improvement (Lizarelli, De Toledo, & Alliprandini, 2019). According to Shanmuganathan's (2018) research, there is a complete mediating influence of continuous improvement on the link between financial success and innovation.

Since they are crucial for boosting competitiveness and meeting consumer expectations, manufacturing companies have extensively implemented and encouraged continuous

improvement programmes and innovation (Lizarelli et al., 2019; Tian, 2023). The link between product innovation and continual improvement is not without detractors, however. One argument is that implicit government guarantees might prevent businesses from continuously innovating, which can result in excessive debt, inefficient investments, expenses associated with rent-seeking, and the growth of zombie businesses (Riesener, Kühn, Perau, & Schuh, 2022). A further contention is that conventional methods of innovation are inadequate for tackling the difficulties brought about by ever-changing market conditions and escalating worldwide rivalry (Çetin, 2022; Riesener et al., 2022). Furthermore, there exists a dearth of research concerning the correlation between innovation success in manufacturing organisations and continuous improvement strategies, such as quality data and reporting and continuous improvement. Given this seeming inconclusive positions in literature, we hypothesize that:

H₀₁: There is no significant relationship between continuous improvement and product innovation.

Employee Involvement and Product Innovation

Product innovation has been said to benefit from employee engagement. Research has shown that workers of all stripes has the capacity to generate novel concepts to enhance workflows, goods, and services (Vidal, 2022). Employee desire and aptitude to generate creative ideas has been shown to be closely correlated with factors such workplace support and development, employee participation, and performance management (Ramzan, Ramzan, Ibrahim, Tangri, Al-Kassem, Inairat, Marwaha & Khatib, 2022). This implies that including workers into the process of innovation may result in higher output and more robust economic expansion (Ramzan et al., 2022). In light of this, employee participation may be seen as a useful tool for coming up with creative concepts and enhancing the results of product innovation. However, others contend that organisational structure and protocols should enable collective employee engagement in product creation (Felstead, Gallie, Green & Henseke, 2020). This emphasises how crucial it is to formalise the process of product creation and development in order to promote communication and cooperation between various organisational divisions (Broberg, Jensen & Gish, 2015).

Notwithstanding, most of these studies have not assessed the relationship between involvement and product innovation within the context of the Nigerian manufacturing industry; therefore it is hypothesized that:

H₀₂: There is no significant relationship between employee involvement and product innovation.

Theoretical framework

Resource-Based View (RBV)

According to the RBV (Barney, 1991; Holdford, 2018), a firm's competitive advantage originates from its special and valued resources and skills. Continuous improvement and employee interaction are considered useful resources in the context of this research. According to Kullberg, Edén, and Wänström (2022) continuous improvement refers to a company's capacity to continuously learn, adapt, and enhance its technology, processes, and output. Businesses may create creative solutions and adapt successfully to shifting market needs thanks to this dynamic aptitude (Barinua & Apochi, 2022). Furthermore, when workers have autonomy and actively participate in decision-making and problem-solving, they provide insightful opinions and inventive ideas that may spur the development of new products (Ramzan et al., 2022; Vidal, 2022). Additionally, their level of commitment to the company's success and its quality objectives increases.

According to the RBV, TQM approaches such as employee participation and continuous improvement may result in important resources and skills that help businesses create novel goods and get a competitive advantage. Consequently, the RBV theory was used in this research to evaluate how these resources mediate the connection between TQM and product innovation.

Empirical Review

Hortsfall, Ukoha, and Alagah (2018) used primary sourced data collected by structured questionnaire, with a sample size of 238 respondents out of a population of 588, to assess the

relationship between Total Quality Management and organisational performance of Manufacturing enterprises in Nigeria. In order to integrate the unit of measurements of the utilised variables, this research uses dimensions like product improvement, process improvement, and customer focus together with measures like employee and customer satisfaction and an all-encompassing moderating variable called technology. The majority of the managers had a strong knack for process improvement and were generally weak towards product improvement, which could also be attributed to their marital status as most of the respondents were married and might have maintained a stringent workplace behaviour due to their level of responsibility in and out of their respective workplaces. The study found that despite the inherent importance of total quality management, managers had rarely adopted it. This was typically due to their gender. A strong and positive correlation was seen between the variables used, indicating that an increase in any of the Total Quality Management indicators is extremely likely to result in an increase in the organisational success status as well. Therefore, it was advised that managers devote the necessary time and funds to putting TQM programmes into action. This research also emphasises how crucial it is to use technology to create a positive organisational climate in order to successfully use TQM.

The research conducted in 2019 by Ezenyilimba, Ezejiofor, and Afodigbue assessed the impact of Total Quality Management on the organisational performance of Nigerian deposit money institutions. The specific goals are to: determine the impact of TQM on customer satisfaction in Nigerian deposit money banks; investigate the relationship between TQM and customers' ongoing loyalty in Nigerian deposit money banks; and determine whether or not the implementation of TQM has aided in producing higher-quality output at a lower cost. The study used a survey research approach, whereby data was gathered via a questionnaire and tabulated. The Statistical Package for Social Science (SPSS) version 20.0 was utilised to facilitate the T-test. The results demonstrate how the implementation of overall quality management methods influences the ongoing loyalty of customers in Nigerian deposit money institutions and how it has helped to achieve higher-quality output at lower costs. The results of the study led to the

recommendation that employee engagement be permitted. This would foster an atmosphere in the workplace where employees feel empowered to comply with client requests and take the appropriate actions to meet organisational values and objectives.

The link between employee participation in decision-making and perceived organisational success was investigated by Sofijanovska and Zabijakin (2013). Concurrently, the notion of employee engagement was examined by situating it within the framework of national culture. Method: information was gathered via a survey of 36 Macedonian industrial businesses. A statistical analysis of the data was done along with a quantitative approach to conduct a hypothesis test. Perceived organisational success is positively correlated with the efficient utilisation of employee participation. More specifically, there is a direct and statistically significant relationship between the management assessment of the performance of the organisation and employee engagement and empowerment programmes as well as the employment of self-managing teams. Based on the above stated findings, it is recommended that businesses implement employee engagement initiatives to improve productivity, expansion, and competitiveness in both local and international markets.

In order to determine whether adopting Continuous Improvement (CI) behaviours is associated with improved radical and incremental product and process innovation performance, Lizarelli, Toledo, Gambi, and Gonçalves (2022) conducted an investigation. Additionally, they sought to ascertain whether CI behaviours had a positive impact on respondents' perceptions of CI contributions to innovation performance. Data were gathered from 139 Brazilian companies, and groups with varying degrees of CI adoption were found using cluster analysis. Manager perceptions of CI and innovation were used to validate variations in innovation performance at organisations using the nonparametric Wilcoxon–Mann–Whitney test. Research indicates that improved performance in terms of product and process innovation was linked to a greater adoption of CI behaviour. Additionally, businesses with more developed CI behaviour levels innovate more, which might support CI investments.

Methodology

The Cross-Sectional Survey design was used for this investigation. The managers and supervisors of the 114 manufacturing companies in Rivers State that are members of the Manufacturing Association of Nigeria (MAN) were the study's target group. based on the information found in the Nigerian directory. One hundred and twenty (120) managers and supervisors from five industrial enterprises in Rivers State that are registered make up the accessible population. This study used a census design since it was more convenient for the researcher. As a result, the sample size of 120 people was kept constant. Primary sources provided the study's data. The answers to the questionnaire that was administered served as the study's main source of data.

Measures

Total Quality Management is the study's independent variable. Its dimensions—continuous improvement and employee involvement—were drawn from research by Sivankali (2012) and Bon and Mustafa (2014). Product innovation, which was the subject of a previous research by Alaei, Shafaaee, Ariana, and Maghvan (2012), is the dependent variable for this investigation. A four-point Likert scale with the options Strongly Disagree (1), Disagree (2), Agree (3), and Strongly Agree (4) was used to operationalize the dimensions and measurements.

Copies of the questionnaire were sent to management specialists in order to assess the validity of the research. They were given time to complete the questionnaire and, if necessary, offered recommendations or critiques. The researcher took note of these recommendations and/or critiques and included them into the instrument to give it face and content validity.

Test of Reliability

Using the Statistical Package for Social Science (SPSS), the Cronbach alpha coefficient was used to evaluate the internal consistency of the survey instrument. Therefore, only those elements yielding alpha values greater than 0.7 were taken into account. The Cronbach Alpha values for every research variable are shown in Table 1.

Table 1: Cronbach Alpha Values for each of the Study Variables

	Cronbach's Alpha	N of Items
Continuous Improvement	.846	4
Employee Involvement	.834	4
Product Innovation	.748	4

Method of Data Analysis

Tables were used to help classify the acquired data into distinct categories for analysis purposes in this research. Percentages were used in the study, and the results were appropriately interpreted. Using the statistical programme for social sciences (SPSS), the hypotheses were tested using the Pearson Product Moment Correlation Coefficient test.

Results and Discussion

Table 2: Distribution and Retrieval of Questionnaire

Questionnaire	Number Distributed	Number Returned and Used
Frequency	200	187
Percentage	100%	93.5%

A total of 200 (100%) copies of the structured questionnaire were distributed to target manufacturing firms within a specified timeframe. The questionnaire was primarily quantitative in nature and was distributed manually through established contacts in the selected manufacturing firms. Retrieval of the data was also completed through the same contacts in the firms. A total of 187 (93.5%) copies were successfully recovered from distribution.

4.2 Demographic Analysis

Data on the demography was examined on four characteristics: Gender, Age, Marital Status and Educational Qualification.

Table 3: Demographic Characteristics

Demographic Characteristics	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Gender				
Male	104	55.6	55.6	55.6
Female	83	44.4	44.4	100.0
Total	187	100.0	100.0	100.0
Age Group				
Less than 25 years	48	25.7	25.7	25.7
26 – 35 years	73	39.0	39.0	64.7
36 – 45 years	31	16.6	16.6	81.3
46 – 55 years	21	11.2	11.2	92.5
56 years and above	14	7.5	7.5	100.0
Total	187	100.0	100.0	100.0
Marital Status				
Single	77	41.2	41.2	41.2
Married	93	49.7	49.7	90.9
Others	17	9.1	9.1	100.0
Total	187	100.0	100.0	100.0
Educational qualification				
B.Sc/HND	102	54.6	54.6	54.6
MS.c/MBA	32	17.1	17.1	71.7
OND/Diploma	53	28.3	28.3	100.0
Total	187	100.0	100.0	100.0

Table 3 provides important information about the research participants' demographic makeup. The research participants are somewhat more male (55.6%) than female (44.4%), according to the table. Additionally, the age category comprises those under 25 (25.7%) and those between 26

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and 35 (39.0%). This points to a comparatively youthful workforce, which may reflect an emphasis on attracting and keeping professionals in their early careers. In addition, the biggest category is made up of married people (49.7%), followed by single people (41.2%). The category "Others" is assigned to a rather small group (9.1%). Last but not least, the bulk of people have a B.Sc. or HND (54.6%), followed by OND/Diploma holders (28.3%) and MSc/MBA holders (17.1%). This distribution suggests a range of educational backgrounds, which may represent a variety of experience levels and skill sets.

Test of Hypotheses

Table 4: Continuous Improvement and Product Innovation (Test for Hypothesis 1)

		Continuous Improvement	Product Innovation
Continuous Improvement	Pearson Correlation	1	.820**
	Sig. (2-tailed)		.000
	N	187	187
Product Innovation	Pearson Correlation	.820**	1
	Sig. (2-tailed)	.000	
	N	187	187

Based on the data presented in Table 4, which indicates a significant relationship between continuous improvement and product innovation ($\rho = .820$ and $p = 0.000$), we reject the null hypothesis and reiterate the presence of a significant relationship between continuous improvement and product innovation, using the $p < 0.05$ decision rule.

Table 5: Employee Involvement and Product Innovation (Test for Hypothesis 2)

		Employee Involvement	Product Innovation
Employee Involvement	Pearson Correlation	1	.776**
	Sig. (2-tailed)		.000
	N	187	187
Product Innovation	Pearson Correlation	.776**	1
	Sig. (2-tailed)	.000	
	N	187	187

Based on the null hypothesis being rejected at $p < 0.05$, we reject the result in Table 5, which shows a significant relationship between employee involvement and product innovation ($\rho = .776$ and $p = 0.000$).

Discussion of Findings

Based on the findings, an empirical correlation was found between overall quality management and product innovation in manufacturing companies located in Rivers State.

Continuous Improvement and Product Innovation (H_{01})

The results of the research and the literature analysis demonstrate a strong correlation between product innovation and continuous improvement. Lizarelli et al. (2019), for example, stress that businesses that have robust practices for continuous improvement do better when it comes to product innovation. Contributing to the discussion is Shanmuganathan (2018), who recognises continuous improvement as a complete mediator in the link between financial success and innovation. Conversely, opposing viewpoints (Çetin, 2022; Riesener et al., 2022) raise worries about government assurances and the shortcomings of conventional innovation methodologies, suggesting that further innovation may be inhibited. The empirical test rejects the null hypothesis (H_{01}) and finds a substantial positive link ($\rho = .820$, $p = 0.000$) between product innovation and continuous improvement. As a result, this research provides empirical support for the claims made by Shanmuganathan (2018) and Lizarelli et al. (2019) on the beneficial relationship between product innovation and continuous improvement.

Employee Involvement and Product Innovation (H_{02})

Product innovation is favourably impacted by employee engagement, which is a significant component. Employee participation in the innovation process boosts output and spurs economic development, according to studies by Vidal (2022) and Ramzan et al. (2022). According to Felstead et al. (2020) and Broberg et al. (2015), formalising the innovation process becomes crucial. Nonetheless, the literature also emphasises the need of institutional support and group organisation for employee participation. Regarding hypothesis (H_{02}), the null hypothesis is

rejected (Table 4.4) according to the empirical study supporting a substantial positive link between employee participation and product innovation ($\rho = .776$, $p = 0.000$). The present research provides further empirical evidence in support of previous academic proposals that show employee participation has a major influence on corporate innovation, including product innovation.

Overall, the synthesis of literature and empirical findings underscores the importance of continuous improvement and employee involvement in fostering product innovation.

Conclusion and Recommendations

The research found a strong empirical correlation between employee participation and continuous improvement—two aspects of comprehensive quality management—and product innovation in manufacturing companies in Rivers State. The results confirm the beneficial relationships reported in the literature, highlighting the importance of TQM procedures for promoting creativity. Consequently, it is recommended that the management of manufacturing firms in Rivers State should:

- i. Strengthen continuous improvement initiatives, by inculcating continuous improvement behaviours. This can involve regular training, assessments of existing processes and fostering a culture of innovation.
- ii. Enhance employee involvement by establishing formalized processes for employee involvement in the innovation process. This may include creating a supportive organizational environment, and adopting structures that facilitate collaboration between different departments.

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