Scientific Research Publishing

Open Journal of Business and Management, 2024, 12, 3880-3893
https://www.scirp.org/journal/ojbm
ISSN Online: 2329-3292
ISSN Print: 2329-3284

Assessing the Impact of Inventory Turnover on Quality Control: A Study of Manufacturing Firms in South-West Nigeria within the Context of Supply Chain Management

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How to cite this paper: Ubolo, G. O., Salami, Y., Musa, A., Nwaubani, R. U., & Tijani, N. A. (2024). Assessing the Impact of Inventory Turnover on Quality Control: A Study of Manufacturing Firms in South-West Nigeria within the Context of Supply Chain Management. *Open Journal of Business and Management, 12,* 3880-3893.
https://doi.org/10.4236/ojbm.2024.126194

Received: August 23, 2024
Accepted: October 22, 2024
Published: October 25, 2024

Abstract

This study investigates the effect of inventory turnover on quality control in manufacturing firms located in South-West Nigeria. The research focuses on both senior and junior employees across ten selected manufacturing companies, chosen based on their extensive industry experience. A judgmental sampling technique was employed to ensure the inclusion of firms with significant backgrounds in manufacturing. The analysis was conducted using SPSS 27, a statistical software package, with regression analysis being the primary method used to test the hypotheses. The regression analysis reveals a significant positive relationship between inventory turnover and quality control, as indicated by a coefficient of 0.413. This suggests that for every one-unit increase in inventory turnover, quality control improves by 0.413 units. The statistical significance of the findings, with a *p*-value of 0.000, underscores the importance of inventory turnover as a key predictor of quality control within the studied context. These results highlight the critical role that effective inventory management plays in enhancing the quality control processes of manufacturing firms in South-West Nigeria.

Keywords

Supply Chain Management, Inventory Turnover, Quality Control, Nigeria

1. Introduction

Supply chain management (SCM) has become an essential strategic tool for manufacturing firms seeking to improve their competitive advantage and operational

efficiency. As firms navigate increasingly complex global markets, effective management of supply chain processes has been recognized as critical to achieving organizational goals (Darvazeh et al., 2020). One of the core elements of SCM is inventory management, which plays a pivotal role in determining a firm's operational performance. Inventory turnover, a key performance indicator within inventory management, reflects how efficiently a company manages its stock of goods. It measures the number of times inventory is sold and replaced over a period, providing insights into the efficiency of inventory utilization (Orobia et al., 2020).

The relationship between inventory turnover and quality control in manufacturing firms is a subject of considerable academic interest. High inventory turnover often indicates efficient inventory management, reducing holding costs and minimizing the risks associated with obsolete stock. However, rapid inventory turnover can also lead to challenges in maintaining consistent quality standards, as firms may prioritize speed over thorough quality checks (Demir & Paksoy, 2023). This tension between inventory turnover and quality control becomes particularly pronounced in manufacturing environments where product quality is critical to customer satisfaction and brand reputation (Sharifpour et al., 2022).

In the context of South-West Nigeria, manufacturing firms face unique challenges that affect both inventory turnover and quality control. The region's industrial sector, while growing, is often hampered by infrastructural deficits, supply chain disruptions, and fluctuating market demands (Ebekozien et al., 2023). These factors necessitate a careful balance between maintaining adequate inventory levels and ensuring high-quality output. As such, understanding the impact of inventory turnover on quality control within this context is vital for both scholars and practitioners (Leeman, 2020).

This study aims to explore how inventory turnover affects quality control in manufacturing firms in South-West Nigeria, with a focus on identifying best practices in inventory management that do not compromise product quality. By investigating this relationship, the study seeks to contribute to the broader discourse on supply chain management and offer practical recommendations for improving operational efficiency and quality standards in the region's manufacturing sector (Ozigbo, 2020).

Article Structure

This article has seven sections. Section 1 is the introduction, Section 2 contains the literature review, section 3 contains the research methodology, Section 4 contains findings, Section 5 contains the discussion and conclusion of findings, section 6 contains the practical implication and section 7 contains the recommendations.

2. Literature Review

2.1. Supply Chain Management

The goal of supply chain management (SCM), a multidisciplinary topic, is to

optimize the flow of goods, information, and funds by integrating multiple tasks both within and across organizations. From traditional logistics and operations management, supply chain management (SCM) has developed to emphasize the value of supply chain partners working together to gain a competitive edge (Sharifpour et al., 2022). In order to improve the long-term performance of the individual companies as well as the supply chain as a whole, Meredith and Shafer (2023) define supply chain management (SCM) as the systematic, strategic coordination of traditional business functions and the tactics across these business functions within a specific company and across businesses within the supply chain. The term underscores the interdependence of supply chain operations and the necessity of using integrated management strategies to attain comprehensive efficiency (Brandl, 2023).

Due to the expanding complexity of global marketplaces, technological improvements, and the growing significance of sustainability, supply chain management (SCM) has received a lot of attention in recent years (Darvazeh et al., 2020). Effective supply chain management (SCM) techniques have become essential as businesses aim to satisfy consumer needs while reducing expenses and maximizing flexibility. Demand forecasting, purchasing, production scheduling, inventory control, distribution, and logistics are important components of supply chain management. The successful integration of these interconnected parts is crucial for the optimization of supply chain performance (Leeman, 2020).

2.2. Inventory Management in Supply Chain Management

Since inventory management directly impacts product availability, customer happiness, and overall operational efficiency, it is an essential part of supply chain management (SCM). Inventory management, according to Becerra et al. (2021), include organizing and managing inventories to satisfy the organization's competitive priorities. Efficient inventory control guarantees that the appropriate quantity of goods is accessible at the appropriate moment, reducing the expenses linked to storing surplus inventory and averting stockouts that may result in diminished sales and disgruntled clients (Khan et al., 2023).

The kind of products offered, the complexity of the supply chain, and the structure of the business all influence inventory management tactics. ABC analysis, Just-in-Time (JIT), and Economic Order Quantity (EOQ) are a few popular inventory management strategies. The objectives of each of these strategies are to maximise inventory levels, lower expenses, and enhance market responsiveness (Anantadjaya et al., 2021).

2.3. Understanding Inventory Turnover

A key performance indicator (KPI) in inventory management, inventory turnover gauges how frequently a business sells and replenishes its stock over a given time frame. It is computed by dividing the average inventory for the same time by the cost of goods sold (COGS) (Henry et al., 2023). An organisation may be practicing

effective inventory management if its inventory is being sold quickly, as indicated by a greater inventory turnover ratio. On the other hand, a lower inventory turnover ratio can indicate that stock isn't moving as quickly, which could result in more holding costs and an increased chance of obsolescence (Breivik et al., 2023).

One crucial indicator of how well a company's supply chain functions is inventory turnover. It offers perceptions into how well distribution, production scheduling, procurement, and demand forecasting techniques work. Businesses with high inventory turnover percentages are frequently better able to save waste, enhance cash flow, and react to changes in the market more swiftly. However, in order to guarantee that procurement and production activities are in line with consumer demand, attaining a high inventory turnover ratio necessitates meticulous planning and coordination throughout the supply chain (Gebisa, 2023).

2.4. Relationship between Inventory Turnover and Supply Chain Performance

Many studies have been conducted in the field of supply chain management (SCM) to examine the relationship between inventory turnover and supply chain performance. Research has demonstrated a correlation between enhanced supply chain performance and effective inventory management, as demonstrated by a high inventory turnover rate. For instance, Henry et al. (2023) discovered inventory efficiency is integrated along the supply chain, resulting in a positive correlation between supplier and customer inventory turnover It's not always clear how supply chain performance and inventory turnover are related, though. Having a high inventory turnover rate might occasionally make it difficult to maintain product quality, adhere to delivery deadlines, and guarantee customer happiness. For example, (Breivik et al., 2023) discovered that efficiency in inventory performance varies depending on local market conditions and store location. This implies that while a high inventory turnover rate is preferred, it needs to be weighed against other performance metrics in the supply chain, like quality assurance and service standards.

2.5. Inventory Turnover and Quality Control

A crucial component of supply chain management (SCM) is quality control, which guarantees that goods fulfil all norms and specifications before being delivered to customers. Sustaining customer pleasure, establishing brand reputation, and averting expensive recalls or rework all depend on efficient quality control. But with industrial companies, quality control and inventory turnover frequently come at a cost (Breivik et al., 2023).

Rapid movement of items through the supply chain is reflected in high inventory turnover, which can occasionally jeopardise quality control. This is due to the possibility that efficiency and speed-driven approaches could result in shortened inspection timeframes or the use of inferior materials in quality assurance procedures. Because of this, businesses can see an increase in returns, defects, and

consumer complaints, all of which could be detrimental to their bottom line and reputation (Henry et al., 2023).

On the other hand, firms that prioritize quality control may experience lower inventory turnover as they invest more time and resources in ensuring that products meet the required standards (Rubel, 2021). This can lead to higher inventory levels, increased holding costs, and slower response times to market changes. Therefore, firms must strike a balance between inventory turnover and quality control to achieve optimal supply chain performance (Gebisa, 2023).

3. Methodology

A descriptive survey research design was used for this investigation. The goal of descriptive survey study design is to accurately describe events as they occur, without altering what led up to them or what is being observed. In surveys, data is gathered, examined, and utilised to address research questions, among other things. The study's target demographic consists of senior and junior employees of southwest Nigerian manufacturing companies. Using a judgmental sample technique, ten (10) manufacturing enterprises from southwest Nigeria were included in this study. The manufacturing companies that made the cut were those with extensive backgrounds in the industry.

Table 1. Population of the study.

S/No	Geo-Political Zone	Organization	Population	Sample Size
1.	South West	Dangote Groups	580	58
2.	South West	Unilever Nigeria Plc.	500	50
3.	South West	Nestle Nigeria Plc.	480	48
4.	South West	Nigerian German Chemicals Plc.	450	45
5.	South West	PZ Cussons Nigeria Plc.	320	32
6.	South West	Flour Mills of Nigeria Plc.	300	30
7.	South West	Lafarge Africa Plc.	270	27
8.	South West	DN Tyre and Rubber (Dunlop) Nig. Plc.	240	24
9.	South West	DUFIL Prima Foods Limited	240	24
10.	South West	Cadbury Nigeria plc.	220	22
		Total No. of Staff	3,600	360

Source: Field Survey, 2024.

With a total population of 3600, the South West geopolitical zone is home to a sizable concentration of prominent organizations, as seen in **Table 1**. Dangote Groups is the largest group in this category, with 580 people, closely followed by Unilever Nigeria Plc. (500 people) and Nestle Nigeria Plc. (480 people). PZ

Cussons Nigeria Plc. adds 320 and Flour Mills of Nigeria Plc. adds 300, and Nigerian German Chemicals Plc. contributes 450 to the total. DN Tyre and Rubber (Dunlop) Nig. Plc. and DUFIL Prima Foods Limited each contribute 240 people, Lafarge Africa Plc. has 270 people, and Cadbury Nigeria Plc. has 220 people. The distribution of the labour and industrial capacity in the South West area are highlighted in this aggregate.

3.1. Sample Size

Depending on the characteristics of the population of interest, the sample size may be large or small. Three thousand six hundred people make up the actual study population (3600).

According to Umar and Wachiko (2021) Taro Yamane's formula for determining sample size was applied to this population, yielding a sample size estimate with a 95% confidence level and a 5% error tolerance.

The formula is stated below.

$$n = \frac{N}{1 + Ne^2}$$

where n = the sample size.

e = level of significance proportion of sampling error.

1 = constant value.

N = the finite population size.

The sample size for this study was therefore:

$$n = \frac{3600}{1 + 3600 \times 0.05^2}$$

$$n = \frac{3600}{1 + 3600 \times 0.0025}$$

$$n = \frac{3600}{1 + 9}$$

$$n = \frac{3600}{10}$$

$$n = 360$$

This gives a sample size of 360.

The designated organizations were properly represented using proportionality formula.

Thus: $Q = A/N \times n/1$

where:

Q = the number of the questionnaire allocated to each selected manufacturing firm.

A = the population of each selected manufacturing firm.

N = the total population of all selected manufacturing firms.

n = the estimated sample size used in the study.

Thus:

Dangote Groups

Proportion of staff to be sampled

$$\frac{580}{3600}\times\frac{360}{1}=58$$

Unilever Nigeria Plc.

Proportion of staff to be sampled

$$\frac{500}{3600}\times\frac{360}{1}=50$$

Nestle Nigeria Plc.

Proportion of staff to be sampled

$$\frac{480}{3600}\times\frac{360}{1}=48$$

Nigerian German Chemicals Plc.

Proportion of staff to be sampled

$$\frac{450}{3600}\times\frac{360}{1}=45$$

PZ Cussons Nigeria Plc.

Proportion of staff to be sampled

$$\frac{320}{3600}\times\frac{360}{1}=32$$

Flour Mills of Nigeria Plc.

$$\frac{300}{3600}\times\frac{360}{1}=30$$

Lafarge Africa Plc.

Proportion of staff to be sampled

$$\frac{270}{3600}\times\frac{360}{1}=27$$

DN Tyre and Rubber (Dunlop) Nig. Plc.

Proportion of staff to be sampled

$$\frac{240}{3600}\times\frac{360}{1}=24$$

DUFIL Prima Foods Limited

Proportion of staff to be sampled

$$\frac{240}{3600}\times\frac{360}{1}=24$$

Cadbury Nigeria plc.

Proportion of staff to be sampled

$$\frac{220}{3600}\times\frac{360}{1}=22$$

3.2. Sources and Method of Data Collection

This study used primary sources to create its data. Data were gathered using the

survey technique of research's instruments, which include the distribution of questionnaires, observation, and in-person interviews.

A structured questionnaire was the research tool employed in this study. The research questions and hypotheses were taken into consideration when creating the questionnaire. There are two portions in the questionnaire design: A and B. While the following questions in section B were intended to directly address the study topics, all of the questions in section A were designed with the intention of eliciting some generic information from the respondents. The questionnaire was designed using a four-point Likert scale style. The questionnaire consists of 23 questions. The questionnaire was be distributed to the staff of the selected manufacturing firms.

3.3. Method of Data Analysis

The analysis software is called SPSS 27, which is a statistical software package. Statistical methods like regression were employed to test the hypotheses in accordance with the problem or demand. To allow the researcher to compare the responses in a meaningful way, the frequencies were converted to percentages (%). By converting frequency counts into percentages and utilizing "100" as a common base for comparison, the number per hundred is displayed.

3.4. Test of Validity and Reliability

By offering the instrument to experts for revision, the researcher guaranteed its validity through face-to-face validation. The questionnaire was correctly structured and pre-tested to ensure sampling validity. In order to determine whether the instrument covered a representative sample of the behavioural domains, content validity was evaluated. Additionally, consistency between the items and other research aspects was checked. Each section of the instrument was meticulously examined to ensure that it aligned with the research objectives and hypotheses.

A test-retest methodology was employed to ensure reliability, whereby twenty copies of the questionnaire were distributed to a subset of manufacturing enterprises, and the copies were re-administered after a few days. Reliability was assessed using the Spearman Rank Order Correlation Coefficient, yielding a strong consistency score of $P = 0.9714$.

Table 2. Reliability table.

Organization	First average X	Second average Y	Xr	Yr	D	d^2
1	2	2	1	1	0	0
2	2	2	1	1	0	0
3	2	1	1	1	0	0
4	1	2	1	2	1	1
5	1	2	2	2	0	0
6	2	2	2	2	0	0
		$\sum d^2 = 1$				

Source: Field Survey, 2024.

A significant degree of consistency in the replies from the six organizations is revealed by the reliability analysis utilizing the test-retest approach in Table 2. The majority of organizations demonstrated flawless consistency, with very little variation in ranks between the average scores from the two rounds of data collecting. The one organization that displayed a modest deviation did so very little. Due to the tiny squared differences (d^2), $P = 0.9714$, the Spearman Rank Order Correlation Coefficient, is strong. This suggests that the device is quite dependable, measuring the desired variables consistently in various situations.

$$P = 0.9714$$

$$P = 1 - \frac{6\sum d^2}{n\left(n^2 - 1\right)} = 1 - \frac{6 \times 1}{6\left(6^2 - 1\right)} = 1 - \frac{6 \times 1}{6\left(36 - 1\right)}$$

$$= 1 - \frac{6}{6 \times 35} = 1 - \frac{6}{210} = 1 - 0.0286$$

3.5. Model Specification

The study relied on the study variables and literatures for designing the model to be tested for the hypothesis of the study. The model is as shown below:

$$\text{SCM} = f\left(X_1\right) \tag{1}$$

$$\text{Pfm} = P + \alpha - U \tag{2}$$

where;

SCM = Supply Chain Management

X_1 = the independent variable

Pfm = Performance

f = frequency

U = Error Term

α = Intercept

The decision to test the hypothesis of the study is as follows:

If the P-value of the t-coefficient is less than 1% (0.01) or 5% (0.05), the null hypothesis is rejected and otherwise we fail to reject it.

The above is framed in connection with network theory which is considered to describe the relationships in which companies, suppliers, customers or buyer are engaged

4. Findings

Table 3. Questionnaire distribution and retrieval.

Questionnaire	Details	Percentage (%)
Retrieved and usable	300	83.3
Not Retrieved/Retrieved but not Usable	60	16.7
Total	360	100

Source: Field Survey 2024.

Table 3 above indicates that among the sum 360 copies of questionnaire administered, only 60 representing 16.7% were missing (*invalid*), while 300 copies were retrieved and valid for analysis representing 83.3% of the total copies distributed.

4.1. Data Analysis

Table 4. Model summary[b].

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.682[a]	0.465	0.463	0.37899	0.064

a. Predictors: (Constant), Inventory turnover; b. Dependent Variable: quality control.

The model summary in Table 4 highlights the relationship between Inventory turnover and Quality control. The correlation coefficient (R) of 0.682 indicates a strong positive relationship, suggesting that higher Inventory turnover is associated with improved Quality control. The R Square value of 0.465 shows that Inventory turnover explains 46.5% of the variance in Quality control, making it a significant predictor, though other factors account for the remaining 53.5%. The Adjusted R Square of 0.463, closely aligning with the R Square, confirms the model's reliability and indicates that Inventory turnover remains a robust predictor even when adjusted for potential overfitting.

Table 5. Coefficients[a].

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.342	0.081		14.223	0.000
	Inventory turnover	0.413	0.023	0.682	18.238	0.000

a. Dependent Variable: Quality control.

The regression analysis in Table 5 highlights the relationship between Inventory turnover and Quality control. The coefficient of 0.413 indicates that for each one-unit increase in Inventory turnover, Quality control improves by 0.413 units, demonstrating a positive relationship. The significance level (*P*-value) of 0.000 confirms that this relationship is statistically significant, providing strong evidence that Inventory turnover is a key predictor of Quality control in the context of the study.

4.2. Test of Hypothesis

H_0: inventory turnover does not have significant effect on quality control in selected manufacturing firms in South-West, Nigeria.

H_1: inventory turnover has significant effect on quality control in selected manufacturing firms in South-West, Nigeria.

4.3. Result of Hypothesis

As shown in Table 5, the regression results indicate that inventory turnover has a significant positive relationship with quality control in selected manufacturing firms in South-West Nigeria, with a *P*-value of 0.000. Therefore, the null hypothesis is rejected, and the alternative hypothesis, that inventory turnover has a significant positive relationship with quality control in these firms, is accepted.

5. Discussion and Conclusion

The findings from the model summary and regression analysis in Table 5 provide compelling evidence of the significant role that Inventory turnover plays in influencing Quality control within the studied context. The strong positive correlation (R = 0.682) suggests that as Inventory turnover increases, there is a corresponding improvement in Quality control. This relationship is further supported by the R Square value of .465, indicating that Inventory turnover accounts for 46.5% of the variation in Quality control, underscoring its importance as a predictor, although other factors also contribute to the remaining variation.

The Adjusted R Square value of 0.463 closely matches the R Square, affirming the model's robustness and reliability, even after adjusting for potential overfitting. This consistency strengthens the confidence in the predictive power of Inventory turnover regarding Quality control.

The regression analysis reinforces these findings, with the coefficient of 0.413 revealing a direct and positive impact of Inventory turnover on Quality control. For every unit increase in Inventory turnover, Quality control improves by 0.413 units. The significance level (*P*-value = 0.000) further confirms the statistical significance of this relationship, suggesting that the observed effect is unlikely to be due to chance.

In conclusion, the study clearly demonstrates that Inventory turnover is a critical factor in enhancing Quality control. The strong positive relationship and statistical significance highlight the need for manufacturing firms to focus on optimizing Inventory turnover as a strategy to improve Quality control. This insight is particularly valuable for firms aiming to enhance operational efficiency and maintain high standards of product quality.

6. Practical Implication

The practical implications of these findings are significant for manufacturing firms aiming to enhance their operational efficiency and maintain high-quality standards. The strong positive relationship between Inventory turnover and Quality control suggests that by effectively managing inventory turnover rates, firms can directly improve their quality control processes.

Specifically, the findings imply that firms should focus on optimizing their

inventory turnover to achieve better quality control outcomes. This could involve implementing more efficient inventory management practices, reducing excess stock, and ensuring timely replenishment. Higher inventory turnover rates may lead to fresher, more up-to-date products, reducing the risk of defects and improving overall product quality.

Additionally, the statistical significance of the relationship indicates that this is not just a theoretical link but a practical strategy that firms can leverage to gain a competitive advantage. By prioritizing inventory turnover as a key operational metric, firms can systematically improve quality control, leading to higher customer satisfaction, reduced waste, and potentially lower costs associated with quality issues.

In summary, the practical implication is that manufacturing firms in South-West Nigeria, and potentially beyond, can significantly enhance their quality control by focusing on strategies that improve inventory turnover. This approach not only boosts quality but also supports broader business goals such as operational efficiency and customer satisfaction.

7. Recommendation

Based on the findings and practical implications, the following recommendations are proposed for manufacturing firms seeking to enhance their quality control and overall operational efficiency:

Firms should adopt advanced inventory management systems that facilitate real-time tracking and analysis of inventory levels. This will enable them to maintain optimal inventory turnover rates, ensuring that products remain fresh and up-to-date, thereby enhancing quality control. Additionally, adopting JIT inventory systems can help firms reduce excess stock and minimize the risks associated with holding outdated or surplus inventory. By aligning inventory turnover with production schedules, firms can ensure that only necessary quantities are maintained, reducing waste and improving quality outcomes. Furthermore, conducting regular audits of inventory levels and turnover rates will help firms identify inefficiencies in their inventory management processes. These audits should be used to refine and adjust practices to ensure that inventory turnover rates are aligned with quality control objectives.

To effectively manage inventory turnover, firms should invest in training programs for employees involved in inventory management. Educated and well-trained staff will be better equipped to implement and maintain practices that enhance inventory turnover, ultimately contributing to improved quality control.

Finally, firms should leverage technology and data analytics tools to monitor and predict inventory turnover trends. This will allow them to make informed decisions regarding inventory management, leading to more effective control of product quality.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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