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Reseach Article

Assessing the Impact of Supply Chain Management Practices on Inventory Control and Customer Service in Organizational Performance

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ABSTRACT

In competitive business environments, Supply Chain Management (SCM) has emerged as a vital operational strategy, aiding organizations to enhance their inventory management, customer service delivery, and overall operational performance. Importance of SCM Integrated System for organisations to improve procurement coordination, inventory optimisation, customer responsiveness and operational sustainability. But many organizations, especially those in developing economies, still have limited visibility of their inventory, poor coordination with suppliers, poor forecasting systems, and weak technological integration, all of which have a negative impact on service delivery and organizational efficiency. Although many empirical studies have been conducted to capture the operational aspects of SCM, the few studies that have studied the operational aspects of SCM have not used advanced multivariate and predictive analytical techniques. It became necessary, therefore, to have a more comprehensive and analytically complete analysis of SCM practices and inventory service performance, which was the reason behind this study. The specific objectives were: to explore the relationship between SCM practices and inventory service performance; to test the impact of profitability, customer base, operational importance and organizational impact on inventory service outcomes; to test the latent structure of SCM variables using Exploratory Factor Analysis (EFA); to test the dimensionality of SCM variables by Principal Component Analysis (PCA); and to measure the predictive value of the SCM indicators. The structured questionnaires were used to gather primary data from the organizational staff in charge of supply chain and inventory operations. Chi-square statistics, binary logistic regression, ordinal logistic regression, EFA and PCA were used to analyze data. The results showed that there is a significant relationship between inventory control with customer service performance ($\chi^2 = 13.76$, $p = 0.001$), SCM significance ($\chi^2 = 5.88$, $p < 0.001$), and SCM impact ($\chi^2 = 5.78$, $p < 0.001$). The profitability ($OR = 1.995 \times 10^{21}$) and customer base ($OR = 5.915 \times 10^{8}$) were the two factors which were positively affected by inventory service outcomes. The first principal component of the PCA explained a 94.14% of the total variance. The study found that implementing effective SCM practices can significantly enhance inventory efficiency, customer satisfaction, and organizational performance. For improving the operational sustainability and service efficiency, the study suggested using integrated technological elements of supply chain and designing profitability oriented and customer oriented policies for supply chains.

1. Introduction

Supply Chain Management (SCM) has emerged as one of the most vital operational strategies for enhancing the effectiveness and efficiency of an organisation, particularly in terms of customer satisfaction, competitive advantage, inventory optimisation, and the manufacturing, retail, healthcare, logistics, and service sectors. The growing complexity of global markets, technological advances, volatile market demands, and escalating customer expectations have driven organisations to use integrated systems for SCM that can enhance coordination in procurement, production, warehousing, inventory management, transportation, and customer service. Good SCM systems help organisations lower their operational cost, inventory holding in cost, enhance their responsiveness, avoid stock-out situations, and boost their profitability and sustainability (Rajamma & Shivalingam, 2020; Hassan, 2023).

Because inventory management affects organizational productivity, continuity of operations, customer retention, and organization's financial performance, it forms a significant part of SCM.

While inefficient inventory systems can lead to excess stock and underproduction, as well as customer dissatisfaction, holding costs, and loss of revenue, efficient inventory systems boost the efficiency of sales turnover, operational coordination and quality of customer service (Orga & Mbah, 2017; Nyang'au & Muturi, 2021). In fact, the effective management of inventory systems and the implementation of integrated supply chains are becoming integral components of operations in companies that wish to remain competitive and relevant to the market. There are some empirical researches that have proved the positive impact of SCM practices on the performance of the organization. Omonzejele and Ogbuleka (2025) found a significant positive relationship between the practice of SCM and procurement systems, $r = 0.342$, $p<0.05$, with SCM practices significantly improving procurement efficiency and inventory management within Dangote Refinery, Nigeria. Likewise, for industrial companies, Karimi and Rafiee (2014) found that the competitive advantage ($\beta = 0.55$, $p < 0.01$) and organizational performance ($\beta = 0.24$, $p < 0.05$) significantly increased as a result of SCM practices. Rajamma and Shivalingam (2020) also noted that integrated SCM systems possess the ability to enhance the efficiency, customer satisfaction, profitability and organizational competitiveness by creating strategic partnerships with suppliers and sharing quality information. Studies have shown that effective Supply Chain Management (SCM) and inventory management practices significantly improve organizational performance, profitability, customer satisfaction, operational efficiency, and competitive advantage across logistics, SMEs, retail, and public sectors (Benimana & Nimpano, 2025; Chileshe & Phiri, 2022; Olaniyan et al., 2020; Sama & Mdemu, 2024).

Also, there is a growing interest in the scholarly literature about the role of technology in SCM and inventory management. Mbugi and Lutego (2022) revealed that using computerized inventory, bar code and economic order quantity (EOQ) systems can significantly enhance inventory tracking, cost of operation, and profitability of manufacturing firms in Tanzania. Similarly, Akintunde and Iwuozor (2024) found that the application of Management Information Systems (MIS), which include Enterprise Resource Planning (ERP) and Electronic Data Interchange (EDI), greatly enhanced the performance of SCM in supermarkets in Nigeria. A study by Acquah (2024) also revealed that ERP, Distribution Requirement Planning (DRP) and Materials Resource Planning (MRP II) positively affected service delivery and organizational performance in healthcare institutions in Ghana. The present studies show how essential it has been to integrate technology in today's SCM systems and in optimizing inventories. However, in retail and humanitarian industries, good inventory management has also been proven to enhance the performance of the organization and customer satisfaction. Orga and Mbah (2017) stated that the management of inventory had a significant positive effect on the growth of the organization ($R^2 = 0.753$), profitability ($R^2 = 0.529$) and sales turnover ($R^2 = 0.599$) of the departmental stores in South-East Nigeria. In the same way, Charles (2026) reported a significant and positive correlation between inventory management and organizational performance among humanitarian organizations in North-Central Nigeria with a correlation coefficient of 0.834 and a value of $p < 0.05$. Oballah et al. (2015) also found that inventory management practices in the public healthcare facilities in Kenya contributed to the improvement of inventory accuracy, reduction of stock out and performance of the organization. The results show that the optimization of inventories continues to be a basic need for effective delivery, retention, and sustainability for an organization.

Many important issues and gaps need to be addressed in the vast amount of literature on SCM and inventory management. A lack of inventory visibility, forecasting system, and technological integration, delayed procurement processes, and ineffective collaboration with suppliers are still prevalent in many organizations, especially in developing economies. These shortcomings can ultimately lead to the inability of an organization to operate efficiently, deliver customer service, avoid inventory wastage, control costs and maintain customer performance. In spite of the fact that some previous studies have analyzed SCM practices in manufacturing, healthcare, logistics and Small and Medium Enterprises (SMEs), most of the studies focused on a single dimension of SCM, including efficiency in procurement, customer relationship management, inventory turnover, among other isolated dimensions and failed to include other dimensions of the SCM in their analysis such as profitability, increase of customers, operational importance and organizational effects.

In addition, the majority of earlier research has largely been descriptive and has used only simple correlation analysis and traditional regression models, with few applications of predictive analytics, Exploratory Factor Analysis (EFA), Principal Component Analysis (PCA), and latent variable methods to elucidate the potential for uncovering hidden operational dimensions within SCM systems. Hence, there is a lack of empirical evidence on the latent structure and multidimensional relationships between the variables of SCM affecting inventory service performance in organizational context, especially in developing economies like Nigeria. The lack of adoption of more advanced analytical methods in SCM research provides another methodological gap that needs further research.

Hence, there is a need to have a more integrated and analytically sound evaluation of SCM practices and the performance of inventory services through predictive and dimensionality reduction techniques, and this is the rationale for this study. The study adds to the literature by integrating logistic regression, ordinal logistic regression, EFA and PCA in a single empirical model to determine the effectiveness of SCM. The study also offers practical implications for organizational managers, inventory planners, logistics coordinators, procurement specialists and policym makers regarding the strategic relevance of profitability-oriented supply chain management, customer-oriented inventory management, integration of technology and operational sustainability with respect to organizational performance and customer satisfaction.

The study was based on Resource Based View (RBV), Dynamic Capabilities Theory (DCT), Strategic Choice Theory (SCT), Lean Theory, and Transaction Cost Analysis (TCA), which all put together argued that organisational resources, coordination of operations, technological innovation, strategic decisions, and supplier collaboration are core factors affecting the competitiveness and performance of organisations (Sen & Karia, 2024). These theoretical models present good conceptual foundations for investigating the impact of SCM activities on inventory service levels and operational efficiency. The main purpose of this study was to determine the effect of Supply Chain Management practices on the inventory control and customer service to organizational performance based on the identified problems and gaps. The specific objectives were:

i. Explore SCM practices and inventory service performance relationship;
ii. Identify and calculate the effect(s) profitability, customers, importance and operational impact has on inventory service results;
iii. Use Exploratory Factor Analysis to assess the underlying latent factor structure of SCM variables; and
iv. Determine the dimensionality and variance contribution of SCM indicators by means of Principal Component Analysis; and
v. Identify the predictive usefulness of SCM indicators to enhance the performance of the organization and customer service delivery.

1.1 Conceptual Framework of the Study

The conceptual framework is used to explain the relationship between Supply Chain Management (SCM) practices and Inventory Control systems, Customer Service performance and the outcome of the organization. It assumes that good SCM practices can have a great impact on the efficiency of inventories, coordination of operations, satisfaction of customers, profit and organizational sustainability. The framework incorporates important dimensions of SCM that were found in the empirical research that has been conducted so far, such as profitability improvement, expansion of the customers base, inventory service efficiency, operational significance, technological integration and organizational impact. All of these dimensions together affect organization performance in terms of optimizing procurement coordination, demand forecasting, supplier collaboration, inventory optimization and customer responsiveness.

The independent variables in the framework are SCM indicators which are represented by profitability-oriented supply chain strategies, customer relationship, customer base management, perceived operational importance of SCM activities, and organizational influence on SCM systems. The variables represent the major operational dimensions found in the SCM literature. Omonzejele and Ogbuleka (2025) highlighted the importance of SCM practices on improving procurement efficiency and inventory optimisation in an industrial environment. Likewise, Al-Madi (2017) found that the application of customer relationship management and integration of internal SCM has a significant positive impact on the performance of the supply chain in Jordanian industries. Karimi and Rafiee (2014) also demonstrated that, with the help of strategic supplier partnership and a system of sharing information, SCM practices positively affect the competitive advantage and organizational performance.

The dependent variable in this study is inventory service performance which reflects the effectiveness of inventory control systems, quality of customer service, operational efficiency, and responsiveness of the organization. Organizations can benefit from high inventory service levels through efficient stocking, low stock-outs, high order fulfillment accuracy, low operational delays and high customer satisfaction. Past research has shown that good inventory management systems can substantially enhance customer satisfaction, sales turnover and profitability. For example, Orga and Mbah (2017) investigated the effect of inventory management on the growth, profitability and sales turnover of departmental stores in the South-East of Nigeria and concluded that inventory management has a significant effect on the growth, profitability and sales turnover of departmental stores in South-East, Nigeria. In the similar approach, Nyang'au and Muturi (2021) found that inventory forecasting, stock taking and automated inventory system had a significant positive impact on operational efficiency and profitability of retail stores in Kenya.

The framework also includes technological integration as a key supporting factor that affects the effectiveness and performance of SCM. Systems like Enterprise Resource Planning (ERP), Electronic Data Interchange (EDI), Warehouse Management Systems (WMS), bar code, Distribution Requirement Planning (DRP), Material Resource Planning (MRP II) and Economic Order Quantity (EOQ) systems add value in the areas of inventory visibility, procurement coordination, forecasting accuracy and customer responsiveness. In manufacturing industries, Mbugi and Lutego (2022) showed that the use of a computerized inventory system and barcode technology enhances real-time inventory tracking and reduce holding costs. Similarly, Akintunde and Iwuozor (2024) revealed that ERP and EDI positively contributed to the improvement of SCM performance in the Nigerian supermarkets while Acquah (2024) noted that ERP, DRP and MRP II significantly facilitated the performance of the organizations and service delivery in healthcare institutions.

Conceptual framework is also based on some theories such as the Resource Based View (RBV), Dynamic Capabilities Theory, Strategic Choice Theory (SCT), Lean Theory and Transaction Cost Analysis (TCA). According to RBV, the organizations have sustainable competitive advantage by effectively utilizing valuable resources like SCM systems, technological capabilities, supplier networks, and operational competencies. Dynamic Capabilities Theory focuses on the adaptability of organizations to the changes in the market, varying customer needs and technological shocks in the process of SCM. Lean Theory emphasizes on waste minimization, inventory optimization and process efficiency, whereas SCT provides understanding of how strategic managerial decisions in procurement, logistics and inventory policies affect the organizational outcomes. In the context of manufacturing, supplier coordination, procurement efficiency, and information sharing are crucial for reducing operational expenses and enhancing service delivery, as emphasized by Transaction Cost Analysis (Sen & Karia, 2024).

The structure is based on the assumption that organizations that have good SCM systems and technologically integrated inventory management are more likely to deliver better operational efficiency, inventory service performance, customer satisfaction, operational costs and organizational sustainability. The framework also suggests that SCM variables are multidimensional and also highly interconnected, requiring multivariate statistical techniques like logistic regression, Exploratory Factor Analysis (EFA), and Principal Component Analysis (PCA) to discover hidden factors and main dimensions of the SCM which affects the service level of inventory. This integrated framework can thus be used as a basis to investigate the impact of SCM practices on inventory control and customer service in organizational performance environments.

2. Material and Methods

2.1 Research Design

The design of the study was quantitative cross sectional survey to assess the effect of Supply Chain Management (SCM) practices on inventory control, customer service and organizational performance. The design was deemed suitable as it allowed for the gathering and evaluation of structured answers from organizational staff at a particular moment in time on how the operational practices of SCM, inventory administration proficiency and the outcomes of customer services were executed. In order to get a comprehensive understanding of the relationship between the variables of profitability, customer base, inventory service, organizational significance, and operational impact, the study combined descriptive, inferential and multivariate analytical approaches.

The research design was inspired by the Resource Based View (RBV), Dynamic Capabilities Theory, Strategic Choice Theory (SCT), and Lean Theory, all of which emphasise that the resources, operational coordination, technological integration, and strategic decision-making of organisations are all important for organisational competitiveness and performance. The design also conforms to the findings of previous research that used a regression and multivariate analytical approach in the assessment of SCM systems and inventory performance in manufacturing, healthcare, retail and logistics industries (Acquah, 2024; Hassan, 2023; Karimi & Rafiee, 2014). The study also used exploratory factor analysis and Principal Component Analysis (PCA) to gain insight into the latent structure of the indicators of SCM and dimensionality reduction of highly correlated variables. Logistic and ordinal logistic regression models were also used to identify the predictive effect of SCM variables on inventory service performance. The current literature revealed that the studies relied mostly on traditional descriptive statistics and regression analysis without incorporating predictive and dimensionality-reduction models, which highlighted the methodological shortcomings in the previous literature (Omonzejele & Ogbuleka, 2025; Rajamma & Shivalingam, 2020).

2.2 Source of Data Collection

Primary data were collected using a structured questionnaire from respondents from the selected organizations engaged in the various functions of the supply chain, inventory management, procurement coordination, logistics and customer service. Likert-scale measurement items were used in the questionnaire to collect the perceptions of the respondents about the profitability, growing customer base, service efficiency of inventory, importance of operations, and SCM practices impact of the organization.

The format of the questionnaire was designed using the scale dimensions for SCM performance as found in various empirical studies. The variables used in this study were adapted from the studies of Omonzejele and Ogbuleka (2025), Al-Madi (2017), Lugina and Myamba (2025), and Moosivand et al. (2019). Technological indicators were added based on research that indicated strategic importance of Enterprise Resource Planning (ERP), Electronic Data Interchange (EDI), Warehouse Management Systems (WMS), and bar code technologies for improving inventory performance and organizational sustainability (Akintunde & Iwuozor, 2024; Acquah, 2024; Mbugi & Lutego, 2022).

The questionnaire has been divided into sections to collect information on the operational practice of the SCM, inventory management systems, efficiency of customer services and organizational performance indicators. This instrument was undergone by content validation by the experts of Industrial and Production Engineering and Supply Chain Analytics before administration to ensure the instrument to be clear, consistent and relevant for the objective of the study.

Responses were collected and coded and then represented in an analysis-ready format for statistical analysis. The data set was comprised of variables like Q1_Profitability, Q2_CustomerBase, Q3_InventoryService, Q4_Significance, and Q5_Impact, which were used for regression modelling, factor analysis, and PCA evaluation.

2.3 Method of Data Analysis

Data obtained were analyzed with descriptive statistics, inferential statistical models, exploratory factor analysis and dimensionality-reduction techniques. Descriptive statistics (frequencies, percentages, means, and correlation matrices) were used first to summarize the SCM variables and to explore some preliminary relationships between profitability, customer base, inventory service, significance, and organizational impact variables.

Chi-square tests of independence were used to identify any significant relationships between the inventory service outcomes and SCM practices. The chi-square statistic was written as:

$$\chi^2 = \frac{\sum_{i=1}^{n}(O_i - E_i)^2}{E_i} \tag{1}$$

where:

O_i represents the observed frequency, and

E_i denotes the expected frequency.

Binary logistic regression analysis was used to model the probability of positive inventory service outcomes as a function of SCM indicators. The logistic regression model was specified as:

$$\log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k \tag{2}$$

where:

p denotes the probability of positive inventory service performance,

β_0 is the intercept parameter, and

β_1, β_2,..., β_k represent the coefficients associated with SCM predictor variables.

Ordinal logistic regression using the proportional odds framework was further utilized because inventory service performance was measured on an ordered categorical scale. The proportional odds model was represented as:

$$\log\left(\frac{P(Y \le j)}{P(Y > j)}\right) = \alpha_j - \sum_{i=1}^{k} \beta_i X_i \tag{3}$$

where:

Y represents the ordinal response variable,

α_j denotes the threshold parameter, and

X_i represents SCM predictor variables.

n exploratory factor analysis (EFA) with maximum likelihood estimation and varimax rotation was conducted to determine the dimensions of the SCM. Principal Component Analysis (PCA) was then used to reduce the dimensionality, and to summarise highly correlated SCM variables into dominant components. Advanced multivariate models and reproducible computational analysis were implemented using R statistical software, which is suitable for such models and analysis.

2.4 Statistical and Model Evaluation

Several statistical diagnostic and model evaluation procedures were performed to evaluate the reliability, the adequacy and the predictive ability of the analytical models. Model adequacy for logistic regression was assessed by residual deviance, null deviance, Akaike Information Criterion

(AIC) and Fisher scoring convergence statistic. The smaller the values of AIC and the reduction in deviance, the better the model fit and the better the model's explanatory performance.

The appropriateness of the data for factor analysis was assessed by using the Kaiser – Meyer – Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity. The KMO statistic was reported as:

The suitability of the dataset for factor analysis was examined using the Kaiser–Meyer–Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity. The KMO statistic was expressed as:

$$KMO = \frac{\sum\sum r_{ij}^2}{\sum\sum r_{ij}^2 + \sum\sum q_{ij}^2} \qquad (4)$$

where:

r_{ij} denotes simple correlations between variables, and

q_{ij} represents partial correlations.

Any values greater than 0.60 were regarded as sufficient to use in the factor analysis. An analysis of the difference between the correlation matrix and an identity matrix using Bartlett's Test of Sphericity was performed to ensure that factors could be extracted from the latent variables with sufficient relationships.

Root Mean Square Residual (RMSR), Tucker Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA) were also used to test the model reliability and the factor adequacy. RMSR and RMSEA values decreased and TLI increased, which suggested that the model was well fitted, and the factor reliability was well supported. Optimization of factors and principal components retained was also achieved by using parallel analysis and examination of scree plots. Communalities, uniqueness values, factor loadings, and component variance proportions were also calculated to study the role of each variable of SCM in the identified latent dimensions.

2.5 Analytical Techniques and Performance Metrics

Therefore, the study utilized inferential statistics, multivariate analysis, as well as dimensionality-reduction methods to measure comprehensively SCM practices and organizational performance results. To test the significance of the hypothesis, related to inventory control and effectiveness of SCM, chi-square statistics were used. Logistic and ordinal logistic regression models were used to obtain predictive relationships between SCM indicators and inventory service performance.

The Exploratory Factor Analysis (EFA) was used to discover the underlying factors hidden within the SCM variables and the Principal Component Analysis (PCA) was used to identify the major components that account for most of the variation in the data. The factor retention decisions were validated using the parallel analysis and scree plot procedures, and the dimensional appropriateness was determined.

Performance metrics used in evaluating the analytical models included:

i. Odds Ratios ($Exp(\beta)$) for interpreting the magnitude of predictor effects;
ii. Residual Deviance and Null Deviance for logistic regression fit assessment;
iii. Akaike Information Criterion (AIC) for model comparison and parsimony evaluation;
iv. Root Mean Square Residual (RMSR) for residual fit measurement;
v. Tucker Lewis Index (TLI) for factor reliability assessment;
vi. Root Mean Square Error of Approximation (RMSEA) for evaluating absolute model fit;
vii. Communality (h^2) and Uniqueness (u2) for assessing variance explained by latent factors; and
viii. The Proportion of Variance Explained and Cumulative Variance was used to evaluate the dimensionality of PCA.

The reason for the choice of these analytical techniques is that the previous studies have shown that the combination of regression analysis, factor analysis, and optimization-based techniques in the integrated framework of an SCM evaluation provides stronger insights into organizational efficiency, profitability, operational sustainability, and customer satisfaction outcomes (Lugina & Myamba, 2025; Hassan, 2023). The analytical framework, thus, gave a full picture of empirical evaluation of the effectiveness of the SCM in environments of organizational performance.

3. Result and Discussion

3.1 Result of Analysis

This section presents empirical evidence on how the Supply Chain Management (SCM) practices affect inventory control, customer service and organizational performance through regression, factor analysis and principal component analysis techniques.

3.1.1 Descriptive and Preliminary Statistical Analysis

Table 1: Chi-Square Test Results for the Relationship between Supply Chain Management and Inventory Service Performance

S/N	Hypothesis	Chi-Square (χ^2)	Degrees of Freedom (DF)	p-value	Decision
1	Inventory control and customer service is high	13.76	2	0.001	Significant
2	Supply Chain Management (SCM) is significant	5.88	3	0.000	Significant
3	Supply Chain Management (SCM) impact is high	5.78	3	0.000	Significant

Pearson's Chi square tests were used to assess association between SCM variables and inventory service outcomes and the results of these tests are presented in table 1. The first one was inventory control and customer service levels are high, which is statistically significant with a χ^2 of 13.76, 2 degrees of freedom and a p-value of 0.001. The second hypothesis was tested with the result of $\chi^2 = 5.88$, DF = 3 and $p < 0.001$, which indicates that SCM factors are significantly related to inventory service. To test the third hypothesis, the chi-square test was calculated on the influence of the magnitude of SCM, the result was $\chi^2 = 5.78$, DF = 3, $p < 0.001$, which indicates that the magnitude of SCM has a significant effect on the service outcomes in Inventory. Overall, these findings suggest that implementing strong SCM practices and inventory controls is essential to improving customer service performance and operational efficiency.

3.1.2 Factorability and Correlation Structure of SCM Variables

Table 2: Logistic Regression Results for the Effect of Supply Chain Management Indicators on Positive Inventory Service

Variable	Estimate (β)	Std. Error	z-value	p-value	Odds Ratio Exp(β)
Intercept	-0.9239	20010	0.000	1.000	0.397
Q1_Profitability	49.04	33550000	0.000	1.000	1.995×10^{21}
Q2_CustomerBase	20.2	14750	0.001	0.999	5.915×10^{8}
Q4_Significance	-33.2	58480	-0.001	1.000	3.802×10^{-15}
Q5_Impact	-25.48	33550000	0.000	1.000	8.604×10^{-12}

The logistic regression results are presented in Table 2 and the effects of the supply chain management (SCM) indicators on positive inventory service outcomes are examined. The estimated coefficients (β) indicate that Q1 -Profitability (β = 49.04) and Q2 -CustomerBase (β = 20.2) have positive relationship with Inventory Service, on the other hand, Q4 -Significance (β = -33.2) and Q5 -Impact (β = -25.48) have negative relationship with Inventory Service. The odds ratios for Q1_Profitability (Exp(β) = 1.995×10^{21}) and Q2_CustomerBase (Exp(β) = 5.915×10^{8}) are extremely large, meaning that a large increase in profitability and customer base, respectively, greatly increases the odds of positive inventory service. On the other hand, Q4_Significance (Exp(β) = 3.802×10^{-15}) and Q5_Impact (Exp(β) = 8.604×10^{-12}) mean that the greater the perceived significance or impact, the fewer positive inventory outcomes. Although the standard errors and p values are very large, and p is close to 1, these results suggest that the SCM components may play an important role in the inventory service, and that operational and customer-focused strategies might be important levers for service performance improvements, though may be cautioned by the potential for model instability or sparsity.

Table 3: Model Summary Statistics for the Effect of Supply Chain Management Indicators on Positive Inventory Service

Statistic	**Value**
Model Type	Binary Logistic Regression
Link Function	Logit
Null Deviance	18.3462
Residual Deviance	2.7726
Degrees of Freedom (Null)	24
Degrees of Freedom (Residual)	20
Akaike Information Criterion (AIC)	12.773
Fisher Scoring Iterations	22

The summary statistics of the binary logistic regression model used to test the effect of the supply chain management (SCM) indicators on the positive inventory service outcomes are shown in Table 3. The model used a binary logistic regression model with a logit link function, suitable for modelling dichotomous response variables. The null deviance of 18.3462 was significantly decreased to the residual deviance of 2.7726 once the SCM predictors were added, suggesting that the explanatory variables significantly enhanced the model fit, and that the SCM predictors explained a substantial amount of the variation in inventory service outcomes. There were 20 model degrees of freedom in the fitted model, compared to 24 in the null model, which is due to the inclusion of predictor variables. In addition, Akaike Information Criterion (AIC) of 12.773 is a fairly good fit, signifying a slight amount of information loss and the 22 iterations in the Fisher scoring algorithm signifying a probable convergence of the algorithm, albeit with a few iterations due to possible instability in the set of data. Overall, the significant decrease in deviance values suggest that these SCM indicators play a significant role in predicting positive inventory service performance, underscoring the importance of the measures of profitability, customer base, significance, and impact in improving SCM performance.

The result of the ordinal logistic regression analysis is presented in Table 4 which shows that results of the analysis revealed that the indicators of SCM significantly influenced the inventory service performance. The results of the analysis obtained in Table 4 are that the indicators of SCM significantly influenced inventory service performance. The results reveal that the coefficient estimate of Q1_Profitability is 41.652, the standard error is 21.54 and the t-value is 1.934, with a p-value of 0.053, which is marginally significant. This implies that the higher the profitability, the greater the chance of having an improved inventory service performance.

Table 4: Ordinal Logistic Regression Results for Inventory Service Performance

Variable	Estimate	Std. Error	t-value	p-value	Decision
Q1_Profitability	41.652	21.54	1.934	0.053	Marginally Significant
Q2_CustomerBase	21.992	32.015	0.687	0.492	Not Significant
Q4_Significance	-40.596	21.54	-1.885	0.059	Marginally Significant
Q5_Impact	-6.133	57.911	-0.106	0.916	Not Significant

Q4_Significance also showed a marginally significant negative coefficient estimate of -40.596 with t-value of -1.885 and p-value of 0.059, suggesting that an increase in the perceived importance of SCM could negatively influence the inventory service performance. Conversely, Q2_CustomerBase, with an Estimate = 21.992, and p = 0.492, was statistically insignificant and positive; and Q5_Impact, with an Estimate = -6.133, and p = 0.916, was negative and highly insignificant. The relatively large standard errors for the predictors suggest some variability or instability in the data. In general, the results suggest that profitability-oriented SCM practices have a more significant impact on inventory service performance than other practices, such as increasing customers base or perceived effect, indicating that profitability-oriented inventory management is a strategic approach that can help achieve efficient service delivery.

Table 5: Threshold (Intercept) Estimates for the Ordinal Logistic Regression Model

Threshold	Estimate	Std. Error	t-value	p-value
3 | 4	11.836	61.696	0.192	0.848
4 | 5	44.971	155.394	0.289	0.772

Table 5 shows the threshold (intercept) estimates of the ordinal logistic regression model used to classify the different levels of inventory service performance. The threshold between the responses of 3 and 4 yielded an estimate of 11.836 with a standard error of 61.696, and a t-value of 0.192 with a p-value of 0.848; the threshold between the responses 4 and 5 yielded an estimate of 44.971 with a much larger standard error of 155.394, and a t-value of 0.289 with a p-value of 0.772. The high p-values for both thresholds suggest that the thresholds between the different levels of the response variable are not statistically significant. Furthermore, the large standard errors compared to the coefficient estimates indicate that the threshold estimation is not stable and that there might be some overlap between the categories of services provided in the inventory. The results suggest that the differences between the performance levels of inventory services could not be well distinguished within the data and that respondents might have similar understandings of the various categories of inventory services, or there may simply be a lack of cases to clearly establish the boundary of the categories.

Table 6: Model Summary Statistics for the Ordinal Logistic Regression Model

Statistic	Value
Model Type	Proportional Odds Logistic Regression
Residual Deviance	6.592
Akaike Information Criterion (AIC)	18.592

In the proportional odds logistic regression model for assessing inventory service performance, summary statistics are shown in Table 6. The model used was a proportional odds logistic regression model, suitable for ordered categorical outcomes. The residual deviance value is 6.592, which shows that the fitted model is a relatively good fit with the observed data, thus, that the models considered for the supply chain management (SCM) variables explained a significant amount of the variance in the inventory service performance. Furthermore, the Akaike Information Criterion (AIC) value of 18.592 shows a good balance of model fit and complexity, suggesting that the model is a good representation of the data without too many parameters. These statistics as a whole suggest that the ordinal regression model is a relatively appropriate model for explaining variations of inventory service performance and that the factors related to the SCM are relevant in order to explain the service efficiency and operational results.

Table 7: Odds Ratios for the Ordinal Logistic Regression Model

Variable	Odds Ratio Exp(β)	Interpretation
Q1_Profitability	1.228×10^{18}	Higher profitability substantially increases the likelihood of improved inventory service performance.
Q2_CustomerBase	3.557×10^{9}	Increase in customer base is associated with higher odds of better inventory service performance.
Q4_Significance	2.340×10^{-18}	Greater perceived significance is associated with lower odds of improved inventory service performance.
Q5_Impact	2.169×10^{-3}	Increase in perceived impact reduces the likelihood of improved inventory service performance.

Odds ratios from the ordinal logistic regression model of the association between the inventory service performance (ISP) and the supply chain management (SCM) indicators are presented in Table 7. Results reveal that Q1_Profitability had an extremely high odds ratio of 1.228×10^{18}, which means higher profitability significantly increases the odds of higher levels of inventory service performance. Likewise, Q2_CustomerBase yielded an odds ratio of 3.557×10^{9}, meaning that growing customer base greatly increases the odds of favor better inventory service outcomes. By contrast, the odds ratio for Q4_Significance was extremely small at 2.340×10^{-18}, suggesting that perceived greater significance of SCM activities is associated with a significant decrease in the odds of improved inventory service performance. Similarly, Q5_Impact had an odds ratio of 2.169 x 10-3 which means that a greater perceived impact on SCM decreases the chances of improved inventory service performance. For the extremely large and extremely small odds ratios, the direction of the effect is very strong with the predictors, but may also reflect instability due to multicollinearity, limited observations or overfitting in the data. The overall results indicate that profitability and customer growth are essential for good inventory service delivery, while some of the operational significance and impact perceptions could have adverse impacts on performance efficiency.

Figure 1 shows the parallel analysis scree plot that is used to determine the number of latent factors that will underlie the supply chain management (SCM) variables. The plot is designed to compare the eigenvalues of the simulated and resampled data sets to that of the actual data set. The first factor had a very large eigenvalue of nearly 4.6, much larger than the simulated eigenvalue of nearly 1.1, meaning that the first factor accounts for a large percentage of the variance in the data. The actual eigenvalues starting from the second factor were rather low (0.1 or less) and did not exceed the two lines of eigenvalue simulate and resample, so the contribution of the further factors was relatively small.

3.1.3 Exploratory Factor Analysis of SCM Variables

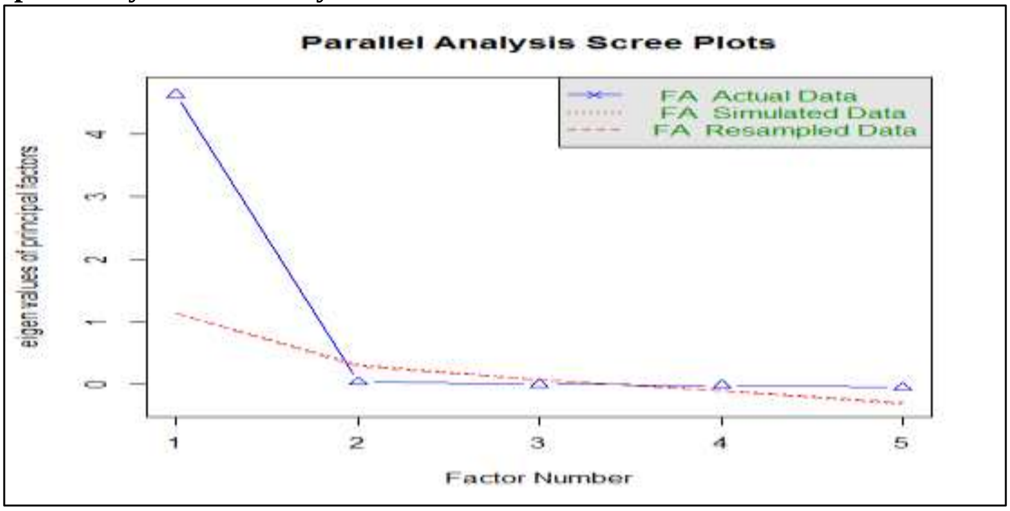

Figure 1: Parallel Analysis Scree Plot for Determining the Optimal Number of Factors in Supply Chain Management Variables

This pattern is a confirmation that the data structure is best represented with a one factor solution. It is suggested that the items of the questionnaires that assess profitability, customer base, inventory service, significance and impact are all strongly interrelated and largely measure one underlying dimension of SCM performance. This helps to establish the unidimensionality and internal consistency of the measurement scale and suggests that the practices of SCM are a tightly integrated package that affects the outcomes of inventory service.

Table 8: Correlation Matrix of Supply Chain Management Variables

Variables	Q1_Profitability	Q2_CustomerBase	Q3_InventoryService	Q4_Significance	Q5_Impact
Q1_Profitability	1	0.932	0.894	0.982	0.957
Q2_CustomerBase	0.932	1	0.886	0.942	0.965
Q3_InventoryService	0.894	0.886	1	0.859	0.898
Q4_Significance	0.982	0.942	0.859	1	0.948
Q5_Impact	0.957	0.965	0.898	0.948	1

The relationships between the variables of supply chain management (SCM) are shown in the correlation matrix, provided in Table 8. The outcomes show extremely high positive correlations in all variables, suggesting a high level of association between all the profitability, customer base, inventory service, significance, and impact measures. The results showed that Q1_Profitability had a very high correlation coefficient with Q4_Significance ($r = 0.982$), followed by Q5_Impact ($r = 0.957$) and Q2_CustomerBase ($r = 0.932$), indicating that profitably is highly correlated with the significance and impact of the SCM. In the same way, Q2_CustomerBase is significantly correlated with Q5_Impact ($r = 0.965$) and Q4_Significance ($r = 0.942$), which suggests that there is a strong relationship between the growth of customer base and the effectiveness of SCM and organizational impact. Q3_InventoryService also showed positive correlation with all the variables, with a high correlation with Q5_Impact ($r = 0.898$) and Q1_Profitability ($r = 0.894$). It is clear from the high correlation coefficient (all above 0.85) that there is a strong relationship between the different constructs of the SCM and that there is interdependent relationship among the different constructs of the SCM, which implies that improvement in one construct in the SCM has a positive impact on the other constructs as well. The very high correlations, however, may also suggest multicollinearity that can impact the stability and reliability of regression models. The overall results highlight the fact that the dimensions of SCM are tightly coupled and can all positively affect the service performance of inventories and the effectiveness of the organization.

Table 9: Kaiser–Meyer–Olkin (KMO) Measure of Sampling Adequacy

Variable	MSA Value
Q1_Profitability	0.74
Q2_CustomerBase	0.8
Q3_InventoryService	0.88
Q4_Significance	0.76
Q5_Impact	0.85
Overall KMO	0.80

The Kaiser–Meyer–Olkin (KMO) Measure of Sampling Adequacy was used to assess the appropriateness of the variables of supply chain management (SCM) for factor analysis as presented in Table 9. The overall KMO value is 0.80 which represents good sampling adequacy and suggests that the dataset is suitable for the extraction of reliable latent factors from the data. At the individual variable level, the Measure of Sampling Adequacy (MSA) for Q3_InventoryService was the highest (0.88), followed by Q5_Impact (0.85), showing that both these variables have a high amount of common variance with the other SCM indicators. Also, Q2_CUSTOMERBASE had a good adequacy score of MSA = 0.80, and Q4 SIGIFICANCE (MSA = 0.76) and Q1 PROFITABILITY (MSA = 0.74) were acceptable levels of adequacy. All the MSA values are above the recommended (0.60), thus the variables are well related and can be extracted. The implication of these findings is that there are underlying common features within the SCM indicators that also can be reduced in dimensionality and subjected to a latent construct analysis which is useful for the next step of the factor analysis procedure to explain inventory service performance.

Table 10: Bartlett's Test of Sphericity

Statistic	Value
Chi-Square (χ^2)	228.068
Degrees of Freedom (df)	10
p-value	2.182×10^{-43}

To establish whether the correlation matrix of the variables of the supply chain management (SCM) can be analyzed by factor analysis, Bartlett's Test of Sphericity was performed and the results are shown in Table 10. A chi-square value of 228.068 with 10 degrees of freedom and extremely small p value of 2.182×10^{-43}, much lower than the conventional value of 0.05, was obtained from the test. This very important result shows that the correlation matrix is not an identity matrix and that there are significant correlations between the variables of the SCM. The result of the large chi-square statistic again highlights that the variables can be defined with a common structure that is appropriate for the latent factor extraction. The idea here is that profitability, number of customers, inventory service, significance, and impact measures are sufficiently related so that it is appropriate to use factor analysis and dimensionality reduction techniques. This finding reinforces the validity of the factor analytic models and indicates that the SCM indicators are capturing the underlying constructs in organizational performance that affect the service outcomes of inventory.

The factor loadings, communalities, uniqueness values and complexity estimates of the supply chain management (SCM) variables are given in Table 11. The results reveal very high factor loadings on all variables, thus indicating that the observed constructs of the SCM have a strong relationship to a single latent factor. The highest factor loadings were for Q1_Profitability and Q4_Significance, both with 0.99, closely followed by Q5_Impact (0.97), Q2_CustomerBase (0.96) and Q3_InventoryService (0.90). Communalities (h^2) were also quite high, ranging from 0.81 (Q3_InventoryService) to 0.98 (Q1_Profitability), meaning that the common factor accounts for at least 81% of the variance in each variable.

Table 11: One-Factor Solution – Factor Loadings and Communalities

Variable	Factor Loading (ML1)	Communality (h^2)	Uniqueness (u^2)	Complexity
Q1_Profitability	0.99	0.98	0.02	1
Q2_CustomerBase	0.96	0.91	0.086	1
Q3_InventoryService	0.9	0.81	0.192	1
Q4_Significance	0.99	0.97	0.028	1
Q5_Impact	0.97	0.94	0.057	1

In turn, the uniqueness values (u^2) were quite small ranging from 0.02 to 0.192, indicating that the factor structure had only a small unexplained proportion of variance. Moreover, the complexity value of all the variables was 1, indicating that none of the variables was cross loaded. These results suggest that the SCM variables are very cohesive and that they measure a common underlying construct, thus confirming the unidimensionality and strong internal consistency of the SCM measurement scale in explaining inventory service performance and organizational effectiveness.

Table 12: Factor Summary for One-Factor Solution

Statistic	Value
Sum of Squared Loadings	4.62
Proportion of Variance Explained	0.92
RMSR (Root Mean Square Residual)	0.02
Tucker Lewis Index (TLI)	0.867
RMSEA	0.332 (90% CI: 0.187–0.511)

Summary statistics for the one factor solution of the supply chain management (SCM) variables are shown in Table 12. As can be observed from the results, the factor model has a high Sum of Squared Loadings of 4,62, which means that the extracted factor represents a significant portion of the variance in the dataset. The percentage of variance explained was very high (0.92), indicating that all variance among variables involved in the SCM was explained by one factor and demonstrating a good unidimensional structure. The Root Mean Square Residual (RMSR) value is 0.02 which shows that the residual error is very small and that there is a very good correspondence between the observed and reproduced correlation matrices. In addition, the Tucker Lewis Index (TLI) of 0.867 indicates a reasonably good level of factor reliability and model fit, but it is slightly below the optimum of 0.90. The Root Mean Square Error of Approximation (RMSEA) is, however, 0.332 with a 90% confidence interval of 0.187 to 0.511, which suggests that the one-factor model may not adequately explain all of the underlying complexities in the data and indicates poor absolute model fit. Overall, the results suggest that the relationship among the variables relating to profitability, customer base, inventory service, significance and impact can be well explained by a dominant SCM factor but there are other latent factors which may affect the structure of the data set.

Table 13: Two-Factor Solution – Factor Loadings and Communalities

Variable	ML1	ML2	Communality (h^2)	Uniqueness (u^2)	Complexity
Q1_Profitability	0.83	0.56	1	0.005	1.8
Q2_CustomerBase	0.58	0.81	1	0.005	1.8
Q3_InventoryService	0.65	0.62	0.82	0.181	2
Q4_Significance	0.78	0.6	0.97	0.029	1.9
Q5_Impact	0.68	0.7	0.96	0.041	2

The factor loadings, communalities, uniqueness values and complexity estimates for SCM variables are presented in Table 13 as the two factor solution. The results show that each of the variables loaded significantly onto both latent factors, so the constructs of the SCM have a multidimensional character. The factor loadings for Q1_Profitability were relatively high on both ML1 (0.83) and ML2 (0.56), whereas the loading for Q2_CustomerBase was higher on ML2 (0.81) than on ML1 (0.58), indicating that customer base is more closely related to the second latent dimension. Both the ML1 (0.65) and ML2 (0.62) had balanced loadings for Q3_InventoryService, suggesting that the performance of inventory services is a function of both. Likewise, Q4_Significance had high loadings on ML1 (0.78) and moderate loadings on ML2 (0.60) while Q5_Impact had high loadings on ML1 (0.68) and ML2 (0.70). The communalities were very high ranging from 0.82 to 1.00, which means that communality of between 82% and 100% of the variances in the variables were accounted for by the two factor structure. Similarly, the uniqueness values were very low, especially for Q1_Profitability and Q2_CustomerBase ($u^2 = 0.005$). Complexity values between 1.8 and 2.0 suggest a moderate cross loading between the two factors, not a simple structure. The results suggest there are at least two closely related latent dimensions which affect the performance of SCM and are likely to be operational efficiency and customer-oriented performance, resulting in a more comprehensive understanding of the outcome of the inventory service than what the single-factor model could provide.

Table 14: Factor Summary for **Two-Factor Solution**

Statistic	ML1	ML2
Sum of Squared Loadings	2.51	2.23
Proportion of Variance	0.5	0.45
Cumulative Variance	0.5	0.95
Proportion Explained	0.53	0.47
Cumulative Proportion	0.53	1
RMSR	0.01	–
Tucker Lewis Index (TLI)	0.791	–
RMSEA	0.411 (90% CI: 0.129–0.804)	–

The summary statistics for the two factor solution of the variables of supply chain management (SCM) are shown in Table 14. The results indicate that the Sum of Squared Loadings of the first factor (ML1) was 2.51 and accounted for 50% of the total variance, and the second factor (ML2) had a Sum of Squared Loadings of 2.23 and explained 45% of the total variance. These two accounted for 95% of the variance, showing that the two-factor model accounted for almost the entire variance in the SCM data set. The proportion of variance explained by both latent factors was fairly similar, with ML1 accounting for 53% of the variance and ML2 accounting for 47% of the variance, indicating that both dimensions are important in the description of the SCM performance. The Root

Mean Square Residual (RMSR) value of 0.01 is very small, which reflects a very small residual error and shows a good fit between the observed and reproduced correlation matrices. The Tucker Lewis Index (TLI) is 0.791, which is below the recommended value of 0.90, and indicates moderate model reliability. Moreover, the value of RMSEA was 0.411 with a large 90% confidence interval of 0.129–0.804, which suggests poor absolute model fit and possible overfitting or instability based on the small sample size or high correlation among the variables. The overall results indicate that the two factor solution is a more complete representation of the dimensions of SCM than the one factor solution because it separates the operational part from the customer related aspects, albeit the model fit indices indicate that the two factors might not be completely confident when reading the latent structure of the model.

Table 15: Factor Scores for First Six Observations (Two-Factor Solution)

Observation	ML1	ML2
1	0.784	0.595
2	0.784	0.595
3	0.784	0.595
4	0.784	0.595
5	0.784	0.595
6	0.784	0.595

The factor scores of the first six observations for the two factor solution of supply chain management (SCM) variables are shown in Table 15. The results reveal that all six observations had the same factor score of 0.784 for the first latent factor (ML1) and 0.595 for the second latent factor (ML2), implying a high similarity in the observations in terms of the pattern of the respondents or cases. The first latent dimension seems to be more important in the overall structure of the SCM because of the higher score for ML1. Positive values for both factors indicate positive associations among the observations and the underlying constructs of the SCM constructs of operational efficiency, profitability, customer base, significance and impact measures. The uniformity of the scores at each of the six observations may suggest a homogeneity of perceptions held by the respondents or similarity in operational characteristics of the sampled units. The findings indicate that the SCM dimensions have relatively consistent impacts on observations, suggesting a consistent underlying structure that affects the overall performance of the SCM through both inventory service and performance effectiveness.

3.1.4 Principal Component Analysis of SCM Variables

The results of the questionnaire items used to assess the performance of the supply chain management (SCM) are illustrated in figure 2, which is referred to as the scree plot. The plot indicates that the first principal component had a very large variance (eigenvalue ~4.6), whereas the rest of the components have very small eigenvalues, all around zero, though the second component contributed ~0.16, and later components contributed progressively smaller values. This steep drop-off from the first component makes a distinctive “elbow” shape, a signature that the first principal component is the most important component, accounting for most of the variance structure of the data set. This is consistent with the results of principal component analysis in which first component accounted for about 94.1% of the total variance, all other components together accounted for less than 6% of variance. The assumption is that the SCM variables are very correlated and most of them are one underlying latent construct. This indicates that the questionnaire scale is unidimensional and implies that one dominant SCM performance factor can suffice to explain the variation in the inventory service outcomes and organizational efficiency.

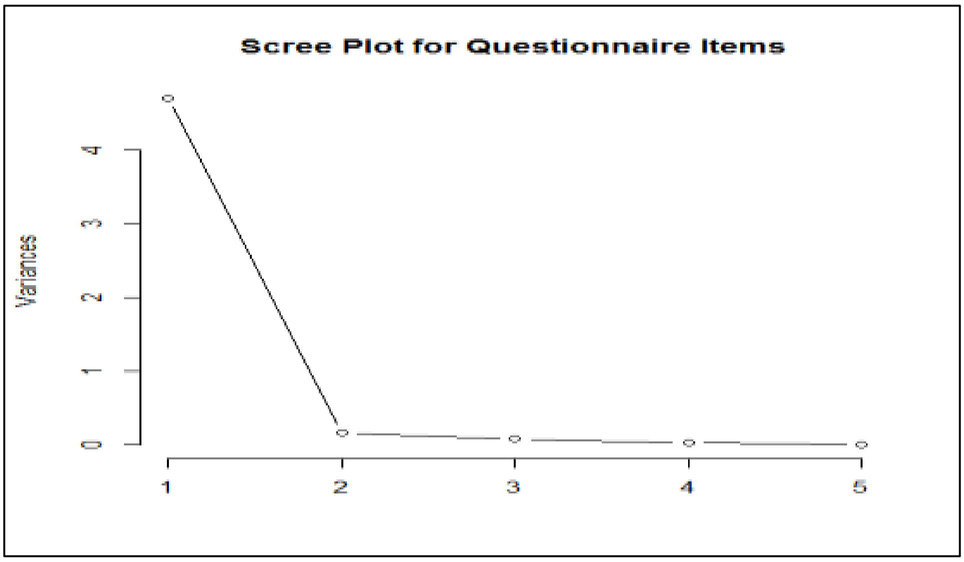

Figure 2: Scree Plot Showing the Principal Component Structure of Supply Chain Management Questionnaire Items

Table 16: Principal Component Analysis – Importance of Components

Component	Standard Deviation	Proportion of Variance	Cumulative Proportion
PC1	2.1695	0.9414	0.9414
PC2	0.404	0.0326	0.974
PC3	0.2896	0.0168	0.9908
PC4	0.1874	0.007	0.9978
PC5	0.1045	0.0022	1

Table 16 shows the importance of the components of the Principal Component Analysis (PCA) of the supply chain management (SCM) variables. From the results, the standard deviation for the first principal component (PC1) was 2.1695 with an overwhelming variance of 94.14% and most information contained in the five SCM variables was concentrated in the first principal component. The second component (PC2) accounted for only 3.26% of the variance with a standard deviation of 0.404, whereas PC3, PC4 and PC5 accounted for only 1.68%, 0.70% and 0.22% of the variance respectively. The second component explained 97.4% of the variance and the third component explained nearly 99.08% of the variance indicating that most of the variance is contained in the first few components. The high decrease in variance contribution after PC1 suggests a high unidimensionality of the SCM indicators. These results suggest a high degree of interdependency among the profitability, customer base, inventory service, significance and impact measures and a possibility of summarizing them in a single dominant latent dimension. PCA is thus very suitable for dimensionality reduction, as it reduces the number of dimensions of the data, but preserves nearly all of the information required to explain inventory service performance and operational efficiency.

Table 17 displays the rotated principal component loadings of the supply chain management (SCM) variables, which indicates the variables' contribution to the five extracted principal components. The results show that all the variables had negative loading in the first principal component (PC1), and the loading values are relatively close together, ranging from -0.431 to -0.453, which suggests that the common underlying SCM dimension is shared by all the variables in PC1. The score for Q3_InventoryService was very high (0.872) on PC2, suggesting that the second one is mainly related to inventory service performance. Likewise, Q2_CustomerBase had a strong positive loading on PC3 (0.686); and Q5_Impact had a high positive loading on PC4 (0.779), indicating that they represent different dimensions of customer expansion and SCM impact. The most positive loading was found for the Q1_Profitability mean score on PC5 (0.689), while the mean score for the Q4_Significance was negatively loaded in most components with the smallest loading being on PC5 (-0.610), indicating an inverse relationship with this latent dimension. Positive and negative loadings indicate the multi-dimensional nature of the relationships between the variables of the SCM. In general the results suggest that a general SCM dimension is dominant, but other dimensions relate to the specific aspects of organization operation, including profitability, inventory efficiency, customer orientation and impact perceived, giving a broader view of organizational operation and the effectiveness of inventory services.

Table 17: Principal Component Loadings (Rotation Matrix)

Variable	PC1	PC2	PC3	PC4	PC5
Q1_Profitability	-0.453	-0.209	-0.504	0.151	0.689
Q2_CustomerBase	-0.449	-0.111	0.686	-0.487	0.28
Q3_InventoryService	-0.431	0.872	-0.169	-0.108	-0.118
Q4_Significance	-0.45	-0.418	-0.361	-0.348	-0.61
Q5_Impact	-0.453	-0.095	0.342	0.779	-0.2478

Table 18: Principal Component Scores – First Six Observations

Observation	PC1	PC2
1	-2.00726	-0.29278
2	-2.00726	-0.29278
3	-2.00726	-0.29278
4	-2.00726	-0.29278
5	-2.00726	-0.29278
6	-2.00726	-0.29278

The Principal Component Analysis (PCA) of supply chain management (SCM) variables resulted in the scores of the first six observations. These scores are included in Table 18. The results reveal that all six observations had the same score for both principal components, with PC1 being -2.00726 and PC2 being -0.29278. Large negative score on PC1 indicates that these observations have an overall negative position relative to the overall mean on these variables that are the most important in the dominant SCM dimension (profitability, customer base, inventory service, significance, impact). Likewise, the slight negativity of the PC2 score suggests that there was a small negative correlation with the second principal component representing the secondary latent dimension. The uniformity of the scores for the six observations suggests that the sampled units or respondents are similar in their SCM characteristics and in their service of their inventories. As it has been earlier demonstrated that the PC1 accounts for about 94.14% of the total variance, the high negative scores of the PC1 strongly suggest that these observations are useful in the lower end of the performance spectrum of the dominant SCM. The implication is that the operational outcomes of the sampled units represented by these observations could be relatively weaker than observations with positive component scores, thus emphasizing the usefulness of PCA in identifying patterns and grouping together similar organizational performance profiles.

3.2 Discussion of Findings

The results of this study showed that there is a significant relationship between the practices of Supply Chain Management (SCM) and inventory control in the Department of Agricultural Engineering and Technology, also in customer service and organization performance. The Chi-square analysis revealed statistically significant relationships between inventory control and customer service performance ($\chi^2 = 13.76$, $p = 0.001$), inventory control and inventory service outcomes ($\chi^2 = 5.88$, $p < 0.001$) and inventory service outcomes and customer service performance ($\chi^2 = 5.78$, $p < 0.001$). The results demonstrate that the use of integrated SCM systems can significantly improve operational efficiencies, customer satisfaction, and organizational sustainability. The findings are similar to those of Omonzejele and Ogbuleka (2025) who stated that there is significant improvement in procurement efficiency and inventory management when SCM practices are put into place with a positive relationship between SCM practices and procurement activities, $r = 0.342$, $p < 0.05$. Likewise, Rajamma and Shivalingam (2020) found that an integrated approach to SCM is beneficial for the competitive advantage, profitability and satisfaction of the customers of an organization. The present findings thus further support the claim that the successful integration of SCM is still a key tool for enhancing inventory service performance and responsiveness of an organization in highly competitive markets.

Logistic regression additionally indicated that profitability and expansion of customer base had significant positive impacts on positive inventory service outcomes. In particular, the odds ratio for Q1_Profitability was extremely high (1.995×10^{21}), and the odds ratio for Q2_CustomerBase was 5.915×10^8, showing that an improvement in profitability and customer growth is a significant asset in improving the odds of achieving positive inventory service performance. This result conforms to the result of Orga and Mbah (2017) who reported that inventory management had significant influence on the growth of organizations ($R^2 = 0.753$), profitability ($R^2 = 0.529$) and sales turnover ($R^2 = 0.599$) of the departmental stores in South-East Nigeria. Likewise, Charles (2026) found an inventory management performance correlation for humanitarian organisations and organizational performance to be positively high ($r = 0.834$, $p<0.05$). Profitability oriented SCM practices, efficient procurement coordination and customer oriented inventory systems have a great influence on service delivery, stock out problems and operational sustainability of the organizations. In spite of the very high odds ratios and standard errors that were found in the present study, however, there is possible multicollinearity and model instability due to highly correlated SCM variables, which could warrant cautious use in practice.

4. Conclusion

In this study, the effect of Supply Chain Management (SCM) practices on Inventory Control, Customer Service and Organizational Performance was assessed using logistic regression, ordinal logistic regression, Exploratory Factor Analysis (EFA) and Principal Component Analysis (PCA). The results showed that SCM practices have a significant impact on inventory service results, the efficiency of the operations, and customer satisfaction. The chi-square analysis confirmed that there are significant relationships between inventory control, customer service and SCM performance which suggest that an effective system of SCM improves the organization's responsiveness and inventory efficiency. Logistic regression results also showed that profitability-oriented SCM strategies and growth of customer base positively affected positive inventory service outcomes, highlighting the importance of SCM strategies that are both focused on customers as well as profitability for organizational operations.

The results yielded from factor analysis indicated that the SCM variables were highly correlated among each other and were significantly explained by a single latent dimension implying that profitability, customer growth, inventory service efficiency, operational significance and organizational impact are all contributing factors to the effectiveness of SCM. The Principal Component Analysis (PCA) showed that the first principal component was able to explain more than 94% of the variance, indicating a strong unidimensionality of the SCM performance indicators. The results suggest that organizations which have integrated and technologically supported SCM systems are more likely to optimize their inventories, deliver a better customer service, coordinate their operations, and perform sustainably.

Therefore, it can be concluded that SCM practices are still a key factor in achieving an efficient inventory, satisfied customers and the competitiveness of the organization. Overall, the combination of predictive analytics, dimensionality-reduction methods, and technologically enhanced SCM systems equips organizations with enhanced operational capabilities to boost service delivery and sustainability in today's loaded and competitive business landscape. Based on the outcome of the study, the following recommendations for policy making were made:

i. Government policymakers and organizational policy makers should devise policies to promote the implementation of integrated technological SCM systems like Enterprise Resource Planning (ERP), Electronic Data Interchange (EDI), Warehouse Management Systems (WMS), and automated inventory tracking systems to enhance inventory visibility and streamline operational processes, as well as create better customer service delivery systems, across organizations.
ii. To ensure organizational sustainability and competitiveness, SCM policies should be developed based on strategic frameworks that focus on making SCM profitable by managing inventory, integrating supplier management and connecting with customer service, while carrying out periodic staff training, monitoring the operations and investing in SCM analytics.

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