

Effect Of Supply Chain Quality Management Practices On The Performance Of Africa Improved Food Rwanda (AIF) (2020-2023)

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Abstract: This study investigated how supply chain quality management practices affect the performance of Africa Improved Food Rwanda (AIF) from 2020 to 2023. Despite AIF's efforts in quality planning, assurance, control, and continuous improvement, its overall performance has remained suboptimal, likely due to weaknesses in these management practices. The research focused on four main objectives: evaluating the effects of quality planning, assurance, control, and continuous process improvement on AIF's performance. The study used theories such as resource-based theory, Deming's quality improvement theory, and reliability theory. Data were collected from 170 AIF employees using questionnaires, interviews, and documentation, and analyzed both quantitatively and qualitatively. Findings from the first objective indicated that item 3 indicates that "Organisation has requirements and recommendations that specify how management operations are to be conducted at a company to ensure that quality is the end result (SOP)" responded at very highest mean and the responses were homogeneous (mean= 5.00, SD=0.000), findings from the second objective indicated that "Actions and Measures are taken after a report of Monitoring and Evaluation in terms of ensuring quality" responded at very highest mean and the responses were homogeneous (mean= 4.88, SD=0.422), and item 2 indicates that "The Organisation machines and equipment's are being checked regularly by RSB" responded at very highest mean and the responses were homogeneous (mean= 5.00, SD=0.000), findings from the third objective indicated that being practiced" responded at very highest mean and the responses were homogeneous (mean= 4.76, SD=0.437), finally from the fourth objective indicated that item 1 indicates that "The Organisation has training policies for employee" responded at very highest mean and the responses were homogeneous (mean= 5.00, SD=0.000).. The study concludes that AIF should continually enhance its safety standards and minimize risks associated with substandard products to improve overall performance.

Keywords: Supply chain Quality Management Practices, Quality Planning, Quality Control, Quality Assurance, Continuous improvement, Performance

1. INTRODUCTION

1.1 Background of the study

Quality management has many dimensions and involves the supervision of all tasks, activities and lines of work performed by employees in order to gain influence and improvement in all fields related to the company (Saffar & Obeidat, 2020). It may involve making different policies, developing different strategies for improvement, interacting with the market and eliminating errors to

improve productivity (Sahoo, 2018). Supply chain quality management (SCQM) has emerged from combining supply chain management and quality management (Foster, 2021), shifting from an internal organisational view of quality management to a supply chain-wide perspective. Supply chain quality management is the coordination and integration of all supply chain activities and stakeholders to monitor, analyse, and continually improve services, processes, and products, leading to value addition to meet the needs of consumers (Robinson, 2015).

Over the past few years, Africa Improved Foods (AIF) as a food manufacturer since its inception in December 2016 has gained extensive experience in food production, producing a wide range of cereal products that meet the highest international quality standards. AIF is one of two manufacturers worldwide and the only producer in Africa of the Super Cereal Plus range, a nutritious cereal combination formula made from locally grown cereals by the WFP that is distributed to communities in need in Kenya, Uganda, Somalia, South Sudan, and Ethiopia (AIF, 2024). Despite many efforts made by African Improved Food (AIF) through supply chain quality management in terms of quality planning, quality assurance, quality control, and supply chain continuous process improvement, its performance as one of the biggest manufacturing companies here in Rwanda remains unobservable and ineffective due to inappropriate management quality practices done by this company.

1.2. Objectives of the study

The general objective of this study was to examine the effect of supply chain quality management practices on the performance of Africa Improved Food.

While Specific objectives were to

- i. To establish the effect of supply chain quality planning on the performance of Africa improved Food.
- ii. To determine the influence of supply chain quality assurance on the performance of Africa Improved Food.
- iii. To determine the effect of supply chain quality control on the performance of Africa Improved Food.
- iv. To establish the effect of supply chain continuous process improvement on the performance of Africa Improved Food.

1.3 Research hypothesis

The study verified the following hypotheses:

H₀₁: There is no significant effect between supply chain quality planning and the performance of Africa improved Food.

H₀₂: There is no significant influence between supply chain quality assurance and the performance of Africa Improved Food.

H₀₃: There is no significant influence between supply chain quality control and the performance of Africa Improved Food.

H₀₄: There is no significant influence between supply chain continuous process improvement and the performance of Africa Improved Food.

II. LITERATURE REVIEW

Theoretical Framework

This Study was guided by three theories: Resources-based Theory, Deming Quality Improvement Theory and Reliability Theory.

Resource Based Theory

The theory derives largely from the work of Penrose in 1959s, in which she identified idle management resources as the main driver of growth (von Nitzsch, et al. 2024). Penrose recognized that internal management resources are both a driver and a

limiting factor for firm expansion. Drawing on the management strategy literature, a firm's RBV describes, explains, and predicts how firms can achieve sustainable competitive advantage through the acquisition and control of their "unique" resources and capabilities. The resource-based view theory holds that valuable, rare, inimitable, and irreplaceable internal organizational resources constitute the basis for sustainable competitive advantage and improved performance (Uyanik, 2023).

Deming Quality Improvement Theory

Quality Improvement Theory was first introduced by Deming in the 1950s as an advocated product quality as a means of reducing costs (Caldwell & Varkey, 2021). He defined quality as a certain degree of consistency and reliability of quality standards with the goal of customer satisfaction. The main idea of the philosophy is to keep the customer in mind. W. Edwards Deming founded Total Quality Management. Quality improvement theory emphasizes that top management plays a key role in quality management within an organization. According to Deming (2016) and Hill (2021), management is responsible for the systems that cause most of the problems within an organization.

Reliability Theory

Reliability theory focuses on achieving a predetermined level of success with a specified level of statistical confidence. It emphasizes error-free operation based on the product's intended use, from initial conformance to specifications at the time of purchase to continued conformance to specifications throughout its lifecycle. Quality is defined by adherence to manufacturing specifications, while reliability ensures continued conformance to those specifications over time, making reliability an extension of quality into the time dimension.

According to the theory, a reliability plan describes in detail the methods, tasks, analyses, tools, and tests required for a specific system, thereby laying the foundation for an effective supply chain quality control plan in the early stages of system development. Rausat and Hoyland (2014) built on their work and introduced the reliability theory of quality management

Empirical Review

Quality management is an integral component of organizational or supply chain excellence to ensure its survival and success in a rapidly changing business environment. Considering quality as a key element of performance is likely to propel an organization to greater heights. Al-Qahtani, Alshehri, and Aziz (2015) conducted the study on the effect of supply chain quality management on organizational performance; their objectives were to establish total quality management implementation in Pakistan and to explore the link between effective implementation and organizational performance. They found that SCQM practices affect organizational performance both positively and negatively. Also, Nsinga (2022) focused on the effect of supply chain quality management practices on organization performance; he found that there is a positive correlation between top management and organizational performance in Rwanda

Conceptual Framework

Figure 1: The conceptual framework illustrating the relationship between Supply chain Quality Management Practices and Africa Improved Food (AIF) Performance

Independent variable:

Dependent Variable: Performance of AIF

Supply Chain quality management practices



Source: Researcher (2024)

Figure 1 logically represents and explains the link between the independent variable (supply chain quality management practices) and the dependent variable (performance of Africa Improved Food); this generally revealed that through supply chain quality management practices in terms of supply chain quality planning, supply chain quality control, and supply chain continuous quality improvement positively affects the performance of Africa Improved Food in terms of satisfying the customers as well as increasing the productivity level.

III. RESEARCH METHODOLOGY

This Study has used both descriptive and correlational research Designs. The research relied on primary data, which was gathered using questionnaires, Interview and observation. The Target Population was composed of 170 respondents who were the total staff of AIF during data collection period. As the Target population was less than 300 ,the sample size is universal(Amin,2005). Due to the fact that the population of the study was relatively small, the study used a census or total enumeration to collect data from the

whole population. Complete enumeration consists of using each and every unit of the population in the study. The study used the universal sampling technique.

Table 1: Research Population: Employees of Africa Improved Food (AIF) Headquarter

Category	Target Population	Sampling Technique
Executive Committee	7	Census Sampling
Finance	4	
Procurement and Sourcing	8	
Operation	15	
Supply chain quality control and Assurance	16	
Casual employees	120	
Total	170	

Source: Research ,2024

IV. RESULT AND DISCUSSION

Data Analysis

Data were analyzed using SPSS version 20.0. Descriptive statistics were used to summarize the quantitative data, while multiple linear regression was employed to determine the significance of each independent variable. Hypotheses were tested using t-tests, with a significance level set at $p < 0.05$ and a 95% confidence interval. Pearson's correlation and regression coefficients further supported the hypothesis testing.

Descriptive statistics

Frequencies and percentages were also used to analyze general information about the respondents and the mean and standard deviation have to be used to describe various aspects of the effect of supply chain quality management practices on the performance of Africa Improved Food.

Correlational Analysis

The researcher used the correlation analysis to determine the direction, closeness, and strength of association between supply chain quality management practices as an independent variable and the performance of Africa Improved Food as the dependent variable. The Spearman correlation coefficient was used as a very useful way to measure the statistical relationship between supply chain quality management practices and performance of Africa Improved Food.

Multiple Linear regression model

The study used a multiple regression equation to determine the effect of Supply chain quality management practices on the performance of improved food products in Africa. The regression equation is shown below.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where:

Y = AIF Performance

β_0 = Constant

$\beta_1 - \beta_4$ = Coefficient of estimates

X_1 = Supply chain Quality Planning

X_2 = Supply chain Quality Assurance

X_3 = Supply chain Quality Control

X_4 = Supply chain Continuous Improvement

ε = Error

Test of the Significance of regression Model

The regression model assessed the extent to which changes in the independent variables were associated with changes in the dependent variable. The F-test from ANOVA was used to test the research hypotheses, evaluating the goodness-of-fit of the regression model. This approach determines if the observed data supports rejecting the null hypothesis.

Reliability and Validity of the measurement Instruments

Before conducting the questionnaire, four research experts were selected to evaluate the points of the questionnaire related to the research objectives. Furthermore, the validity was tested by using Content Validity Index (CVI) Formula below:

$$CVI = \frac{\text{Total numbers of relevant items in the instrument}}{\text{Total numbers of items in the instruments}} = \frac{37}{43} = \mathbf{0.86}$$

Cronbach's alpha coefficient was used to measure the internal consistency of the studies. The questionnaire was used as the instrument may be considered reliable if Cronbach's alpha coefficient ≥ 0.7 (Amin, 2005).

Table 1: Reliability Tests Results

Items/ Variables	Cronbach's Alfa Coefficients results	Decisions
Quality planning	0.82	Acceptable
Quality assurance	0.96	Acceptable
Quality control	0.81	Acceptable
Continuous improvement	0.92	Acceptable
Performance	0.71	Acceptable

Source: Research data (2024)

Correlational Analysis

The Main objective of the study was to examine the effect of Supply Chain Quality Management Practices on the Performance of Africa Improved Food (AIF).The result is illustrated below

Table 3: Findings on Correlation Coefficients matrix between Variable

Correlations		Performance	Quality planning	Quality assurance	Continuous control	Continuous Improvement
Performance	Pearson	1				
	Correlation					
	Sig. (2-tailed)					
	N		170			

Quality planning	Pearson					
	Correlation	.477	1			
	Sig. (2-tailed)	.053				
	N	170	170			
Quality assurance	Pearson					
	Correlation	.410	.251	1		
	Sig. (2-tailed)	.102	.332			
	N	170	170	170		
Continuous control	Pearson					
	Correlation	.171	.054	.346	1	
	Sig. (2-tailed)	.512	.838	.174		
	N	170	170	170	170	
Continuous Improvement	Pearson					
	Correlation	.185	.387	.451	.139	1
	Sig. (2-tailed)	.478	.125	.069	.596	
	N	170	170	170	170	170

Source : Primary data (2024)

According to Pearson's correlation coefficient theory, Table 4.8 shows that when Africa Improved Food's performance actually changed at a rate of 1, the quality planning fluctuated at 0.477 therefore this means that the two variables are lowly correlated. In addition, when quality assurance also changed by 0.410, Africa Improved Food's performance actually changed at a rate of 1, also this means that the two variables are lowly correlated. In short, there is a fairly low positive correlation between the three variables. Therefore, quality control plays an important role in minimizing the environmental impact of food production (Gunasekaran et al. 2019). Products can harm the health of consumers and cause widespread foodborne illness. In addition, the disposal of bad products also causes environmental pollution, further exacerbating the negative impact of the business on society (Ajibade et al. 2021). Regression analysis

Inferential statistics help researchers find explanations for situations or phenomena. They allow researchers to draw conclusions based on extrapolation and are fundamentally different from descriptive statistics, which simply summarize the actual measured data. Therefore, this section covers model summaries, ANOVA tests, and coefficient correlations.

Table 4. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.708 ^a	.502	.320	.412

a. Predictors: (Constant), Continuous Improvement, Continuous control, Quality planning, Quality assurance

Source : Primary Data (2024)

From the table 4 above, R is the correlation coefficient which shows the relationship between the study variables, from the findings shown in the table below there was a positive relationship between the study variables as shown by 0.502 at the 1% significance level. Furthermore, the Adjusted R squared is the coefficient of determination which tells us the variation in the dependent variable due to changes in the independent variables, from the findings in the table above the value of adjusted R squared was 0.320 which is an indication that there was variation of 32% on Africa Improved Food's performance due to changes in continuous improvement,

continuous control, quality planning, quality assurance at 95% confidence interval. This is an indication that 41.2% of the changes in performance could be account for by the independent variables.

Test of the significance of the Model

Table 5: ANOVA Results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.881	4	.470	2.768	.002 ^b
	Residual	1.869	165	.170		
	Total	3.750	169			

a. Dependent Variable: Performance

b. Predictors: (Constant), Continuous Improvement, Quality control, Quality planning, Quality assurance

Source : Primary data (2024)

If P-value < 5% -Model fit

If P-value > 5% -Model not fit

Conclude: The model is fit to predict the study variables because P value < 0.02 or 5%.

Regression Results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.279	.614		2.083	.061
	Supply chain Quality planning	.492	.242	.471	2.034	.000
	Supply chain Quality assurance	.656	.300	.587	2.188	.000
	Supply chain Quality control	.393	.270	.352	1.455	.014
	Supply chain Continuous Improvement	.590	.530	.295	1.113	.009

a. Dependent Variable: Performance

Source : Primary data (2024)

From the regression equation above, it was found that holding all the total quality management to a constant zero, performance of Africa Improved Food will be 127.9 percent, a unit increase in the use of quality planning would lead to increase the performance of Africa Improved Food at 49.2%, a one percent increase in the use of quality assurance would lead to an increase the performance of Africa Improved Food at 65.6%, also a one percentage increase in the use of quality control would lead to 39.3% increase of performance of Africa Improved Food and finally one percentage increase in the use of continuous improvement would lead to 59% increase of performance of Africa Improved Food. Overall, the quality assurance practices had the greatest effect on performance of Africa Improved Food, followed by continuous improvement, quality planning as well as well as quality control. At 5% level of significance and 95% level of confidence, quality planning had 0.000 level of significance; quality assurance had a 0.000 level of significance, continuous improvement has a 0.009 level of significance and finally quality control had a 0.014 level of significance. Therefore, all the variables were significant ($p < 0.05$).

The multiple regression models for this research can be stated as:

$$Y = 1.279 + 0.492X_1 + 0.656X_2 + 0.391X_3 + 0.590X_4 + \varepsilon$$

Test of hypotheses results

The study examined the effect of Supply chain quality management practices on the performance of Africa Improved Food were used. Findings are below:

Table 4.13: Hypotheses summary results

	P value	Decision
H₀₁: There is no a significant effect between supply chain quality control quality planning and the performance of Africa improved Food.	0.000	Rejected
H₀₂: There is no a significant influence between supply chain quality control quality assurance and the performance of Africa Improved Food.	0.000	Rejected
H₀₃: There is no a significant influence between supply chain quality control quality control and the performance of Africa Improved Food.	0.014	Rejected
H₀₄: There is no a significant influence between supply chain quality control continuous improvement and the performance of Africa Improved Food.	0.009	Rejected

Source : Primary Data (2024)

The results of the hypotheses testing in Table 4.13 provide significant overviews of the effect of quality management practices on the performance of Africa Improved Food. Each null hypothesis (H₀₁, H₀₂, H₀₃ and H₀₄) has been rejected (p < 0.05), indicating strong evidence against the idea that these total quality management practices have no significant effect on the performance of Africa Improved Food. Specifically, continuous improvement, quality control, quality planning, as well as quality assurance all demonstrate a significant effect on the Africa Improved Food's performance. These findings emphasize the critical role of total quality management in achieving the performance of Africa Improved Food in general. As stated by Mizuno (2020) focusing all employees on quality management and continuous improvement, many agro processing companies can establish and maintain cultural values that create long-term success for both customers and the company. Kaydos (2020) revealed that continuous improvement is a powerful tool that helps individuals and organizations continually improve performance and achieve better results.

V. CONCLUSION AND RECOMMENDATION

5. Conclusion

The study results concluded that the combination of Supply Chain Quality Planning, Supply Chain Quality Control, Supply chain Quality Assurance and Continuous Improvement has a positive effect on the Performance of Africa Improved Food (AIF) with 70 % as Represented by R square at 95% confidence interval.

Findings indicated that the standard covers all aspects of Africa's improved food's activities, including identifying its key processes, defining roles and responsibilities, its policies and objectives, and documentation requirements. Findings indicated that actions and measures are taken after a report of monitoring and evaluation in terms of ensuring quality; also, organization machines and equipment's are being checked regularly by RSB; moreover, organization machines and equipment's are calibrated. Findings indicated that consistent commitment to quality management practices benefits both supplier and customer. The organization management has provided a conducive environment that directs the effort of employees towards attainment of quality. Moreover, the technical team sits regularly to check on quality management practices being practiced; finally, the organization also adjusts product quality according to feedback. Findings indicated that employees are trained on information and technology continuously; the organization has training policies for employees; and moreover, the organization has set a time limit

to meet the efficiency of product delivery. Furthermore, the organization compares improvement process outcomes with goals, and its employees are also continuously trained to enhance quality performance

6. Recommendations

Diverse Policy recommendation can be drawn from the findings of the study

- Africa Improved Foods should take into account the needs, requirements and preferences of its customers and constantly assess potential risks to its satisfaction and explains in detail what needs to go right and what could go wrong.
- Africa Improved Food should monitor feedback to observe which changes are successful and identify the next areas to optimize product quality and should set clear goals and establish communication and reporting practices. Africa Improved Food should also develop a strategy for testing programs and measure and update indicators of success.
- Africa Improved Foods should implement modern technology at every possible level to measure outcomes related to quality control. By ensuring continuous improvement, Africa Improved Foods can directly leverage measurable feedback from customers. This is a great way to identify issues that may not be apparent at the production level.

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