



Logistics Management Practices And Operational Performance Of Multinational Corporations In Rwanda A Case Study Of Nelsap-Cu, Rusumo Project

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Abstract:

Background: This study examines the effect of logistics management practices and operational performance of multinational corporations in Rwanda using the case study of NELSAP-CU Rusumo project for the period 2016-2021. The specific objectives of the study were to analyze how warehouse management affects the operational performance, assess the effect of inventory management on the operational performance and to establish the effect of transport management on the operational performance of NELSAP-CU Rusumo project.

Materials and methods: The researcher used a quantitative research design involving both descriptive and inferential analysis. Data was collected from 52 people who included 29 junior staff, 18 middle-level managers and 5 senior managers from NELSAP-CU Rusumo project by use of the questionnaire survey. There was no sampling because the population size (65) was small. Validity was ensured by using the content validity index while internal reliability was ensured by using pilot-testing. Only quantitative data was used and this was analyzed using descriptive statistics (minimum, maximum, mean and standard deviation) and inferential statistics (multiple linear regression analysis) which were conducted using Microsoft Office Excel Data Analysis ToolPak.

Results: For the first hypothesis, findings from the regression analysis show that warehouse management had a negative ($\beta_1 = -0.208$) and statistically significant ($p = 0.000 < 0.05$) effect on the operational performance of NELSAP-CU Rusumo Project at a 5% level of significance. Therefore, the study fails to accept the first hypothesis by stating that warehousing management has a statistically significant effect on the operational performance of NELSAP-CU Rusumo Project. The test for the second hypothesis shows that inventory management had a positive ($\beta_2 = 0.230$) but not statistically significant ($p = 0.063 > 0.05$) effect on the operational performance of NELSAP-CU Rusumo Project at a 5% level of significance. For the third hypothesis, it is observed that transport management also had a positive ($\beta_3 = 0.003$) but not statistically significant ($p = 0.977 > 0.05$) effect on the operational performance of NELSAP-CU Rusumo Project at a 5% level of significance.

Conclusion: The significance of the study lies in its potential to inspire the management of NELSAP-CU (Rusumo Project) to become agile and continuously improve their logistics management practices based on the prevailing changes in the operating environment. This study recommends that the management should consult the relevant stakeholders and engage in decision-making when selecting the mode of transport to ensure effective and efficient delivery of material supplies.

Key Words: Logistics Management Practices, Operational Performance, Multinational Corporations, Nelsap-Cu, Rusumo Project, Rwanda

i. Introduction

The increasing rate of globalization and international trade has propelled advancements in logistics management from the simple concepts of warehousing and transportation to become a strategic function in many companies. As noted by Sople (2018), logistics capabilities increase the supply chain operation and play an important role in both organizational strategy and operational performance. The author (Sople, 2018) further noted that the leading global retail giants, Wal-Mart and Levi Strauss focus on their distinctive logistic capabilities to maintain their competitive advantage.

In Africa, Kenya, South Africa, Nigeria, Egypt, Tanzania and other countries with coastlines have positioned themselves as the logistics hubs on the continent to improve supply chains and business operations. In Rwanda, the importance of logistics management continued to grow with Fast Moving Consumer Goods Companies opting for this mode to deliver their products across the country and beyond and not so much on other sectors (David, 2013). Being located in the hinterland of the East African Community, logistics management plays a significant role, for not only improving business operations but also economic growth.

At a business level, the performance of an organization is evaluated by how it reduces cost or increases value and the lead time for receiving inventories and serving customers' needs. Three common measures of performance are used when evaluating firm's operational performance: efficiency, responsiveness and effectiveness (Caridi, 2016). Efficiency implies minimization of total system-wide costs from transportation and distribution to inventories of raw materials, work in process (WIP) and finished goods.

Propositions by Kent (2018) indicate that to be efficient, firms should utilize strategies aimed at creating the highest cost efficiency and for such efficiencies to be achieved; logistics management needs to be improved. For responsiveness, the firms should establish flexible logistics management functions to ensure that customers are served satisfactorily. Effectiveness on the other hand means doing the right thing at the right time. Firms should ensure that they do enough research to know what their customers need and should get the right resources to serve their customers satisfactorily.

Organizational performance can therefore be best measured through operational cost reduction and customer service delivery levels (Meijjaard, 2017) As more manufacturers struggle with global markets, competition from low-cost countries and faltering home economies, the attention of many manufacturers and retailers have naturally turned to cost and waste reduction. It is therefore very important to understand the best cost reduction strategies and identify the main cost drivers in a firm's operations. While an obvious need for cost reduction arises, the reality is that many firms do not know where most of the cost of a product occurs.

It is also equally important to understand the overhead structure, as this can help to identify perverse incentives that may affect later decisions (Meeker & James, 2015). The prevailing peace and prosperity in Rwanda has motivated various multinational organizations from the private sector, non-government organizations and intergovernmental organizations to establish operations in the country (Nzohabonimana, 2019). One of these multinational and intergovernmental organizations is the Nile Equatorial Lakes Subsidiary Action Program (NELSAP). NELSAP is the leading intergovernmental organization of the Nile Basin working on the sustainable development of shared Nile Basin water and other related resources.

The Regional Rusumo Falls Hydroelectric Project is a hydropower project under joint development by the governments of the Republic of Burundi, Republic of Tanzania and the Republic of Rwanda through a commonly owned Rusumo Power Company (Rusumo Project, 2021). The transmission lines will extend from the power generation plant to Gitega in Burundi, Kigali in Rwanda, and Nyakanazi in Tanzania.

The project will develop renewable hydroelectric power as part of a broader program to support the sustainable management of the Kagera River Basin and promote growth and poverty reduction. NELSAP-CU coordinates the implementation of the project on behalf of the three countries. This study sought to empirically examine how logistics management affects the operational performance of multinational organizations using NELSAP-Rusumo Hydropower project as a case study. Logistics management focused on three variables: warehousing management, inventory management and transport management functions. The specific objectives that guided this thorough research are:

- i. To examine the effect of warehousing management on the operational performance of NELSAP-CU Rusumo Project.
- ii. To analyze how inventory management affects the operational performance of the NELSAP-CU Rusumo Project.
- iii. To assess the effect of transport management on the operational performance of the NELSAP-CU Rusumo Project.

ii Theoretical Literature

Warehousing Management and Operational Performance

Warehousing is an important part of a firm's logistics system that stores products (raw materials, parts, goods-in-process and finished goods) at and between points of origin and points of consumption. Warehousing can be provided by either warehouses or distribution centres (Emberson, 2016). An important decision for many firms is the criteria for locating the warehouse facilities. Cost factors are prevalent in the decision-making models. Resources such as skilled labor are also emphasized in some of the models.

Another dominant factor is what might be named accessibility, meaning infrastructure and availability of transportation modes (Storey & Godsell, 2006). Mamad (2013) also emphasizes time and reliability related considerations. This includes the proximity of customers manufacturing facilities and suppliers. The roles of warehouses are being seen as increasingly important as they change from "holding yards" to "switching yards". Karimi (2016) lists the roles of warehouses as being: make/breakbulk consolidation centers, transshipment facilities, assembly facilities, product fulfillment centers, returned goods depots and other miscellaneous roles such as customer support. This, therefore, means that warehouses play a key role in supporting supply chain strategies.

They may simply serve markets or hold inventory and therefore provide means for achieving appropriate customer service and cost reduction in an environment prone to long lead times and disruptions.

Inventory Management and Operational Performance

Besides the various activities associated with a lean supply chain, many firms across the world are always finding different methods and techniques to reduce their investments in inventory, because it is indirectly taxing on the profitability of the firm. Inventory management is a strategic area in logistics operation and has an impact on the efficiency and effectiveness of the overall supply chain system.

Whilst inventories provide some security against fluctuations in the level of customer demand, there is concern that they may reduce the ability of supply chains to respond to changes like a demand. Inventories in the international supply chains may therefore act as a buffer against one risk whilst increasing another type of risk. Davis (2016) lists factors such as speed to the market for new products, responsiveness to market niches, and the feedback time for quality issues. Harrison (2016) have put forward inventory reduction strategies such as reduction of production lead times, product postponement, total cycle time, compression, centralization of inventory and the virtual warehousing concept.

Managing all kinds of assets in an organization can be viewed as an inventory problem. Nearly all the literature on optimal inventory management uses the criteria of cost minimization or profit maximization. An inventory manager's goal for example is modeled as minimizing cost or maximizing profit while satisfying customer's demands.

Too much inventory consumes physical space, creates a financial burden, and increases the possibility of damage, spoilage and loss. Further, excessive inventory frequently compensates for sloppy and inefficient management, poor forecasting, haphazard scheduling, and inadequate attention to process and procedures. In this context, the lean production principle pioneered by Cooper (2007) has been linked to a reduced level of inventories.

Transport Management and Operational Performance

Transportation management is the buying and controlling of transportation services by either a shipper or a consignee. Today, more than ever before, organizations are concerned about transportation management because transportation represents a major expense item. Transportation is the most costly logistics activity for many organizations and is pivotal to the successful operation of any supply chain Karimi (2015). Sople (2018) explains that the movement of goods from the point of production to the point of consumption is done through various modes of transportation. Depending on the transportation load, the number of delivery points, existing distribution centers, product value, frequency of delivery, urgency and the cost economics, different types of networks are used.

Spillan (2014) points out that the transportation cost for a given mode of transport is a function of the distance and the quantity of the goods shipped. In general, transport rates taper with the increasing distance. This implies that with increasing distance, the rate of increase of transportation costs will go down. For longer distances travelled, the related fixed costs at the points of origin and destination are distributed over more kilometers. Further, the longer the distances travelled, the overall utilization of the vehicle is likely to be higher.

This is known as the economies of distance in transportation. According to Storey (2017), a carrier makes investment decisions regarding the transportation equipment (locomotives, trucks, aeroplanes, etc) and in some cases infrastructure (rail), and then makes operating decisions to try to maximize the return from these assets. A shipper in contrast uses transportation to the total cost (transportation, inventory, information, sourcing and facility) while providing an appropriate level of responsiveness to the customer.

Customer Service Delivery Levels and Operational Performance

A competitive advantage accrues to those firms that can quickly respond to changing market conditions Mentzer (2019). Since the Internet allows the near-instantaneous transfer of information between various links in the supply chain, it is ideally suited to help firms keep pace with their logistical environments. Many businesses have placed a priority upon real-time information regarding the status of orders and production from other members of the supply

chain Demers, (2001). Federal Express is an example of such a business Cooper (2007). Federal Express allows customers to track packages easily and quickly in real-time.

This makes Federal Express a critical member of other organizations' supply chains. With a proper logistics management system, a firm can manage the right inventory levels and deliver what the customer needs at exactly the right time. An effective logistics information system (LIS) also allows real-time sharing of logistical information for proper management of the logistics functions.

Operational Cost Reduction

Effective logistics management helps reduce costs by reducing errors, providing better tracking of purchase orders and goods delivery, streamlining ordering processes, and cutting acquisition cycle times. Recent research by the Aberdeen Group, an Internet research firm, has shown that an automated inventory system (which is part of logistics management) can cut average costs from \$100 (when done manually) to \$33 (Chopra & Meindl, 1999). One survey of large companies by an IT research and consulting firm found that Internet-based inventory management could save roughly 5 percent on high-cost strategic goods, allow a reduction in warehousing staff by 10 percent, and offer a high return on investment Konrad (2014). Thirty percent of the total product cost is usually related to logistics and therefore a reduction of a firm's logistics cost can directly reduce the operational costs of the organization.

iii. Empirical Literature

Dozens of researchers have conducted empirical research on the effect of logistics management on the operational performance of firms in both profit and non-profit sectors. The foregoing sections (2.2.1-2.2.3) review the empirical research on three of the components of logistics management: warehouse management, inventory management, transport management, and their effect on the operational performance of firms.

Effect of Warehouse Management on Operational Performance

It has been observed that warehousing affects the operational performance of firms. In a comprehensive investigation conducted by Probir (2013) in an African survey of supply chain integration, it was found out that there was a significant negative correlation between the length of time that materials, work in progress and finished goods stayed in the warehouse and organizational performance measures such as total logistics costs, on-time delivery and rate. From this observation, it is worth noting that warehouse management has a negative correlation with organizational performance.

Similarly, Gligor and Holcomb (2014) researched in East Africa on a comparative analysis of integrated logistics and supply chain management in manufacturing and service industries using qualitative and quantitative research methods. The researcher found that integrated logistics capabilities, which involved warehousing, worked on means to decrease wasted space and non-value activities across the supply chain. From this investigation, the researcher believes that warehousing is an important function for firms as it improves the operational performance of the firm by reducing space wastage and putting firms to maximum use, which also has a bearing on firm revenue and customer satisfaction.

Another study of Small and Medium Enterprise (SMEs) in Kenya using a mixed-methods approach, Hugos (2011) found that firms faced major challenges in integrating their supply chains internally and with other supply chain partners. However, those with effective warehouse management systems were effectively integrated with their partners and other actors in the supply chain, which improved the firms' operational performance. This finding lends credence to the observation by Beamon (1998) who found that warehousing practices and information System capability for agility act together to affect a positive relationship between organizational strategy and supply chain performance.

In a related development, Tukamuhabwa (2011) found out that warehouse management practices are practiced poorly and this affected the supply chain efficiency and operational performance of firms in Uganda. There is a limitation on research regarding the organization, generalization of potentials and customization of performance of supply chain prompting arising from weaknesses in the warehouse management function. It is necessary to conduct more research building upon her findings.

Effect of Inventory Management on Operational Performance

Khan and Bosgraaf (2019) in their study on "inventory management in a high technology organization" found that to successfully put in force stock management practices, it is necessary to combine inventory management in the ordinary or everyday functions achieved with the aid of the organization's employees. This is, while consumer desires to order equipment or items, they would call up the stock control or management system screen related to the acquisition. When the users request the acquisition of a particular form of asset, then it would be feasible and possible for the stock system to decide if the asset is already in excess, or if it needs to be bought under the current existing quantity purchase agreement with a supplier. This seems to suggest that inventory management if made an everyday function across the organization would drive operational performance efficiency.

A study conducted by Wild (2017) on best practices in inventory management in the United Kingdom using regression analysis found out that proper inventory management had a positive effect on operational outcomes such as quick delivery of supplies, lean production and customer satisfaction across the supply chain. It was revealed that the usage of the inventory management system to manipulate and manage the acquisition and installation of stock or items could help in the control of the firm operations, at the same time as assisting in the mission of employees to carry out asset associated work features. This methodology will result in a work drift and asset management device that is optimized to the organization's vision.

These findings were corroborated by Schwartz and Rivera (2010) who argued that inventory management system as a technique or process interfaces with many employees performing distinct systems of management and control disciplines related to an asset or item implementation, guide, and protection features within the organization in addition to finance and corporate management areas throughout the organizations. These functions have a bearing on the operational performance of firms. In a study by Heizer and Render (2018), it was observed that the vehicle used to manipulate the inventory management subject is Change Management. Without the presence of adequate Change management, the integrity of the stock management procedure can't be ensured. These systems control or manage disciplines, capabilities encompass each system, and facts network elements and feed the Configuration management disciplines or areas to correctly manage and control inventory. It is worth noting that change management is an essential function for eliminating supply chain bottlenecks that has a positive effect on the operational efficiency of firms.

It is observed that inventories that can be withdrawn from the warehouse ought to count number to prevent loss between the warehouse and the factor of the sale in the organization's warehouse. Oballah, *et al.* (2015) in their study on the effect of inventory management practices on organizational performance in public health institutions in Kenya found that inventory is held as protection from uncertainties or unforeseen situations which can happen during operation, a function that is handled within the processes of inventory management, therefore reinforcing the fact that inventory management improves operational performance of firms.

Similarly, Adyemi and Salami (2010) also observed that inventories which are raw material inventories in extra of those needed to help operation can result from a speculative purchase made as a result of managements expecting both anticipated fees increase and a strike would possibly appear. The presence of required raw materials will allow the agencies to take benefit of a discount of market fees, it facilitates to defend in opposition to inflation, it provides strategic shares of items that might be in quick supply thus enhancing operational efficiency.

Effect of Transport Management on the Operational Performance

The need for materials movement along a supply chain to improve firm operations puts transport management at the core of logistics management. Some studies have consequently been conducted to explore the effect of transport management on firm operational performance. Firstly, using bivariate regression analysis, Bullard (2013) conducted a study on addressing urban transportation equity in the United States among manufacturing firms in the seven states of California, Massachusetts, North and South Dakota, North and South Carolina and Florida. The findings revealed that manufacturing firms that had efficient transport systems were performing better than those that were transport constrained. The researcher concluded that the transport system is a critical factor for accelerating the performance of firms not only in operations but also in human resource productivity and financial outcomes.

Secondly, Kithiia (2015) conducted a study on Maersk Kenya Limited, a logistics firm to examine the effects electronic logistics has on the operational performance of logistics firms. Using a sample of 75 individuals drawn from 107 employees of the firm, the study revealed that e-logistics influenced the operational performance of logistic firms positively. These findings are corroborated by Eric's (2013) study of the politics of public transportation in Ghana using the case of Metro Mass Transit where he found out that an effective transport system significantly influenced the operational performance of the nearby firms. Similarly, Muchori (2015) analyzed the effect of congestion in the road traffic on freight logistics efficiency at the port of Mombasa. Building on the infrastructural pressure on the road from Nairobi to Mombasa, which has continued to put a strain on logistics operations at the port, the study, employed a descriptive survey design and used a sample size of 150 respondents from a possible 10450 employees. The correlation results revealed that traffic congestion had a positive correlation with transport costs. Consequently, traffic congestion impacted negatively the efficiency of freight logistics. In a related development, Mukolwe and Wanyoike (2015) assessed how transport management practices used in logistics affect operational efficiency in Mumias Sugar Company. Using descriptive and inferential statistics, the study revealed among other findings that transport management and the practices used for physical distribution are synonymous with the flow of raw materials and goods that is cost-effective which impacts positively on operational efficiency.

Mwangangi (2016) examined the influence logistic management has on the performance of manufacturing firms. The study used both primary and secondary data drawn from employees of the firms and published and unpublished records. Using multiple regressions analysis, the study revealed that transport management by use of transport management systems was a significant predictor of firm performance.

iv. Theoretical Framework

The Theory of Supply Chain Management

The term supply chain management (SCM) has been used to explain the planning and control of materials and information flows as well as the logistics activities not only internally within a company but also externally between companies Fisher (2003). Some fields such as purchasing and supply, logistics and transportation, operations management, marketing, organizational theory, management information systems and strategic management have contributed to the explosion of the SCM theory. Many authors have highlighted the pressing need for clearly defined constructs and conceptual frameworks to advance the theory of supply chain management Saunders.

The theory of SCM emphasizes collaborative advantage. The business world is composed of a network of interdependent relationships developed and fostered through strategic collaboration to deliver mutual benefits to all supply chain partners (Miles & Snow, 2017). SCM seeks improved performance through better use of internal and external capabilities to create a seamlessly coordinated supply chain, thus elevating inter-company competition to inter-supply chain competition (Chopra & Meindl, 1999). Therefore, in the context of SCM. A single firm no longer affects performance. Rather, the performance of all members involved contributes to the overall performance of the entire supply chain.

The Systems Theory

The Systems theory focuses on the relations between the parts. Rather than reducing an entity such as the human body into its parts or elements (e.g. organs or cells), systems theory focuses on the arrangement of and relations between the parts how they work together as a whole. The way the parts are organized and how they interact with each other determines the properties of that system (Ahrne, 2000). The behavior of the system is independent of the properties of the elements. This is often referred to as a holistic approach to understanding phenomena.

Richard (1998) explains that the systems theory can be a useful way of thinking about the job of managing. It provides a framework for visualizing internal and external environmental factors as an integrated whole. It allows recognition of the proper place and function of subsystems. The systems within which businessmen must operate are necessarily complex. However, management via systems concepts fosters a way of thinking which, on the one hand, helps to dissolve some of the complexity and, on the other hand, helps the manager recognize the nature of the complex problems and thereby operate within the perceived environment.

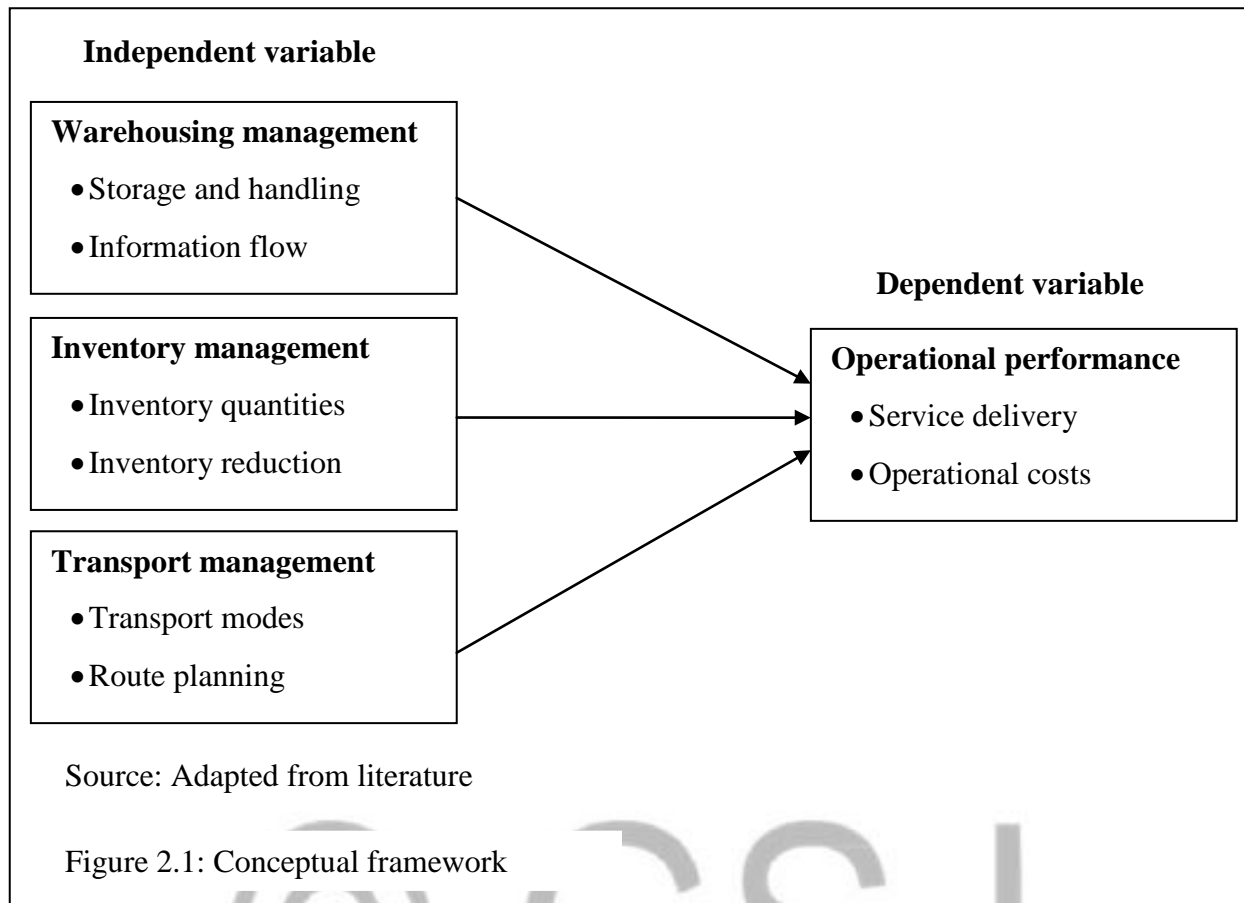
The Coordination Theory

The coordination theory is a body of principles about how activities can be coordinated, that is, about how actors can work together harmoniously Hewitt (2000). There are theories, concepts, and results from many different fields that could both contribute to and benefit from the development of such general theories. For instance, it is clear that questions about how people coordinate their activities are central to parts of organization theory, sociology, social psychology, anthropology, linguistics, law, and political science. Important parts of economics and management science also analyze how people can coordinate their work with a special focus on rational ways of allocating resources Huber (2001). Saunders (2006) explains that in the coordination theory, the common problems have to do with coordination: How can overall goals be subdivided into actions? How can resources be allocated among different actors? How can information be shared among different actors to help achieve the overall goals? In its attempts to find generalizations that apply across disciplines and levels of analysis, coordination theory resembles earlier work on systems theory and cybernetics. Many researchers agree that the major components of coordination include goals, activities, actors and interdependencies (Chopra & Meindl, 1999).

v. Conceptual Framework

The conceptual framework shows the relationship between logistics management and the operational performance of multinational companies. Logistics management is the independent variable and it is represented by 3 sub-variables which include warehouse management, inventory management and transport management. On the other hand, operational performance forms the dependent variable.

Figure 1: Conceptual Framework



Source: Researcher, (2021)

Logistics management is the governance of supply chain functions. Logistics management activities typically include inbound and outbound transportation management, fleet management, warehousing, materials handling, order fulfillment, logistics network design, inventory management, supply/demand planning, and management of third-party logistics services providers. To varying degrees, the logistics function also includes customer service, sourcing and procurement, production planning and scheduling, packaging and assembly. Logistics management is part of all levels of planning and execution strategic, operational and tactical.

It is an integrating function, which coordinates all logistics activities, as well as integrates logistics activities with other functions including marketing, sales manufacturing, finance, and information technology. Companies must recognize that the competition today is through their capabilities and competencies. By managing their core processes better than competitors manage theirs, organizations can create superior value for customers and consumers. Logistics best practice is presented as a work in progress, subject to a continuous change based on the evolving nature. With the use of logistics management, the goal is to link the marketplace and the operating activity business in such a way that customers are serviced at higher levels and a lower cost. If an organization can perform these activities in a more cost-effective way than the competitors can, the organization will gain an advantage in the marketplace.

vi. Research Materials and Methods

Research Design

The research design refers to the overall strategy that chooses to integrate the different components of the study coherently and logically, thereby, ensuring effectively addressing the research problem (Kara, 2012). A research design is the arrangement of conditions for the collection and analysis of data in a manner that aims to combine relevance with research purposes. It is the blueprint for the collection, measurement and analysis of data.

In the case of this research, the main driving factor that prompted the researcher to conduct this study is the need to generally find out whether the information provided by Logistics management can be used to increase the

performance of NELSAP-CU, Rusumo project in Rwanda. The case study design was used as the research design for this study because the researcher wanted to deeply analyse how logistics management affects operational performance on a single phenomenon.

Study Population

The population is defined as the total collection of elements about which one wish to make a sum (Donald & Schindler, 2006). The population of this study was 65 people who included top level, middle level and lower-level management and of the NELSAP-CU Rusumo Project as shown below:

Table 1: Population of Study

Management Level	Number
Senior Management	6
Mid-level Management	23
Junior Staff	36
Total	65

Source: NELSAP-CU Research, 2021

Sampling Technique and Sample Size

Since the population (65) was numerically small, all of them were included in the study using census method. The inclusion of the entire population was preferred because Logan (2018) argues that populations, which are smaller than 100 individual elements (people), should be fully covered in order to enhance the validity and reliability of findings. However, out of the 65 subjects, only 52 were able to provide data.

Data Collection Methods

The questionnaire with close-ended questions was designed and distributed to 65 respondents to get the needed information. It was constructed on a five-point likert scale where 1= Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, and 5=Strongly Agree. The questionnaire was preferred because it collects information from many respondents in a very short time compared to other data collection tools.

Validity and Reliability of the Instrument

Validity of the Instrument

Validity explains how well the collected data covers the actual area of investigation. It shows the extent to which a research instrument “measures what it is intended to measure” (Field, 2015). To ensure validity, the researcher used content validity index (CVI) where the questionnaire survey was measured using ratings by subject matter experts to determine item relevance. Where the subject matter experts made recommendations for improvement, their suggestions were incorporated in the final questionnaire survey where some items, which were considered irrelevant, were eliminated. According to Amin (2005), the CVI is calculated by the formulas:

$$CVI = \frac{\text{No. of items declared valid}}{\text{Total number of items}} \times 100 = \frac{28}{32} \times 100 = 87.5\%$$

With a CVI of 87.5%, the questionnaire was considered valid because Amin (2005) argues that the instrument that generates the average CVI of ≥ 0.7 or $\geq 70\%$ is accepted for use in data collection.

Reliability of the Instrument

The reliability of the research instrument refers to consistency of the instrument in generating similar results when applied in different contexts. In order to improve the reliability of the questionnaire survey, the researcher pilot-tested the questionnaire across three groups of students (4 students per group) and the results generated from the pilot test were consistent and this shows that the survey had a higher rate of internal consistency.

Data Analysis

The researcher used Microsoft Office Excel’s Data Analysis ToolPak to analyze data. The analysis was based on both descriptive statistics (mean and standard deviation) and inferential statistics (multiple linear regression analysis).

Descriptive Statistics

Descriptive statistics was used because it helps to describe the basic features and status of affairs concerning the functions of warehouse management, inventory management, transport management and operational performance. Descriptive statistics provided simple summaries (mean and standard deviation) about the

sample and the measures/response items. In other words, descriptive statistics was preferred because it presents lots of quantitative measures/descriptions in a manageable form. For example, the researcher the response means and standard deviation to describe the nature of responses on each of the response items under the study variables (warehouse management, inventory management, transport management and operational performance).

Inferential Statistics

Inferential statistics are used to estimate the relationship between the independent and dependent variables as well as the statistical significance of the relationship. To test the validity (acceptance or rejection) of the hypotheses and determine the statistical significance of the effect of logistics management and operational performance, the researcher conducted a multiple linear regression analyses using Microsoft Office Excel's Data Analysis ToolPak.

The regression model and output represents each of the independent variables under logistics management (warehouse management, inventory management and transport management) as well as the dependent variable (operational performance) and estimates how much change in the dependent variable (Y) is caused by each of the independent variables (X_1, X_2, X_3). The model for the regression analysis is indicated below:

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

Where:

Y = Dependent variable (operational performance)

β_0 = Constant

$\beta_1 \dots \beta_3$ = Regression coefficients for predictor variables under logistics management

X_1 = warehouse management

X_2 = inventory management

X_3 = transport management

ε/u = Error term/other unobserved factors

viii. Results

Response Rate

The researcher distributed the questionnaire to 65 respondents who included 36 junior staffs, 23 mid-level management and 6 senior staffs of NELSAP-CU. Table 2 shows that 29 (80.6%) of junior staffs, 18 (78.3%) of mid-level management and 5 (83.3%) were able to provide data. These represented the total response rate of 80% for the three population strata.

Table 2: Response Rate and Level of Seniority/Management

	Sample Size	Actual Respondents	Response Rate
Junior Staff	36	29	80.6%
Mid-Level Management	23	18	78.3%
Senior/Top Management	6	5	83.3%
Total	65	52	80.0%

Source: Primary Data, 2021

The total response rate of 80% is considered acceptable because it is above the recommended 55.6% response rate. According to Baruch (1999), the overall acceptable average response rate was 55.6% and it is considered to provide adequate reliability. It can therefore be concluded that this response rate is adequate to eliminate the possibility of sampling bias in assessing the effect of logistics management on the operational performance of NELSAP-CU.

Respondents' Profile

The study sought to establish the profile of the respondents based on gender, level of education and the length of stay at NELSAP-CU. The researcher examined the gender of respondents as shown in Table 4.2 because gender is used as an indicator of measuring the variability in responses between male and female respondents.

Table 3: Respondents' Gender

	Frequency	Valid Percent
Male	28	53.8
Female	24	46.2

Total	52	100.0
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Source: Primary Data, 2021

It is observed in Table 3 that there was fair gender balance with 53.8% males compared to 46.2% females. This gender balance is important in studying the effectiveness of logistics management because men and women have equally important roles to play in managing logistics processes because of their unique gender attributes. For example, women pay more attention to details which helps to ensure proper inventory management such as store arrangement.

Duration of Work with the Institution

Table 4 shows the length of time that respondents had worked with NELSAP-CU at the time of the survey. Understanding the time spent with the organization was an important aspect for determining respondents understanding of the effectiveness of logistics management in operational performance.

Table 4: Duration of work with this institution

	Frequency	Valid Percent
Less than 2 years	8	15.4
2- 4 years	19	36.5
Above 4 years	25	48.1
Total	52	100.0

Source: Primary Data, 2021

As Table 4 shows, it is indicated that majority respondents (84.6%) had worked with NELSAP-CU for 2 years and above while 15.4% had worked there for less than 2years. This finding suggests that majority respondents had spent adequate time to understand the logistics management practices and their role in operational performance. This level of awareness improves the validity and reliability of the study. Harrison and Wicks (2013) who argued that staffs who have spent considerable time engaged in institutional work possess more information on different organizational practices and this gives confidence that the data provided for this study was authentic also corroborate this finding.

Level of Education

Table 5 shows that the researcher also requested respondents to indicate their level of education. This is because education is an important indicator for determining the respondents' ability to understand research concepts and provide valid data. It helps in improving the validity and reliability of the data provided.

Table 5: Respondents' level of education

	Frequency	Valid Percent
Bachelor Degree	28	53.8
Master Degree	24	46.2
Total	52	100.0

Source: Primary Data, 2021

As shown in Table 5, it is observed that all respondents had completed university education (53.8% with Bachelor's degrees and 46.2% with Master's degree). The nature of this data shows that respondents had relevant education to understand the research concepts in logistics management and operational performance. Coffman (2007) who argued that the level of education has a bearing on respondents' capability to understand the research questions during the research survey, thus improving data validity and reliability, corroborates this finding.

Descriptive Statistics

Descriptive statistical analysis is used to describe the nature of responses in regard to the response items/statements in the questionnaire. This descriptive analysis is based on data collected from respondents using a five-point lickert scale where 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree and 5=Strongly Disagree. The analysis focuses on the distribution of data based on the measures of central tendency and dispersion (minimum, maximum, mean and standard deviation). The closer the mean responses move towards 1, the higher the level of disagreement with the research construct and the higher the mean responses are towards 5, the higher is the level of agreement with the research construct. The sections covered by descriptive statistical analysis include: i) effectiveness of warehouse management, ii) effectiveness of inventory management, iii) effectiveness of transport management, and iv) assessment of operational performance of NELSAP-CU Rusumo Project.

Effectiveness of Warehouse Management Practices

Table 6 shows the respondents level of agreement on the effectiveness of warehouse management practices in NELSAP-CU Rusumo Project.

Table 6: Effectiveness of Warehouse Management

Response Item	N	Min.	Max.	Mean	SD
We use shelving and rack systems for our inventories	52	1	5	4.038	1.455
Enrollment in local colleges, 2005					
College	New students	Graduating students	Change		
<i>Undergraduate</i>					
Cedar University	110	103	+7		
Elm College	223	214	+9		
Maple Academy	197	120	+77		
Pine College	134	121	+13		
Oak Institute	202	210	-8		
<i>Graduate</i>					
Cedar University	24	20	+4		
Elm College	43	53	-10		
Maple Academy	3	11	-8		
Pine College	9	4	+5		
Oak Institute	53	52	+1		
Total	998	908	90		

Source: Fictitious data, for illustration purposes only

Source: Primary Data, (2021)

As Table 6 shows, it is observed in item 5 that majority respondents agreed that they used shelving and rack systems for our inventories in NELSAP-CU Rusumo Project (Mean=4.038; SD=1.455). In item 6, majority respondents also agreed that inventory control software is used in NELSAP-CU Rusumo Project (Mean=4.596; SD=0.891). The response is similar in item 7 where majority agreed that inventory moving equipment was effectively used in NELSAP-CU Rusumo Project (Mean=4.481, SD=1.019). However, item 8 shows that respondents disagreed that shipping supplies for orders made were fulfilled (Mean=2.885; SD=1.987) thus indicating flaws in the management of materials delivery for the project.

Furthermore, item 9 shows that respondents agreed that security to protect stored inventories was effectively provided (Mean=4.981; SD=0.139). In the same tone, item 10 shows that majority also agreed that access to cost-effective warehousing facilities for NELSAP-CU Rusumo Project was guaranteed (Mean=4.615; SD=1.051). It is worth to note that despite the flaws identified in item 8, the above findings indicate that warehouse management practices in NELSAP-CU Rusumo Project were highly effective.

Effectiveness of Inventory Management Practices

Table 7 shows the respondents level of agreement on the effectiveness of inventory management practices in NELSAP-CU Rusumo Project.

Table 7: Effectiveness of Inventory Management Practices

Response Item	N	Min.	Max.	Mean	SD
There is effective inventory planning and control	52	1	5	4.365	1.138
Inventory management controls inventory-related costs	52	1	5	4.538	1.019
There are guidelines to monitor the use of inventories	52	1	5	4.75	0.837

There are security measures against theft and pilferage	52	4	5	4.981	0.139
The inventory management systems are automated	52	1	5	4.462	0.979
The firm adopts best practices for inventory management	52	1	5	4.5	1.057
The firm focuses on inventory optimization	52	1	5	3.904	1.347

Source: Primary Data, 2021

Table 7, items 11 and 12 show that majority respondents agreed that there was effective inventory planning and controls (Mean=4.365; SD=1.138) and that inventory management practices controlled inventory-related costs in order to improve efficiency (Mean=4.538; SD=1.019). Similarly, item 13 shows that majority also agreed that there were guidelines to monitor the use of inventories (Mean=4.750; SD=0.837). Furthermore, item 14 reveals that majority also agreed that there were security measures against theft and pilferage in NELSAP-CU Rusumo Project (Mean=4.981; SD=0.139).

In item 15, it is further observed that majority respondents revealed that the inventory management systems in NELSAP-CU Rusumo Project were automated to improve efficiency (Mean=4.462; SD=0.979). Regarding good practices, item 16 shows that majority respondents also said that NELSAP-CU Rusumo Project adopts best practices for inventory management (Mean=4.500; SD=1.057). Lastly, item 17 reveals that majority also agreed that NELSAP-CU Rusumo Project focuses and prioritizes inventory optimization (Mean=3.904; SD=1.347), thus reducing inventory wastage. The above findings suggest that IM practices in NELSAP-CU Rusumo Project were effective thus improving the potential for better operational performance.

Effectiveness of Transport Management Practices

Table 7 shows the respondents level of agreement on the effectiveness of transport management practices in NELSAP-CU Rusumo Project.

Table 8: Transport management

Response Item	N	Min.	Max.	Mean	SD
The firm considers the various regulations in selecting its transportation modes	52	1	5	4.462	1.056
The firm consults stakeholders in the transport network and route planning	52	1	5	2.038	1.137
The firm has adopted containerization	52	1	5	4.731	0.843
The firm has adequate transport facilities	52	4	5	4.981	0.139

Source: Primary Data, 2021

Table 8 item 18 shows that majority respondents agreed that NELSAP-CU Rusumo Project considers the various regulations in selecting its transportation modes (Mean=4.462; SD=1.056). But item 19 shows that majority respondents (Mean=2.038; SD=1.137) disagreed with the statement that NELSAP-CU Rusumo Project consulted stakeholders in the transport network and route planning. Furthermore, it is observed in item 20 that majority respondents (Mean=4.731; SD=0.843) also agreed that NELSAP-CU Rusumo Project has adopted containerization to minimize bulkiness of inventory. Lastly, item 21 also reveals that majority respondents (Mean=4.981; SD=0.139) agreed that NELSAP-CU Rusumo Project has adequate transport facilities. The above findings suggest that transport management practices in NELSAP-CU Rusumo Project were effective thus improving the distribution of inventories in the supply chain.

Operational Performance of NELSAP-CU Rusumo Project

Table 9 shows the respondents level of agreement regarding the operational performance of NELSAP-CU Rusumo Project.

Table 4.8: Operational Performance

Response Item	N	Min.	Max.	Mean	SD
There is a quick response to clients requests	52	4	5	4.962	0.194
There is good communication with clients	52	4	5	4.769	0.425
There is fair treatment of the customers while serving them	52	2	5	4.731	0.63
We operate with reduced errors	52	1	5	2.635	1.284
We have better tracking systems for purchase orders	52	1	5	4.404	1.257
Our ordering processes are streamlined	52	1	5	3.904	1.587

Source: Primary Data, 2021

As Table 9 shows, item 22 shows that majority respondents (Mean=4.962; SD=0.194) agreed that there was quick response to clients requests, thus indicating effective customer service. Similarly, item 23 shows that majority respondents (Mean=4.769; SD=0.425) agreed that there was good communication with clients, while it is also observed in item 24 that majority respondents (Mean=4.731; SD=0.630) agreed that there was fair treatment of the customers during customer service processes.

However, item 26 shows that fewer respondents (Mean=2.635; SD=1.284) agreed that NELSAP-CU Rusumo Project operated with reduced errors, thus indicating optimal resource usage and reduction of pilferage. Additionally, item 27 reveals that majority respondents (Mean=4.404; SD=1.257) agreed that NELSAP-CU Rusumo Project had better tracking systems for purchase orders and goods delivery. Similar observations in item 28 demonstrated that majority respondents (Mean=3.904; SD=1.587) agreed that NELSAP-CU Rusumo Project's ordering processes were streamlined. The above findings suggest that on most indicators, operational performance in NELSAP-CU Rusumo Project was effective and satisfactorily.

Inferential Statistical Analysis

The inferential statistical analysis for this study is based on the multiple linear regression (MLR) model which shows how changes in independent variables result into changes in the dependent variable. MLR analysis was used to determine the significance of the relationship between logistics management and operational performance of NELSAP-CU Rusumo Project. The predictor variables are warehouse management practices (X_1), inventory management practices (X_2) and transport management practices (X_3) while operational performance (Y) is the outcome or independent variable.

Regression Statistics

The MLR statistics in Table 10 shows the relationship between logistics management practices and operational performance of NELSAP-CU Rusumo Project.

Multiple R	0.552
R Square	0.305
Adjusted R Square	0.261
Standard Error	0.258
Observations	52

Source: Microsoft Excel (2010)

As Table 10 shows, it can be observed that there is a moderate multiple correlation of 0.552 (55.2%) between logistics management and operational performance NELSAP-CU Rusumo Project. Furthermore, the Adjusted R Square of 0.261 shows that logistics management can explain 26.1% of the variation in operational performance practices.

Analysis of Variance

The analysis of variance (ANOVA) in Table 11 shows whether the regression model predicts the outcomes very well.

	Df	SS	MS	F	Significance F
Regression	3	1.402	0.467	7.011	0.001
Residual	48	3.199	0.067		
Total	51	4.601			

Source: Microsoft Excel (2010)

Observations from the analysis of variance in Table 11 indicate that the regression model is statistically significant ($P=0.001<0.05$) at 5% level of significance. Therefore, since the p-value is less than 0.05, it is worth to conclude that the regression model used predicts the outcomes significantly well.

Regression Coefficients

The coefficients results indicated in Table 12 are used to determine the significance of different independent variables on the outcome variable and to test the research hypotheses.

Table 12: Regression Coefficients

	Coefficients	SE	t Stat	P-value	CI Lower 95%	CI Upper 95%
Intercept	4.151	0.576	7.204	0.000	2.992	5.309
Warehouse Mgt	-0.208	0.054	-3.870	0.000	-0.316	-0.100
Inventory Mgt	0.230	0.121	1.907	0.063	-0.013	0.472
Transport Mgt	0.003	0.096	0.029	0.977	-0.190	0.196

Source: Microsoft Excel (2010)

The multiple linear regression's test of significance results shows that all the predictor variable of warehouse management (X_1) had a negative and statistically significant effect on operational performance, while inventory management (X_2) and transport management (X_3) had positive but not statistically significant effect on operational performance of NELSAP-CU Rusumo Project.

Hypotheses Testing

Hypothesis 1

The first hypothesis stated that warehousing management has no statistically significant effect on the operational performance of NELSAP-CU Rusumo Project. However, the regression analysis in Table 4.11 shows that warehouse management (X_1) had a negative ($\beta_1 = -0.208$) and statistically significant ($p = 0.000 < 0.05$) effect on the operational performance of NELSAP-CU Rusumo Project at a 5% level of significance. Therefore, we fail to accept the first hypothesis by stating that warehousing management has a statistically significant effect on the operational performance of NELSAP-CU Rusumo Project

Hypothesis 2

The second hypothesis stated that inventory management has no statistically significant effect on the operational performance of NELSAP-CU Rusumo Project. This is confirmed by the regression analysis in Table 4.11 which shows that inventory management (X_2) had a positive ($\beta_2 = 0.230$) but not statistically significant ($p = 0.063 > 0.05$) effect on the operational performance of NELSAP-CU Rusumo Project at a 5% level of significance. Therefore, we fail to reject the second hypothesis by restating that inventory management has no statistically significant effect on the operational performance of NELSAP-CU Rusumo Project.

Hypothesis 3

The third hypothesis stated that transport management has no statistically significant effect on the operational performance of NELSAP-CU Rusumo Project. This hypothesis is corroborated by the regression analysis in Table 4.11 which shows that transport management (X_3) had a positive ($\beta_3 = 0.003$) but not statistically significant ($p = 0.977 > 0.05$) effect on the operational performance of NELSAP-CU Rusumo Project at a 5% level of significance. Therefore, we fail to reject the third hypothesis by restating that transport management has no statistically significant effect on the operational performance of NELSAP-CU Rusumo Project.

x. Discussion of Findings

Logistics management is an important function that enhances the effectiveness and distribution of resources across the organization's supply chain to improve efficiency and performance. However, some empirical literature suggests that in certain circumstances that are organizational-specific, logistics management practices have produced mixed results in regard to performance. This section provides a discussion of the main findings from the research and links them with literature outcomes.

The first objective aimed at examining the effect of warehousing management on the operational performance of NELSAP-CU Rusumo Project. Findings shows that warehouse management had a negative ($\beta_1 = -0.208$) and statistically significant ($p = 0.000 < 0.05$) effect on the operational performance of the project at a 5% level of significance. This indicates that a unit change in warehouse management diminishes the operational performance of NELSAP-CU Rusumo Project by 20.8%. This finding is consistent with David (2013) whose study on third-party logistics in distribution efficiency delivery for fast-moving consumer goods in Kenya revealed that there was a 36% increase in operational efficiency of the surveyed firms as a result of efficient warehouse management for consumer goods. However, Emberson (2016) observed that warehouse management did not have a significant effect on firm performance in Nigeria.

The second objective was to analyze how inventory management affects the operational performance of the NELSAP-CU Rusumo Project. However, it is observed that inventory management had a positive ($\beta_2 = 0.230$) but not statistically significant ($p = 0.063 > 0.05$) effect on the operational performance of the project at a 5% level of significance. This is in sharp contrast with Adeyemi and Salami (2010) whose study on inventory management practices in Coca-Cola Bottling Company, Ilorin plant in Nigeria revealed that inventory management practices significantly improved the firm's operational efficiency and performance. It was observed that when the firm

automated its inventory management processes, there was a 17% improvement in operational efficiency which was statistically significant at a 5% level.

The third objective assessed the effect of transport management on the operational performance of the NELSAP-CU Rusumo Project. However, the regression analysis shows that transport management had a positive ($\beta_3=0.003$) but not statistically significant ($p=0.977>0.05$) effect on the operational performance of NELSAP-CU Rusumo Project at a 5% level of significance. Nevertheless, Spillan (2014) in his empirical study on logistics and supply chain process and competitive advantage used a regression analysis to model the effect of transport management on operational efficiency of firms in Poland. The findings revealed that effectiveness of transport management contributed up to 21.8% of the firms' performance and the effect was statistically significant at a 5% level of significance. In contrast, however, Palevich (2015) found that there was no effect of transport management on operational performance in the healthcare sector.

xi. Summary of Major Findings

Warehouse Management and Operational Performance of NELSAP Rusumo Project

Descriptive analysis shows that warehouse management practices in NELSAP-CU Rusumo Project were highly effective due to the high level of agreement with the research constructs. It is observed that NELSAP-CU Rusumo Project used shelving rack systems and inventory software for their inventories in order to avoid waste and spoilage and to enhance storage efficiency. Similarly, the project further used inventory-moving machinery to enable quick movement of supplies from the supply chain for use in the production and construction process. In regard to inventory safety, it is observed that security to protect stored products was effectively provided, thus protecting the project resources from loss. However, the regression analysis shows that warehouse management had a negative ($\beta_1= -0.208$) and statistically significant ($p=0.000<0.05$) effect on the operational performance of NELSAP-CU Rusumo Project at a 5% level of significance.

Inventory management and operational performance of NELSAP Rusumo Project

The descriptive analysis shows that inventory management practices were generally effective as respondents appreciated that inventories were efficiently and optimally handled and monitored to ensure proper management and utilization. It is observed that NELSAP-CU Rusumo Project conducted effective planning and control of inventories to ensure that what the project needed for daily operations were available at the right place, right time and right quantity. Furthermore, the presence of security measures has protected the inventories from theft and vandalism thus improving the inventory efficiency of NELSAP-CU Rusumo Project.

The firm has adopted inventory benchmarking practices and this has ensured smooth functioning of the inventory management process. The practice of inventory optimization as enabled the firm to have the right materials to meet construction targets while reducing inventory holding costs, thus indicating that the project accounts for supply and demand volatility. Despite the effectiveness of inventory management, the regression analysis shows that this function had no statistically significant ($p=0.063>0.05$) effect on the operational performance of NELSAP-CU Rusumo Project at a 5% level of significance.

Transport Management and operational Performance of NELSAP Rusumo Project

Descriptive analysis regarding inventory movement shows that transport management for project inventories was an effective function in the organization because materials could be easily transported from one place to another to facilitate construction processes. The firm involves key stakeholders in transport planning to ensure that alternative perspectives are exhausted which gives the project management a chance to select the best transport option. In situation where logistics are bulky, NELSAP-CU Rusumo Project considers containerization to ensure efficient transportation to the construction site. Despite the effectiveness of transport management, the regression analysis shows that transport management had no statistically significant ($p=0.977>0.05$) effect on the operational performance of NELSAP-CU Rusumo Project at a 5% level of significance.

xii. Conclusions

The study was conducted on the effect of logistics management practices on operational performance of multinational corporations in Rwanda using the case of NELSAP-CU Rusumo Project. The study was based on the hypotheses that warehouse management (H_01) inventory management (H_02) and transport management (H_03) have no statistically significant effect on operational performance of NELSAP-CU Rusumo Project. From the regression analysis, observations show that warehouse management had a negative ($\beta_1= -0.208$) and statistically significant ($p=0.000<0.05$) effect on the project operational performance at a 5% level of significance. This indicates strong evidence against the first hypothesis.

However, inventory management ($p=0.063>0.05$) and transport management ($p=0.977>0.05$) show no statistically significant effect on the project operational performance at a 5% level of significance. These indicate a weak evidence to reject the second and third hypotheses. It is worth to note that there is inefficiency in fulfilling shipping supplies orders, stakeholders' consultation during transport network and route planning. High operational error rates were also observed. These present potential for hampering project's operational efficiency. Logistics management remains a critical function for enhancing operational performance of firms since it improves warehouse management, inventory management and transport efficiency for both inbound and outbound materials.

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