



LOGISTICS MANAGEMENT AND SUPPLY CHAIN PERFORMANCE. A CASE OF LIQUEFIED PETROLEUM GAS AT SOCIETE PETROLIERE LTD

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Received: December 17th, 2024; **Accepted:** January 25th, 2024; **Published:** February 2nd, 2024

DOI: <http://zenodo.org/records/10608799>

ABSTRACT

This study examined the logistics management and supply chain performance. A case of liquefied petroleum gas at Societe petroliere Ltd. The target population for this study was 146 employees of the Societe petroliere Ltd employees and sample size was 59 employees. Study employed descriptive statistics and inferential statistics, both qualitative and quantitative were utilized to analyse the data with assistance of SPSS software program version 25.0 descriptive statistics and inferential statistics were employed to present frequencies tables, percentages, mean and standard deviation and Inferential analysis was used in order to use Pearson correlation and multiple regression model to test the relationship between the independent variables and dependent variable. Qualitative and quantitative analysis utilized descriptive statistics in order to produce frequency tables, percentages and mean. Inferential statistics were used in order to use person correlation and multiple regression model to test and draw relationship between variables both for independent and dependent. Effect of warehouse management on performance supply chain of LPG at SP Ltd. The overall means of results was 4.96, the effects of Inventory management activity on performance supply chain of LPG at SP Ltd. The overall means of results was **4.85**, the effects of transportation management activity on performance

supply chain of LPG at SP Ltd. The overall means of results was **4.87**, the data of supply chain performance was analyzed, the overall means of results was **4.87** depending on the results, it presented that the supply chain performance was on good grades. It indicated that the relationship between Logistics management and supply chain performance between warehouse management, inventory management, transportation management and supply chain performance was **0.509**, **0.842** and **0.854** respectively, and the results presented that the variables were statistically significant with p value=0.000^b. The results presented the variables of logistics management, The results on warehouse management were statistically significant with p value=0.000^b, the Inventory management was statistically significant with p value=0.000^b, and the Transportation management was statistically significant with p value=0.000^b. It concluded that there was a significant relationship between logistics management and supply chain performance. The study recommended that MINICOM and MINFRA should mobilize Rwandans to engage in vending LPG Gas in plenty so that adaptability of using Gaz can replace usual fuel that cause deforestation and pollution

Keywords: Logistics; Logistics management; supply chain; Supply chain performance

1. Introduction

Various important studies were deployed to investigate the role of logistics management for the sake of the customers' satisfaction, needs and requirement [3][10][11][30][31][25][40]. The postulations of the researches fundamentally hit on the successful logistics management among the following include; warehousing management, inventory control, Inventory management, transportation management ,material handling equipment, packaging processing and again logistics management and may play important role in generating organizational combativeness[6][17][21][32][1] . Global LPG production reached over 292 million metric tons per year in 2015 while global LPG consumption is over 284 metric tons per year. Natural gas constitutes the largest proportion, 62%, in the production of LPG while the rest is produced by the petrochemical refineries from crude oil. 44% of global consumption constitutes household consumption. The USA is the leading producer and exporter of LPG. [33]. As per the study conducted by GIZ in February 2014, in 2010, the consumption of LPG in Africa is highly clustered in North African countries, comprising around 85% of Africa's total consumption. Although Nigeria is the largest LPG producer in Sub-Saharan Africa, annual per capita consumption is less than 1 kg whereas in countries like Algeria, Egypt, Tunisia, Libya and Morocco, users consume 45 kg of LPG per year [33].

Rwanda had a population of over 12.6 million in 2020. The adoption of LPG for cooking has increased nationally from 2.4% in 2016 (MTF, 2018) to 5.6% in 2020 (CFET, 2020), and 6.6% in 2021, and 7.7% in 2022 and by LPG volume (MT) 19,245 in 2020 (MT) 22,308 in 2021 and (MT) 27,154 respectively. In the City of Kigali alone, the consumption increased from 7.4% in 2016, to 45.1% in 2020, However firewood remains the dominant cooking fuel in Rwanda, particularly in rural areas where 91.1% of households rely on it for cooking. The firewood users, one-third of households gather firewood for free. Charcoal is the predominant fuel used in urban areas, both in Kigali (76.9% of Kigali

households) and in other urban areas (44.5% of other urban households). The majority of LPG use is in Kigali city, where 45.1% of the households use LPG, representing 76.2% of total national household LPG consumption. Therefore .7.7% is still low number to the population of more than 12.6 million and also more problems are ; increase of initial cost of LPG equipment for consumers, such as a historical 25% customs duty to imported LPG equipment; Consumer concerns about LPG being safe to use; Consumer misinformation about LPG, for example about its cost to cook a meal, its benefits, how to use it safely and efficiently, and its overall safety; Poor quality of imported LPG cookstoves, which contributes to a consumer viewpoint that LPG is unsafe and inefficient to cook. Nevertheless, SP Ltd its principal activity is importation, Inventory and marketing of petroleum products through its eighteen retail stations countrywide.

1.2 Objectives of the study

Specific Objectives of the study are as follow:

- i. To establish the effect of warehouse management on performance supply chain of LPG at SP
- ii. To investigate the effects of Inventory management on performance supply chain of LPG at SP
- iii. To analyse the effects of transportation management on performance supply chain of LPG at SP Ltd

1.3 Research Questions

- i. What is the effect of warehouse management activity on performance supply chain of LPG at SP Ltd?
- ii. What is the effects of inventory management activity on performance supply chain of LPG at SP Ltd?
- iii. What is the effects of transportation management activity on performance supply chain of LPG at SP Ltd?

2. Literature Review

2.1 Conceptual Review

Conceptual review will examine the concepts of independent variables and dependent variables in order to construct the readiness of the study.

Logistics Management

Logistics is defined in the Council of Supply Chain Management Professionals as: The process of planning, implementing, and controlling procedures for the efficient and effective transportation and storage of goods including services, and related information from the point of origin to the Point of consumption for the purpose of conforming to customer requirements [2]. Logistics management brings value addition through competitive advantage to the companies that support customers and business excellence [5]. This is the practice of application of logistics management where by the provisions of goods are delivered in right place at right time in order to attain efficiency. This has been in occurrence by practitioners and governments [36]. Realizing the essence of sustainability in logistics management it is vital for competitive advantage [5] because functional performance has a positive impact on company's financial performance [16] (Horvath et al., 2005; Liu & Lyons, 2011)

Warehouse management

Warehouse management is a bout planning and control processes to operate in the warehouse [2]. The warehouse management play important role in basic logistics management process in managing the scope of work of suppliers according to arrangement of inlet and outlet of LPG in other words inflows and outflows, of goods. [19]. Warehouse poses an important role in the supply chain, as the goods transported from the factory to the final receiver are stored. It means that in case of an unproductive warehouse operation, the whole supply chain may be incapacitated, e.g., as a result of lack of goods, delays, jams. The Planned logistics actions within the scope of a warehouse should avoid it from posing holding up of the supply chain, linkage of logistics and their respective

components undergo calculated warehouse zones by Parameters in particular, Technologies of interior transport and storage, pragmatic in the warehouse, should correspond to the specificity of operated goods [19].

Inventory Management

Inventory management deals with balancing the cost of maintaining additional products on hand against the risk of not having those items when the customer wants them (i.e. the cost of lost sales). This task has become more complex as firms have gradually lowered inventory levels. The challenge in this situation is to manage the rest of the logistics system to accommodate the lack of inventory so that customer service does not suffer. However, all of the interest in reducing inventories notwithstanding, the fact remains that inventory management is still necessary for serving customers in many markets [8]. The inventory necessities of firms were directly related to the facility network and the anticipated level of customer service [4]. Theoretically, a firm could stock every item sold in every facility devoted to examining each client, but very few business operations could afford such an expensive inventory deployment strategy because the risk and total cost is prohibitive [4].

Transport Management

Transportation physically connects the sources where the supply chose in sourcing the clients decided to be served as part of the customer service policy [2]. Transportation is the physical exercise for moving of goods from a point of origin to a point consumption. This can be inbound logistics or outbound logistics exercise, Transportation management plays important role in many logistics systems, that include liberalization of transportation laws where many countries adopt the political will for flexibility of goods moving in their restive countries and setting affordable price that that encourages managers to go ahead while logistics management connected to Transportations results into the efficiency. Then inventory level picks the role in response to just-in-time (JIT) strategizing transportation as avail, and

loading the frequency support transport planning to greater and excellent attainment, and reducing drastically damages that would affect the customers service levels that would otherwise result from those inventory reductions.[8].

Performance of supply chain

Supply chain performance can be seen as an excellent by which supply chain's activities ensure effective and efficiency realization of firm's goal and objectives[34] define supply chain performance as the operational excellence to deliver leading customer experience. The performance of a supply chain is influenced by both internal and external factors of the firm. SCM measures can be categorized broadly into two categories qualitative measures such as customer satisfaction and product quality; and quantitative measures such as order-to-order lead time, response time, flexibility, resource utilization and delivery performance.

2.2 Theoretic Review

Theories were established to make know-how about distinguished theories that are related to the assessment of role of logistics management on performance of supply chain. A case of LPG gas SP Ltd.

Theory of Constraint

Goldratt's management philosophy was widely known as the theory of constraints (TOC) . [7]. It aimed at initiating and enforcing breakthrough the enhancement concentrating on a flaw that prohibited a system from attaining better results level. In essence, according to the TOC paradigm, every company should have at least one limit [35]. Partnering corporations shared promises and incentives with their upstream and downstream partners in order to gain a competitive advantage, according to [35]. Benefit and output can be increased in the (SC) as a mixing of supply and demand when all supply chain (SC) partners are integrated and operated as a homogenous entity [9] . [12] stated that, as the market's demand grew, the logistic process got increasingly sophisticated, with significantly

higher demands, especially when it comes to gaining a competitive advantage [9]

It is assumed that the device's owner determined its purpose. According to [7], might be used to direct a single organization to focus on leveraging resources in SCM depending on different logistics costs. TOC thinking process is used to identify issues in the management of apparel logistics, indicating the necessity for executives from multiple businesses to interact in order to increase the total profit of the firm. [7]. To protect real sales from demand and supply unpredictability, a mathematical model was presented to determine the time buffer at various participating position members of devised performance indicators in order to keep participants' trust [14]. Therefore, TOC is used in this regard to the study on Logistics management and performance supply chain. A case of Liquefied Petroleum Gas at SP Ltd.

Resource Based View Theory

Resource based view encouraged to explicate the internal source of firm's sustained competitive advantage [23] RBV of the firm affirms that, Internal resources of the firms were sources of competitive advantage [39], These resources are of value, that are also scarce, unique and difficult to substitute.

The two assumptions for RBV theories were; resources and capabilities which were heterogeneously distributed among firms; and resources and capabilities proved that they not perfect mobile, hence imperfect mobile which made firms' differences and remain stable over time [20]. In Logistic Management, resources are described as basic elements or perquisite for the development and operation of Logistics Business sector and it is required for building up the firms' capabilities (Aldin, et al., 2004) [13] used the RBV to explain the importance of logistics management to a firm. According to [13], logistics flexibility and efficiency was considered to be a source of competitive advantage for entrepreneurial firms. Ownership of firm specific assets enabled a company to develop a competitive advantage.

[24]from logistics literature, argued that the RBV theory was an appropriate theory for supply chain and logistics management research. These studies found logistics resources and capabilities to be significantly positive related to firm performance. Some literature used RBV theory to examine the impact of information flow on 3PL providers competitive advantage [24] while others examined the effects of logistics capabilities on firm performance [41]. Therefore, the RBV provided a theoretical foundation for this research on Logistics management and performance supply chain. A case of Liquefied Petroleum Gas at SP Ltd

2.3 Empirical Literature review

[29] assessed how 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. [30] examined the influence logistic management has on 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.

[27] analyzed the effect of congestion in the road traffic on freight logistics efficiency at the port of Mombasa. Building

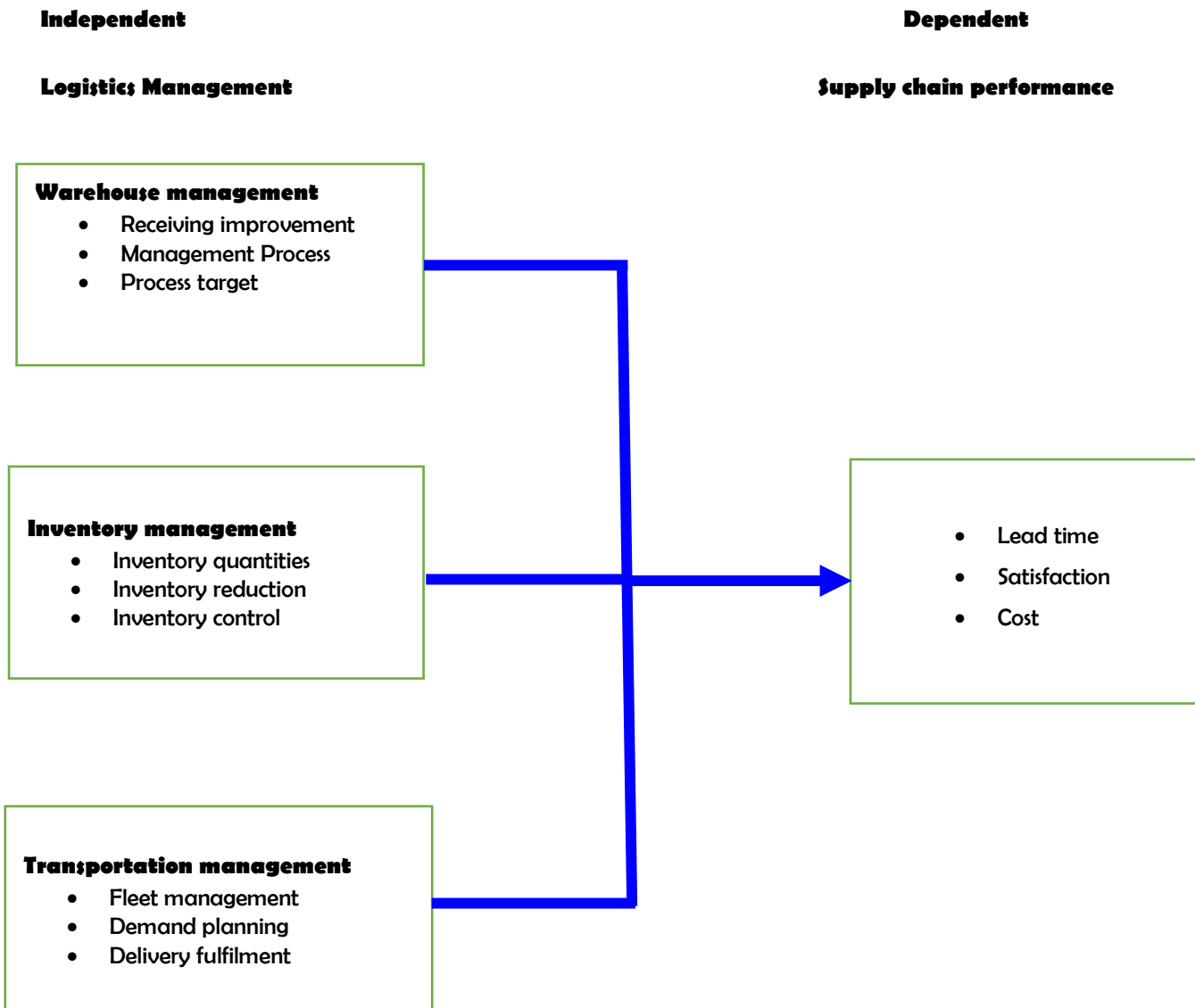
on the infrastructural pressure on the road from Nairobi to Mombasa which has continued to put strain logistics operations at the port, the study employed a descriptive survey design and used a sample size of 150 respondents from a possible 10450 employees. The correlation results revealed that traffic congestion had a positive correlation with transport cost. Consequently, traffic congestion impacted negatively on efficiency of freight logistics.

[38] examine the association between transportation and logistics system. The results reveal that transportation and logistics system have interdependent relationships. The improvement of transport efficiency would change the overall logistics performance, in addition, [1] investigates the role of logistics in product distribution to pursue efficiency. Four variables including inventory control, logistics improvements, supply chain management system and system performance improvements are found to be highly essential for success of supply chain management.

[37] finds a positive association between logistics processes efficiency (e.g., physical supply, physical distribution and logistics spanning process) and customer service. Moreover, logistics processes positively affect firm performance where customer service mediates this relationship. [15] indicates the intermediary positive effect of supply chain management strategy and logistics performance on firm's financial performance through improving firm's marketing performance. [17] also find a reasonable moderate correlation between supply chain management practices and firm performance.

2.4 Conceptual framework of the study

Figure 1: Conceptual framework of the study



Source: Researcher 2023

3. Methodology

Research Design

This research was descriptive design, the research design method was used on purpose of assessment. According to [22] descriptive research design was adopted to the questions in relations to the responses from incoming data collection to be conducted from the field, from the

qualitative perspective, the research design utilized qualitative and quantitative approaches, there was qualitative approach that served to use interview and that of qualitative approach used descriptive statistics to enable thoughts gathering of people on Logistics management on supply chain performance. A case of LPG GAS SP Ltd

Study population

According to [28] target population refers to the total number of elements under review in a study and upon which the researcher intends to obtain information from. Target population from LPG Gas SP Rwanda was 146 employees from the different departments that include Logistics department, Operation department, Finance department and customer service

Sample size

The sample size was the proportion from the total population of the study within specific research. This study has adopted the sample size calculation formula of Slovin (1980). The sample was calculated from all concerned departments from SP Ltd

$$n = \frac{N}{1 + N * (e^2)} = \frac{146}{1 + 146 * (0.1^2)} \approx 59$$

Data collection procedures and instruments

Data collection procedures and instruments involves primary data that gained information from the time questionnaires and interview were employed for data collection. Then Secondary data was that information that

was gathered in documentaries and from there, both of them, the respective instruments and tools was applicable.

Data analysis

The data analysis of this study used descriptive research and inferential statistics was applied; the primary data was collected from the field to be analysed by researcher. Descriptive statistics were used to produce mean, percentage and standard deviation, and it was important to avail access in findings combination from each component in the research study [26]. Research employed inferential statistics to achieve the best retrieving the bond correlation between elements of independent and dependent variables. Multiple correlation and regression model was used to analyse the data; SPSS (Statistical Package for Social Sciences version 25.0) as software tool used to analyses data and achieve findings for interpretation

4. Data Analysis and Discussion

This section presents the findings from inferential statistical test including correlation coefficient and multiple linear regression analysis between independent variable and dependent variables in this research study.

Table 1 Correlation coefficient

		WAREHOUSE MANAGEMENT	INVENTORY MANAGEMENT	TRANSPORTATION MANAGEMENT	SUPPLY CHAIN PERFORMANCE
WAREHOUSE MANAGEMENT	Pearson Correlation	1	.280 [*]	.282 [*]	.509 ^{**}
	Sig. (2-tailed)		.032	.031	.000
	N	59	59	59	59
INVENTORY MANAGEMENT	Pearson Correlation	.280 [*]	1	.824 ^{**}	.842 ^{**}
	Sig. (2-tailed)	.032		.000	.000
	N	59	59	59	59
TRANSPORTATION MANAGEMENT	Pearson Correlation	.282 [*]	.824 ^{**}	1	.854 ^{**}
	Sig. (2-tailed)	.031	.000		.000
	N	59	59	59	59
SUPPLY CHAIN PERFORMANCE	Pearson Correlation	.509 ^{**}	.842 ^{**}	.854 ^{**}	1
	Sig. (2-tailed)	.000	.000	.000	
	N	59	59	59	59

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Primary data, (2023)

The statistical package for social science (SPSS) software version 25.0 was used to determine the Pearson coefficients. The Pearson coefficient correlation is between -1 and 1 where -1 to 0 presents negative correlation (-1 to -0.5 indicates high negative correlation and -0.5 to 0 indicates low negative correlation) and 0 to 1 presents positive correlation (0 to 0.5 presents low positive correlation while

0.5 to 1 presents high positive correlation). According to the results, the correlation between warehouse management, inventory management and transportation management and supply chain performance was **0.509, 0.842** and **0.854 respectively**, it presents that there was a significant relationship between microfinance logistics management and supply chain performance

Table 2 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.926 ^a	.857	.849	1.32908

A. Predictors: (constant), transportation management, warehouse management, inventory management

Source: Primary data, (2023)

The results present the Model Summary, the results present that the R Square=0.857 It was clear that 92.6% of all

variables of supply chain performance can be explained by one's of all variables of the logistics management.

Table 3 ANOVA^a of Logistics management and supply chain performance

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	582.404	3	194.135	109.901	.000 ^b
	Residual	97.155	56	1.766		
	Total	679.559	59			

a. Dependent Variable: SUPPLY CHAIN PERFORMANCE

b. Predictors: (Constant), transportation management, warehouse management, inventory management

Source: Primary data, (2023)

The results indicate ANOVA^a, the results presented that the variables were statistically significant with F= 109.901 and p value=0.000b, it means that there was a significant

relationship between Logistics management and supply chain performance

Table 4 Coefficients' of Logistics management and supply chain performance

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-27.841	7.003		-3.976	.000
	WAREHOUSE MANAGEMENT	1.234	.242	.272	5.096	.000
	INVENTORY MANAGEMENT	.899	.208	.390	4.317	.000
	TRANSPORTATION MANAGEMENT	1.124	.223	.456	5.040	.000

a. Dependent Variable: SUPPLY CHAIN PERFORMANCE

Source: Primary data, 2023

The results present the constant of independent variables of the logistics management. It is statistically significant since p value is less than 0.05. The results present the variables of Logistics management., Warehouse management was statistically significant with p value=0.000^b, the Inventory management was statistically significant with p value=0.000^b, and the Transportation management was statistically significant with p value=0.000^b.

As per SPSS generation of table 4.9 in regard to the equation $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \epsilon$, where by Y= Project performance then the Equation served as;

$Y = -27.841 + 1.234X_1 + 0.899X_2 + 1.124X_3 + 1.329\epsilon$

It is in this regard that using the regression equation mentioned above in respect to the holding all constants (Warehouse management, Inventory management and Transportation management) in line with the supply chain performance was at **-27.841**, This implies that ensure supply chain performance , there was a need to careful warehouse management completion package otherwise not doing it , it would lead into failure of the whole logistics management and again the inventory management required a tied and close tactics to ensure supply chain performance and finally entire transportation management proved significance as it is known cross cutting issue that connect all logistics management and

ensuring success of supply chain performance attainment when it is implemented well .

The SPSS Calculated the t-statistic as t-test decreased on - 3.976 and t-test increased on 5.096 and t-test increased 4.317 and t -test increased on 5.040 and. The results present the variables of Logistics management, the Warehouse management was statistically significant with p value=0.000^b, the Inventory management was statistically significant with p value=0.000^b, and the Transportation management was statistically significant with p value=0.000^b

It is in this regard that using the regression equation mentioned therefore, in respect to the holding all constants (Warehouse management, Inventory management and Transportation management) in line with the Logistics management and supply chain performance was at **-27.841** This implies that all the factor are linked together to ensure supply chain performance, there was a need only to undertake carefully warehouse management , Inventory management and transportation management in other words the supply chain performance required Warehouse management inventory management and transportation management to enable supply chain performance. The SPSS Calculated the t-statistic as t-test increased on 5.096 and t-test increased on 4.317and t-test

increased on 5.040. The results present the variables of Logistics management, the Warehouse management was statistically significant with p value=0.000^b, the Inventory management was statistically significant with p value=0.000^b, and the Transportation management was statistically significant with p value=0.000^b.

From the table 4.12 Coefficients^a of Logistics management and supply chain performance fell under Unstandardized Coefficients to enable results attaining the t-test explained in above by B values in series as through dividing B values with Standardized Coefficients Beta to attain the value , t-test; -27.841, by 7.003 resulted into constant t of -3.976, then 1.234 was underwent division by 0.242 and resulted into warehouse management with 5.096 and then 0.899 went on dividing with 0.208 and resulted to the Loan borrowing factor with 4.317, and finally 1.124 by 0.223 on factor of Transportation management with 5.040 value

5. Conclusion

Logistics management was proven to be of highly valued in far as the tool in this research work activities related to logistics management and supply chain performance. It provided a vital scenario of how any logistics management activities workout and the way of measuring concerned items and how it can assist to attain the planned achievement of research objectives (Kabus, J., 2016). In this study, researcher concluded basing on the results. According to the results, the relationship between warehouse management, Inventory management and transportation management was **0.509**, **0.842** and **0.854** respectively, and the results presented than the variables were statistically significant with p value=0.000^b, it concluded that there was a significant relationship between logistics management and supply chain performance.

6. Recommendations

The LPG investors should consider the information taken in Logistics management and supply chain performance to ensure LIQUIFIED PETROLEUM GAS replace fuels that are used in Rwanda

The government (MINECOM, MINIFRA) should know that the outcomes of supply chain performance of Liquefied petroleum gas must bring impact in Rwandan Citizen so that they should be engaged in overall activities in order to acquire basics of LPG and starts mini warehouses of in order to support SP Ltd to reach the beneficiaries.

The MINIFRA should provide regular the professional guidelines to LGG Dealers to ensure if they follow in safety and standards of LPG Gaz in their value chain system in general.

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