

Mediating Effect of Le-agile Supply Chain Strategies on the Effect of Supply Chain Management Practices on Operational Performance of Large Manufacturing Firms in Kenya

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Abstract

Background

Supply chain strategies play the role of helping firms achieve efficiency and effectiveness in their operations. The le-agile supply chain strategy combines both lean and agile supply chain concepts. The study focused on the effect of supply chain management practices on operational performance and the mediating effect of le-agile supply chain strategy on the relationship between supply chain management practices and operational performance. Previous studies have been carried out in Asia, America, and Europe, while studies carried out on Kenyan manufacturing firms are scanty. This study seeks to bridge this gap.

Methodology

A cross-sectional survey was adopted and data was collected between November 2019 and February 2020. Stratified random sampling was used to select a sample of 154 out of 410 large manufacturing firms in Kenya. The data was cleaned coded and analyzed with the aid of the Statistical Packages for Social Sciences (SPSS). Mediated regression analysis was performed with the aid of Hayes (2013) Process Macro model 6, and the findings were presented in tables accompanied with explanations.

Findings

The findings reveal that the le-agile supply chain strategy partially mediates the effect of supply chain management on the operational performance of large manufacturing firms in Kenya. The findings support the arguments of the theory of constraints and recommend that firms adopt supply chain strategies to improve their operational performance and consequently their overall performance.

Originality/Value

The study builds contextualized empirical findings on the relationship between Le-agile Supply Chain Strategies, Supply Chain Management, and Operational Performance. Secondly, the study proposes a framework that can be used by manufacturing firms to improve their operational performance. Lastly, the study proposes a longitudinal study on supply chain management practices, le-agile supply chain strategy, and operational performance to create a deeper understanding of the relationship between the variables including in small-scale manufacturing organizations. It further suggests that a similar study is performed on medium and small-scale manufacturing firms.

Key Words: Supply Chain Management Practices, Lean, Agile, Le-Agile Supply Chain Strategy, Operational Performance

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I. Introduction

Operations management involves managing the resources of a firm to facilitate the production and subsequent delivery of goods and provision of services to the customers. When the operations of a firm are managed well, it increases the performance of a firm. Operations management helps in overcoming the constraints in a firm while ensuring that the firm's resource capabilities are utilized well. The resources at the disposal of firms can be tangible (machines, human resources, etc.) or intangible (reputation, relationships with customers and suppliers, etc.) (Pycraft et al., 2010). To remain competitive, firms need to manage their operations in a way that gives them an edge over their competitors (Slack & Lewis, 2011).

According to (Chopra & Meindl, 2013; Kumar & Kushwaha, 2018; Sukati et al., 2012), several parties work together to ensure that the requests of the customers are met. These are manufacturers, transporters, suppliers, and warehouses among others. On the other hand, supply chain strategies assist firms to achieve their

objectives of delivering goods to customers by enabling the firms to survive the environment of competition (Kushwaha, 2012). The Kenya Association of Manufacturers (KAM) observe that the Kenyan manufacturing sector has experienced a drop in contribution towards the Gross Domestic Product (GDP) of the country (KAM, 2018). Competition in the supply chain has made it necessary for manufacturing firms to adopt supply chain strategies. This study was aimed at establishing the mediating effect of the le-agile supply chain strategy on the effect of supply chain practices on the operational performance of large manufacturing firms in Kenya.

1.1 Objectives of the Study

- i. To establish the effect of supply chain management practices on operational performance
- ii. To determine the mediating effect of le-agile supply chain strategy on the relationship between supply chain management practices and operational performance.

1.2 Hypotheses of the study

- i. Supply chain management practices do not have a significant effect on the operational performance of large manufacturing firms in Kenya.
- ii. The le-agile supply chain strategy does not have a significant mediating effect on the relationship between supply chain management practices and the operational performance of large manufacturing firms in Kenya.

II. Literature Review

2.1 Theoretical Review

2.1.1 Resource-Based View Theory

According to Resource-Based View, proposed by Birger Wernerfelt in 1984, organizations have intangible and tangible qualities which of which interactions within an environment composed of internal and external factors that influence firms' competitive advantage (Barney, 1991). According to RBV, a firm's competitive environment is greatly determined by a firm's internal environment (Egbunike & Okerekeoti, 2018). Therefore, a firm's competitive advantage lies in its ability to apply its unique core competencies and resources in a way that best takes advantage of opportunities and minimizes the effects of threats presented by the firm's environment (Lysons & Farrington, 20'06).

The resources are valuable, rare, and sometimes durable, and not substitutable (Preutisrunyanont et al., 2010). Superior structures and systems give firms unique capabilities that can lead to quality and cost advantage (Sillanpää & Sillanpää, 2000). Appropriate supply chain strategies that can help them achieve their full potential, help firms manage costs, increase flexibility, speed, and dependability and hence improve operational performance (Chopra, & Meindl, 2013; Barney, 1991). RBV theory has is applied in this study to understand how unique resources possessed by the firms can be integrated with appropriate supply chain strategies to achieve competitive advantage.

2.1.2 Theory of Constraints

The theory of constraints is of the idea that each system has bottleneck operations that prevent it from achieving maximum performance (Şimşit et al., 2014). According to the theory, the bottlenecks should be identified and removed with the aid of appropriate software (Pycraft et al., 2010). The theory of constraints is also fundamental in guiding the firm in the process of deciding on the best supply chain strategy to choose. Supply chain strategies can be adopted with information on organizational constraints to overcoming the challenges faced in the day-to-day running of the manufacturing organizations. Understanding the theory of constraints emphasizes the need to adopt sustainable and efficient supply chain strategies (Koh, 2007).

2.2 Empirical Review

2.2.1 Supply Chain Management Practices and Operational Performance

A supply chain is a group of organizations that are independent of each other, who work independently or jointly to add value to goods and then deliver them to the end-user (Lu, 2011). Supply chain activities are traceable right from the origin, to the final destination and sometimes back to the origin, through forward and reverse supply chain management. Similarly, supply chain management practices are on both the demand and supply sides of the supply chain. Supply chain management aims at enhancing the efficiency of operations throughout the supply chain to improve customer satisfaction, increase profit, and tackle issues to do with competitive pressures (Habib, 2013). Supply chain management allows coordination of the business functions within the organization and with supply chain partners enhancing smooth business operations (Mentzer et al., 2001).

Koh et al. (2007) identified outsourcing, strategic collaboration, lean practices, and multiple sourcing as key supply chain management practices. In addition to the practices, Miguel and Brito (2017), supplier

relationship management as a critical supply chain management practice. According to Monczka et al. (2005), purchasing and delivery management influences the success of internal supply chain operations. Odero and Shitseswa (2017) discussed procurement planning, supplier evaluation and procurement cost, quality, and time management as critical supply chain management. In this study, the focus is on purchasing management, physical distribution management, logistics management, and materials management as supply chain management practices.

According to Li et al. (2006), supply chain management improves the performance of organizations and by extension the performance of the entire supply chain. This is because; supply chain management cuts across the various players within the supply chain. A study by Salleh (2016) established that supply chain management enhances information sharing and partnership, which has a positive effect on organizational performance. In a study focused on Indian manufacturing companies, Kushwaha (2012) established that supply chain management practices enhance operational performance. They established that supply chain management practices enhance inventory and warehousing management, supplier relationship management, strategic sourcing, and use of information communication technology, customer relationship management, and transport and distribution management.

A study by Miguel and Brito (2017) established that appropriate supply chain management practices, characterized with information sharing, long-term supplier relationship and cooperation, and process integration positively influences operational performance. Pycraft et al. (2010) contend that the real-time flow of information and feedback achieved through the adoption of appropriate supply chain strategies enhances organizations' potential of achieving operational objectives. Appropriate supply chain activities can be used as a competitive tool towards the attainment of operational performance (Mentzer et al., 2001)

2.2.2 Le-Agile Supply Chain Strategies

The manufacturing environment today is faced with issues such as globalization and technological advancement. As a result, there is a need to have all the supply chain partners who are the manufacturing firms, suppliers, customers, and competitors, have collaborations with each other to complete the industry (Koh et al., 2007). Le-agile supply chain strategy combines both the lean and agile supply chain strategies at a decoupling point, which separates the lean processes from the agile practices in the supply chain (Zhang et al., 2012). Collaborations achieved through le-agile supply chain strategies lead to streamlining of the supply chain resulting in reduced lead time, efficient processes, and elimination of non-value adding activities (Sillanpää & Sillanpää, 2000). Similarly, competition leads to the development of new manufacturing strategies which are lean, agile, and le-agile (Saadoon & Samman, 2014).

Figure 1 below presents a le-agile supply chain strategy as conceptualized by Naylor et al. (1999).

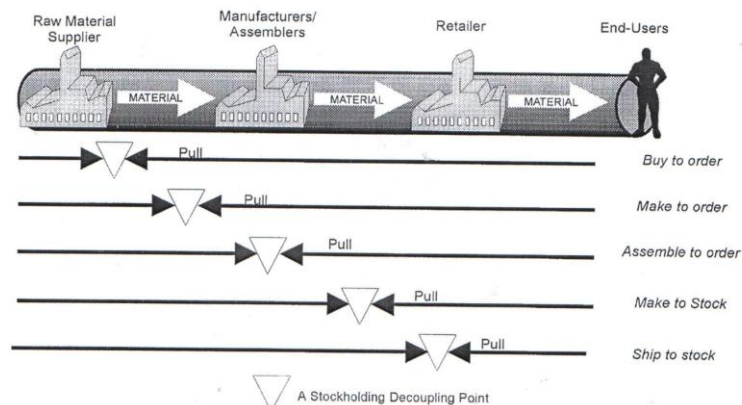


Figure 1: Le-agile Supply Chain Strategy

Source: Naylor et al. (1999)

A le-agile supply chain is associated with enhanced information sharing, shorter supply chains, close cooperation between enterprises, and reduced time wastage within the supply chain (Zhang et al., 2012). Saadoon & Samman (2014) established that Lean, agile, and le-agile manufacturing strategies lead to enhanced operational efficiency and sustainability. The study further revealed that lean manufacturing has a significant positive effect on all the operational performance measures (cost, efficiency, effectiveness, quality, productivity, sustainability, and superior service). Miguel and Brito (2017) too found a positive relationship between lean and agile supply chain practices and operational performance. These findings are consistent with those of Sohel et al. (2015) that the le-agile supply chain strategy had a positive effect on supply chain efficiency.

Le-Agile supply chain strategies are associated with enhanced flexibility, responsiveness, speed, and competence. This capability facilitates proactive supply chain decisions and actions enhancing the operational outcome of the organizations. Similarly, Le-Agile supply chain strategies are associated with reduced costs and enhanced productivity leading to improved operational performance (Taj & Morosan, 2011). According to Saadon and Samman (2014), the high level of customization, responsiveness, flexibility, cost, and wastes reduction lead to operational competitiveness and in turn enhanced operational performance.

III. Research Methodology

This study adopted positivist philosophy to facilitate empirical examination and logical analysis. Positivist philosophy facilitates conclusions from the analysis of data collected on the study variables. This study adopted a cross-sectional survey design. The population is comprised of 410 manufacturers. The 154 manufacturers were picked using the formula (1) proposed by Mugenda and Mugenda (1999) for populations less than ten thousand;

$$n = \frac{z^2pq}{d^2} \dots\dots\dots(1)$$

Where:

n= sample size

z= the standard normal deviation (1.96 for 95% confidence level)

p=the proportion of the target population estimated to have the characteristic being measured {0.2 (Chege et al., 2014)}.

q=1-p= the proportion of the target population estimated not to have the characteristic being measured (0.8)

d= significance level (5%),

giving

$$n = \frac{1.96^2(0.2)(0.7)}{0.05^2} = 246 \text{ manufacturers}$$

The final sample size was calculated using formula (2) below proposed by Mugenda and Mugenda (1999)

$$n_f = \frac{n}{n+n/N} \dots\dots\dots(2)$$

Where:

n_f= the desired sample size (when N is less than ten thousand)

n= the sample size calculated earlier (246)

N= population size (410), giving

$$n_f = \frac{246}{1 + 246/410} = 154 \text{ manufacturers}$$

Structured questionnaires were self-administered to gather research data using a Likert scale (1-strongly disagree to 5-strongly agree). The research instruments were tested to determine whether they were valid and reliable. Face validity was achieved by ensuring the questionnaire was clear and logical while construct validity was achieved through factor analysis. The reliability of the questionnaire was determined through Cronbach Alfa, thereby a result; $\alpha > 0.7$ revealed that the questionnaire was reliable. The direct relationship between supply chain practices and operational performance was tested through correlation and regression analysis. The Hayes Process Macro was used to test the mediation effect. Tables were utilized in presenting data.

IV. Discussion

The study examined the extent of the adoption of supply chain management practices in manufacturing firms in Kenya. The findings were as presented in Table one.

Table 1: Mean Responses on adoption of Supply Chain Management Practices

Performance Indicator	Mean
Purchasing Management	3.74
Physical Distribution Management	3.48
Logistics Management	4.19
Materials Management	4.29

The findings indicate that the manufacturers in Kenya have adopted the studied supply chain management practices. Materials management was found to be the most adopted practice, and physical distribution management was the least adopted practice.

Le-Agile supply chain practices were assessed through descriptive analysis. The mean responses were presented in Table two.

Table 2: Mean Response on Le-Agile Strategy

Performance Indicator	Mean
Lean Strategy	3.97
Agile Strategy	4.02

While the manufacturers had adopted both lean and agile strategies, most of the manufacturing firms are keen on the adoption of an agile strategy than the strategy. This could be attributed to the fact that the operating environment has become fragile and unpredictable. This has made manufacturers more responsive to the constantly changing business environment.

The operational performance of the manufacturing firms was measured in terms of cost, speed, quality, flexibility, and dependability. The mean responses of operational performance are presented in Table three.

Table 3: Mean Response on Operational Performance

Performance Indicator	Mean
Cost Performance	4.10
Speed Performance	4.13
Quality Performance	4.23
Flexibility Performance	4.10
Dependability Performance	4.37

Findings in Table three indicate that each of the five indicators had a high mean that was larger than 4, indicating that the manufacturing firms have achieved a high level of operational performance.

The study further determined the mediating effect of the le-agile strategy on the effect of supply chain management practices on operational performance. Hayes (2013) process model VI was in the test for mediation. The study first determined the effect of supply chain management practices on operational performance. Table four presents the regression results on the effect of supply chain management practices on operational performance.

Table 4: Supply Chain Management Practices on Operational Performance

Model Summary						
R	R-sq	MSE	F	df1	df2	p
.5762	.3320	.1022	77.0363	1.0000	155.0000	.0000
Model						
	Coeff	Se	T	p	LLCI	ULCI
Constant	2.1690	.2294	9.468	.0000	1.7160	2.6221
SCMP	.5123	.0584	8.7770	.0000	.3970	.6276

Outcome variable: Operational Performance

The model is significant at $R^2=0.3320$, $F=77.0363$ and $p<0.05$. The results indicate that supply chain management practices explain 39.5 percent of the variation in operational performance. Supply chain management practices are established to have a significant positive effect on operational performance at $\beta=0.5123$, $t=8.7770$, and $p<0.05$. The model $OP = 2.1690 + .5123SCMP$ indicates that unit change in supply chain management practices leads to direct change in operational performance by 0.5123.

Further, the effect of supply chain management practices on the lean chain strategies was also found to be positive and significant. The results were as summarized in Table five.

Table 5: Effect of Supply Chain Management Practices on Le-agile Supply Chain Strategy

Model Summary						
R	R-sq	MSE	F	df1	df2	p
.6288	.3954	.1501	101.3552	1.0000	155.0000	.0000
Model						
	Coeff	se	t	p	LLCI	ULCI
Constant	1.1902	.2780	4.2811	.0000	.6410	1.7393
SCMP	.7123	.0708	10.0675	.0000	.5725	.8520

Outcome variable: Lean supply chain strategy

The results in table 5 ($R^2=.3954$, $F=101.3552$, and $p<0.05$) indicate that the model is significant and that supply chain management practices account for 39.54% of variations in le-agile supply chain strategy. The results ($\beta=0.7123$, $t=10.0675$ and $p<0.05$) further indicate that supply chain management practices have a

significant positive effect on le-agile supply chain strategy, with a unit increase in supply chain management practices leading to an increase in le-agile supply chain strategy by 0.7123. Further, the effect of supply chain management practices and lean supply chain strategy on agile supply chain strategy was significant. The findings were as presented in table six.

Table 6: Effect of Supply Chain Management Practices and Lean Supply Chain Strategy on Agile Supply Chain Strategy

Model Summary						
R	R-sq	MSE	F	df1	df2	p
.5693	.3241	.1568	36.9279	2.0000	154.0000	.0000

Model	Coeff	Se	t	P	LLCI	ULCI
Constant	1.5744	.3005	5.2388	.0000	.9807	2.1680
SCMP	.2026	.0930	2.1779	.0309	.0188	.3863
LSCS	.4183	.0821	5.0949	.0000	.2561	.5805

Outcome variable: ASCS

The results presented in table 6 indicate that the model is significant at ($R^2 = 0.3241$; $p = 0.000$). The results ($\beta = 0.4183$, $t = 2.1779$, $p < 0.05$) indicate that supply chain management practices have a positive and significant effect on agile supply chain strategy while ($\beta = 0.4183$, $t = 5.0949$, $p < 0.05$) indicates that lean supply chain strategy has a significant positive effect on agile supply chain strategy.

To test whether the le-agile supply chain strategy completely mediates the relationship between supply chain management practices and operational performance, lean and agile supply chain strategies were entered sequentially into the model. The results of the analysis are presented in Table seven.

Table 7: Effect of Le-Agile Supply Chain Strategy on the relationship between Supply Chain Management Practices and Operational Performance

Model Summary						
R	R-sq	MSE	F	df1	df2	P
.7121	.5071	.0764	52.4700	3.0000	153.0000	.0000

Model	Coeff	Se	T	P	LLCI	ULCI
L						
Constant	1.5579	.2276	6.8441	.0000	1.1082	2.0076
SCMP	.2013	.0659	3.0548	.0027	.0711	.3315
LSCS	.3847	.0619	6.2107	.0000	.2623	.5070
ASCS	.0740	.0562	1.3161	.1901	-.0371	.1851

Outcome variable: Operational performance

The regression model was found to be statistically significant ($R^2 = 0.507$, $F = 52.470$, $p < 0.05$). The findings indicate that 50.7 percent of the variation in operational performance is due to supply chain management practices and le-agile supply chain strategy. The regression coefficients for supply chain management practices ($\beta = 0.201$, $t = 3.055$, $p < 0.05$) are still significant after the introduction of the lean and agile supply chain strategies into the model. The results ($\beta = 0.385$, $t = 6.211$, $p < 0.05$) were positive but statistically significant, while the effect of agile supply chain strategy ($\beta = 0.740$, $t = 1.316$, $p > 0.05$) had a positive but insignificant influence on operational performance.

To determine whether the le-agile supply chain strategy completely mediates the relationship between supply chain management and operational performance, the indirect effect of the le-agile supply chain strategy was analyzed. The Indirect Effect of Supply Chain Management Practices through Le-agile Supply Chain Strategy was tested through non-parametric bootstrapping at 0.05. The findings were as presented in Table eight.

Table 8: Indirect Effect of Supply Chain Management Practices through Le-agile Supply Chain Strategy

Effect	BootSE	BootLLCI	BootULCI
.0221	.0226	.1066	.4377

Outcome variable: Operational Performance

The effect was found to be 0.0226 at (95%, $LLCI = 0.1734$, $ULCI = 0.072$) which was statistically significant because zero does not lie between the lower limit confidence interval and the upper limit confidence interval. Therefore, the Le-agile supply chain strategy has a significant mediating effect on the relationship between supply chain management practices and operational performance. Figure 2 gives a summary of the coefficients obtained in the analysis.

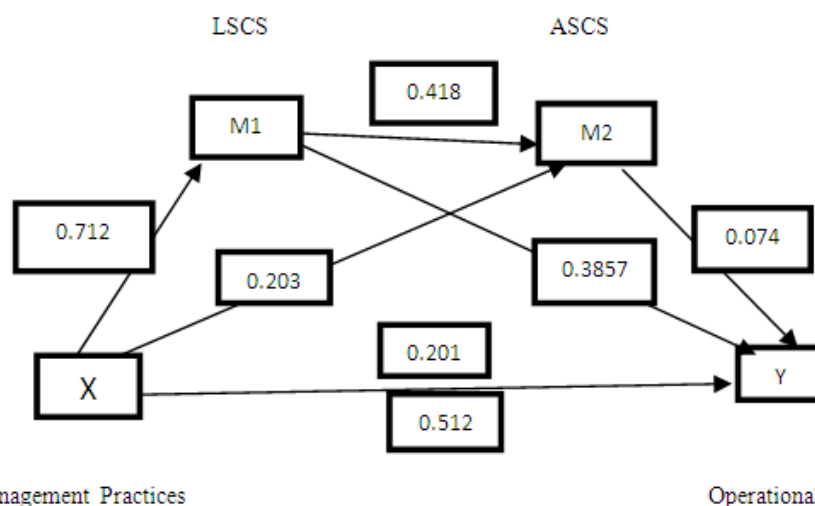


Figure 2: Coefficients for the mediating effect of le-agile supply chain strategy on the effect of supply chain management practices on operational performance.

V. Conclusion and Recommendations

The study findings reveal that supply chain management practices have a significant and positive effect on operational performance. Similarly, the findings reveal that Le-agile Supply Chain Strategy has a significant mediation effect on the effect of supply chain management practices on operational performance. This implies that a combination of lean and agile supply chain strategy capabilities such as responsiveness, competence, speed and flexibility, efficiency, and effectiveness influence internal supply chain management practices towards the achievement of enhanced operational performance. Such capabilities enhance the ability of organizations to understand and respond to supply chain disruptions and consequently enhancing performance. The study recommends that manufacturing firms in Kenya and beyond consider the integration of Le-Agile supply chain strategies in their internal supply chain operations. The study also recommends that a longitudinal study be conducted to enhance understanding of the relationship between Le-Agile supply chain strategy and operational performance in a manufacturing environment. It further recommends that a similar study is carried out on the small and medium manufacturing firms.

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