

**LEAN SUPPLY CHAIN MANAGEMENT PRACTICES AND
PERFORMANCE OF MANUFACTURING FIRMS IN
MOGADISHU, SOMALIA**

BY

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DEDICATION

To my family for their financial and emotional support

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First I thank Allah for this fir I have come

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ABBREVIATIONS AND ACRONYMS

GDP	Gross Domestic Product
LPT	Lean Production Theory
LSCM	Lean Supply Chain Management
SCM	Supply Chain Management
TOC	Theory of Constraints
UNDP	United Nations Development Programme

ABSTRACT

The study's goal was to see how lean supply chain management affected the performance of manufacturing firms in Mogadishu, Somalia. The study had two objectives: to evaluate the level to which manufacturing firms in Mogadishu, Somalia have adopted lean supply chain management practices and to ascertain the association amongst lean supply chain management practices and performance of Manufacturing Firms in Mogadishu, Somalia. The paper used descriptive research design, with all Manufacturing Firms listed by the Ministry of Commerce and Industry in Mogadishu as the study's population. Census was carried out on all the 35 manufacturing companies in Mogadishu, Somalia. The study used primary data drafted by questionnaires which were administered through electronic email by use of google forms. The findings indicate that Manufacturing Firms in Mogadishu, Somalia, adopted lean production and lean transportation to a large extent while lean procurement was adopted to a medium extent. The results reveal that lean production, lean procurement and lean transportation influences performance (profitability and market share) of manufacturing firm's in Mogadishu. Lean supply chain management thus has an affirmative and substantial relationship with performance of manufacturing firms in Mogadishu. The managers and decision makers can use the outcome to establish lean supply chain management practices that influences performance and adopt them in their manufacturing firms. Future research should concentrate on the impact of lean supply chain management on supply chain performance of small, medium and manufacturing firms in Mogadishu Somalia to see if the results will be the same.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Many entities are looking for ways that can put them ahead of others due to the increasing global business competition. According to Chen, Liu and Oderanti (2020), organizations are no longer competing on the company orientation but the focus has shifted to supply chain orientation making supply chain improvement essential to survive. The adoption of innovative supply chain management practices (SCM) by firms are being embraced so as to retain their competitiveness in the sector as well as enhancing performance (Vanichchinchai, 2019). Firms which need to stay ahead of competitors in the industry are minimizing wastes through lean supply chain management (LSCM). To compete successfully in today's economic environment, firms must become considerably more involved in how their clients and vendors conduct their activities. With the increase of global competition, there must be close collaboration between the firm and the clients so that the firm can obtain integral information pertaining to what the client's needs, monitor the source of raw materials, monitor the design and assembly of product from the vendor, transportation and storage of end products and finally be able to deliver what the clients are really asking for (Zhou & Ji, 2020)

Theories that support the adoption of LSCM that were featured are Lean production theory (LPT) and Theory of Constraints (TOC) with Lean Production Theory being the overarching theory. This is because the theory stresses on the relevance of eliminating waste which is the main purpose of Lean supply chain management. Lean production theory suggests that firms should implement waste elimination and buffer stock in the production process (Palevich, 2011). Goldratt (1984) states that theory of constraints is of the opinion that the main focus of managers should be to effectively manage the capability and capacity of some major constraints which limits the performance of the organization for them to be competitive.

Manufacturing businesses in Somalia face resource limits and competitiveness both locally and worldwide, necessitating the need to prioritize resource provision and utilization by minimizing each wastage in the value chain thus the relevance of LSCM in manufacturing firms as founded by Shah and Ward (2003). The manufacturing sector is regaining its foot after the civil war that broke out in 1990's which interfered with majority of the manufacturing firms which were forced

out of business (Tybout, 2000). However, the business has acquired substantial traction among Somali Diasporas, who are making major investments in both large and small-scale operations. Through the investments of those in diaspora as well as the investment by foreigners, the industry is improving and contributing greatly to the economy of Somalia.

1.1.1 Lean Supply Chain Management Practices

Singh and Modgil (2020) define lean as a management philosophy which focuses on value addition to the clients by waste removal and continuously improving processes and systems by applying lean principles, practices and techniques. Núñez-Merino, et al. (2020) view lean as a systematic way of waste removal through gradual and constant improvement to enhance the quality that the client's needs. Value addition and waste removal is no longer an option for firms as firms that do not embrace lean are faced with rigid competition which will hamper their performance and growth in the sector (Garcia-Buendia, Moyano-Fuentes & Maqueira-Marín, 2021). Lean entails generating more value that can be transferred to clients by using minimal resources, that is, maximizing client's value through waste minimization. Lean can be considered as a management philosophy involved in pointing out and eliminating waste in the organizations' product value chain (Tortorella, Giglio & Limon-Romero, 2018). According to Zhou and Ji (2020) a SC is termed as a system of facilities and activities associated with the development of products, purchasing of raw materials from the members of the supply chain, production of products as well as distribution of the final product to the customers.

Vanichchinchai (2019) described lean supply chain as a set of firms having a direct link of service, products and information movement upstream as well as downstream with the aim of waste removal and value creation in a cost efficient way that the value can be transferred to clients.

According to Nimeh, Abdallah, and Sweis (2018), the application and culture of lean supply chain focuses on matters involving wastes and inefficiencies of a firm's operations and how to reduce or eliminate them. Given that business leaders have no direct influence or control over the external environment, firms ought to manage their internal processes to get rid of cost overruns, wastes and inadequacies that could lead to losses and perhaps collapse of the firm (Baliga, Raut & Kamble, 2019)). Lean supply chain management practices that has extensively been covered in literature includes Lean Procurement, Lean Production, supply chain integration, lean logistics and waste

management (Moyano-Fuentes, Maqueira-Marín, Martínez-Jurado & Sacristán-Díaz,2020; Baliga, Raut & Kamble, 2019; Vanichchinchai, 2019; Chen, Liu & Oderanti, 2020; Nimeh, Abdallah & Sweis, 2018) . These are the LSCM practices that the study focused on.

1.1.2 Firm Performance

Rompho (2018) defines performance as the measurable features of a firm's processes such as stock turns, reliability and cycle time of production. Based on Knod and Kaydos (2020), performance is an organization's ability to convert inputs into outputs. A firm assesses its performance against predefined criteria like reducing waste, productivity of operations, cycle and lead time, how a firm is responsible environmentally and firm's compliance to regulations (Inman & Green, 2018). Performance focuses on a firm's internal working capability in terms of reducing cost and eliminating waste, enhancing the quality of product as well as developing novel products, enhanced capacity of delivery and increased productivity (Yadav, Jain, Mittal, Panwar & Lyons, 2019). Performance also refers to the measurable characteristics of a firm's system, such as manufacturing cycle time, dependability, profitability, market share and stock rotations. According to Rompho (2018), it also indicates performance aspects like market share, return on investment and client satisfaction.

The performance of a company's operations is frequently weighed against a preset standard of how responsible it is, its effectiveness and efficiency through its cycle time, productivity, waste removal and being compliant with established rules (Buer, Semini, Strandhagen & Sgarbossa, 2021). Measuring performance is important to enterprises because it improves effectiveness in production, creates products with superior quality and that satisfies consumers resulting in better earnings and enhanced revenues (Dubey et.al. 2020). The firm's performance defines how efficiently and effectively it produces products and services, as well as how well the product and service meet the expectations and requirements of customers as well as how it enhances profitability and boosts market share (Lu, Ding, Asian & Paul, 2018). According to Kaydos (2020), performance is critical in managing processes of a firm and is vital in ensuring and guaranteeing a firm's competitiveness. It improves the organization's performance in order to achieve its main goals, such as service delivery, quality, return on investments, market share and productivity (Yadav et. al., 2019).

Given the scope of this research, the emphasis on the performance of a firm has been placed on the financial and non-financial aspects. This is based on the empirical studies as most of the studies looks at a firms performance in terms of the financial aspects and non-financial measures. The firm's financial measures that were adopted entailed market share and profitability (Buer et. al., 2021; Dubey et. al., 2020). Timeliness consists of timely delivery of service and goods that meets client's satisfaction as well as lead and cycle times.

1.1.3 Manufacturing Firms in Mogadishu, Somalia

Manufacturing is the process of transforming raw resources to finished goods through production and are made available to be consumed (Levinson, 2018). The process allows inputs to be converted into finished goods that are sold to customers. The industry has a tremendous impact on a country's economic progress. However, significant technological advancements have occasioned a paradigm shift from goods to service economies, forcing the sector to stagnate. Manufacturing entity's stability is a major predictor of a rising and resilient economy. Furthermore, the sector is inextricably linked to all other industries of the economy.

Before the civil war began in 1991, Somalia had fifty-three small, medium, and large manufacturing enterprises that were state owned. As a result, according to Tybout, the war rendered none of them functioning (2000). However, the business has acquired substantial traction among Somali Diasporas, who are majorly investing in small and large-scale operations. In Mogadishu, thirty-five manufacturing companies are in responsible of soap production, foam mattresses, plastic stacks, aluminum, stone processors, designing fishing boats and mineral water as indicated by the report of Ministry of Commerce and Industry (MoCI, 2018). The industry in Somalia generates ten percent of the nation's GDP, delivers 2% of formal employment, and accounts for 0.1% of Somali exports (MoCI, 2017). There has been a paramount increase of investment, based on UNDP (2018), with report expressing buoyancy in performance of the economy as a plant value of \$8.3 million for bottling Coca-Cola product was brought up in Mogadishu in 2004. Investment is encouraged as the government engages in initiatives to attract foreign direct investments. Among the initiatives set up by the government includes the provision of custom grants, bylaws that exempts duties for acquisition of machines and tools as well as fifty percent duty discount on relevance of raw materials that passes by the Mogadishu port as explained by Mohamed et al. (2019)

1.2 Research Problem

Enhancing performance is an important metric in manufacturing organizations and firms use a variety of tactics, like lean supply chain management, to improve their performance. Adoption of LSCM philosophies has increased pressure on firms to come up with innovative methods to generate and transfer value to consumers with minimal resources, or to maximize clients value while removing wastes and boosting profitability with cutting supply chain costs (Inman & Green, 2018). Adoption of LSCM has emerged as a critical channel of gaining a competitive edge and boosting a firm's performance, as rivalry is no more amongst firms, but between supply networks. Numerous businesses have realized that building an edge in a sustainable way for an increasingly congested environment requires lean supply chain management (Lu et. al., 2018).

Manufacturing companies and organizations face a variety of issues, including managing operational expenses, overheads, utilities, and wastes while attempting to increase its performance. As noted by Mohamed et al. (2019), the external environment of operations has become so unpredictable and turbulent that manufacturing firms in Mogadishu who want to retain their profitability and competitiveness must adopt LSC philosophies which have been found to enhance performance and accorded firms massive gains strategically. Manufacturing companies are under growing pressure to meet consumer demands while also lowering costs, shortening lead times, reducing inventory levels, and reducing waste in order to maintain profitability and improve performance (Kaydos, 2020).

Garcia-Buendia, Moyano-Fuentes and Maqueira-Marn (2021) found that LSCM positively influences performance in the majority of the studies they analyzed. Buer, Semini, Strandhagen, and Sgarbossa (2021) discovered that the complementing effect of lean manufacturing and digitalization on performance is enhanced by lean manufacturing. According to Alvim and Oliveria (2020) in LSCM- a lean methodology adopted to lean manufacturing, it is critical to examine the SCM as a system and not to apply the lean concept solely to insulated segments of the chain when implementing an LSCM. Extending lean management along the supply chain, Moyano-Fuentes, Maqueira-Marn, Martinez-Jurado, and Sacristán-Daz (2020) note that LSCM improves efficiency in the Spanish industrial sector. Vanichchinchai (2019) found that Lean

Manufacturing had a substantial impact on supply chain performance in Thailand manufacturing enterprises that used lean manufacturing.

On the influence of material management on construction project delivery in Somalia, Wayrah, Sarpin, Mohamed and Masrom (2021) found that delays in production and processes had a detrimental impact on service delivery of construction projects in Somalia. Ibrahim (2020) examined the logistics outsourcing strategies and performance of Mogadishu's SMEs businesses. The findings show that inventory management, well managed warehouses, and lean transportation all have an impact on the success of SMEs in Somalia. Mohamud Gele (2019) found that supply chain collaboration, reverse logistics, and green production improve a firm's competitiveness in Mogadishu. Mohamed (2019) observed that integration through supply chain collaborations improves a firm's responsiveness in his study of supply chain integration and responsiveness of supermarkets in Mogadishu.

According to previous research, there is a need for Lean SCM and performance of manufacturing firm in Somalia, which this study attempts fill. The purpose of this study is to ascertain how Lean supply chain management affects the performance of manufacturing firms in Mogadishu, Somalia. The research aimed at providing reply to the subsequent queries: what is the level of adoption of lean SCM practices among manufacturing firms in Mogadishu, Somalia? What is the correlation between Lean supply chain management practices and performance of manufacturing firm in Mogadishu, Somalia?

1.3 Objectives of the Study

The specific objectives included:

- i. To determine the adoption level of lean supply chain management practices by manufacturing firms in Mogadishu, Somalia
- ii. To establish the relationship between lean supply chain management practices and performance of manufacturing firms in Mogadishu, Somalia.

1.4 Value of the Study

Academics, policymakers and practitioners will greatly gain from the study. The research will look into several LSCM practices employed in Mogadishu's manufacturing industry. It is intended to add additional knowledge in the subject of LSCM and so researchers will profit from the outcome because it will establish a foundation for future research and also gives an understanding of the responses that manufacturing enterprises in Somalia can implement.

The findings will assist practitioners in determining which LSCM Practices are critical in enhancing an entity's performance. The study will also be useful to managers, particularly those making decisions to improve management strategies of manufacturing industry, and will aid in ascertaining the key causes why organizations should begin or continue to practice LSCM practices as a strategy to enhance performance.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This segment investigated the anchoring theories, delve into exploring LSCM, explore LSCM and performance and conclude with a conceptual framework.

2.2 Theoretical Literature Review

The paper was steered by Theory of Constraints (TOC) and Lean production theory (LPT) and linking the theories to how they are related with LSCM and performance.

2.2.1 Theory of Constraints

Goldratt developed the theory of constraints, a system management philosophy, in 1984. According to this theory, managers need to concentrate on efficiently controlling the capability and competence of the entity's few key constraints if they are to enhance their performance. The essential idea behind the TOC is that constraints define the performance boundaries of any system in an entity. Based on Dettmer (1996), TOC encourages managers to reassess and review some of their main assumptions that aid in attaining the firm's objectives and improving performance. The main concern of the theory is comprehending and managing the constraints that stand in the way of an organization's achievement of its objectives. The primary notion of the Theory of Constraints, according to Goldratt (1984), is that any firm with the sole purpose of maximizing profits must be faced with constraints or obstacles in the way of attaining their goals. The theory thus offers a dependable approach that demands on following through and concentrating on the refinement of strategies in key sections where they will have a significant influence on the profit and thus the need to maintain their focus (William, 1996).

Lean SCM is critical in the attainment of a firm's performance as firms that implement the practices have been observed to have massive gains in their bottom-line as well as improved processes. The theory aids decision makers in coming up with ways which they can combat the constraints that they are faced with in their daily operations to enhance their performance. The theory aids decision makers in coming up with solutions to some of the problems they face at the work place. The theory is thus pertinent to the research as it helps in identification of problems

and in coming up with lean strategies that will aid in solving the identified constraints by manufacturing firms in Mogadishu.

2.2.2 Lean Production Theory

The theory centers on regulating the flow of production by incorporating value adding activities to the end product. This theory suggests firms should implement waste elimination and buffer stock in the production process (Palevich, 2012). Waste of time, over processing, over production, excess inventory, movement and defects should be totally eliminated by a firm for them to achieve efficiency and effectiveness in the company. The continuous flow and improvement of the production system is central to lean production theory (Dunning & Richert, 2001). All subsequent improvements in production will be driven by the selection and implementation of relevant measurements in the manufacturing process. The elimination of waste is a major focus in lean production systems (Jones & Richert, 2000). Some waste measures, on the other hand, might not be seen as such in classic mass production processes. Excess inventory is one such measure that lean strives to eliminate.

This theory is applicable to the topic under study and manufacturing firms in Mogadishu should be able to eliminate all the waste in their production processes if at all they want to achieve an entity's performance. Manufacturing firms need to engage themselves with activities that only adds value to the production and entire SC for them to achieve performance and have a competitive edge beating the competition. The aim of lean production theory is to be able to minimize waste in the production process as well as emphasize on only value adding activities and thus the theory is pertinent to the study as the study is about LSCM and lean principle is all about waste minimization and value adding activities.

2.3 Lean supply chain management practices

Lean philosophy and LSCM emphasizes on elimination of waste across the supply chain and involvement of activities which adds value to the chain. The practices that were covered in the study and meets the lean principles are lean production, lean procurement and lean transportation and they are discussed below.

2.3.1 Lean Production

Lean production is an assimilated processes of SCM that aims at achieving massive-volume, flexible production with low raw material stocks. It is founded on the principle that nothing is manufactured unless it is required. Lean production should ideally be adopted across the SC, with the motion traveling reverse from consumer to the source of raw materials (Garcia-Buendia et al., 2021). According to Nez-Merino et al. (2020), lean production is constantly aiming to remove waste, growing the percentage of time spent to value-addition processes. As per Singh and Modgil (2020), lean production is achieved with little waste owing to unnecessary activities, ineffective activities, or too much cushioning in processes. Lean production aims to optimize processes while progressively decreasing resources needed for output (Zhou & Ji, 2020).

Zhao et al. (2021) discovered that lean production results in the production of products at a lower cost than products manufactured without the use of lean principle. Saudi et al. (2019) describe lean production as minimizing waste by eliminating unnecessary procedures. According to Zhou and Ji, (2020), the remunerations of lean production include automation, removal of time waste, minimal inventorying, and space economization in order to make high-quality, cost-effective products. According to Moyano-Fuentes et al. (2020), lean production is associated with quality, delivery, flexibility, and cost. Lean production, according to Martnez-Jurado and Sacristán-Daz (2020), results in advanced levels of quality and productivity, as well as better client satisfaction.

2.3.2 Lean Procurement

Baliga, Raut and Kamble (2019) describe lean procurement as procurement in which suppliers can be relied on to supply the required materials in the appropriate place, in the right amounts and on time. Lean Procurement calls for suppliers to be reviewed and chosen utilizing numerous characteristics like their culture quality that they offer, how reliable they are competitiveness of their prices as well as how they generally behave. According to Vanichchinchai (2019), lean procurement is termed as a philosophy, culture of a work place, a technique, a management idea, a methodology or a value. According to Chen, Liu and Oderanti (2020), in order for lean procurement to be successful, supply chain members must be dependable and committed throughout the process. Lean procurement practices, according to Nimeh, Abdallah and Sweis (2018), entails regular small quantity purchase from limited vendors that deliver the orders in precise quantities at a specified place and time. Tortorella et al. (2017) go on to say that purchasers

in lean systems are quite flexible when it comes to establishing specifications for their requirements and information is readily exchanged among members. According to Jasti and Kurra (2017), the relationship between customers and suppliers is based on the length of time they have worked together and demonstrated dedication. E-procurement and procurement process automation are also part of lean procurement that assist in waste removal along the supply chain while also increasing efficiency and effectiveness.

2.3.3 Lean Transportation

According to Lu et al. (2018), lean methodology is being applied in several aspects of the organization's supply chain management. When applied to transportation, the notion of lean processes yields significant benefits to a business. Significant waste and excessive expenses exist in the majority of transportation networks (Rompho, 2018). Customers are increasingly understanding the value that transportation offers, and this is becoming one of the differentiating characteristics in the worldwide market. Taylor and Kaydos (2020) presented four lean transportation laws to help describe the bearing of lean transportation on an entity's bottom line as part of the idea of lean supply chain management. They entail every day's event management legislation, the transportation waste law, the distribution performance law and the transportation strategy law. Lean transportation comprises coordinated distribution, backhaul management, forward and reverse logistics, optimum mode selection and order pooling, cross docking, and proper equipment size as concluded by Inman and Green (2018),.

2.4 Empirical Literature Review

Research already done has mainly established an affirmative correlation between lean SCM and performance in the global, regional and local front. Garcia-Buendia, et al. (2021) found that LSCM positively influences performance in the majority of the studies they analyzed. The methodology used was a systematic literature review leaving a gap for adoption of primary data. Buer, Semini, Strandhagen, and Sgarbossa (2021) discovered that the complementing impact of lean manufacturing and digitalization on performance is enhanced by lean manufacturing. A cross-sectional design was utilised for the investigation. Focus was on lean manufacturing and digitization and not LSCM. According to Alvim and Oliveria (2020), in Lean SCM- a lean methodology used to lean manufacturing, it is critical to examine the SCM as a system and not

adopting lean concept solely to individualized segments of the chain when implementing an LSCM. A descriptive and exploratory design was used. The gap was left on performance as it was not covered. Extending lean management along the supply chain, Moyano-Fuentes, Maqueira-Marn, Martnez-Jurado, and Sacristán-Daz (2020) observe that LSCM improves efficiency in the Spanish industrial sector. A descriptive design was used. Vanichchinchai (2019) found that Lean Manufacturing had a substantial impact on supply chain performance in Thailand manufacturing enterprises that embraced lean manufacturing. The descriptive exploratory design was used. Supply chain performance was the focus and not firm's performance.

On the influence of managing material on delivery of construction project in Somalia, Wayrah, Sarpin, Mohamed and Masrom (2021) found that delays in production and processes had a detrimental impact on service delivery of construction projects in Somalia. A descriptive design and survey were used. Focus was on material management and not LSCM. Ibrahim (2020) examined outsourcing strategies and performance of Mogadishu's small and medium-sized businesses. The findings show that inventory management, well managed warehouses, and lean transportation all have an impact on the success of SMEs in Somalia. The method used was a cross-sectional survey design. Focus was on logistics outsourcing and not LSCM. Mohamud Gele (2019) found that supply chain collaboration, reverse logistics, and green production improve a firm's competitiveness in Mogadishu. A descriptive design was used. The study focused on sustainable supply chain and not LSCM. Mohamed (2019) observed that integration through supply chain collaborations improves a firm's responsiveness in his study of supply chain integration and responsiveness of supermarkets in Mogadishu. The study used a descriptive design as well as a census. The study focused on responsiveness and not performance.

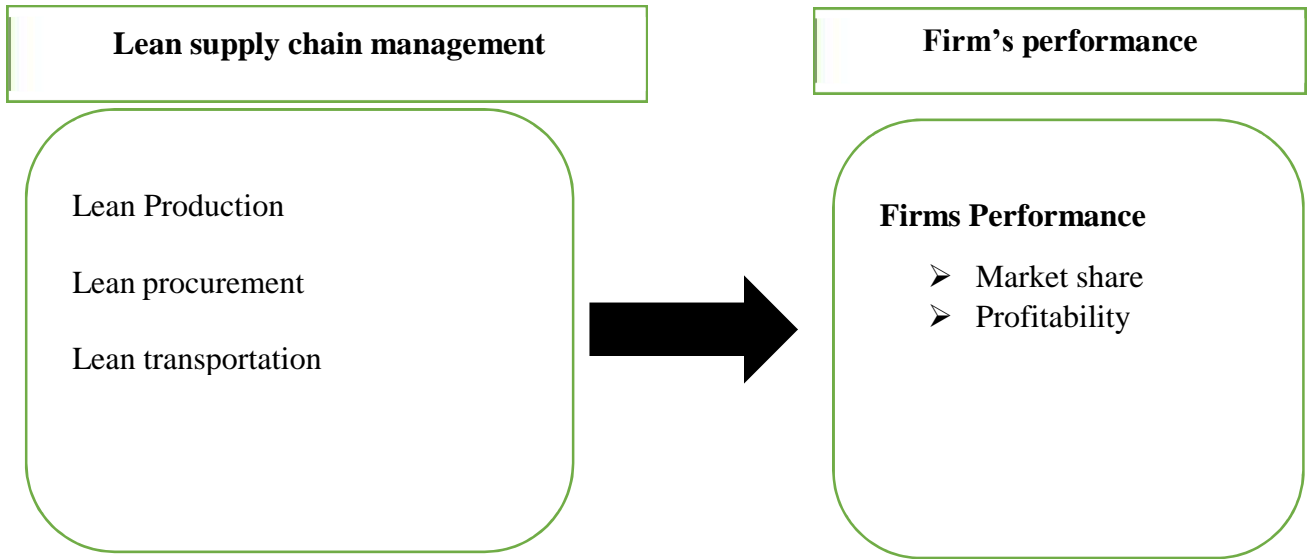
2.5 Conceptual framework

The aim of a conceptual framework is to illustrate the correlation between the variables under study as noted by Peters et al. (2000). The independent variable is identified as LSCM and is operationalized by lean production, lean procurement and lean transportation. The dependent variable of the study is firm's performance and is quantified through market share and profitability. Figure 2.1 illustrates the framework.

Figure 2. 1 Conceptual Framework

Independent Variable

Dependent Variable



Source; Researcher (2021)

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This section describes the research approach employed to conduct this work. It embodies the design, population and sampling, information gathering instruments and analysis procedures.

3.2 Research Design

Descriptive design was adopted. Sekeran and Boujie (2009) assert that a descriptive study is undertaken with an aim of determining and describing the features of the constructs of concern in a situation. This design was suitable in establishing the influence of LSCM and performance of manufacturing entities in Mogadishu, Somalia.

3.3 Target Population

The population entailed all the manufacturing entities in Mogadishu Somalia which are listed by the Ministry of Commerce and Industry (2020). The ministry places the number of manufacturing firms at 35 (Appendix II). Considering the small population, census- which is the study of the whole population- was adopted.

3.4 Data Collection

Primary data acquired using structured questionnaires was used in the study. The targeted persons were supply chain managers of every listed manufacturing firms in Mogadishu and thus a single questionnaire was administered to the managers. Supply chain managers are considered as they oversee the operations and are in charge of which strategies to adopt so as to enhance the firms performance. This places those at a vantage position of having the knowledge of the variables being studied and best suited to fill the questionnaires. The questionnaires were administered by use of electronic mails through Google forms. Section A contained demographic information, B; extent of adoption of LSCM and C; Firm's performance measures linked with the adoption of lean supply chain management.

3.5 Data Analysis

The gathered information was edited and analysed to check the completeness level and be deemed fit for analysis. SPSS was used to analyse the complete data. Data was analyzed as per the specific objectives. The level of adoption of LSCM by manufacturing firms in Somalia, which is the first objective, was analysed using descriptive statistics. Objective two which aims at establishing the association between LSCM and performance was analysed through regression analysis.

The regression equation was in the form of:

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \varepsilon$$

Where: Y= Firm's performance

β_0 = Constant factor

$\beta_1 - \beta_5$ = Coefficient of independent variables

X_1 = Lean production

X_2 = Lean procurement

X_3 = Lean transportation

ε = Error term

CHAPTER FOUR: DATA ANALYSIS, FINDINGS AND DISCUSSIONS

4.1 Introduction

The outcome of the analysis, their explanations and discussion are presented in this chapter. The biographic information, Lean supply chain management adoption levels, and a regressed analysis indicating the correlation between LSCM and firm's performance were all be covered in this chapter

4.2 Response Rate

The targeted respondents were the 35 manufacturing companies in Mogadishu and comprehensive information was gathered from 29 manufacturing companies, accounting for 87.88 percent of the respondents. This rate was considered satisfactory for analyzing the data.

Table 4. 1 Response rate

Rate	Frequency	Percentage (%)
Responded	29	83
Not responded	6	17
Total	35	100

Source: Study Data

4.3 General Information

The respondents' positions in the company, period of work in the position they held, and time the Large Manufacturing businesses have been operating in Mogadishu, Somalia were used to cover the general information. Table 4.2 portrays the position of respondents and highest education level in the manufacturing entities in Mogadishu.

Table 4. 2 Position in the company

Position in the company	Frequency	Percentage (%)
Supply chain Director	10	34.48
Supply chain managers	8	27.58
Supply chain officers	11	37.93
Education level		
Certificate/Diploma	3	10.35
Bachelor's Degree	15	51.72
Master's Degree	7	24.14
Doctoral Degree	4	13.79
Total	29	100

Source: Study Data

Table 4.3 portray that 34.48% represented supply chain directors, 27.58% represented supply chain managers while the remaining 38% were supply chain officers. The results means that majority (62.06%) of those who filled the questionnaires were at a managerial position and were suitable and knowledgeable on the subject under study being LSCM and performance. The outcome on the length of work is tabulated in 4.3

Table 4. 3 period of work

Period of work (years)	Frequency	Percentage (%)
0-2	3	10.34
3 -5	5	17.24
5 -10	10	34.48
Over 10	11	37.93
Total	29	100

Source: Study Data

On the period that the respondents had worked in the firms, the majority (37.93 %) were working in the Manufacturing entities for above 10 years. 34.48% for periods ranging from 5-10 years and

17.24% for 3- 5 years and the last 10.34% had served the Manufacturing firms for 2 years (0-2) and below. Hence, 89.66%, represented above three years of experience of those who responded meaning that they had adequate knowledge and were experienced enough to give answers to the queries.

4.4 Adoption of Lean Supply Chain Management

The goal of the paper was to see how far manufacturing companies in Mogadishu, Somalia, had adopted LSCM practices. Lean production, lean procurement and lean transportation were the three constructs of LSCM practices and the outcome of the analysis are summarized in the subsequent tables

4.4.1 Lean Production

The study aimed at finding out the extent of adoption of lean production by the manufacturing entities in Mogadishu, Somalia and the outcome of analysis is tabulated in 4.4

Table 4. 4 Lean Production

Indicator	Mean	Std. Dev
The firm produces the right product the first time	3.85	0.729
The firm engages in Continuous improvement of products in production	3.57	0.974
The firm carries out mass production for multiple orders placed by clients	3.22	1.981
The firm minimizes wasteful process in production process	3.34	1.797
The firm engages in quality product production and processes	3.92	0.729
Aggregate Score	3.58	1.461

Source: Study Data

Based on the respective Mean and Standard Deviations, the firm producing the right product the first time (M= 3.85, SD= 0.729), engaging in continuous improvement of products in production (M= 3.57, SD= 0.974), and engaging in quality product production and processes (M= 3.92, SD= 0.729) were adopted to a large extent by the manufacturing enterprises in Mogadishu. Minimizing

wasteful process in production process (M= 3.34, SD= 1.797) and carrying out mass production for multiple orders placed by clients (M=3.22, SD=1.981) were adopted to a moderate extent.

General score (M=3.58, SD=1.461) indicate that lean production was adopted to a large extent by the manufacturing firms in Mogadishu hence an indication that the practices are valuable to the firm. The outcome are consistent with that of Núñez-Merino, et al. (2020) who found that lean production systematically removes waste (activities that do not add value) through gradual and constant improvement to enhance the quality that the client’s needs. Vanichchinchai (2019) found that Lean Manufacturing had a substantial impact on supply chain performance in Thailand manufacturing enterprises that used lean manufacturing. According to Nez-Merino et al. (2020), lean production is constantly aiming to remove waste, and enhance value-adding processes. Zhao et al. (2021) discovered that lean production results in the production of goods and services at a lower cost than those manufactured without the use of lean management.

4.4.2 Lean Procurement

The study wanted to ascertain the level of adoption of lean procurement by the large manufacturing firms in Mogadishu, Somalia and the outcome are tabulated in 4.5

Table 4. 5 Lean Procurement

Indicator	Mean	Std. Dev
Firm has clear and precise procurement procedures	3.41	1.59
The firm practices competitive sourcing	3.26	1.77
Firm has invested in strategic suppliers for prompt procurement	3.42	1.58
The firm only procure what is needed for production	3.38	1.66
The firm has committed procurement personnel and suppliers	3.31	1.69
Aggregate Score	3.35	1.68

Source: Study Data

Table 4.5 indicate that having clear and precise procurement procedures (Mean= 3.41, SD= 1.59) and practicing competitive sourcing (Mean= 3.26, SD= 1.77) were used to a medium extent as evidenced by the means and deviations. The firm investing in strategic suppliers for prompt procurement (Mean= 3.42, SD= 1.58), only procuring what is needed for production (Mean= 3.38,

SD= 1.66) and having committed procurement personnel and suppliers (Mean= 3.31, SD= 1.69) were adopted to a medium extent.

The aggregate score with the mean of 3.35 and SD of 1.68. This infers that lean procurement was adopted to a medium extent by the manufacturers in Mogadishu and thus inferring that the manufacturers did not put much effort in lean procurement practices. The results contradicts those of Baliga, Raut and Kamble (2019) who noted that in lean procurement, suppliers can be relied on to supply the required materials in the appropriate place, in the right amounts and on time. Nimeh et al. (2018) add that it entails regular small quantity purchase from limited vendors that deliver the orders in precise quantities at a specified place and time. Singh and Modgil (2020), argue that lean procurement helps in saving cost as the entity only procures what is needed.

4.4.3 Lean Transportation

The study aimed at determining the level of adoption of lean transportation by the manufacturing firms in Mogadishu, Somalia. Table 4.6 gives the individual and general mean and standard deviation for lean transportation.

Table 4. 6 Lean Transportation

Indicator	Mean	Std. Dev
Firm has ensured there's an effective transportation system	3.91	1.09
The firm has schedule for order deliveries	3.43	1.55
Firm has budget to ensure control of transportation process	3.62	1.16
Firms has adopted reverse logistics as a transportation strategy	3.54	1.09
The firm engages in backhaul management	3.41	1.99
Aggregate score	3.58	1.57

Source: Study Data

The firm ensuring that there's an effective transportation system (3.91, SD= 1.09), having a budget to ensure control of transportation process (3.62, SD= 1.16) and embracing reverse logistics as a transportation strategy (3.54, SD= 1.19) were all adopted to a large extent with regards to table 4.6. Having a schedule for order deliveries (3.43, SD= 1.55) and a practicing backhaul

management (3.41, SD= 1.99) were adopted to a medium level as indicated by their individual means and standard deviations.

The overall mean of 3.58 and SD of 1.57 implies that lean transportation was adopted to a large extent and that the practices are crucial for the firm in achieving its performance. Lean transportation was adopted to a large extent implying that manufacturers in Mogadishu value lean transportation practices. The outcome agrees with that of Rompho (2018) who found that having a lean transportation saves cost associated with fuel as only necessary trips are made. Taylor and Kaydos (2020) adds that lean transportation saves time due to scheduling of routes and thus products are delivered on time where needed. Singh and Modgil (2020) concludes that lean transportation is crucial to a firm that wants to enhance their performances and attain customer satisfaction due to prompt deliveries. Inman and Green (2018) argues that lean transportation reduces cost through reverse logistics and backhaul management.

4.5 Lean supply chain management and firm’s performance

The paper's second objective was to find out the correlation between LSCM and firm’s performance of manufacturing firms in Mogadishu. The information was fitted with a linear regression, and the results are shown below.

Table 4. 7 Model Summary of firms performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.771 ^a	.651	.585	.52802

a. Predictors: (Constant), Lean Transportation, Lean Production, Lean Procurement

Source: Study Data

The R^2 is 0.65 transforming to 65 percent, as displayed in Table 4.7. This indicates that the regression model is relevant and that the adoption of LSCM Practices is responsible for 65% of the increases in firm’s performance. Tabulated in 4.8 is the outcome of ANOVA.

Table 4. 8 ANOVA Analysis of firms performance

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	5.720	3	1.907	6.838	.002 ^b
Residual	6.970	25	.279		
Total	12.690	28			

a. Dependent Variable: Firms Performance

b. Predictors: (Constant), Lean Transportation, Lean Production, Lean Procurement

Source: Study Data

The F value of 6.838 was substantial as it's greater than F critical of 1.907 and is corroborated by the p value of (0.002) which did not exceed 0.05, indicating that the model was sufficient and significant. Lean supply chain management practices has a statistically noteworthy association and influences performance of manufacturers in Mogadishu, as indicated by the P value of less than 5% (0.002 < 0.05).

Table 4. 9 Coefficient of firm's performance

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	3.720	1.730		2.150	.001
Lean Production	1.180	.202	.185	8.910	.032
Lean Procurement	1.020	.410	.733	2.486	.020
Lean Transportation	1.050	.191	.062	5.497	.006

a. Dependent Variable: Firms Performance

Source: Study Data

$$Y = 3.720 + 1.180 (\text{lean production}) + 1.020 (\text{lean procurement}) + 1.050 (\text{lean transportation})$$

The findings tabulated in 4.9 show that the P value of lean production (t=8.910, P<0.05) and lean procurement (t=2.486, P<0.05) and lean transportation (t=5.497, P<0.05) are less than 5% implying an affirmative and significant correlation with firms performance of manufacturers in Mogadishu, Somalia. This therefore infers that lean production, lean procurement and lean transportation influence firm's performance of manufacturers in Mogadishu, Somalia.

The general findings indicated that lean supply chain management practices has a statistically relevant correlation and influences performance of Manufacturing organizations in Mogadishu,

Somalia as indicated by the ANOVA Analysis (0.14) and the coefficient analysis with the p values which was less than 0.05.

Objective two had to ascertain the correlation between LSCM Practices and performance of manufacturing firms in Mogadishu and it was determined that LSCM practices had an affirmative and substantial relationship with performance of the manufacturing firms in Mogadishu and thus objective three was fulfilled. Specifically, it was established that lean production, lean procurement and lean transportation influenced performance of manufacturing (profitability and market share) firms in Mogadishu. The outcome goes hand in hand with that of Garcia-Buendia et al. (2021) who found that LSCM positively influences performance. Inman & Green (2018) argue that LSCM philosophies has increased pressure on firms to come up with innovative methods to generate and transfer value to consumers with minimal resources, or to maximize clients value while removing wastes and boosting profitability with cutting supply chain costs.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The chapter included an overview of major results, as well as conclusions formed from the outcome and recommendations drawn in response to them. The suggestions and conclusions reached are aimed at answering the study question or accomplishing the study objectives.

5.2 Summary of Findings

As per the outcome of objective one, the findings indicate that manufacturing firms in Mogadishu, Somalia adopted lean production and lean transportation to a large extent while lean procurement was adopted to a medium extent. This is an indication that the first objective was met. The manufacturing firms in Mogadishu adopted lean production by producing the right product the first time, engaging in continuous improvement of products in production, engaging in quality product production and processes, minimizing wasteful process in production process and carrying out mass production for multiple orders placed by clients. Lean procurement practices adopted entails having clear and precise procurement procedures, practicing competitive sourcing, investing in strategic suppliers for prompt procurement, procuring only what is needed for production and having committed procurement personnel and suppliers. Lean transportation was adopted to a large extent by ensuring that there's an operative transportation system, having a financial plan and estimates to guarantee control of transportation activities, embracing reverse logistics as a transportation strategy, having a schedule for order deliveries and a practicing backhaul management

The second objective was to ascertain the correlation of LSCM practices and performance of Manufacturing Firms in Mogadishu. This objective was achieved as it was established that; lean production, lean procurement and lean transportation influenced performance manufacturers in Mogadishu. The general results affirmed that LSCM practices (lean production, lean procurement and transportation) have an affirmative and substantial relationship and influences performance (profitability and market share) of Manufacturing Firms in Mogadishu, Somalia. It is thus

summarized that there is an affirmative and substantial correlation between LSCM and SC Performance of Manufacturing Firms in Mogadishu

5.3 Conclusion

The aim of this work was to determine the correlation between LSCM and SC Performance of Manufacturing Firms in Mogadishu, Somalia. Based on the analysis, a significant correlation was found to exist between LSCM and SC Performance. LSCM (lean production, lean procurement and lean transportation) impacted performance of Large Manufacturers in Mogadishu through profitability and market share. Hence, it is concluded that from the outcome as well as literature, the adoption of lean production, lean procurement and lean transportation influences performance and thus manufacturers should adopt the practices due to their benefits

It is concluded that lean production, lean procurement and lean transportation have all been adopted to a large extent by the Manufacturers in Mogadishu. The study thus concludes that it is relevant for a firm to integrate LSCM practices in their activities if they are to enhance their performance as it has been found from the outcome.

5.4 Recommendations form the study

The manufacturing firms in Mogadishu have adopted lean production to a large extent an indication that the practices are valuable to the firm. The study recommends that the practices be adopted to a very large extent as they have been found to influence firm's performance. This is because lean production systematically removes waste (activities that do not add value) through gradual and constant improvement to enhance the quality that the client's needs. It also constantly aim at removing waste and enhances value-adding processes. Lean production results in the production of goods and services at a minimized cost than those produced without the use of lean management

Lean procurement was adopted to a medium extent inferring that manufacturers in Mogadishu did not focus too much on the practices and their benefits are overlooked. It is recommended that the practices be adopted to a large extent as through lean procurement, suppliers can be relied on to supply the required materials in the appropriate place, in the right amounts and on time and aid in saving cost as the entity only procures what is needed.

Lean transportation is recommended to be adopted to a very large extent by manufacturers in Mogadishu since having a lean transportation saves cost associated with fuel as only making necessary trips. Lean transportation saves time due to scheduling of routes and thus products are delivered on time where needed and aids in enhancing performances and attain customer satisfaction due to prompt deliveries. Lean transportation reduces cost through reverse logistics and backhaul management.

Since it has been found that LSCM practices influences performance, the study recommends full adoption of the practices to ensure that the manufacturing firms in Mogadishu fully attains its goals and boost their overall performances. It's also endorsed that all manufacturing companies should adopt lscm practices as a method to compete and stay in business as well as enhancing their performance.

5.5 Limitation of the study

As per the COVID 19 rules and regulations set I n place, it was quite hard to reach the study's participants and thus the study used electronic mails which did not hamper the outcome of the study.

The study did manage to obtain back all the questionnaires which were administered as some of the participants were not available to participate in the study. This limitation did not stop the study from meeting its objectives as those who responded were sufficient enough to give a dependable outcome for the study.

5.6 Suggestions for Further Research

Future research should establish if there are any more lean supply chain management practices apart from lean production, procurement and transportation. Other researchers can borrow the constructs to see if the findings of this study can be copied in other areas, such as public institutions or the service industry. Future research could look into the bearing of LSCM on competitiveness, financial performance, SC responsiveness, and even operational performance. Another area for future research could be the drives and obstacles that come with implementing lean supply chain management practices. Other Academicians can also shift attention on the determinants of LSCM.

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APPENDIX I: QUESTIONNAIRE

The Questionnaire is drafted to support the data collection associated with **LEAN SUPPLY CHAIN MANAGEMENT AND PERFORMANCE OF MANUFACTURING FIRMS IN MOGADISHU, SOMALIA**. The information collected shall be utilized for education purposes and shall be held private. Kindly feel free to respond to the queries in the subsequent sections to the best of your knowledge.

SECTION A: DEMOGRAPHIC INFORMATION

1. What is the name of your Manufacturing Firm?

..... (Optional)

2. Kindly indicate the option that best describes your Highest Level of Education

- a) Certificate/Diploma { }
- b) Bachelor's Degree { }
- c) Master's Degree { }
- d) Doctoral Degree { }

3. In what capacity do you serve in the firm?

- a) Supply Chain Director { }
- b) Supply Chain Manager { }
- d) Supply Chain/Procurement Officer { }

4. Check the option that best indicates the period you have worked in the manufacturing firm

- Less than a year [] 1-5 years []
- 6-10 years [] Over 10 years []

SECTION B: EXTENT OF LEAN SUPPLY CHAIN MANAGEMENT ADOPTION

5. Rate the extent to which lean production practices have been adopted by the manufacturing firm you work for. Adopt the subsequent key; 1- very small extent, 2- small extent, 3- medium extent, 4- large extent and 5- very large extent.

LEAN PRODUCTION	1	2	3	4	5
The firm produces the right product the first time					
The firm engages in Continuous improvement of products in production					
The firm carries out mass production for multiple orders placed by clients					
The firm minimizes wasteful process in production process					
The firm engages in quality product production and processes					

6. Rate the extent to which lean procurement practices have been adopted by the manufacturing firm you work for. Adopt the subsequent key; 1- very small extent, 2- small extent, 3- medium extent, 4- large extent and 5- very large extent.

LEAN PROCUREMENT	1	2	3	4	5
Firm has clear and precise procurement procedures					
The firm practices competitive sourcing					
Firm has invested in strategic suppliers for prompt procurement					
The firm only procure what is needed for production					
The firm has committed procurement personnel and suppliers					

7. Rate the extent to which lean transportation practices have been adopted by the manufacturing firm you work for. Adopt the subsequent key; 1- very small extent, 2- small extent, 3- medium extent, 4- large extent and 5- very large extent.

LEAN TRANSPORTATION					
Sufficient system of transportation					
Schedule for order deliveries					
Existence of budgets for managing transport processes					

Firms has adopted reverse logistics as a transportation strategy					
--	--	--	--	--	--

Any more?

.....

SECTION C: Firm’s performance outcomes from the adoption of lean supply chain management.

8. Lean SCM has been established to influence performance of organizations that have implemented it. Kindly show the extent that the manufacturing firm has experienced the subsequent Firm’s performance after implementing LSCM using: 1- very small extent, 2- small extent, 3- medium extent, 4- large extent and 5- very large extent).

Firms performance Outcomes	Rating				
PERFORMANCE METRICS	1	2	3	4	5
Profitability					
Market share					

Others(please specify)

.....

THANK YOU FOR YOUR TIME AND HELP

APPENDIX II: LIST OF MANUFACTURING FIRMS IN MOGADISHU

Source: Ministry of Commerce and Industry (2020)