The Effects of Lean Supply Chain Management on Organizational Performance the Case of FAFFA Food S.C.

BY: Birhan Teklie

A Research thesis Submitted to Departments of Logistics and Supply Chain Management

Presented in partial fulfilment of the requirements of Masters of Arts degree in Logistics and supply chain management

Advisor : Dr. BUSHA T.

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THE EFFECT OF LEAN SUPPLY CHAIN MANAGEMENT ON ORGANIZATIONAL PERFORMANCE: THE CASE OF FAFFA FOOD S.C.

BY

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Statement of Certification

This is to certify that the thesis on The Effects of Lean Supply chain Management on organizational performance in case of FAFFA Food S.C. prepared and submitted by Birhan Teklie in partial fulfillment of the requirements for the Degree of Master of Arts in Logistics and Supply Chain Management complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Advisor signature date place

DECLARATION

This research project is my original work and has never been submitted in any other University or College for the award of degree or diploma or certificate. All sources of materials used in the thesis have been duly acknowledged.

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Contents

Acknowledgments....vi
List of Tables....x
List of figures....xii
Acronyms....xiii
ABSTRACT....1
CHAPTER ONE....2
INTRODUCTION....2
1.1 Background of the study....2
1.2 Statement of the Problem....3
1.3 Research Questions....4
1.4 Objective of the study....5
1.4.1 Specific objective of study....5
1.5 Significance of the study....5
1.6 Scope of the study....5
1.7 Limitations of the Study....6
1.8 Operational Definition of Terms....6
1.9 Organization of the Research Report....7
CHAPTER TWO....9
LITERATURE REVIEW....9
Introduction....9
2.1 Theoretical Foundation....9
2.2 The concept of Lean....9
2.3 Importance of lean supply chain....11
2.4 Lean supply chain practices....13
2.4.1 Lean Procurement....14
2.4.2 Lean Production....17
2.4.3 Lean Transportation....21
2.4.4 Lean Warehousing....24
2.4.4.1 Model of Lean Warehousing....25
2.4.5 Lean Customer practice....28
2.4.6 Lean supplier's practices....29
Quality Systems....33
2.5 Organizational Performance....35

2.6 Empirical Review on Lean Supply Chain Management 37
2.7 Summary of Literature Review 38
2.7 Conceptual Framework 38
CHAPTER THREE 41
RESEARCH METHODOLOGY 41
INTRODUCTION 41
3.1 Description of study area 41
3.2 Research Approach 42
3.3 Research design 42
3.3.1 Variables of the study 43
3.4 Research Population and sampling 43
3.4.1 Population 43
3.4.2 Sampling method 44
3.5 Sources of data 45
3.5.1 Data collection tools 46
3.5.2 Data collection procedure 46
3.6 Data analysis 46
3.6.1 Descriptive statistical Analysis 46
3.6.2 Inferential statistical Analysis 47
3.7 Scale reliability and validity 48
3.7.1 Reliability 48
Source: Respondents survey result test, 2020 49
3.7.2 Validity 49
3.8 Ethical consideration 49
CHAPTER FOUR 51
DATA PRESENTATION, ANALYSIS AND DISCUSSION 51
4. INTRODUCTION 51
4.1. Demographic information of the respondents 51
4.1.1. Educational background of the respondents 51
4.1.2. Level of experience of the respondents 52
4.1.3. Department of the respondents 52
4.2. Descriptive analysis 53
4.2.1. Response on lean supply chain management and organizational performance 53

4.2.2. Descriptive statistics of organizational performance 59
4.3. Relationship between lean supply chain management and performance ... 63
4.3.1. Correlation analysis 64
4.3.2. Regression Analysis 66
CHAPTER FIVE 71
SUMMARY, CONCLUSION AND RECOMMENDATION 71
INTRTODUCTION 71
5.1. Summary of findings 71
5.2. Conclusions 74
5.3. Recommendations 75
5.4. Suggestion for future studies 76
REFERENCE 77
Appendix A 82
Appendix B 89

List of Tables

Table 2.1; Evolution of SCM

Table 2.2: The Comparison between Conventional and Lean Model

Table 3.1: Target Population of the Study

Table 3.2: Sample size determination

Table 3.3; reliability test

Table 4.1: Educational level of respondents

Table 4.2: Work experience of respondents

Table 4.3; department of the respondents

Table 4.4: Descriptive Statistics of Lean procurement

Table 4.5: Descriptive Statistics of Lean production

Table 4.6: Descriptive Statistics of Lean Transport

Table 4.7: Descriptive Statistics of Lean customer

Table 4.8: Descriptive Statistics of Lean customer

Table 4.9: Descriptive Statistics of Lean warehouse

Table 4.10: Descriptive Statistics of return on investment

Table 4.11: Descriptive Statistics of profitability

Table 4.12: Descriptive Statistics of growth on return on investment

Table 4.13: Descriptive Statistics of market share

Table 4.14: Descriptive Statistics of sales growth

Table 4.15: Descriptive Statistics of competitive position

Table 4.16: Descriptive Statistics of quality

Table 4.17: Descriptive Statistics of Challenges facing during the implementation of lean supply chain management

Table 4.18: correlation matrix between lean supply chain management practices and or Table

Table 4.19; model summary

Table 4.20: ANOVA Result between Lean supply chain management and Organizational Performance

Table 4.21: Regression coefficients between lean supply chain management and Organizational Performance

List of figures

Figure 2.1: transportation and JIT

Figure 2.2: Model of Lean Warehousing

Figure 2.3, a framework for lean supplier management.

Figure 2.4, supplier selection process

Figure 2.5, quality systems

Figure 2.6, Performance evaluation of lean suppliers

Fig 2.7, Conceptual framework

Acronyms

ISO:-International standard organization

OP: - Organizational performance

ROI: -Return on investment

SPSS:-Statistical package for social science

SRM; - Supplier relationship Management

JIT: - just in time

LSCM: -lean supply chain management

TQM: - Total quality management

TPM: - Total productive maintenance

VSM: - value stream mapping

VA: - Value added

NVA: - Non value added

ABSTRACT

Lean supply chain management enables firms to tailor their supply chain processes and organizational roles to support lean supply chain principles. The purpose of the study was to investigate the effect of lean supply chain management on organizational performance in case of FAFFA Food S.C. The research questions were presented in order to identify the effect of lean supply chain management on organizational performance as well as the challenges faced the implementation of lean supply chain management. The study employed descriptive and an explanatory research design. Out of the study population of 177 employees of the enterprise, a sample size of 110 was taken, whose elements was selected using a stratified sampling technique. Questionnaires were used as the primary data collection instrument. The response rate was 85%, with 94 questionnaires properly filled out of the distributed 110 questionnaires. Data was analyzed using descriptive statistics, correlation and regression analysis and presented in tables with the help of SPSS 20 software. The study indicated that lean supply chain management practiced in FAFFA Food S.C occasionally. The study revealed that lean supply chain management practice contributed to FAFFA Food S.C organizational performance to a moderate extent. The study also showed that there was significant relationship between lean supply chain management practices and organizational performance of FAFFA Food S.C. The study further revealed that lean procurement, lean supplier, and lean warehousing practices had predicting power on organizational performance of FAFFA Food S.C. The study also revealed that FAFFA Food S.C faced challenges Misunderstanding of lean and Resistance to change to a great extent. The study recommended giving priority and enhancing the lean supply chain management practices they can significantly improve its organizational performance from the current position.

Keywords: *lean supply chain management, lean procurement, lean production, lean transportation, lean warehousing, lean supplier, lean customer*

CHAPTER ONE
INTRODUCTION

This section encompasses background of the study, statement of the problem, objective of the study, research question, limitation and scope of the study, among others.

1.1 Background of the study

According to Lewis (2000), the implementation of lean supply chain management enable firms to tailor their supply chain processes and organizational roles to support lean supply chain principles. A lean supply chain is a great facilitator for any organization that tries to become further lean and effective. Companies which practice a lean supply chain are able to control their own lean practice more easily, providing better customer value by responding more efficiently, quickly, and certain to customer needs. That, in turn, enables the operation of the lean supply chain, creating a different phase that highly translates to superior financial performance for these companies. Thus organizations striving to become lean would benefit from a systematic approach towards building and managing their supply chain.

Lean supply chain needs organizations to examine their business processes in order to identify areas whereby resources are wasted which can be measured in monetary value. This creates a window to minimize wastage and improve on the way of doing things. According to Hines, Holweg& Rich (2004) of Belgian service firms found that lean management seeks to create value to the customer perspective other than the producer perspective by redesigning the organization into value streams and adopting practices that add value. Lean supply chain management led to improved organizational performance.

Agus and Hajinoor (2012) described that the theory and philosophies of lean and its related tools, practices and procedures can be extended outside the boundaries of a company to its supply chains

Consequently Lehtinen (2005) have clearly identified that the lean concept is appropriate for food companies. The lean production gives tools for a food company to examine and eliminate unnecessary inventories and other forms of waste along the supply chain. By applying lean a food company can either increase customer value through cost reduction or through provision of additional value-enhanced services such as shorter lead times.

1.2 Statement of the Problem

In manufacturing industries including food, supply chain is the most costly activity requiring significant attention, effective strategy, and management. These industries need to have clear supply chain strategy and direction that support firms' business strategy. In addition, the supply chain management including; the production planning, inventory control, distribution, and logistics processes should be well integrated and coordinated to reduce costs and increase contribution margins (Heizer, 2011).

In most Ethiopian food manufacturing industries including Fafa, the supply chain strategies and activities were not clearly described and articulated. The supply chain decisions in this sector are mostly intended to gain short term returns. In addition, the customer focused and internally focused performance attributes of the supply chain system were not diagnosed and evaluated for improvement and benchmarking (Faffa Foods SC - Business Plan, 2013-15 GC).

According to preliminary interview with the management team (Ato Haile and Ato Zelalem), Faffa before privatization has inherited operational problems and technical challenges. The sales revenue was totally dependent on relief aid sales with limited commercial products and decreases by 7-12% from the previous sales in the last years. The supply chain system was characterized by its inefficiency. There was no clear and articulated supply chain strategy to source, produce, and distribute products. Ad hoc and in efficient supply chain system to source, produce, and distribute has resulted in poor supply chain performance (reliability, responsiveness, flexibility, and asset management efficiency).

The production was exposed to waste and defective products were produced as the process was supplied manually. The machineries were old that consumes high energy and large number of personnel's were employed to facilitate the production process and for the packaging.

The procurement process was characterized by many suppliers with high number of personnel's were involved on the procurement process. Those suppliers were selected based on the lowest price submitted during the bid rather than based on their performance. Those contracts were for short period of time and there was little/no collaboration between the suppliers and the company to work together and to share information on time and openly.

Transportation was the other wastage area and it was characterized by large shipments rather than small quantity with respect to the concept of just in time delivery. Different food products shipped within single shipment that causes damage and contamination of the products.

The warehouse also characterized by poor facilities even if it was not ventilated. Products were stored for long period of time, large inventory buffer stored, different products were stored together which is exposed to damage, contamination and high possibility of perishability of the products.

Following privatization, Faffa Food Share Company has consistently worked to reform the business structure, expand the revenue base, and increase earning through business expansion. As a result, it was believed that, significant achievements were made in solving inherited operational problems, technical challenges, and dependency on relief aid products. Specifically, the implementation of lean supply chain practices, tools like kaizen, and fully automation of the production helps the company to minimize the above stated problems and enhance better organizational performance.

A research by Daniel (2015) indicates that in Ethiopia supply chain is characterized by poor lean practices.

Azman, (2010) and Wasonga, (2014) recommended that companies can therefore focus on problems during the implementation of lean supply chain and effects of lean supply chain practices and performances.

Even though, the lean supply chain practice is well considered in the business strategy the performance is not quantified and described (Faffa Foods SC - Business Plan, 2013-15 GC).

Based on informal discussion with the managements of FAFFA Food Share Company, the researcher found the gap that there is need for further research in the area. It is evident that no known local study had been done on this phenomenon and it was against background that the researcher intends to clearly state the effects of lean supply chain practice on organizational performance with specific reference to FAFFA Food Share Company. The intended purpose to conduct this is study is to narrow down the above stated problems.

1.3 Research Questions

The research questions are the following

1. What are the effects of lean supply chain management practice (lean procurement, lean productions, lean transportation, lean warehousing, suppliers practice and lean customers practice) on organizational performance?

2. What are the challenges that affect the implementation of lean supply chain management?

1.4 Objective of the study

General objective

The main objective of the study was to examine the effect lean supply chain management on organizational performance in case of FAFFA Food S.C.

1.4.1 Specific objective of study

1. To analyze the effects of lean supply chain management practice (lean procurement, lean productions, lean transportation, lean warehousing, suppliers practice and lean customers practice) on organizational performance
   2. To assess the challenges that affects the implementations of lean supply chain management.

1.5 Significance of the study

The significances of this study can be seen from different dimension.

The primary advantages of this study was practical importance to FAFFA Food S.C and other concerned body by providing information on lean supply chain management practices to support their decision regarding performance of organization. The study will also benefit the academic community as it may contribute to the increasing body of literature on lean supply chain management and it present avenues for continuing particularly on effect of lean supply chain management. Finally for future studies on such areas, it gives a comprehensive starting point for further research on the effect of lean supply chain management.

1.6 Scope of the study

Lean supply chain management encompasses vast areas of managerial practices include demand management, standardization, waste management, cross-enterprise collaboration and organizational behavior. However, it is difficult and unmanageable to conduct the study in all areas, particularly in terms of research manageability.

Lean supply chain management defined in different ways depending on the understanding of explanation of different scholars, but the subject scope of this study was delimited to the certain major Lean supply chain management practices can be identified with respect to major and the organization can predominantly exercise it. Lean supply chain management practices a composition of the following six activities: Lean Procurement, Lean Production, Lean Transportation, lean customers practice, lean suppliers practice and Lean Warehousing (Martin 2016). As he stated those practices are parts of waste management. The study was delimited on the above lean practices and challenges that affect the implementation of lean supply chain management.

The study considered FAFFA Food S.C; because FAFFA Food S.C is the main and the biggest food complex company which implements leans supply chain practice.

1.7 Limitations of the Study

Since the research is focused on the selected framework of lean supply chain management practice it was difficult to generalize the finding of the study to all other lean supply chain management practices that are described by different researchers and authors. So to improve generalizability the study can be replicated for other lean supply chain management practice.

- ✓ It was found during the course of this research that there was a problem of getting all the relevant information from the respondent because of potential suspicion that the researchers may be an investigator in disguise.
- ✓ There was a shortage of secondary sources of data, especially since Ethiopia is not so much experienced lean supply chain practice a shortage of journals, articles and books printed out in the area.
- ✓ Unwillingness of the company to give the secondary sources
- ✓ **Systematic bias** results from errors in the sampling procedures, and it cannot be reduced or eliminated by increasing the sample size. This includes defective measuring device, Indeterminacy Principle, Inappropriate sampling frame, and Natural bias in the reporting of data.

1.8 Operational Definition of Terms

Lean supply chain management:-is about removing of unwanted components from the process (Lee et al., 1997).

Lean procurement:-is trademarked strategy that can help you dramatically reduce that you spend in time and money on the large categories of products such as a wide range of low value high velocity business supplier (Ellram, 1995).

Lean Warehousing:-is a very important component of LSCM which can be useful to the distribution area to reduce waste, increase the utilization of the available space, improve on productivity and meet the increasing demands of the customer (Ackerman, 2007).

Lean transportation:-is a scheme with four general stages including alignment with the company's strategic, identification of waste, structuring strategy options and selection, and then implementation and control (Hines and Taylor, 2000).

Lean production: emphasizes the need to make productive activities flow directly towards the customer and the system allows the customer to pull the product exactly when needed through the operation (Lewis, 2000).

Lean customer: involves establishing effective partnership with customers always seeking continuous improvement in the supply chain to reduce cost **(FAO, 2007).**

Lean supplier: a procedure that offer a flow of goods, services and technology from suppliers to the Company (with the related flows of information and extra communications in both parties) without waste (Yixun Guo and Zhiduan Xu, 2007).

1.9 Organization of the Research Report

The study is organized into five chapters,

Chapter one: contains background of the study, statement of the problem, basic research questions, objective of the study, significance of the study, and delimitation/scope of the study limitation of the study, definition of terms and organization of the study. **The second chapter**: deal with the literatures relevant to the study and conceptual frame work **Third chapter**, deal the type and design of the research, the subjects/participants of the study, the sources of data, the data collection tools, the procedures of data collection, and the methods of data analysis used will be described. **Chapter four**: summarize the results/findings of the study and interprets

and/or discusses the findings **Chapter five** summarizes the results/findings of the study and interprets and/or discusses the findings. Finally chapter five comprises four sections, which includes summary of findings, conclusions, recommendations and suggestions

CHAPTER TWO
LITERATURE REVIEW

Introduction

This chapter presents a review of literature on the concept of the study. The chapter looks at lean supply chain management and organizational performance. It also discusses the theoretical underpinning of the study as well as the framework linking lean components and organizational performance.

2.1 Theoretical Foundation

To be effective, organizations all over the world must take comparative advantage which is in various forms including low cost of production and differentiated products of which they can choose either to command premium prices. According to Porter (1990), organizations need to deliver products of high quality and offer services more efficiently in order to sustain competitive advantage. This section focused on the theoretical underpinnings of the study.

2.2 The concept of Lean

There are lots of explanations available to define "Lean". For instance, The National Institute of Science and Technology (NIST/MEP, 1998) defines Lean as A systematic method to recognizing and eliminating waste (non-value added activities) through continuous improvement by following the product at the pull of the customer in need of perfection (Buzby, Gerstemfeld, Voss & Zeng, 2002). Basically, lean means to give more value for customers with minimum resources. Other words, the main idea is to increase customer value while reducing waste. In fact, the word "Lean" was first derived in the Future Car Investigation by MIT professors to implement Japan's new production system that do away with mass production meanwhile it produces much waste(Womack et al., 1991; Macduffie& Helper, 1997; Conti et al., 2006). According to Macduffie & Helper (1997) Waste is described as anything that hinders with the smooth flow of production. According to Monden (1998) The eight wastes focused in TPS are overproduction, waiting, conveyance, over processing, excess inventory, movement, defects and unused employee creativity, and the biggest one being over production.

Wu and Wee (2009) also describes that the term “lean” means a sequence of actions or solutions to minimize waste, reduce non-value added (NVA) operations, and increase the value added (VA). This VA and NVA thinking were resulting mainly from TPS. A lean company understands customer value and emphasis on its vital procedures to continuously increase it. The main drive is to deliver perfect value to the customer through a perfect value formation process that has no waste. According to Lean Enterprise Institute, (2009) to achieve Lean success, level of thinking need to be change in order to attention of management from improving separate technologies, properties, and vertical departments to improving the flow of products and services along whole value streams that flow horizontally across technologies, assets, and departments to customers. Removing waste through whole value streams, instead of at isolated points, establish procedures that need less human effort, less space, less capital, and less time to make products and services at less costs and with fewer defects, compared with traditional business structures. Organizations are able to react to changing customer needs with high diversity, high quality, low cost, and with very fast delivery.

Based on Anand and Kodali (2008), only in recent times, scholars have highlighted that the philosophy and practices of lean and its related tools, methods, practices and processes can be extended outside the boundaries of an organization to its supply chains.

However, the idea of lean supply chain was projected in 1994, when the advocates of lean manufacturing, Womack and Jones (1994) projected the concept of ‘lean enterprise’.

The supply chain management theory has developed with it through the five distinct phases shown in Table 2.1 below.

Table 2.1; Evolution of SCM

Phase 1(to 1960)	phase 2(1970-1980)	phase 3(1980-1990)	Phase 4(1990-1999)	Phase 5(2000-)
Warehousing and transportation;	Total cost Management	Integrated Logistics Management	Supply chain Management	Lean Supply chain Management
Management Focus; operation management efficiencies	Management Focus; optimizing operation cost and customer service	Management Focus; Tactics/strategies, logistics strategies	Management Focus; strategies, channel coevolution, goals	Management Focus; e-business, e-marketing, supply chain management synchronization
Organization Design; decentralized function	Organization Design; centralized function	Organization Design; integration of logistics functions	Organization Design; partnering virtual organization market coevolution	Organization Design; Networked channel, Exchanges Agility

Source: McKee & Ross (2009)

2.3 Importance of lean supply chain

Scholars, Lee et al. (1997) and Lummus et al. (2003) explained that the information transferred from one point to another in supply chain tends to be inaccurate and can mislead upstream bodies in the production decisions, follow-on in wastes, thus disturbing the coordination between the different stages of a supply chain. Lean supply chain as a continuous improvement processes focus on the avoidance of waste or non-value added functions. These waste and non-value-added stops across the supply chain and reduce set of times to allow for the economic production of small quantities. Gordon (2008) came out with his points that strongly support on lean supply chain best practices and performance. Hence, there is a study by Accenture,

INSEAD and Stanford University show correlation between companies with a successful supply chain strategy and significant financial success. The correlation focuses on four lean supply chain perspectives: How organizations keep goods and services flowing in a smooth, uninterrupted and cost effectives fashion from suppliers to customer firms end to end. Inventory perspectives; How do we keep minimal, but sufficient inventory in the supply chain pipeline in order to provide good service levels without interruptions? Lean procurement; how can procurement scale and improve its processes to minimize transactions, reduce total cost and work with the best possible suppliers who meet its requirements, Adopting lean within customer and supplier firms; How can business work to eliminate waste while adding value to its customers?

Bozdogan (2002) illustrated that the successful of lean supply chain management principles derive from 10 Basic Lean Principles:

- ✓ Focus on the supplier network value stream
- ✓ Eliminate waste
- ✓ Synchronize flow
- ✓ Minimize both transaction and production costs
- ✓ Establish collaborative relationships while balancing cooperation and competition
- ✓ Ensure visibility and transparency
- ✓ Develop quick response capability
- ✓ Manage uncertainty and risk
- ✓ Align core competencies and complementary capabilities
- ✓ Foster innovation and knowledge-sharing

Bozdogan (2002) has emphasized the differentiation between conventional versus lean model adapted into lean supply chain management based on 22 characteristics identified.

Table 2.2: The Comparison between Conventional and Lean Model

CHARACTERISTICS	CONVENTIONAL	LEAN
structure & Number	vertical & Many	clustered & Fewer
Number of Procurement	Large number	Limited number

personnel		
Basis of Outsourcing	Cost based	Strategic based
interactions	Adversarial; zero-sum	Cooperative, positive-sum
Relationship	Transaction-focused	Mutually beneficial
Selection length	Lowest price	Performance based
length of Contract	Short term contact	Long term contact
Pricing methods	Through Competitive bids	Through Target costing
change of Price	Up ward	Down ward
Quality of the product	Inspection-intensive	Designed-in
Delivery	Large amounts	Smaller amounts (JIT)
Inventory buffers	Large Minimized,	eliminated
Communication	task-related & limited	multi-level & Extensive
Information flow	Directive means one-way	Collaborative means two-way
Role in development	Limited; build-to-print	Substantial
Production flexibility	Low flexibility	High flexibility
Technology sharing	Very limited	Nonexistent
Committed investments	Minimal-to-some	Substantial
Mutual commitment	Very limited; nonexistent	High commitment
Governance	Based on Market-driven	Based on Self-governing
Future expectations	No Guarantee	May be Considerable

Source: Bozdogan (2002)

2.4 Lean supply chain practices

Lean is a management thinking that is focused on customer value through elimination of waste and continuous improvement in a system through the application of lean principles, practices and techniques (Paschal, Engstrom & Longstrand, 2012). Based on Jaskanwal, Deep and Rajdeep (2013) lean emphasis more on avoiding waste from both inner and external supply chains and this can only be realized by reducing excessive inventories, replenishment times and unnecessary costs. The traditional method is to identify the end-to-end procedure within a company's value stream. Over

this method, the activities that can be eliminated or increased to gain efficiencies are modified in order to streamline the whole process. According to Eaton (2013) encompassing the value stream from a single company to contain the entire supply chain provides us the idea of a lean supply chain management. This research focused on lean procurement, lean production, lean customer, lean transportation, lean supplier, and lean warehousing.

2.4.1 Lean Procurement

According to Harland (2012) emphasized that lean procurement practice helps to realize the following; avoid the difficulties to the free flow of information in to the supply chain; create real time visibility in to the inventory in motion, change supply chain since push to pull consumption focused replenishment model. Murch (2014) also supports the idea stated above. Additionally, Wilson and Roy (2009) the lean model is established on procedures and methodologies it's just in time and total quality management forerunners and lean procurement is conceptualized differently amongst organizations. Wilson and Roy (2009) stats that lean procurement can be considered as a philosophy, a technique, a work culture, a management concept, a value or a methodology. Additionally, Puschmann and Alt (2005) to make lean procurement successful members of the supply chain are expected to be reliable as well as show commitment in the whole process. Ellram (1995) defines lean procurement principles as generally small lot sizes purchased often from a few suppliers who deliver the products in exact quantities at an agreed time and place. Under lean procurement suppliers are assessed and selected using several factors such as quality, culture, reliability behaviors and price (Ellram, 1995). Waters-Fuller (1995) describes further that buyers in the lean systems are more flexible when designing specifications of their requirements and information is shared freely among the members. Morgan and Hant (1994) explains that buyers and suppliers relationship is based on the period they have worked together and has shown commitment. Procurement's main duties have traditionally provided purchased materials and services on time, at the lowest costs, and highest quality to meet their customer satisfaction. Nevertheless, its role has extended to play a vital part in improving the flow of information and materials throughout the whole supply chain.

Abdul Latif Jameel Company (2013) states the following about the lean procurement as Best practice procurement management activities extended to contract negotiation by launching basic operational requirements, engaging in strategic sourcing practices such as market research, vendor evaluation and integration.

2.4.1.1 Challenges in Lean Procurement

Abdul Latif Jameel Company (2013) states that an unbalanced volume of waste in a value chain is straight associated to procurement procedures not employed appropriately. Companies often lack clearness over their supply chain and then fight to localize and differentiate value from waste.

Balancing procurement associated events that are necessary waste with those that generate value presents an ongoing challenge for organizations of all sizes. The importance of implementing Lean methods for procurement administrators and purchasing actions can dramatically affect a company's cash flow and its bottom line.

2.4.1.2 Focus Areas of Lean Procurement

Abdul Latif Jameel Company (2013) states that waste in procurement procedures can be recognized classified and eliminated in the same way as waste in manufacturing as well as make great savings potential. Lean activities, Kaizen approaches, and reengineering methods can be useful in every stage of the supply chain. The right Lean practice can increase product quality, minimize lead-time and reduce working capital.

- **Movement &material Handling:** Internal storage and transport of inventory
- **Inventory**: Surplus of inventory because of wrong information in material requirements planning (MRP) systems.
- **Waiting:** People, process and techniques delays in non-transparent procedures.
- **Over-Production:** Keeping extra work-in-process or finished goods than required. Assembling materials without internal customer order.
- **Over-Processing:** Significant information is hindered in the system. Principles that involve too many competitive bids.
- **Defects:** Information from material or service asker is not professionally established or deals with wrong standards or information is incorrect or does

not have the excellence it should have. Without confirmation from supplier about purchase orders.

- **Improper Procedures;** Regular changes to decisions already made, long lead time, wrong material delivery schedule.

2.4.1.3 Areas of Waste and Lean Solutions

According to Abdul Latif Jameel Company (2013) Designing and adopting a Lean procurement procedure can radically change the method a company does business. A perfect and standardized practice to purchase materials or parts and just-in-time inventory strategies decreases the load on the balance sheet as well as stabilizes the whole value chain.

Suppliers selected and evaluated the similar way will have the similar purchasing procedure and can be more easily coordinated into elastic production procedures. Being consistent and elastic means a competitive edge.

Organizations adopt Lean Solutions in procurement tasks in a same way to other functions. The solutions must appropriate the difficulties without losing quality, maximizing lead time and costs.

Pull method; Allow FIFO at the batch level**,** minimize inventory amounts all over the procedures**,** Avoid over-production**,** and Increase visibility of blockages in the procedure

One Piece Flow method; Allow FIFO to a particular product / service level**,** Build transparency of the real procedure lead time, Decrease lead time**,** Minimize inventory amounts in the entire process**,** Increase quality**,** confirm the procedures in the right system

TAKT method; transparency procedure, Well-adjusted distribution of the workload over the resources, Flexible Process, Capability to plan resource capacity and / or increase proper forecasting, Optimum efficiency in supply of resource

Zero Defects method; Allows problem cause investigation and explaining**,** Avoids problems snowballing through the procedure**,** Better quality**,** Allows an open principles of problem resolving rather than finger pointing

Tangible Improvements of the solutions

Lead Time improvement; Applying inventory reporting and accuracy standards permitted for faster decision making and ordering minimizing lead time for special orders, improving an insurances claims procedure reduced average throughput time.

Costs minimized; Inventory accuracy progresses from Lean material requirement planning solution minimized inventory.

Quality improvements; Improving and standardizing business to business data exchange procedure reduced supplier caused errors, Lean material requirement planning solutions facilitated inventory resolution to be reduced to an annual activity achieved inventory data quality, Improving an insurances claims procedure reduced errors by 98% over the whole procedure

2.4.2 Lean Production

According to Hayes (1981); Krafjick (1998) lean production idea is an alternative to the traditional manufacturing models. Numerous benefits have been realized by organizations that have applied lean production practices including but not limited to increased quality time, reduced waste of materials as well as reduced lead times (Lewis, 2000). According to Womack (1990) the principles of lean production are applicable in all the industries across the global market.

According to Lewis (2000) lean production is a level of input resources in the system for a given level of output .In order to achieve this, waste has to be eliminated from the system. Lean production emphasizes the need to make productive activities flow directly towards the customer. However, the system allows the customer to pull the product exactly when needed through the operation.

According to Womack & Jones (1996) lean production model show how organizations can achieve performance advantage due to their commitment on improving flow of material and information among all the business functions as well as emphasis on customer pull rather than organization push. Additionally, Motwani (2003) states that lean production as an enhancement of mass production which is as a result of producing the right product the first time, efforts to continued improvement, quality in products and processes, minimizing waste as well as flexible production.

Krafjick (1998) defines lean production produces higher levels of quality and productivity and better customer responsiveness.

2.4.2.1 Goals and Objectives of Lean Manufacturing (Production) Systems

The goals of lean manufacturing systems differ between various authors. While some maintain an internal focus e.g. Womack & Jones (1996) states to increase profit for the organization, others hold that the technique should be customer centric. Some commonly mentioned goals are to eliminate waste, improve quality; to stay competitive in the marketplace; all these goals whether they be organization centered or stakeholder-centered, there is need for any given organization to know its customers' wants and needs so as to design processes that meet their expectations and requirements efficiently and effectively. Major goals identified in literature include;

To eliminate waste; According to Smeds (1994) waste arrives in many ways in the production system namely. Waste is an activity that consumes time, resources or space but does not add any value to the product or service. The primary goal of lean manufacturing is the elimination of waste at all stages of production process.

Stock/Inventory – JIT replace the idea of 'Just in Case'. According to Smeds (1994) inventory was held only because these were problems in the production system; this resulted to holding excess inventory.

The process itself/over processing – this occurs when wrong techniques, oversize equipment, working to tolerances that are too tight are used to perform processes that are not required by the customer and so forth; these processes add no value thus they result to waste (Smeds, 1994).

Material Movement/Transport– too much travel between work-stations, excessive machine movements from start point to work start point are all examples of the waste of motion (Smeds, 1994).

People Movement/Motion – Excessive movement of people may arise from poor job layouts, their having to go and look for material for the next task. Shops congested with inventory lengthen the search too; thus time is wasted (Smeds, 1994).

Running process too early/ too fast/ Overproduction– Overproduction leads to the build-up of inventory which not only wastes investment but also space and transport

resources as the stock often has to be moved several times to keep out of the way. Waiting time between processes – this is wasteful because inability to deliver quickly to demands results often to obsolescence of items produced thus resulting to waste.

To reduce time; lean approaches are often instituted to reduce the time required to carry out any given task (processing time) from start to finish.

To reduce total costs; to minimize costs, lean practices are adopted by the organization to ensure efficiency and effectiveness in production; at best, producing optimally to meet the requirements of customers as over production will only result in increased costs (Smeds, 1994).

2.4.2.2 Lean Manufacturing Principles and Tools

The idea of lean production seeks to eliminate wastes often related with production operations, this objective is realized by adopting some principles alongside a number of tools listed and explained below;

Just in time (JIT); According to Sugimori et al., (1977), production system defines systems supporting 'only the necessary products, at the necessary time, in the necessary quantity'. In other words, this inventory approach is applied to increase efficiency and decrease waste by receiving goods only as they are needed in the production process, thereby reducing inventory costs. This method requires producers to forecast demand accurately. According to Hall, (1987), JIT thinking is associated with total quality maintenance and people involvement this opinion is in similarity with Davy et al., 1992 in their opinion of JIT principle as intended for elimination of waste, and full utilization of people, equipment, materials, and parts.

Total quality management (TQM);According to Ross, (1993) TQM is an integrated management thinking and set of practices that emphasizes continuous improvement, meeting customer requirements, reducing rework, long range thinking, increased employee involvement and teamwork, process redesign, competitive benchmarking, team-based problem solving, constant measurement of results, and closer relationships with suppliers

Cellular manufacturing; According to Ross, (1993)Cellular manufacturing is a process of manufacturing which is a subsection of just-in-time manufacturing and lean manufacturing encompassing group technology. The aim of cellular

manufacturing is to move as quickly as possible, make a wide variety of similar products, while making as little waste as possible. Cellular manufacturing includes the use of multiple "cells" in an assembly line fashion.

Value stream mapping: According to Ross (1993) a lean-management technique for examining the current state and designing a future state for the series of events that take a product or service from its beginning through to the customer; at Toyota, it is known as "material and information flow mapping"; it can be applied to nearly any value chain), Five S(sort, straighten, shine, standardize and sustain).

Kanban (pull) systems; literally signboard or billboard in Japanese) is a scheduling system for lean manufacturing and just-in-time manufacturing (JIT). Kanban is an inventory-control system to control the supply chain.

SMED (Single-Minute Exchange of Die); is one of the many lean production methods for reducing waste in a manufacturing process. It provides a rapid and efficient way of converting a manufacturing process from running the current product to running the next product. This rapid changeover is a key to reducing production lot sizes and thereby improving flow (Mura), reducing production loss and output variability.

Poka-yoke (error-proofing); According to Robinson (1997), Poka-yoke (error-proofing) is any mechanism in a lean manufacturing process that helps an equipment operator avoid (yokeru) mistakes (poka). Its purpose is to eliminate product defects by preventing, correcting, or drawing attention to human errors as they occur.

Total productive maintenance; According to Gubata (2014) Total productive maintenance is a system of maintaining and improving the integrity of production and quality systems through the machines, equipment, processes, and employees that add business value to an organization. TPM emphases on keeping all equipment in top working condition to avoid breakdowns and delays in manufacturing processes, elimination of time batching, mixed model processing, rank order clustering, single point scheduling, redesigning working cells, multi-process handling and control charts (for checking mura – improving work flow by reducing unevenness), total productive maintenance, production smoothing or production leveling, setup reduction for waste elimination.

The adoption of the efficient production practices based on the flow of optimization is expected to lead to better operating results using for example, an inventory leanness, which in turn should enhance the enterprise's performances.

2.4.3 Lean Transportation

According to Villarrel, Garcia and Rosas (2009) lean practice is extended in different areas of supply chain management of the organization. In transportation the concept of lean techniques when applied will yield important benefits for an organization. According to Mckinnon (2003) in most of the transportation networks exists significant waste and unnecessary costs. In the recent times, customers understand the value that transportation adds and therefore this is becoming one of the differentiating factors in the global market.

The idea of lean transportation as a component of lean supply chain management has four lean transportation laws which were proposed by Taylor and Martinchenko (2006) to help explain the impact of lean transportation on the operational performance of an organization. These laws include the law of daily event management, the law of transportation waste, the law of transportation performance as well as the law of transportation strategy. Hines and Taylor (2000) suggested that implementation of a lean practice for elimination of waste in the transportation process and they proposed a scheme with four general stages including alignment with the company's strategic, identification of waste, structuring strategy options and selection, and then implementation and control.

Having said that, it is important now to investigate the link between lean production basics and transportation industry i.e. to think over the applicability of lean to contexts other than manufacturing. The section will be organized according to the basics of lean as seen in the previous part and as summarized in the lean house. These main elements are JIT, quality and waste elimination which is reflected in Jidoka.

According to (Womack, The Machine That Changed the World: Based on the Massachusetts Institute of Technology 5-Million-Dollar 5-Year Study on the Future of the Automobile (1990) and (Badurdeen, 2008) a vital characteristics of lean technique is it is functionality to any industry, any service and any situation. According to Ohno (1978) the claim of the universality of lean, even though criticized, is based on the thinking that the entire standard behind lean is inclusive,

very simple and even common sense. When it comes to a key logistic function like transportation, a strong link may exists between the scope of lean and its basics from one side and transportation from the other side:

Transportation and JIT

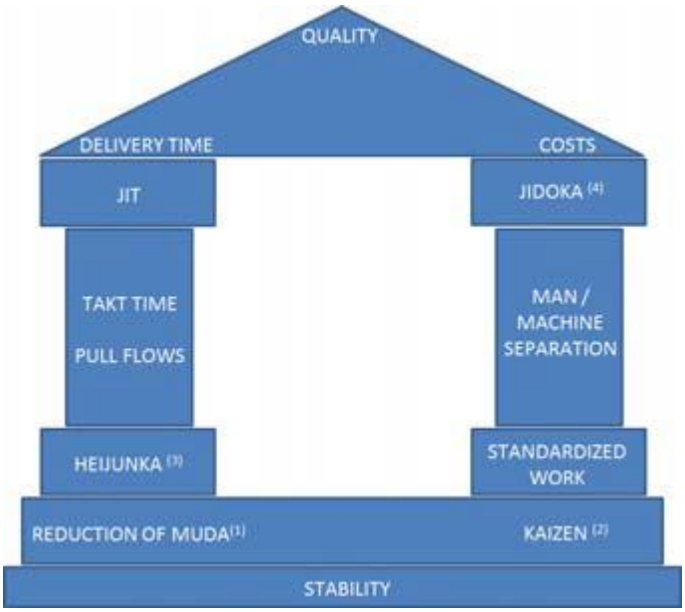


Figure 2.1: transportation and JIT adapted from (IPS Inc., 2012)

The sound relation between transportation and just in time approach stems from two things. The major is the pivot function of transportation role in supply chains. It is really the only means to transport goods between different parts of the chain. The second is the just in time approach necessities based on time, flow and delivery. Thus, succeeding a just in time approach cannot be realized without a helping transportation method which allows the proper flow of goods and their delivery JIT. This indicates that transportation supervisors want to align transportation function to the just in time logic of the company, as opposed to trying to improve it autonomously.

On the other hand, Regan & Garrido (2000) states that the reality that transportation supervisor's standards for choosing shippers and carriers are influenced by just in time application shows the importance of transportation function in supporting just in time approach.

According to Perry (1988) comparing to traditional systems where transportation supervision was isolated from purchasing and inventory procedure, in just in time approach, transportation is more attentive, efficient and customized. This shows the need for more control for transportation practice to achieve a well-organized, dependable and appropriate transportation for just in time systems.

Transportation and quality; Based on the idea of Monden (2011) quality assurance is among the main objective of lean; it is a way to make sure that only good units are flowing between processes. In transportation, delivery time can be seen as a key quality dimension. In fact, together with other quality dimensions delivery time can reflect whether JIT and Jidoka has been successfully implemented and whether the quality challenge has been totally faced by delivering the right goods at the right place and time.

Thus, it could be inferred that poor transportation services (in regard to responsiveness, people, reliability, etc.), unmanaged transportation networks, and /or a price-based choice of carrier can destroy the quality that has been built internally due to lean implementation that value quality assurance in all transportation processes.

According to Womack &Jones (2003) transportation should therefore support the idea of wastes elimination and quality assurance that is implemented inside the firm for other functions or processes; that is to say lean transportation is the way to bring lean out from the firm to the whole supply chain. Support of this interpretation can be found in the "lean enterprise" concept where the leanness should be extended from the firm to the of whole supply chain in order to create value in all processes from raw material to delivery to the customer. This value created or added is the guarantee that quality will not be lost between supply chain nodes while performing transportation, loading or unloading of goods.

Transportation and Waste elimination; Lean production school, had coined the importance of transportation when it classified it as one of the seven production´s wastes that should be eliminated. It could be argued however, that the transportation waste described in literature about lean refers to internal transportation that occurs between processes and not to the broader transportation that occurs between supply chain nodes.

According to (Hines & Rich 1997) nonetheless, being the main activity that links suppliers to customers and consequently a major contributor in the value creation and delivery processes in the supply chain, it cannot be assumed (without analysis or experimentations) that the transportation function has no wastes or that it does not need efforts for waste detection and elimination; The main issue here is the ability to keep the focus on eliminating transportation waste instead of the narrower and safer view of "eliminating " transportation cost.

Detecting wastes of transportation function requires classifying transportation processes into value-adding, non-value adding and necessary but non-value adding. This analysis of transportation activities will lead to waste recognition and elimination which is broader and more efficient than cost reduction.

The importance of approaching wastes in transportation stems from the fact that this function is a key element in product delivery, besides it is the 2nd biggest cost in logistic and it adds lead time

Levinson & Rerick (2002) states which affects the delivery process and the perception about the service quality. It could be inferred that in lean transportation the focus should be on relentlessly working with carriers on continuous improvement of transportation, while eliminating wastes and reducing cost as Toyota for instance has been always doing (WCL Consulting 2003).

The issue is now more about the way lean tools or way of thinking can be shared between carriers and shippers in the transportation industry so they can improve efficiency and enhance the service quality of this key logistic function.

2.4.4 Lean Warehousing

Ackerman (2007) defines that lean warehousing is a very important component of LSCM which can be useful to the distribution area to reduce waste, increase the utilization of the available space, improve on productivity and meet the increasing demands of the customer. According to Ackerman and Bodegraven (2007) warehouse in any age comes down to only two things: the management of time as well as the management of space. They further added that the warehouse was and still is used to manage the freight costs in this environment and it's also used in concert with advances in the capabilities to deliver and improve on customer service.

Visser (2014) states that transforming the operations of an organization to a lean warehouse environment do not play a role of just another venture or program. It is a different way of doing business. According to Reichart and Holweg (2007) for organizations to maximize the value of lean warehousing they need to implement lean warehousing. Lean warehousing refers to minimizing waste in the entire supply chain while ensuring that the right products are availed to the final customer according to their specifications.

The importance of lean thinking and applications for warehouse operations have been discussed by different writers, for example, Gaunt (2006) has described that in comparison to manufacturing processes, warehouse operations are simpler and not very much considered for lean applications. However there exists the opportunity for time and cost savings in warehouse operations.

Garcia (2003) defined the applications of lean tools in warehousing operations in one of his articles on the topic of lean warehousing. He also explained that the most commonly implemented lean tool in warehousing is value stream mapping (VSM); it can be used to analyze operations and evaluate the associated lead time and the total processing time. It mentioned that waste and non-value added activities and indicates areas of improvement. Gu et al (2006) has also described the importance of lean applications in warehousing by noting that market competition requires continuous improvement in the design and operations of production-distribution network, which in turn requires higher performance from warehouses. The implementation of new management thinking's such as Just-In-Time (JIT) or lean production also brings new challenges for warehouse systems, including tighter inventory control, shorter response time, and a greater product variety. Myerson (2012) also highlighted that most of the lean tool concepts can be applied to warehouses, such as 5S, value stream mapping (VSM), team building, kaizen, problem solving and error proofing, kanbans / pull systems, line balancing and general waste reduction. Mayerson (2012) further suggests that in order to achieve performance improvements, warehouse activities may be considered as an assembly line. Non value added tasks can be reduced by analyzing physical operations, paths of picking, and waste motions and by trying to avoid a poor availability and maintenance of tools and equipment.

2.4.4.1 Model of Lean Warehousing

Mayerson (2012),defines as Lean warehousing is a combination of terms i.e. lean and warehousing where as lean is a philosophy, a concept, an approach or a way of thinking that helps to shorten the total lead time, improve efficiency, reduce the cost of operations and enhance the productivity of the system. The lean ideas and tools are generic in nature, therefore it can be implemented in multiple situations and working environments e.g. manufacturing, services, supply chain management or warehousing etc. The adoption of lean tools in a particular organization or working environment can be done under certain theoretical and practical guidelines that help to understand and implement the fundamental operational and organizational changes in the system. These procedures would also help to understand the compatibility or incompatibility of existing practices in the system to lean adoption guidelines. Accordingly the adoption of lean in warehousing operations would also need some set of theoretical guidelines that would represent the operational and organizational requirements of lean warehousing.

According to Lambert (2012) the theoretical model on lean warehousing is based on the detailed literature review of the topics mainly lean manufacturing and the other important topics like just-in-time (JIT), the Toyota Production System, Quality Assurance and Control, Human resources Management and Warehouse operations and management etc.

He also highlighted that the characteristics desired to be included in the model of lean warehousing can be listed as comprehensiveness and applicability i.e. the model has to be comprehensive in structure and should be easy to apply in different types of warehouses and should be helpful for the design, operations and performance evaluation of the warehouses.

The comprehensiveness of the model of lean warehousing means that the theoretical model of lean warehousing should include and discuss all the organizational, operational and human related characteristics that relate to the lean warehousing. In fact, lean warehousing is not simply a warehouse management practice but it is a comprehensive organizational system and the projected model of lean warehousing comprehensively covers all the related aspects (Myereson, 2012).

The applicability of the model of lean warehousing means that the model of lean warehousing should be applicable to all types of warehouses and should not be type specific.

Based on Wijentuge (2016) the short listing of lean constructs for the theoretical model of lean warehousing has been based on the suitability of each lean construct for lean warehousing. It is important to mention here that it has been clearly described in literature that majority of lean application can be equally useful for warehousing operations, however it has never been mentioned in literature that all types of lean applications can be equally useful for warehouse operations. So for the warehousing operations only those lean applications would be short listed that can suitable for applying there in a warehouse set up. The second important point to be mentioned here is that lean applications have been grouped according to the aspects it covers in its application.

The most important aspect considered for defining the lean constructs for the proposed model is that the proposed lean constructs should sufficiently cover all the possible aspects of a lean warehousing i.e. operational, organizational and human resources.

Accordingly, Mayerson (2012) defined five lean constructs for the proposed theoretical model of lean warehousing. These lean constructs include waste control, flow management, quality assurance, human resources management and continuous improvement. For each lean construct have been short listed and defined its relevant lean applications that serve as the each attributes to lean constructs. The lean applications have been short listed by considering the aspect that they should be simple to understand and commonly discussed and applied in lean organizations.

Learned from the literature, since the warehousing operations are simpler as compared to manufacturing operations, therefore the lean applications with simpler structure and easy to understand approach have been given importance as compared to rather complicated and more advanced lean applications.

The five main constructs of lean warehousing identified are presented in figure 2.4. Each lean construct and its relevant lean applications have been discussed in detail for their relevance and justification of their inclusion in the proposed model of lean warehousing.

Sources: Mayerson , 2012

Figure2.4: Model of Lean Warehousing

2.4.5 Lean Customer practice

According to FAO (2007) lean customer practice involves creating effective partnerships with customers always seeking methods of continuous improvement in the total supply chain to reduce costs. Lean customers expect value from the products they purchase and provide value to the consumers who they cooperate with. Lean approach encourages a rapid response to the customers ever changing demands with emphasis on mass customizations rather than mass production. Lean systems make the work flow more efficient, productive, and flexible to changes in requirements (Simone & Kleiner, 2004).

2.4.5.1. Advantage of lean customer practice

The advantage of lean customer practices summarized as follows

Table 2.3; advantage of lean customer practices

Lean Customer Advantage	Description
Strategic leverage	Continuous systems improvement; simple management

	practices; easily implementable; critical success factors; leans tools.
Customer satisfaction	Create customer benefits; customer centricity; consultation; engagement; evaluation.
Value creation	Cutting costs; reduce waste; respect people; needs assessment; match price to production cost.
Relationship building	Stakeholder engagement; predictable supplier quality; value chain management; educate suppliers; create trust.
Improved efficiency	Increase operational efficiency; standardize operating procedures; control push and pull factors; employee skills enhancement; optimize time and cost
Increased productivity	Quality products and services; performance enhancement; limited variability; operational speed; reduced production cycle.
Competitive advantage	Organizational capabilities; knowledge management; optimizing shareholder value; global offerings; differentiation

Sources; *Simone &Kleiner, 2004*

2.4.6 Lean supplier's practices

Lambert (2012) states that suppliers using lean are able to respond to changes. Their prices are usually lower due to the efficiencies of lean processes, and their quality has improved to the point that incoming inspection at the next link is not needed. Jusko & Jill (2007) also added that Lean suppliers bring on time and their culture is one of continuous improvement. To develop lean suppliers, organizations should consist of suppliers in their value stream. They should encourage suppliers to make the lean transformation and involve them in lean activities. This will help them fix problems and share savings. In turn, they can help their suppliers and set continually declining price targets and increasing quality goals (Halldorsson, Kotzab, Mikkol, & Skjoett-Larsen, 2007).

2.4.6.1. A FRAMEWORK FOR LEAN SUPPLIER MANAGEMENT

According to Yixun Guo and Zhiduan Xu (2007), Lean production method cannot be achieved without a lean supply. A lean supply procedure should deliver a flow of goods, services and technology with the associated flows of information and other communications in both directions from suppliers to the Company without waste. The core of a lean supply chain management is lean supplier practice.

Sources; Yixun Guo and Zhiduan Xu, 2007

Figure 2.3, a framework for lean supplier management

According to Yixun Guo and Zhiduan Xu (2007) the framework includes all features of lean supplier management as well as supplier classification, supplier development, business policy, and supplier approval and supplier assessment. The importance of the framework is to achieve the Company's selection of suppliers, employing TQM methods, so that improved productivity outputs from the optimal deployment of resources. According to the framework, supplier management practices may be classified into two parts: the first part is focused at choosing a new supplier; the second part is to control existing suppliers. If a new supplier is chosen and confirmed, it will include into the Company's supplier base and then can be control by the second part principles.

The first part to select new suppliers includes the followings.

(I) Develop criteria based on market and business needs

(2) Weight the criteria based on importance

(3) Identify all potential suppliers

(4) reduce the number of suppliers to be considered based on required criteria

(5) Visit Supplier and perform Supplier Quality Assessment to further evaluate

(6) Perform final evaluation and rating of the supplier "finalists"

(7) Negotiate and Select "best" supplier or combination of suppliers

(8) Feedback learning to selected supplier(s) for subsequent quality planning

The second part to control the existing supplier base includes the followings:

(l) Assessment of Suppliers quality: This is a comprehensive, on-site assessment of supplier's quality method and procedures. Using standard and time-proven methods, a supplier is evaluated for its capacity to meet the organizations excellence benchmarks. This proper, proof-based method is used to evaluate the supplier's current abilities, emphasis on continuous improvement and ability to meet ever-increasing interests of the company.

(2) Evaluation of suppliers Performance: evaluation of suppliers Performance is to inspect those existing suppliers in the Company's supplier base during previous period by method of some benchmarks like quality, delivery, cost, responsiveness & support and innovation. Therefore the organization may distinguish on which stage its every supplier will be located and then should take certain equivalent actual measures to progress.

(3) Project center for Productivity: in this case Productivity refers to the capability to cash quality and/or consistency developments. It is predictable that suppliers who are in the Company's top 80% spent will offer a number of productivity designs to the organization every year. Actually, the organization can launch a supplier accessible idea record in which a supplier is encouraged to join to and put forwards suggestions for productivity. Productivity project center is a method to manage these suggestions and provide information about the implementation of these suggestions. The information is very important for the certain commodity supervisor to make sourcing judgments.

(4) Certification of Supplier: Certification of supplier is the description/status given to a supplier who constantly proves outstanding performance of quality, productivity, and delivery. By means of certification, suppliers may benefit from systematic developments which possibly maximize the supplier's profit margin, first concern for new business and visible acknowledgment from the organization; the company may

advantageous from confidence in the supplier's quality methods to constantly produce error-free and better products/services, products/services are received when needed, and year- over- year productivity developments.

In this framework, the better-quality supplier base is dynamic. Perhaps new evalueted and selected suppliers are input. Meanwhile, a supplier's data will be improved according to its performance over previous periods. Those suppliers who will not pass the certification will reject.

The above is to be used as a guideline only. The business needs and value of opportunities will determine the ultimate decision of the supplier's category. Usually, there are four types of suppliers as follows:

Type I, Low value/low risk and convenience sources;

Type II, Great value/little risk and many Sources;

Type III, Little value/great risk or single sources;

Type IV, Great value/great risk and/ sole sources.

According to those four types of suppliers, suppliers divide into four groups as shown below:

- Strategic suppliers:
- Key item suppliers:
- Manage-By-Exception suppliers:
- Approved supplier

The figure below illustrates briefly

Suppliers	Define Metrics and Expectations	Identify Gaps / Opportunities	Improve (verify)
Strategic	Consider certification criteria plus client needs.	Jointly identify and prioritize.	Close gaps and show results jointly. Re-categorize supplier if/when needed.
Key Item	Client needs.	Use some specific standards of the Company to develop plan.	Work quality plan to completion then re-categorize supplier.
Manage-by-Exception	Specific to problem.	Establish target expectations.	Report progress until gap closed. Maintain data monitoring system and move back to "approved."
Approved	Communicate Certification criteria, generic expectations.	Supplier responsible.	Supplier responsible; provides data to Commodity Manager, as requested.
Not yet selected	Supplier quality assessment and other needed information.	Select best supplier based on assessment results and information obtained.	Categorize supplier and continue as noted.

Sources; Yixun Guo and Zhiduan Xu, 2007

Figure 2.4, supplier selection process

2.4.6.2. *Quality Systems and Assessments of Lean Suppliers*

Quality Systems

According to Yixun Guo and Zhiduan Xu (2007) quality will not happen by accidental, particularly over the long term. By way of the organization wants to have higher points of guarantee with respects to supplier quality, reliability, service ability, and delivery, other consideration is placed on the supplier's quality structure. For that reason, the following prospects are placed on a supplier:

(1) Have a recorded quality scheme.

(2) Use procedure controls and emphasis on defect prevention instead of defect finding.

(3) Keep documents that help to lot trace ability.

(4) Keep documents that support consistency and serviceability performance criterias.

(5) Describe all procedures.

(6) Meet plans and procedures that result in Cp> 2 and Cpk> 1.5.

(7) Try for persistent development in quality and reliability in all aspects of processes.

The figure below provides a summarization.

Category	Define Metrics	Identify Gaps	Improve (verify)
Strategic	Concurrent product / process design; Voice of the Customer (VOC); Quality Function Deployment (QFD); Cycle time methodology; Defect measurement / 6 sigma; Failure Modes and Effects and Criticality Analysis (FMECA) / Failure Modes and Effects Analysis (FMEA); Reliability methods; Process capability; Data interpretation / presentation; Design of Experiments (DOE);Decision and risk analysis	Value Analysis and Value Engineering (VA/VE); Pugh Concept Selection; Process Mapping; Process capability; Descriptive statistics; Graphical techniques	Management-By-Fact(MBF); Concurrent product / process design; Design for "x" (DFX); Mistake proofing / fail-safing; Seven basic quality tools; Data interpretation / presentation
Key Item	VOC; QFD; Defect measurement / 6 sigma; Item Quality Process; FMECA /FMEA; Reliability methods; Process capability; Data interpretation / presentation; DOE; Decision & risk analysis	VA/VE; Pugh Concept Selection; Process Mapping; Cycle time methodology; Tolerating; Item Quality Process; Process capability; Descriptive statistics; Graphical techniques	MBF; Design for "x" (DFX); Item Quality Process; Mistake proofing / fail-safing; Seven basic quality tools; Data interpretation / presentation
Manage-By-Exception	Defect measurement / 6 sigma; FMECA /FMEA; Reliability methods; Seven basic tools; Data interpretation / presentation; Decision & risk analysis	Process Mapping; Graphical techniques	MBF; Design for "x" (DFX); Cycle time methodology; Mistake proofing / fail-safing; Seven basic quality tools; Data interpretation / presentation; Statistical software
80% Spend (subset of Approved)	Defect measurement / 6 sigma; Data interpretation / presentation	Process Mapping; Graphical techniques; Benchmarking	7 basic quality tools; Data interpretation / presentation; Strategic Cost Analysis
100% Spend(Approved)	Defect measurement / 6 sigma; Data interpretation / presentation	Graphical techniques	7 basic quality tools; Data interpretation / presentation

Sources; Yixun Guo and Zhiduan Xu, 2007

Figure 2.5, quality systems

2.4.6.3. The Supplier Quality Assessment

According to Yixun Guo and Zhiduan Xu (2007) The Supplier Quality Assessment method is a complete, on-site assessment of supplier's quality scheme and practices. Using standard and time-proven systems, a supplier is evaluated for its ability to achieve the Company's quality and cycle time prospects. This aggressive, proof-based method is used to recognize the supplier's present competences, emphasis on continuous improvement and ability to achieve ever-increasing demands. Features of the valuation comprise:

(1) Controlling of the business and, **quality method,** assurance, dimension and recording, training, cost analysis, continuous improvement actions and groups, and customer reaction

(2) Capability of the Process: considering customer needs, specification appraisal, order entry, use of procedure directions, competence studies, and identification of main procedure constraints that affect ability to achieve customer needs, and procedure control.

(3) Control of Change: Customer announcement of supplier make happen changes, audit trails, and amendment control.

(4) Management of the Procedure: ongoing control criteria, use of statistical and problem-solving methods, Training, data gathering and usage, and procedure assessment and development.

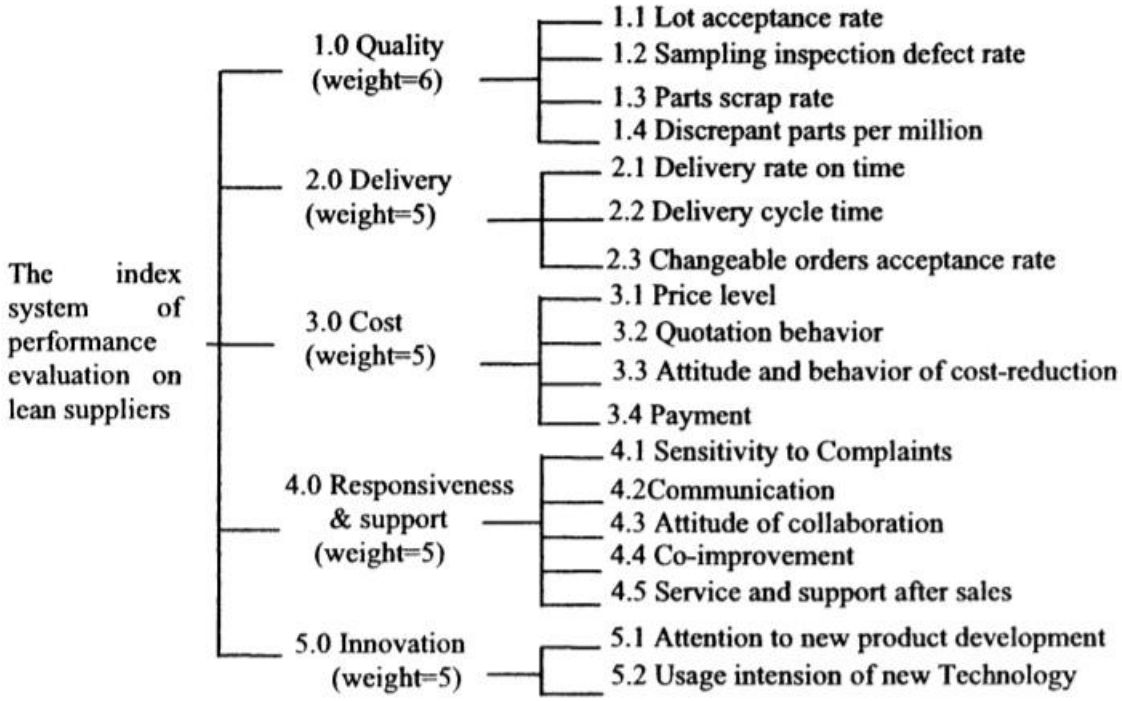
(5) Management of purchased and control of non-compatible materials: How data is defined, traced, examined, and used to develop the purchasing, plan, agreement, and production procedures.

(6) Preventive and Remedial action: assessment of difficulties, application of solutions to prevent reappearance of difficulties, usage of data to recognize trends and prevent potential difficulties, and confirmation of efficiency of solutions.

Even though the evaluation provides several IS0900X thoughts, it goes further than ISO certification evaluation, into the efficiency of the procedures themselves. ISO certification does not essentially associate to a fruitful Supplier Quality Assessment outcome.

2.4.6.4. Performance Evaluation on Lean Suppliers

According to Yixun Guo and Zhiduan Xu(2007) the objective of performance appraisal on lean suppliers are to know what performances a supplier has reached over the previous period (a year usually), to recognize probabilities that a supplier will be enhanced, and to deliver indications for re-certification of suppliers during next years. Clearly, the objectives of performance appraisal are those existing suppliers and are active over the previous period. According to the lean production, the index scheme of performance appraisal on lean suppliers may be adopted by Yixun Guo and Zhiduan Xu (2007) shown ass follows in Figure 2.8.



Sources; Yixun Guo and Zhiduan Xu, 2007

Figure 2.6, lean suppliers Performance evaluation

2.5 Organizational Performance

According to Gavrea et al. (2011) the concept of organizational performance is very common in the academic literature; its definition is difficult because of its many meanings. For this reason, there is no a universally accepted definition of this concept. I addition Santos and Brito (2012) stated that the definition of firm performance and its measurement continues to challenge scholars due to its complexity

Performance measurement is a topic which is often discussed but rarely defined. Literally it is the process of quantifying action, where dimension is the method of quantification and achievement clues to performance (Neely et al., 2005). According to the marketing perspective, organizations achieve their goals that are they perform, by satisfying their customers with greater efficiency and effectiveness than their competitors. The terms efficiency and effectiveness are used precisely in this context. Effectiveness refers to the extent to which customer requirements are met, while efficiency is a measure of how economically the firm's resources are utilized when providing a given level of customer satisfaction.

Richard et al. (2009).Organizational performance contains three definite parts of company's outcomes: 1, financial performance such as ROA, profits, ROI, etc.; 2, market performance includes market share, competitive position, sales, etc.; and, 3, shareholder return including total shareholder return, economic value added, etc.

According to Shang and Marlow (2007) Performance has been regarded in a great variety of ways by logistics researchers. The definition and measurement of performance is often a challenge for researchers because organizations have multiple and frequently conflicting goals. Thus, the definition of the performance is 'ultimately up to the evaluator'. According to Shang, (2004) measurement refers to a firm's performance measurement system which can be stated as the method of quantifying the efficiency and value of action leading to performance. An excellent measurement system should produce three primary benefits: reduced costs, improved service, and the generation of healthy growth.

Based on the idea of Neely et al. (2005) the level of performance a business attains is a function of the efficiency and effectiveness of the actions it take on and means:

According to Wijetunge (2016) Organizational performance is difficult to measure and there is no universally accepted definition. However, Organizational performance indicates to how well an organization realizes its market as well as its financial objectives. This definition covers both financial performance and operational performance. different studies have measured organizational performance by financial as well as market performance, including ROI, market share, profit, the growth of return on investment, growth of market share, sales growth, and competitive position. Hajiesmaeili et al. (2016) stated that Marketing performance reflects, the

organization's ability to increase sales and expand market share as compared to its competition and financial performance refers an organizations profitability and return on investment as compared to its competition. Korsita and Cania (2006) have used two criteria at the same time, financial and market indicators, with return on investment (ROI), the market share difference of profit on sales, increased ROI, increased sales, increased share the overall market and competitive position to measure organizational performance.

The researcher believes that marketing and financial measure are convenient to measure organizational performance. Based on this, the study measures the performance of FAFFA Food S.C by using both marketing (market share, growth of sales and competitive position) and financial measures (return on investment - ROI, profitability and growth of ROI).

2.6 Empirical Review on Lean Supply Chain Management

Several studies have been undertaken in the area of lean supply chain management. Azman (2010) did a study on Lean supply chain implementation; practice and performance in case Malaysia's electrical and electronics industry. He stated that lean supply chain practice influence performance of Malaysia's electrical and electronics industry.

Wasonga (2014) did a study on lean supply chain management practices in service industry in Kenya a case of Kenyatta National Hospital and stated that lean supply chain practices and improved supply chain performance had a positive relationship between them. The study recommended integration of lean supply chain processes, creating awareness and motivation to employees in relation to benefits of lean practices and enhancing organizational awareness and involvement to make operations of the hospital efficient and effective. Additionally the study also suggested that further study to be undertaken in the areas of lean supply chain management and its effects on the organizational performance.

Hejna and Hosking (2003) undertook a study on operational efficiencies and recommended various strategies that are considered important in achieving operational efficiency. Their study found that projected developments in operational efficiency are realized in replacement of facilities but such improvements does not

apply to all the cases and are often attributable to increased service volumes as they are to fundamental changes in the service delivery systems.

Wanjiku (2013) did a study on LSCM in manufacturing firms in Kenya. She pointed out that implementation of LSCM had a positive relationship with the operational performance of the manufacturing organizations. Additional, the study showed that in order for LSCM to succeed in the manufacturing sector, the management needed to involve the suppliers as well as acquire more skills and knowledge on the management of LSC.

Rono (2013) did a study at lean manufacturing practices in a continuous process industry on Bamburi Cement Limited. He pointed out that few scholars have examined the application of the lean manufacturing tools and techniques to a continuous process industry. His study found that lean manufacturing is not well implemented.

In Ethiopia only few researches done on the lean and lean supply chain management. Daniel (2015) did a study on lean philosophy for global competitiveness for chemical manufacturing industries. He reveals that lean practice in Ethiopia is very poor and lean philosophy can bring for chemical industries competitiveness.

The major reason driving this study is lack of empirical evidence on the effect of lean supply chain management and organizational performance.

2.7 Summary of Literature Review

The theoretical and the empirical literature determine that, the existing literature on the effects of lean supply chain management practice on organizational performance is not extensive in Africa and in Ethiopia particularly. Most of studies related with lean supply chain management are done abroad and in Ethiopia are rare. This indicates that, studies should be done in Ethiopian in the area. This study will look at the effect of lean supply chain management components on the organizational performance on FAFFA Food S.C.

2.7 Conceptual Framework

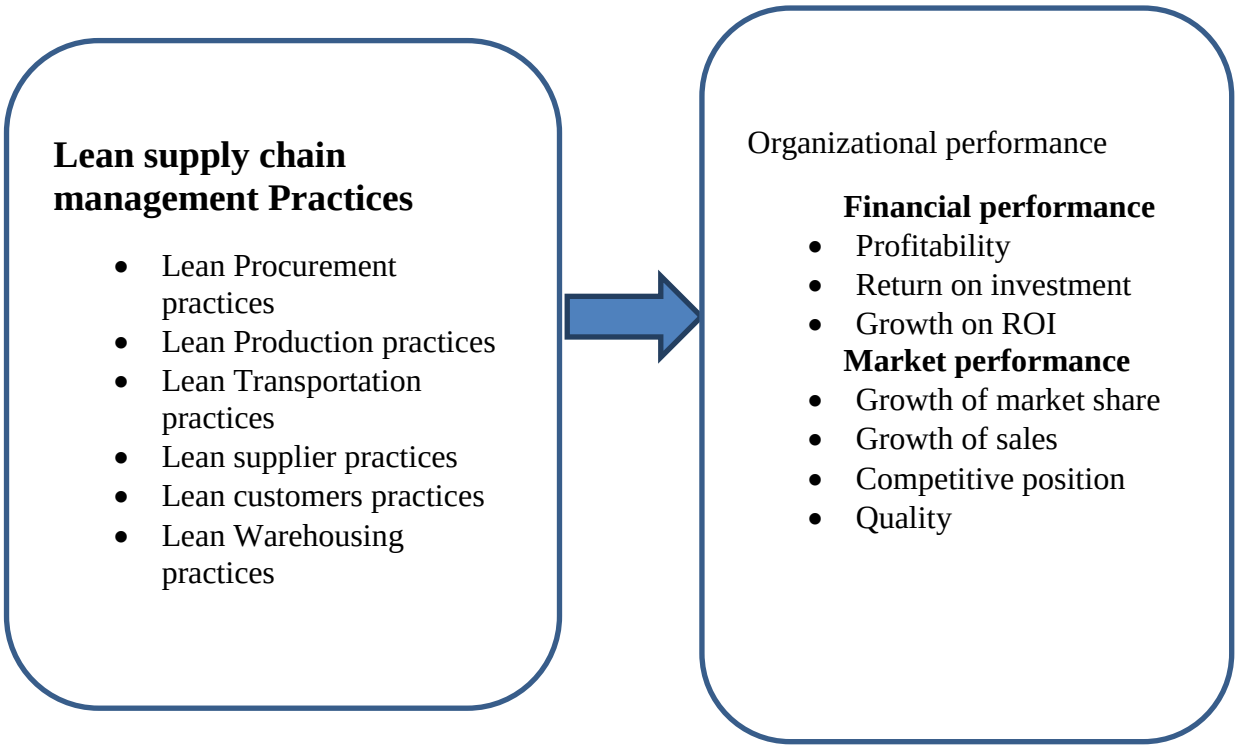
According to Wilson et al. (2015) a conceptual framework is a visual or written product, one that, "explains either graphically or in narrative form, the main things to be studied, concepts, or variables and the presumed relationship among them. Jabareen (2009) also defined as Conceptual framework is a network of linked concepts that together provide a comprehensive understanding of a phenomenon

The below figure illustrates the conceptual framework of this study. Based on the research questions, literatures and presumed relationship between the lean supply chain management practices and organizational performance, the conceptual framework underlines the effect of lean supply chain management practices on the organizational performance.

Considering the different practices of lean supply chain management and measurement of organizational performance, this study adopts the lean supply chain management practices of lean procurement, lean production, lean transportation, lean customer, lean supplier and lean warehousing as independent variable and organizational performance (financial and Customer satisfaction) as dependent variable.

Independent variables Dependent variable

Lean supply chain management practices Organizational performance



Source: Adapted from: Patric m. muchiri (2014) and Mutua Muskyoka (2014)

Fig 2.7: Conceptual framework

CHAPTER THREE
RESEARCH METHODOLOGY

INTRODUCTION

This section presents the research methodology that used to carry out this research. It encompasses the research approach design, population and sampling, data collection instruments and data analysis techniques.

3.1 Description of study area

FAFFA Food S.C is a pioneer of food processing industry in Ethiopia. It locates in Addis Abeba, Debrezeyit road, between Saris and Kality roundabout. The company established in 1962 as an ethio-swedish joint venture with the objective of reducing the risk of malnutrition among children in Ethiopia by producing low cost and high protein weaning food. It was privatized since providing August 2009 to Petram Private Limited Company. Under the new ownership, Faffa foods Share Company has expanded its capacity, diversified and introduced new products. At present, the company has an installed capacity to produce more than 21.6 thousand tons of nutritious foods per annum. The company has been producing various products namely Faffa, cerifam, Famix, Edgetmilk, DubeDuket, favena, corn flakes and breakfast cereal products supplies to the market. Looking into the future, the company is planning to produce new products and remain competitive and strongly focused on consumer satisfaction by providing the healthiest and most nutritious food products to the public.

Regarding the market demand, Faffa food Share Company has a strong market share of 20% in baby foods, 18% in milk, 30% in relief and 1% in snacks (Faffa Foods Share Company Business Plan, 2014 -2016).

The Addis Ababa city market channel survey conducted by Faffa Foods Food Share Company in 2012 indicates that 90.71% of the products are distributed and reaches the consumer through retail shops, 1.64% through supermarkets, 0.2% by wholesalers and others 7.63%. The findings clearly show that all suppliers are competing on the basis of marketing and distribution of their products, mainly through retail shops. Faffa Food Share Company distributes its products through retail networks mainly through private retail shops that constitute 98% of its total sales. The reaming 2% is distributed through own retail shops, supermarkets and mini market stores. The

company has competitive advantage over its competitors in terms of the size of retail outlets, availability and visibility of its most parts of the Addis city and major towns in the regional states. In addition the established partnerships with retail outlets, door to door delivers, and credit sales provision are an added value to its competitiveness in the market. (Faffa Foods SC -Business Plan (2014 -2016).

Vision

To play a leading role in building mentally and physically capable generation producing highly nutritional value products while becoming an internationally competitive business entity.

3.2 Research Approach

According to Creswell (2005) the three methods that are commonly implemented in a research are quantitative, qualitative and mixed approach, where one of them is not better than the others, all of this depends on how the researcher want to do a research of study. He asserted that quantitative research is a type of educational research in which the researcher decides what to study, asks specific, narrow questions, collects numeric (numbered) data from participants, analyzes these numbers using statistics, and conducts the inquiry in an unbiased, objective manner. Variables can be defined as attributes or characteristics of individuals, groups, or sub-groups of individuals (Creswell, 2009). Whereas qualitative approach used to reveal the meaning that informs the action or outcomes that are typically measured or quantified by quantitative approach. Mixed research method is defined as the class of research welfare the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language in to a single study (Kothari, 2004).

This research used mixed approach because; mixed research is useful to capture the best of both qualitative and quantitative approaches. Greener, 2008 and Saunders et.al (2007) the advantage of using mixed methods is that it enables to triangulate and support the data and result collected by questionnaire.

3.3 Research design

Different authors discuss three types of research design. These are exploratory (emphasizes discovery of ideas and insights), descriptive (concerned with determining the frequency with which an event occurs) and explanatory (concerned with determining the cause and effect relationships).The researcher used both descriptive and explanatory features of study that allows both quantitative and qualitative data analysis and inferential statistics respectively. The descriptive study allowed the researcher to describe those data and helps to know the event that was taken place, whereas explanatory study to examine the relationships between variables. Based on Cooper and Schindler, (2000) explanatory research emphases on why questions. In answering the `why' questions, the study is involved in developing causal explanations. Causal explanations argue that phenomenon Y (organizational performance) is affected by factor β (lean supply chain practices). So, the study followed an explanatory research that describes and explains deeply the effect of lean procurement, lean warehousing, lean production, Lean supplier practices, Lean customers practices and lean production on organizational performance.

Those two research designs facilitate research to be as efficient as possible yielding maximum information (Kothari, 2004).

3.3.1 Variables of the study

The study has both dependent and independent variables.

Independent variables are; Lean procurement, Lean Warehousing, Lean transportation, Lean production, Lean supplier practices, Lean customers practices

Dependent variable; organizational performance (financial performance and market performance)

3.4 Research Population and sampling

3.4.1 Population

According to Mugenda& Mugenda (2003) Target population refers to all members of a real set of people, events or objects to which the study generalizes hypothetical results of the research. Population also refers to a well-defined set of individuals (or objects) having some common observable characteristics that are being investigated. For this study, the population was all the employees of FAFFA. According to the human resources department, the company has the total population of the organization

is 217 and from stated population 40 were temporary employees, whereas 177 were permanent. To collect data about lean supply chain management the researcher will target the 151 lean supply chain related employees of the company that have direct relationship with lean procurement, lean warehousing, lean production Lean supplier practices, Lean customers practice and lean transportation working under procurement, production, and warehouse transport and management department.

Table 3.1: Target Population of the Study

Departments	Population
Management	10
Procurement	12
Production	68
Warehouse	16
Marketing	18
Transportation	27
Total	**151**

Sources: FAFFA, 2019

3.4.2 Sampling method

Alreck & Settle (2005) stated that the choice of sample size is made after considering statistical precision, practical issues and availability of resources. Samples that are selected on a random basis are considered as a representative of the population. The researcher selected the sample from the target population by using probability sampling particularly stratified random sampling technique because the target population is heterogeneous. According to Malhotra &Peterson (2006) there is no a single and precise way to determine the size of sample; hence there are a number of inadequacy for deciding on sample size. The larger the sampling size of a research, the more accurate the data generated. The researcher used Yamane's (1967) formula to determine the sample size for the study based on a 95% desired confidence level and a 5% desired level of precision.

$$n = N/(1 + (N * e^2))$$

Where:

N=Population size

e=Tolerance at desired level of confidence, take 0.05 at 95% confidence level.

n=sample size

$$n = 151/(1 + (151 * 0.05 * 0.05))$$

$$n = 110$$

The sample size from the target population was 110.

Table 3.2: Sample size determination

Departments	Population	Sample
Management	10	7
Procurement	12	9
Production	68	49
Warehouse	16	12
Marketing	18	13
Transportation	27	20
Total	**151**	**110**

Sources: FAFFA, 2019 and own computation using Yamane's (1967) formula

According to the formula the sample size for the study was be 110 respondents.

3.5 Sources of data

To obtain reliable data the researcher used both primary and secondary data. The primary data for research paper collected from employees, supervisors and manager of the targeted units and the secondary data also collected from written materials like scholar journals, organizational reports, and manuals, from books and intranet & internet.

3.5.1 Data collection tools

This study employed closed ended questionnaire. Closed- ended questionnaire is designed due to different reasons. Firstly, to constrain respondents from writing answer out of the concern of the issue, secondly, to coding, editing and analyzing easily. The other reason for choice of closed ended questioner is that most of the time respondents are not willing to fill questioners with blank spaces, (meaning blank space questioners are boring for respondents), and as a result non-response will occurred. So, to prevent this condition the researcher chooses to use closed-ended, (tick boxes), type of questioner.

In designing the questionnaire a 5-point Likert-Scale approach used

To maintain the validity of the constructs and scale used in this research, most of the questionnaires adopted from previous researches with modifications and some of the questionnaires developed based on careful review of literatures, statement of problem, literature review, conceptual framework and the research questions. Secondary data (past data that collected and tabulated through use of graphs charts and reports) collected from, journals, books and internet.

3.5.2 Data collection procedure

To obtain the first-hand information questionnaires was distributed personally by researcher visiting all stratums. In order to avoid confusion and to make the administration ease, a close follow up was maintained during filling up of the questionnaire

3.6 Data analysis

After the data collected, both descriptive and inferential statistical techniques employed to analyze the data. The data was analyzed using computer software Statistical Package for Social Sciences (SPSS) version 20.

3.6.1 Descriptive statistical Analysis

Descriptive analysis is presented by using statistical tools mainly frequencies, percentages, mean and standard deviation to summarize the responses. According to according to Denscombe (2012) descriptive statistics is a process of transforming a mass of raw data into tables, charts, with frequency distribution and percentages which are a very vital part of making sense of the data.

3.6.2 Inferential statistical Analysis

In inferential statistical analysis, correlation and multiple regression methods were utilized using statistical package for social sciences (SPSS) software. Spearman coefficient of correlation analysis was carried out on the data obtained from the respondents to examine the relationship between the independent and dependent variables, and multiple regressions used to examine the six combined effect of the independent variable aspects have on organizational performance.

Correlation

Correlation is used to describe the strength and direction of relationship between two variables (Independent variables are; Lean procurement, Lean Warehousing, Lean transportation, Lean production , lean supplier, lean customer and Dependent variable; organizational performance).

Correlation output always lies between -1.0 and +1.0 and if "r" is positive, there exists a positive relationship between the variables. If it's negative, the relationship between the variables is negative. A value of 0 correlations represents no relationship. The results of correlation coefficient may be interpreted as follows.

Correlation Coefficient	**Interpretation**	
(-1.00 to -0.8]	Strong	Negative
(-0.8 to -0.6]	Substantial	
(-0.6 to -0.4]	Medium negative	
(-0.4 to -0.2]	Low	
(-0.2 to 0.2)	Very Low	
(0.2 to 0.4)	Low	Positive
(0.4 to 0.6)	Medium positive	
(0.6 to 0.8)	Substantial	
(0.8 to 1.00)	Strong	

Multiple Regression Analysis

The second aspect of the relationship between variables that is examined by multiple regression which involves specification of the form of the relationships so as to find a mathematical expression that enables us to predict the score of one variable (called dependent variable) from knowing the score of the other variables (called independent variables).

According to Cooper and Schindler (2001) Multiple regression analysis is a statistical analysis technique used to establish the linear relationship between a single dependent variable and two or more independent (explanatory) variables and is used to test the proposed hypotheses. Hair et al. 2006) also stated that Multiple regression analysis provides an index of the degree of relationship (1 = perfect relationship, 0 = no relationship) between the criterion variable(s), on the one hand, and the weighted combination of the predictor variables as specified by the regression equation, on the other hand—that is, *R.* They also noted that Regression analysis predicts changes in a dependent variable by simultaneously accounting for the impact of various independent variables via their weighted combination. Interpreting the results of regression analysis may be more easily evaluated by examining the *R*-squared (R^2) statistic, which indicates the proportion of variance in the dependent variable that is shared by the weighted combination of independent variables.

The use of multiple regression analysis is very suitable in cases where it is of interest to determine the collective effect of several independent variables on a particular dependent variable (adjusted R square), as well as it being of interest to know the specific effect of each independent variable on the dependent variable in the presence of the other independent variables (i.e. determining the effect of each independent variable while controlling the effect of the other independent variables).

3.7 Scale reliability and validity

3.7.1 Reliability

According to Golafshani (2003) describes reliability as the extent to which results of a study are consistent over time and there is an accurate representation of the total population under study. According to Toke et al. (2012), also stated that the aim of reliability analysis is to find the extent to which a measurement procedure produced the same result if the process is repeated over and over again under the same conditions.

According to Sekaran (2005) the most common technique used in the literature to assess the scale's reliability and stability is use of the Chronbach Alpha Statistics. Chronbach Alpha should be over 0.70 to produce a reliable scale and any scale with Chronbach Alpha less than this standard should be eliminated. The Chronbach alpha for lean procurement, lean production, lean transportation, lean customer, lean

supplier, lean warehouse and organizational performance were 0.763, 0.705, 0.733, 0.741, 0.730, 0.747 and 0.800 respectively implying that the items in the construct are indicative of the same underlying disposition. The following table shows the summary of reliabilities of all constructs.

Table 3.3; reliability test

	Variable name	Cronbach's Alpha	No. of Item
1	Lean procurement	0.762	6
2	Lean production	0.705	6
3	Lean transport	0.733	5
4	Lean customer	0.741	5
5	Lean supplier	0.730	5
6	Lean warehouse	0.747	6
7	Organizational performance	0.800	7
8	Overall	0.929	40

Source: Respondents survey result test, 2020

3.7.2 Validity

According to Kothari, (2004) Validity shows the degree to which instruments measure what they are supposed to measure Content validity was most relevant for our present study. This was because it was concerned with how well the content of the instrument samples the kinds of things about which conclusions were to be drawn. Content validity refers to the extent to which a measure represents all facets of a given social construct. There are several ways of establishing validity such as content validity; convergent validity concurrent; predictive validity; construct validity; and convergent validity (Joppe, 2000). To establish content Validity of the instruments, researcher internal examiner examined the content of the instruments and advised the researcher on the content validity. This feedback was used to revise the instruments.

3.8 Ethical consideration

In order to build honesty in the mind of respondents it was necessary to give full information about the purpose of the study and the researcher's status and role. The respondents were guaranteed that the information provided by them is confidential and used only for academic purpose. In addition, respondents were informed not to

include any identity detail and personal reference in the questionnaire. This minimizes the biasedness of the response collected from the respondents. In addition, the different research studies, articles and text books used as a reference in the study was exhaustively cited. Such action helped the respondents to avoid deception and not to cause harm of any body by any action of the study.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4. INTRODUCTION

In this chapter, the data collected was analyzed and presented based on the objectives of the study set above. The data was found to be important to explain the effect of lean supply chain management on organizational performance case study on FAFFA Food S.C. The questionnaires were developed in five scales ranging from one to five; where 1 represents to a very great extent, 2 Great extent, 3 Moderate extent, 4 to a low extent, 5 a very low extent, for measurements of organizational performance and lean supply chain practice and 5 represents strongly agree, 4 agree, 3 Neutral, 2 disagree, and 1 strongly disagrees for the challenges that affect the implementation of lean supply chain management practices. In order to assess the relationship between lean supply chain management and organizational performance, Correlation and regression analysis were conducted for scale typed questionnaire. A total of 110 questionnaires were distributed to employees and 94(85.5%) were obtained valid and used for analysis. The collected data were presented and analyzed by helping SPSS version 20 statistical software. The study used correlation analysis, specifically Spearman correlation, to measure the degree of association between different variables under consideration. Regression was also used to test the effect of independent variable on dependent variable.

4.1.Demographic information of the respondents

In the following table, the demographic information of respondents is presented. These include Gender of respondents, age, educational level and experience of respondents. To get information on these issues the respondents were asked and their responses are analyzed as follows. The results of this survey processed with the help of SPSS software.

4.1.1. Educational background of the respondents

Education is paramount in enabling the respondents to conceptualize issues related to resource utilization. This finding was in line with Katz (1992) finding that those with higher education are more successful as they have more knowledge and have modern managerial skills making them more conscious of the reality of the business work. This indicates that they easily understand the questionnaire and deliver reliable data.

Table 4.1: Educational level of respondents

		Frequency	Valid Percent	Cumulative Percent
Valid	up to 12	3	3.2	3.2
	Diploma	34	36.2	39.4
	Degree	48	51.1	90.4
	Masters	9	9.6	100.0
	Total	94	100.0	

Source: SPSS output of survey, 2020

As it can be seen form the Table 4.1, most of respondents' educational qualification is above 1st degree level i.e. 51.1% and 9.6% of the respondents have bachelor and post graduate degree respectively. This implies that they are capable of conceptualizing and respond authoritatively on issues and practices.

4.1.2. Level of experience of the respondents

Table 4.2: Work experience of respondents

		Frequency	Valid Percent	Cumulative Percent
Valid	below 3	26	27.7	27.7
	4-6	44	46.8	74.5
	7-9	19	20.2	94.7
	above 10	5	5.3	100.0
	Total	94	100.0	

Source: SPSS output survey, 2020

Work Experience: From the total respondents, 44 respondents (46.8%) fall at a work experience of 4-6 years, 26 respondents (27.7%) fall at a work experience level of below 3 years, 19 respondents(20.2) falls at 7-9 and the remaining respondents 5(5.3%) were above10 years. From this it can be concluded that the majority of respondents, 68 respondents (72.3%) fall at a work experience above 4 years. This implies the fact that most of the respondents have sufficient knowledge and experience about their organization and provide the reliable data.

4.1.3. Department of the respondents

Table 4.3; department of the respondents

		Frequency	Valid Percent	Cumulative Percent
Valid	Procurement	8	8.5	8.5
	Production	42	44.7	53.2
	Warehouse	9	9.6	62.8
	Transport	18	19.1	81.9
	Management	6	6.4	88.3
	Sales	11	11.7	100.0
	Total	94	100.0	

Source: SPSS output survey, 2020

Table 4.3, shows that 42(44.7%0 of the respondents are from production department, 18(19.1%) from transport department, 11(11.7%) from sales department, 8(8.5%) from procurement department and the remaining 6(6.4) were from management stuff. This implies that due to their detailed involvement on lean supply chain management activity of the company, the information gathered from them is accurate and relevant for the study. Therefore, the findings can be generalizable for the company.

4.2.Descriptive analysis

4.2.1. Response on lean supply chain management and organizational performance

As cited by Girma Kumsa (2018), Mesfin (2016) used a kind of rule of thumb to create equal intervals for a range of five points Likert scale (that ranges from strongly disagree to strongly agree in the survey questionnaire). The calculated mean value that ranges from 1 to 1.80 implies strong disagreement, a mean range from 1.81 to 2.6, from 2.61 to 3.4, from 3.41 to 4.2 and from 4.21 to 5.00 represented respondents' perceptions of somewhat disagree, neutral, somewhat agree and strongly agree respectively. The 0.8 served as a boundary for each elements of the measurement in the questionnaire. The result 0.8 was found by dividing the difference between the maximum (5) and minimum (1) scores to the maximum score (5) of the questionnaire. In the process of examining of the data, standard deviation was used. Small standard deviations (relative to the value of the mean itself) indicate that data are close to the mean whereas a large standard deviation (relative to the mean) indicates that the data

points are distant from the Mean. Standard deviation is a measure of how well the mean represents the data (Field, 2009).

4.2.1.1.Mean and standard deviation of responses on Lean procurement

Table 4.4: Descriptive Statistics of Lean procurement

Descriptive Statistics

Lean procurement	N	Mean	S.D
The company has included strategic sourcing in its procurement planning process	94	3.6596	.92228
The company has integrated suppliers in the entire supply chain improve customer service	94	3.5745	.95590
The company has mechanisms in place to ensure free flow of information to a supply chain.	94	3.4894	1.01330
My company creates real time visibility into inventory in motion.	94	3.5319	.88842
My company has minimized the lead times for critical materials	94	3.6702	.94344
The company has ensured minimum order cycle time for the reduction of cost and waste	94	3.6064	.91837
Valid N (listwise)	94		

Source: SPSS output survey, 2020

The mean and standard deviation for My Company has minimized the lead times for critical materials scores 3.67 and .888 respectively, followed by The Company has included strategic sourcing in its procurement planning process which scores mean 3.659 and with standard deviation of 0.922. Based on the finding on Table 4.4 all six questions asked under lean procurement scores a mean greater than 3.5, which implies the respondents agreed to the fact that lean procurement are practiced in their organization. The literature also agrees with the literature review that was presented in the second chapter of the study. The finding about Lean procurement practices in FAFFA Food S.C (table 4.4) agrees with the literature review that was presented in the second chapter of the study. According to Harland (2012) stated that lean procurement practice helps to achieve the following; create real time visibility in to the inventory in motion, remove the obstacles to the free flow of information in to the supply chain; change supply chain from push to pull consumption based replenishment model. Murch (2014) also supports the idea stated above.

4.2.1.2.Mean and standard deviation of responses on Lean production

Table 4.5: Descriptive Statistics of Lean production

Descriptive Statistics

Lean production	N	Mean	Std. Deviation
My company has minimized the reject ratio (amount of scrap) in order to reach profitability goals	94	3.7340	1.07938
There is an increase in product flow through elimination of all non-value added activities in your company	94	3.6277	.91562
My company reduces down time to ensure that the potential return on investment is quite high	94	3.5319	1.00217
My company has flexible production techniques using minimal inventories of raw materials.	94	3.6915	.90431
My company ensured that there is high Overall Equipment Effectiveness (personel, machineries….)	94	3.5532	.91130
My company minimized Takt time(the amount of time that it takes to complete a task) in order to decrease cost and waste reduction	94	3.5745	.94459
Valid N (listwise)	94		

Source: SPSS output survey, 2020

from the table 4.5, My company has minimized the reject ratio (amount of scrap) in order to reach profitability goals scored the highest mean 3.734 and SD of 1.079, followed by My company has flexible production techniques using minimal inventories of raw materials with the mean of 3.691 and SD of 0.904. There is an increase in product flow through elimination of all non-value added activities in your company (M=3.627, SD=0.915), My company minimized Takt time(the amount of time that it takes to complete a task) in order to decrease cost and waste reduction(M=3.574, SD=0.944), My company ensured that there is high Overall Equipment Effectiveness (personel, machineries….)(M=3.553, SD=0.911) and My company reduces down time to ensure that the potential return on investment is quite high(M=3.531, SD=1.00217). This implies that a high standard deviation spread from .90431to 1.079 which implies that respondents were more varied in their opinion to the responses given under lean production. A mean score greater than 3.5which implies the respondents agreed to the fact that lean production are exercise in their organization. The literature also agrees with the findings of table 4.5. According to Smeds (1994) waste arrives in many ways in the production system. waste is an activity that consumes time, resources or space but does not add any value to the product or service. The primary goal of lean manufacturing is the elimination of waste at all stages of production process.

4.2.1.3.Mean and standard deviation of responses on Lean Transport

Table 4.6: Descriptive Statistics of Lean Transport

Descriptive Statistics

Lean transport	N	Mean	S.D
There is a relation between transportation and JIT system in your company.	94	3.8191	.91537
The company has a smooth flow of goods and services to the customer.	94	3.7553	.91212
Lean transportation planning has ensured waste and cost reduction	94	3.6489	.99144
Production is pulled by shipment of finished goods	94	3.3936	.98612
Firm has a budget to ensure operational efficiency for transportation process	94	3.5957	.98722
Valid N (listwise)	94		

Source: SPSS output survey, 2020

As revealed from the table 4.6, the statement There is a relation between transportation and JIT system in your company was relatively the most rated with mean of (M=, 3.8191, SD=.91537) indicating that it was occasionally practiced followed by The company has a smooth flow of goods and services to the customer (M= 3.7553, SD= 0.91212). Lean transportation planning has ensured cost and waste reduction (M= 3.6489, SD= 0.99144), Firm has a budget to ensure operational efficiency for transportation process (M=3.5957, SD= 0.98722), and Production is pulled by shipment of finished goods (M=3.3936, SD= 0.98612) were occasionally practiced respectively. The finding about lean transport practices in FAFFA Food S.C (table 4.6) agrees with the literature review that was presented in the second chapter of the study. Lean transportation focus should be on relentlessly working with carriers on continuous improvement of transportation, while eliminating wastes and reducing cost as Toyota for instance has been always doing (WCL Consulting, 2003).

4.2.1.4.Mean and standard deviation of responses on Lean Customer

Table 4.7: Descriptive Statistics of Lean customer

Descriptive Statistics

Lean customer	N	Mean	Std. Deviation
Customer needs are established	94	3.9149	.86335
My company assured that there is high Net Promoter Score (how likely your customers are to refer you to someone else)	94	3.6277	.92729
Only what will satisfy the customer is delivered	94	3.5106	1.00263
The company assured that there is minimum First Response Time to maximize customer satisfaction	94	3.6277	.92729
My company delivers quality products to avoid returns	94	3.6383	1.02497
Valid N (listwise)	94		

Source: SPSS output survey, 2020

According to the table 4.7, the mean for customer needs are established scores 3.9149 which highly represent the data and the SD was .86335, followed by My Company delivers quality products to avoid returns which scores mean of 3.6383and SD 1.02497. Mean of My Company assured that there is high Net Promoter Score (how likely your customers are to refer you to someone else) and The Company assured

that there is minimum First Response Time to maximize customer satisfaction scores 3.6277 and SD 92729 and Only what will satisfy the customer is delivered scores mean 3.5106 and SD 1.00263. Based on the finding on Table 4.7, all five questions asked under lean customer scores a mean greater than 3.5, which implies the respondents agreed to the fact that lean customers are exercise in their organization. The literature also implies that lean customer helps in establishing effective partnerships with customers always seeking methods of continuous improvement in the total supply chain to reduce costs. Lean customers expect value from the products they purchase and provide value to the consumers who they interact with (FAO 2007).

4.2.1.5.Mean and standard deviation of responses on Lean Supplier

Table 4.8: Descriptive Statistics of Lean Supplier

Descriptive Statistics

Lean supplier	N	Mean	Std. Dev
There is close collaborations with supplier	94	3.7872	.87832
The firm gives suppliers feedback on quality and delivery	94	3.5957	.98722
Supplier are directly involved in the new product development	94	2.7553	1.13295
The company has established processes to evaluate the performance of the suppliers	94	3.3617	1.02497
My company assured there is a process for improving the supplier base with performance management to avoid risks	94	3.6809	.80606
Valid N (listwise)	94		

Source: SPSS output survey, 2020

The table shows that There is close collaborations with supplier scores the highest mean(3.7872) and the second least SD(0.87832) following by My company assured there is a process for improving the supplier base with performance management to avoid risks(M=3.6809, SD=.80606). The firm gives suppliers feedback on quality and delivery (M=3.5957, SD 0.98722), the company has established processes to evaluate the performance of the suppliers (M=3.3617, SD1.0249) and Supplier are directly involved in the new product development scores the least mean 2.7553 and higher SD 1.1329. This implies that the respondents agreed that suppliers' involvement on new product development should be improved. The literature in the chapter two also agrees with the finding in table (4.8).According to Yixun Guo and Zhiduan Xu(2007),

a lean supply arrangement should provide a flow of goods, services and technology from suppliers to the Company (with the associated flows of information and other communications in both directions) without waste.

4.2.1.6.Mean and standard deviation of responses on Lean warehouse

Table 4.9: Descriptive Statistics of Lean warehouse

Descriptive Statistics

Lean warehouse	N	Mean	S.D
The company has decreased the Rate of Return to minimize cost and waste	94	3.6277	1.05733
The management of the company supports lean warehousing by providing enough resources	94	3.7872	.90247
The company has a distribution center.	94	3.8191	.90355
The company minimizes the Order Lead Time to achieve customer satisfaction	94	3.7021	.93705
Firm efficiently utilizes its space and machines	94	3.8404	.96501
My company decreases carrying costs(capital cost, storage cost, equipment) contributes for profitability of our organization	94	3.5106	1.03430
Valid N (listwise)	94		

Source: SPSS output survey, 2020

From the table 4.9, Firm efficiently utilizes its space and machines scored the highest mean 3.8404 and SD of 0.96501, followed the company has a distribution center with the mean of 3.8191 and SD of 0.90355. This implies that a high standard deviation spread from .90247to 1.05733 which implies that respondents were more varied in their opinion to the responses given under lean warehousing and a mean score greater than 3.5which implies the respondents agreed to the fact that lean warehousing has an effect on organizational performance. The finding agrees with the literature review that was conducted in the second chapter of the study. Lean warehousing is a very important component of LSCM which can be useful to the distribution area to reduce waste, increase the utilization of the available space, improve on productivity and meet the increasing demands of the customer (Ackerman, 2007).

4.2.2. Descriptive statistics of organizational performance

4.2.2.1.Mean and standard deviation of responses on return on investment

Table 4.10: Descriptive Statistics of return on investment

Descriptive Statistics

Return on investment	N	Mean	Std. Deviation
Rate of return on investment value	94	3.2553	.91506
Rate of return on investment Rate	94	3.4574	.88797
Valid N (listwise)	94		

Source: SPSS output survey, 2020

As shown in the table 4.10, in terms of rate of return on investment value (M=3.2553, SD=0.91506) and rate return on investment rate (M=3.4574, SD=0.88797) the performance of the organization is moderate.

4.2.2.2.Mean and standard deviation of responses on Profitability

Table 4.11: Descriptive Statistics of profitability

Descriptive Statistics

Profitability	N	Mean	Std. Deviation
Profitability Ratio	94	3.5213	.82604
Gross profit	94	3.5745	.99989
Operating profit	94	3.6489	1.00223
Net Profit	94	3.7660	1.09176
Valid N (listwise)	94		

Source: SPSS output survey, 2020

From the table 4.11, net profit scores the highest mean 3.766 and the highest SD 1.09176 followed by operating profit with the mean score 3.6489 and SD 1.00223. Gross profit (M=3.5745SD= .99989) and Profitability Ratio scores the least mean value 3.5213and the least SD .82604. This implies that the performance of the organization in terms of profitability is good.

4.2.2.3.Mean and standard deviation of responses on growth on return on investment

Table 4.12: Descriptive Statistics of growth on return on investment

Descriptive Statistics

growth on return on investment	N	Mean	Std. Deviation
Compounded Annual Growth Rate	94	3.6596	.92228
Total Return on investment	94	3.5532	.88739
Valid N (listwise)	94		

Source: SPSS output survey, 2020

The table shows that, in terms of Annual Growth Rate (M= 3.6596, SD=.92228) and Total Return on investment (M=3.5532, SD=.88739), the performance of the organization is good.

4.2.2.4.Mean and standard deviation of responses on market share

Table 4.13: Descriptive Statistics of market share

Descriptive Statistics

market share	N	Mean	Std. Deviation
Relative Market share	94	3.2234	.89388
Market share rate	94	3.4043	.79405
Valid N (listwise)	94		

Source: SPSS output survey, 2020

The table shows that, Market share rate scores the highest mean and the least SD (M=3.4043, SD=.79405) and Relative Market share scores the least mean value and the highest SD (M=3.2234, M=.89388). This implies that the performance of the organization in terms of market share is moderate.

4.2.2.5.Mean and standard deviation of responses on sales growth

Table 4.14: Descriptive Statistics of sales growth

Descriptive Statistics

sales growth	N	Mean	Std. Deviation
Positive sales growth	94	3.4681	.88842
Valid N (listwise)	94		

Source: SPSS output survey, 2020

The table shows that, in terms of sales growth (M=3.4681, SD=.88842), the performance of the organization is moderate.

4.2.2.6.Mean and standard deviation of responses on competitive position

Table 4.15: Descriptive Statistics of competitive position

Descriptive Statistics

competitive position	N	Mean	Std. Deviation
Better price for customers	94	3.4787	1.00246
Efficiency	94	3.5106	.88894
Customer satisfaction	94	3.5745	.89790
Flexibility	94	3.5106	.88894
Competitive win rate	94	3.6277	.77576
Valid N (listwise)	94		

Source: SPSS output survey, 2020

As indicated in the table 4.15, in terms of efficiency (M=3.5106, SD=.88894), Customer satisfaction (M=3.5745, SD=.89790), flexibility (M=3.5106, SD=.88894), Competitive win rate (M=3.6277, SD=.77576), the performance of the organization is good and in terms of Better price for customers (M=3.4787, SD=1.00246) the performance of the organization is moderate.

4.2.2.7.Mean and standard deviation of responses on quality

Table 4.16: Descriptive Statistics of quality

Descriptive Statistics

Quality	N	Mean	Std. Deviation
Quality product	94	4.0213	.89176
Quality process	94	4.1489	.91531
Valid N (listwise)	94		

Source: SPSS output survey, 2020

Table 4.16 shows that, in terms of quality process (M=4.1489, SD=.91531) and Quality product (M=4.0213, SD=.89176), the performance of the organization is very good.

4.2.2.8.Mean and standard deviation of responses on challenges of lean supply chain management

The study also at determining as to whether there were any challenges experienced during the implementation process of lean supply chain management. The findings are shown below by the table

Table 4.17: Descriptive Statistics of Challenges facing during the implementation of lean supply chain management

Descriptive Statistics

Challenges facing during the implementation of lean supply chain management	N	Mean	Std. Deviation
Lack of employee training and motivation	94	2.7447	1.06696
Limited resources	94	2.4574	.94658
Lack of top management commitment	94	2.5745	.99989
Negative attitude from employees	94	2.5745	1.04201
Lack of clear benefits from lean supply chain management	94	2.6383	.97110
Resistance to change	94	3.0532	1.11072
Cost and resources allocation	94	2.6170	1.06868
Misunderstanding of lean	94	3.5532	1.24103
Conflict with other initiatives of the company	94	2.5000	1.10473
Lack of broad organization involvement	94	2.6383	1.00377
Lack of supply chain integration	94	2.8404	1.04009
Limited control and in monitoring suppliers delivery time	94	2.5957	.99805
Valid N (listwise)	94		

Source: SPSS output survey, 2020

As indicated in the table 4.17, Misunderstanding of lean (M=3.5532, SD=1.24103) and Resistance to change (M=3.0532, SD=1.11072), scores the highest mean value. The remaining challenges scores below mean value of 2.8. This indicates that during the implementation of lean supply chain management Misunderstanding of lean and Resistance to change are the major challenges of lean supply chain management.

4.3. Relationship between lean supply chain management and performance

This section contains correlation and regression analysis. The section was meant to achieve both general and specific objectives in establishing the relationship that exists between the variables.

4.3.1. Correlation analysis

Correlation analysis was done to achieve the study specific objectives which were to establish the influence of lean procurement, lean production, lean transportation; lean customers lean suppliers and lean warehousing on organizational performance at FAFFA Food S.C.

Table 4.18: correlation matrix between lean supply chain management practices and organizational performance

Correlations

			proc	prod	tran	cu	sup	war	op
Spearman's rho	proc	Correlation Coefficient	1.000	.540**	.466**	.566**	.364**	.516**	.537**
		Sig. (2-tailed)	.	.000	.000	.000	.000	.000	.000
		N	94	94	94	94	94	94	94
	prod	Correlation Coefficient	.540**	1.000	.500**	.526**	.433**	.646**	.490**
		Sig. (2-tailed)	.000	.	.000	.000	.000	.000	.000
		N	94	94	94	94	94	94	94
	tran	Correlation Coefficient	.466**	.500**	1.000	.501**	.518**	.536**	.477**
		Sig. (2-tailed)	.000	.000	.	.000	.000	.000	.000
		N	94	94	94	94	94	94	94
	cu	Correlation Coefficient	.566**	.526**	.501**	1.000	.431**	.608**	.642**
		Sig. (2-tailed)	.000	.000	.000	.	.000	.000	.000
		N	94	94	94	94	94	94	94
	sup	Correlation Coefficient	.364**	.433**	.518**	.431**	1.000	.473**	.438**
		Sig. (2-tailed)	.000	.000	.000	.000	.	.000	.000
		N	94	94	94	94	94	94	94
	war	Correlation Coefficient	.516**	.646**	.536**	.608**	.473**	1.000	.652**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.	.000
		N	94	94	94	94	94	94	94
	op	Correlation Coefficient	.537**	.490**	.477**	.642**	.438**	.652**	1.000
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.
		N	94	94	94	94	94	94	94

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

Source: SPSS output survey, 2020

A correlation coefficient has a value ranging from -1 to 1. Values that are closer to the absolute value of 1 indicate that there is a strong relationship between the variables being correlated whereas values closer to 0 indicates that there is little or no linear relationship The strength of correlation can be described using the guide that Evans (1996) suggests for the absolute value of r as cited in (Beldjazia and Alatou, 2016). If "r = 0.00-0.19 - very weak, r= 0.20-0.39 - weak, r = 0.40-0.59 - moderate, r = 0.60-0.79 - strong and r = 0.80-1.0 - very strong". Since the data is not a continuous data (likert scale) Spearman correlation coefficients were appropriate and determined with the objective to obtain information about the relationships between the dependent and independent variables as presented in table.

As shown from the table 4.18, lean procurement has a positive and significance influence on organizational performance of FAFFA Food S.C. r (94) =0.537, $p \leq 0.01$. According to Evans (1996) magnitude of correlation, the relationship between the two variables is moderate.

Table 4.18 shows that, Lean production r (94) = .490, $p \leq 0.01$ has a positive and significant relationship. This implies that lean production and organizational performance tend to increase together. . According to Evans (1996) magnitude of correlation, the relationship between the two variables is moderate.

The findings revealed that lean transportation has a positive and significant relationship with organizational performance r (94) = .477, $p \leq 0.01$ in which their relationship is moderate. Further, the result indicated that lean supplier has moderate relationship with organizational performance which is positive and significant at ($r=0.511$, $p<0.01$).

From the results, the correlation between lean supplier and organizational performance has positive and significant ($r=0.438$, $p<0.01$) which is moderate relationship between the two variables according to the correlation magnitude of Evans (1996).

From the results, the correlation between lean customer and organizational performance has positive and significant ($r=0.642$, $p<0.01$) which is strong relationship between the two variables according to the correlation magnitude of Evans (1996).

In the same way, strong and statistically significant positive correlation is found between lean warehousing and organizational performance with (R =.652, P< 0.01). Therefore, Lean Warehousing and Organizational performance are strongly correlated.

Generally, the correlation analysis showed that there is a positive and statistically significant relationship between lean supply chain management practices and organizational performance of FAFFA Food S.C.

4.3.2. Regression Analysis

A multiple regression analysis was carried out to determine the influence of independent variables on the dependent variable. Multiple regressions also used to determine the overall fit (variance explained) of the model and the relative contribution of each of the predictors to the total variance explained.

According to Ballance (2004), the correct use of the multiple regression models requires that several critical assumptions be satisfied in order to apply the model and establish validity. Inferences and generalizations about the theory are only valid if the assumptions in an analysis have been tested and fulfilled.

Before carrying out multiple regression analysis, the researcher has checked the required assumptions that the data must meet to make the analysis reliable and valid. These are normality of the distribution, multicollinearity tests. Each test is explained below.

1, Normality Distribution Test

Multiple regressions require the independent variables to be normally distributed. Skewness and kurtosis are statistical tools which can enable to check if the data is normally distributed or not. Smith and Wells (2006) stated that kurtosis is defined as "property of a distribution that expresses the thickness of the tails. The thickness of the tail comes from the amount of scores falling at the extremes relative to the normal distribution". Skewness is a measure of symmetry. A distribution or data set is symmetric if it looks the same to the left and right of the center point. The skewness and kurtosis test results of the data is within the acceptable range (1.0 to +1.0) and it can be concluded that the data is normally distributed. So the result of kurtosis skewness exist between -1.0 to +1.0 which acceptable and error term for each variable

constant. Additionally there are two methods to check normality assumption include using a histogram (with a superimposed normal curve) and a Normal P-P Plot. It can be concluded that normality is guaranteed as the histogram generated is normally distributed and the P-P plot follows the diagonal reference line as shown in appendix. The kurtosis and skewness results are also shown in appendix B.

2, Multicollinearity Test

Multicollinearity refers to the situation in which the independent/predictor variables are highly correlated. When independent variables are multicollinearity, there is "overlap" or sharing of predictive power. This may lead to the paradoxical effect, whereby the regression model fits the data well, but none of the predictor variables has a significant impact in predicting the dependent variable. Menard, (1995) stated that tolerance should be more than 0.2 and VIF should be less than 10. Therefore the result obtained confirmed this one and acceptable. Multicollinearity test results are shown in appendix B.

3, Linearity assumption: according to Balance (2004) Linearity defines the dependent variable as a linear function of the predictor (independent) variable. Linearity assumption was tested by producing scatterplots of the relationship between each of independent variable and the dependent variable. By visually looking at the scatterplot produced by SPSS, the relationship between each independent variable and the dependent variable found to be linear as shown in appendix B.

4, Homoscedasticity assumption: According to Tsegaye, (2018) the assumption of homoscedasticity indicates to equal variance of errors across all levels of the independent variables. This means that errors are spread out consistently between the variables. This is evident when the variance around the regression line is the same for all values of the predictor variable. Homoscedasticity can be checked by visual examination of a plot of the standardized residuals by the regression standardized predicted value. Ideally, residuals are randomly scattered around zero (the horizontal line) providing even distribution. Heteroscedasticity is shown when the scatter is not even; fan and butterfly shapes are common patterns of violation. To measure homoscedasticity, the researcher created a scatterplot of standardized residuals versus standardized predicted values using SPSS and found that heteroscedasticity was not a major problem as shown in appendix B

After the data was tested for the above required multiple regression assumptions and confirmed that it has meet all these assumptions, multiple regression analysis was

carried out to determine how well the regression model fits the data (model summary), independent variables statistically significantly predict the dependent variable (ANOVA) and statistical significance of each of the independent variables (regression coefficients).

4.3.2.1.Model Summary

In the model summary below the coefficients R, indicates a very strong correlation of .759 between lean supply chain practices and Organizational performance. The R^2(also called the coefficient of determination), Value of .576(57.6%) implies relative contribution of lean supply chain practices in interpreting the organizational performance, the remaining 42.4% of the changes in the change can be attributed to other factors. The adjusted R2 is .546, which implies that lean supply chain activities can account for 54.6% of the variation in organizational performance. Although there might be many factors that can explain the variable on organizational performance, nearly 54.6% of it is explained by lean supply chain practices. This means that the remaining 45.4% of the variation in Organizational Performance cannot be explained by those dimensions lean supply chain practices.

Table 4.19; model summary

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.759[a]	.576	.546	.35488

a. Predictors: (Constant), war, sup, proc, tran, prod, cu

b. Dependent Variable: op

Source: SPSS output survey, 2020

4.3.2.2. ANOVA Model Fit

Table 4.20: ANOVA Result between Lean supply chain management and Organizational Performance

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	14.860	6	2.477	19.665	.000[b]
	Residual	10.957	87	.126		
	Total	25.817	93			

a. Dependent Variable: op

b. Predictors: (Constant), war, sup, proc, tran, prod, cu

Source: SPSS output survey, 2020

The regression model overall fit can be examined with the help of ANOVA. The F-ratio in the ANOVA table 4.20 tests whether the overall regression model is a good fit for the data. Accordingly, table 4.22 shows that the value of R and R2 found from the model summary is statistically Significant at (F=19.665), (P<0.001) and it can be said that there is a relationship between Lean supply chain management and Organizational performance.

4.3.2.3. Regression Coefficients

Table 4.21: Regression coefficients between lean supply chain management and Organizational Performance

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.562	.298		1.885	.063
	Proc	.195	.087	.206	2.238	.028
	Prod	.051	.085	.059	.596	.553
	Tran	-.018	.079	-.021	-.230	.819
	Cu	.169	.088	.189	1.918	.058
	Sup	.158	.076	.176	2.070	.041
	War	.279	.087	.341	3.199	.002

a. Dependent Variable: op

Source: SPSS output survey, 2020

Standardized Coefficients

The standardized coefficients are useful to know which independent variable is more important. They are used in comparison of impact of any independent variable on the dependent variable. As indicated in regression coefficients table lean warehouse had the highest standardized coefficient (.341) followed by lean procurement (.206). This revealed that lean warehouse practices had higher relative effect on organizational performance. Lean customer, lean supplier lean production and lean transportation are ranked from three to six respectively in their relative importance on organizational

performance. As indicated from the table 4.21 from regression coefficient table, the predictor variables of lean warehouse, lean supplier, and lean procurement practices are statistically significant in predicting organizational performance because all their p-values are less than alpha level of 0.05. However, the p-value for lean customer(0.058), lean transportation (0.819) and lean production(0.553) are greater than alpha level of 0.05, which indicates that they are not statistically significant which shows that changes in both variables are not associated with changes in the dependent variable (organizational performance).This may be due to inappropriate implementation of those lean practices as misunderstanding of lean and resistance to change were major challenges are founded in the deceptive analysis. Rono (2013) did a study at lean manufacturing practices in a continuous process industry on Bamburi Cement Limited. He pointed out that few scholars have examined the application of the lean manufacturing tools and techniques to a continuous process industry. His study found that lean manufacturing is not well implemented. Additionally, Daniel (2015) did a study on lean philosophy for global competitiveness for chemical manufacturing industries. He reveals that lean practice in Ethiopia is very poor and lean philosophy can bring for chemical industries competitiveness. But literatures showed in the second chapter of the study that lean customer, lean transportation and lean production practices were important factors of lean supply chain management practices in determining organizational performance.

CHAPTER FIVE
SUMMARY, CONCLUSION AND RECOMMENDATION

INTRTODUCTION

The study sought to establish the effect lean supply chain management on the organizational performance of FAFFA Food S.C. The seven specific objectives of the study were to analyze the effects of lean procurement on organizational performance, to explore the effects of lean production on organizational performance, to examine the effects of lean transportation on organizational performance, to assess the effects of lean warehousing on organizational performance, to examine the effects of lean suppliers practice on organizational performance, to explore the effects of lean customers practice on organizational performance, and to assess the challenges that affects the implementations of lean supply chain management in FAFFA Food S.C. The data were collected from primary sources. The primary data were generated from employees using questionnaires, Descriptive statistics, correlation and regression analysis were used for analyzing the data. This chapter provides the summary of findings with respect to the study objectives, conclusions and recommendations of the study as well as limitations and suggestions for future research.

5.1. Summary of findings

- The study established out of 94 respondents most of the respondents (72.3) have above 4 years' work experience in the organization. Additionally respondents educational background reveals that majority of them (96.7) are educated.
- In relation to lean procurement, from descriptive analysis it can be concluded that their mean score is greater than 3.5 meaning that the respondents agree with the statements of lean procurement. Under correlation analysis the result from the study shows that there is significantly moderate correlation between lean procurement and organizational Performance, with correlation coefficient of 0.537 (r=0.537) with significance value less than 0.01.The output from regression analysis shows that it is one of the strong predictors of the dependent variable which is organizational performance with beta coefficient of 0.195 at significance level .028.
- In relation to lean production, from descriptive analysis it can be concluded that their mean score is greater than 3.5 meaning that the respondents agree

with the statements of lean production. Under correlation analysis the result from the study shows that there is positive and significantly moderate relationship between lean production and organizational performance, with correlation coefficient 0.490(r=.490) with significance value less than 0.01 and it is statistically insignificant predictor of organizational performance with beta coefficient of .051 at significance level of .0.553.because of its p-value 0.553 is greater than the alpha level of 0.05 which shows that lean production is not properly addressed in FAFFA Food S.C.

- Based on the descriptive analysis, mean score of lean transportation is greater than 3.5 this means that the respondents agree with the statements of lean transportation. Based on the correlation analysis the result from the study shows that there is there is positive and significantly moderate relationship between lean transportation and organizational performance, with correlation coefficient of 0.477(r=.477) with significance value less than 0.01. In addition the regression analysis shows that lean transportation is statistically insignificant predictor of organizational performance with beta coefficient of -0.018 at significance level of 0.819.because of its p-value 0.819 is greater than the alpha level of 0.05 which shows that lean transportation is not properly addressed in FAFFA Food S.C.
- According to the descriptive analysis mean score of lean warehouse is greater than 3.5which implies the respondents agreed to the fact that lean warehousing has an effect on organizational performance. Considering the correlation analysis the result from the study shows that there is positive and significantly strong correlation between lean warehousing and organizational performance, with correlation coefficient of 0.652(r=.652) with significance value less than 0.01.the regression analysis indicates that lean warehousing is statistically significant predictor of organizational performance with beta coefficient of 0.278 at significance level of .0002.
- As in indicated in the descriptive analysis the mean score for suppliers involvement in the new product development is 2.75 this shows that supplier involvement in the new product development must be improved. For the remaining questions the mean score is above 3.5 which imply the respondents agreed to the fact that lean supplier has an effect on organizational performance.in addition the correlation analysis shows that that there is

positive and significantly moderate correlation between lean supplier and organizational performance, with correlation coefficient of 0.438(r=.438) with significance value less than 0.01 and the regression analysis indicates that lean supplier is statistically significant predictor of organizational performance with beta coefficient of 0.158 at significance level of .041.

- As indicated in the descriptive analysis scores a mean greater than 3.5, which implies the respondents agreed to the fact that lean customers are exercise in their organization. The correlation analysis shows that there is positive and significantly strong correlation between lean customer and organizational performance, with correlation coefficient of .642 (r=.642) with significance value less than 0.01.the regression analysis indicates that lean customer is statistically insignificant predictor of organizational performance with beta coefficient of 0.169 at significance level of .058. Because of its p-value 0.058 is greater than the alpha level of 0.05which shows that lean transportation is not properly addressed in FAFFA Food S.CS.
- Based on the descriptive analysis management Misunderstanding of lean (M=3.5532, S.D=1.24103) and Resistance to change (M=3.0532, SD=1.11072), their mean score is above three, are the major challenges of lean supply chain management.
- In addition the descriptive analysis indicates that quality (M=4.O851, SD=.903535),Profitability (M=3.62767, SD=.97998), growth on return on investment (M=3.6063, SD=.90483),sales growth (M=3.4681, SD=.88842), and competitive position (M=3.5404, SD=.8908) contributes to the performance of the organization a great extent and in terms of return on investment(M=3.356, SD=.901515) and market share(M=3.31385, SD=.843965) the performance of the organization is moderate.
- As indicated from output of regression analysis only three lean supply chain management practices (lean procurement, lean supplier and lean warehousing) are had a relevant effect on organizational performance. With p-value for lean customer (0.058), lean transportation (0.819) and lean production (0.553) practices are insignificant. Despite literature has outlined them as important lean supply chain management practice which shows that they are not properly addressed in FAFFA Food S.C. Additionally adjusted R^2 = .546 which revealed that the model accounts for 54.6% of the variation in organizational

performance is explained by the linear combination of all the independent variables of lean supply chain management practice. The ANOVA test result showed that R and R2 found from the model summary was statistically significant at (F=19.665), P<0.001).

5.2. Conclusions

Based on the findings presented in previous sections, the study drawn the following conclusions.

From the descriptive statistical analysis result regarding the state of lean supply chain management practice in in FAFFA the study concluded that;

- ✓ All the lean supply chain management practices (lean production, lean procurement, lean transportation, lean warehouse, lean customer and lean supplier management practices) were practiced occasionally.
- ✓ In addition, the study concluded that lean supply chain management practices contributed to FAFFA Food S.C performance to a great extent.

In relation to the relationship between lean supply chain management practices and organizational performance, the study concluded that

- ✓ There is a positive and significant relationship between lean supply chain management practices and organizational performance of FAFFA Food S.C.
- ✓ Furthermore, lean supply chain management practices namely lean production, lean procurement, lean transportation, lean supplier management practices have moderate relationship with organizational performance of FAFFA Food S.C and lean warehouse and lean customer practices have strong relationship with organizational performance of FAFFA Food S.C.

In relation to the predicting power of independent variables, the study concluded that

- ✓ The independent variables of lean procurement, lean supplier, and lean warehousing practices had predicting power on organizational performance of FAFFA Food S.C. lean transportation, lean production and lean customer practices did not have effect on organizational performance of FAFFA Food S.C. Despite literature has outlined them as important lean supply chain management practices which show that they are not properly addressed in FAFFA Food S.C.

- ✓ Regarding the lean supply chain management challenges, faced by FAFFA Food S.C, Misunderstanding of lean and Resistance to change affect FAFFA Food S.C. to a great extent.

5.3. Recommendations

Based on the above findings the study therefore recommends the following.

The findings of the study showed that FAFFA Food S.C. adopted lean supply chain management practices occasionally. Moreover, the study confirmed that lean supply chain management practices had strong positive relationship with organizational performance of FAFFA Food S.C. Therefore, the study recommends FAFFA Food S.C. to give priority and enhance the lean supply chain management practices because if FAFFA Food S.C practiced at their maximum effort, they can significantly improve its organizational performance from the current position.

In addition, the study confirmed that lean supply chain management practices namely lean procurement, lean supplier and lean warehousing practices significantly influence the organizational performance of FAFFA Food S.C The study therefore, recommends FAFFA Food S.C;

- ✓ The company might have to included strategic sourcing in its procurement planning process, might have eliminate the lead times for critical materials, create real time visibility into inventory in motion, integrate suppliers in the entire supply chain to improve customer service
- ✓ To work closely in collaboration with suppliers, gives feedback on quality and delivery to suppliers, involving suppliers in the development of new product, improve the supplier base to avoid risks and evaluate the performance of the suppliers
- ✓ Working on Minimizing the order lead time, carrying costs, decrease the rate of return and efficiently utilizes its space and machines

Further, the study established that the key lean supply chain management challenges faced by FAFFA Food S.C misunderstanding of lean supply chain management and resistance to change which shows that inappropriate implementation of lean supply chain management practices. Due to this lean production, lean customer and lean transportation became insignificant even if the literature and previous studies prove them as important lean supply chain management practices which show that they are not properly addressed in FAFFA Food S.C.

The study recommends that recommends FAFFA Food S.C to

- Forming lean supply chain management team, give training to employees about the concept and practice of lean supply chain management and collect the feedback.
- Assessing change risks, accepting the change, developing a culture of trust, transparent communication, positive interpersonal relationships
- The management should involve the employees as well as acquire more skills and knowledge about lean practices and they should review the implementation of lean practices and measure the outcomes.

5.4. Suggestion for future studies

Despite the research being able to address research questions, few areas are yet to be addressed. To begin with Lean supply chain management encompasses vast areas of managerial practices include demand management, standardization, waste management, cross-enterprise collaboration and organizational behavior. This study encompasses only Lean supply chain management practices a composition of the following six activities: Lean Procurement, Lean Production, Lean Transportation, lean customers practice, lean suppliers practice and Lean Warehousing and challenges faced during the implementation of lean supply chain management.so there is a need for further study on the above elements. Even if those lean practices studied on FAFFA Food S.C. the study suggests further studies be undertaken on other firms for comparison. Additionally, the study found that there are challenges that faced lean supply chain management, and there should be further studies undertaken how to address those challenges.

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Appendix A

ADDIS ABABA UNIVERSITY

SCHOOL OF COMMERCE

DEPARTMENT OF LOGISTICS & SUPPLY CHAIN MANAGEMENT

Dear respondent

This questionnaire is designed to undertake research on the title of **"The Effects of Lean Supply chain Management on organizational performance"** as a partial fulfillment requirement for M.A degree in Logistics & Supply Chain Management. This information is intended for academic purposes only and will be treated with confidentiality. Please complete all sections of this document. All questions are interrelated and are equally important for the study.

Finally, I would like to thank you for your concern and patience while responding to the questionnaire.

General Instruction:

- Please do not write your name or address on the questionnaire.
- please put a tick (√) mark in the appropriate box of your answer
- Contact address: if you have any question please contact me through the following addresses

Birhan Teklie

Telephone: 09 22 82 51 57

Email: birhanteklie21@gmail.com

Part One: General Information

A. Level of education

Up to grade 12 ☐ College diploma ☐ University degree ☐

Master's Degree ☐ PhD ☐

B. Department

Procurement ☐ production ☐ warehouse ☐

Transportation ☐ Management ☐

C. Years of experience at the organization:

1-3 years ☐ 4-6 years ☐ 7- 9 years ☐ Above 10 years ☐

Part Two: Research questions

Please tick appropriately the extent to which your organization has been practicing the following lean supply chain management components. (Use the scale to tick the most appropriate response)

1) To what extent does your company apply the following components of lean supply chain management practice? Use Likert scale

1) **To a very great extent 2) Great extent 3) Moderate extent 4) to low extent 5) a very low extent**

Indicators/statement		1	2	3	4	5
Lean procurement						
1	The company has included strategic sourcing in its procurement planning process					
2	The company has integrated suppliers in the entire supply chain improve customer service					
3	The company has mechanisms in place to ensure free					

	flow of information to a supply chain.					
4	My company creates real time visibility into inventory in motion.					
5	My company has minimized the lead times for critical materials					
6	The company has ensured minimum order cycle time for the reduction of cost and waste					
Lean production						
1	My company has minimized the reject ratio (amount of scrap) in order to reach profitability goals					
2	There is an increase in product flow through elimination of all non-value added activities in your company					
3	My company reduces down time to ensure that the potential return on investment is quite high					
4	My company has flexible production techniques using minimal inventories of raw materials.					
5	My company ensured that there is high Overall Equipment Effectiveness (personel, machineries….)					
6	My company minimized Takt time(the amount of time that it takes to complete a task) in order to decrease cost and waste reduction					
Lean transportation						
1	There is a relation between transportation and JIT system in your company.					
2	The company has a smooth flow of goods and services to the customer.					

3	Lean transportation planning has ensured waste reduction					
4	Production is pulled by shipment of finished goods					
5	Firm has a budget to ensure operational efficiency for transportation process					
Lean customers						
1	Customer needs are established					
2	My company assured that there is high Net Promoter Score (how likely your customers are to refer you to someone else)					
3	Only what will satisfy the customer is delivered					
4	The company assured that there is minimum First Response Time to maximize customer satisfaction					
5	My company delivers quality products to avoid returns					
Lean suppliers						
1	There is close collaborations with supplier					
2	The firm gives suppliers feedback on quality and delivery					
3	Supplier are directly involved in the new product Development					
4	The company has established processes to evaluate the performance of the suppliers					
5	My company assured there is a process for improving the supplier base with performance management to avoid risks					
Lean warehousing						
1	The company has decreased the Rate of Return to minimize cost and waste					
2	The management of the company supports lean					

	warehousing by providing enough resources					
3	The company has a distribution center.					
4	The company minimizes the Order Lead Time to achieve customer satisfaction					
5	Firm efficiently utilizes its space and machines					
6	My company decreases carrying costs(capital cost, storage cost, equipment) contributes for profitability of our organization					

Part Three: organizational performance Measures

This part of the questionnaire covers items related to organizational performance dimensions. Please put a tick (√) mark on the appropriate number to indicate the extent to which logistics management practice contribute to the organizational performance. The scale below will be applicable:

1) **To a very great extent 2) Great extent 3) Moderate extent 4) to a low extent 5) a very low extent**

Organizational Performance parameters		**1**	**2**	**3**	**4**	**5**
Return on investment		**1**	**2**	**3**	**4**	**5**
1	Rate of return on investment value					
2	Rate of return on investment Rate					
Profitability						
1	Profitability Ratio					
2	Gross profit					
3	Operating profit					
4	Net Profit					
Growth on Return on Investment						
1	Compounded Annual Growth Rate					

2	Total Return					
Market share						
1	Relative Market share					
2	Market share rate					
Sales Growth						
1	Positive sales growth					
Competitive position						
1	Better price for customers					
2	Efficiency					
3	Customer satisfaction					
4	Flexibility					
5	Competitive win rate					
Quality						
1	Quality product					
2	Quality process					

Please specify if any other organization performance measure which FAFFA Food S.C must address in order to improve its performance

……..……

……

……..

PART FOUR: Challenges facing during the implementation of lean supply chain management

2. Please indicate the levels of agreement which the following challenges affect the adoption and implementation of lean supply chain management practices in your firm kindly indicate by ticking the column that best describes your option.

1) Strongly Disagree 2) Disagree 3) Neutral 4) Agree 5) Strongly Agree

	Challenges	**1**	**2**	**3**	**4**	**5**
`1	Lack of employee training and motivation					

2	Limited resources					
3	Lack of top management commitment					
4	Negative attitude from employees					
5	Lack of clear benefits from lean supply chain management					
6	Resistance to change					
7	Cost and resources allocation					
8	Misunderstanding of lean					
9	Conflict with other initiatives of the company					
10	Lack of broad organization involvement					
11	Lack of supply chain integration					
12	Limited control and in monitoring suppliers delivery time					

Thank you for your response!!!!

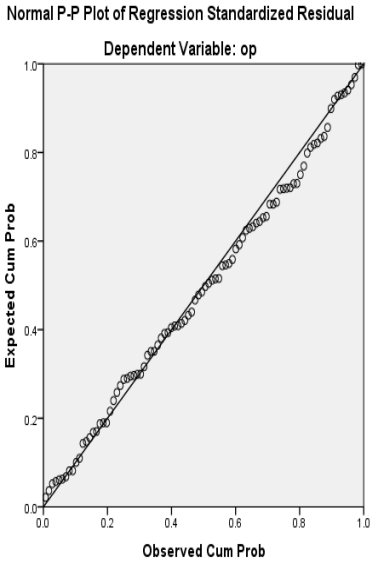
Appendix B

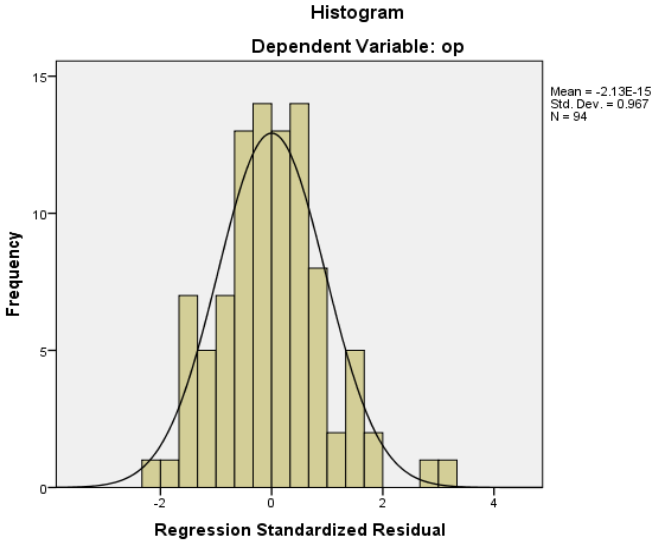
Regression Model assumption Tests

1. Normality Distribution test

Descriptive Statistics

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
Proc	94	.126	.249	-.665	.493
Prod	94	-.262	.249	-.275	.493
Tran	94	-.185	.249	-.582	.493
Cu	94	-.336	.249	-.625	.493
Sup	94	-.119	.249	.046	.493
War	94	-.296	.249	-.681	.493
Op	94	-.257	.249	-.083	.493
Valid N (listwise)	94				





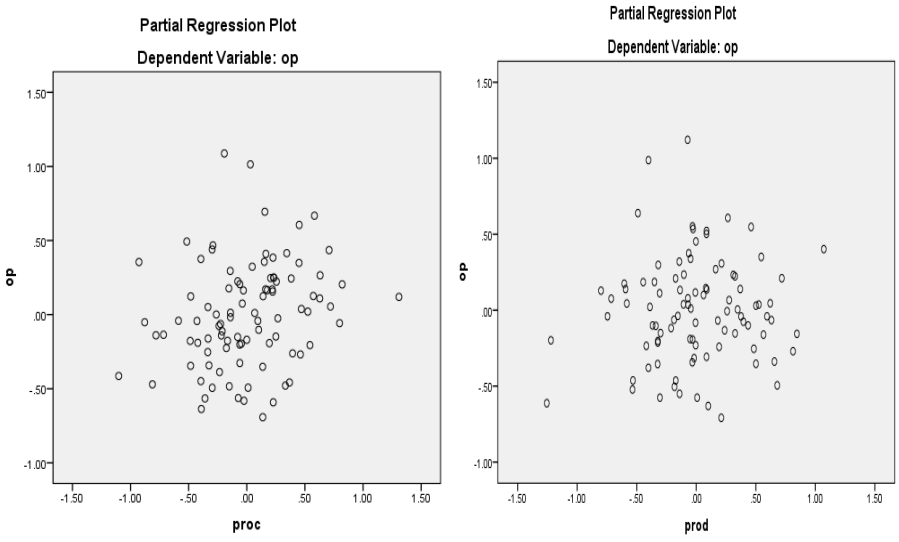
2. **Multicollinearity Test**

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.562	.298		1.885	.063		
	Proc	.195	.087	.206	2.238	.028	.578	1.729
	Prod	.051	.085	.059	.596	.553	.505	1.980
	Tran	-.018	.079	-.021	-.230	.819	.598	1.672
	Cu	.169	.088	.189	1.918	.058	.504	1.984
	Sup	.158	.076	.176	2.070	.041	.679	1.474
	War	.279	.087	.341	3.199	.002	.429	2.329

a. Dependent Variable: op

3. Linearity…



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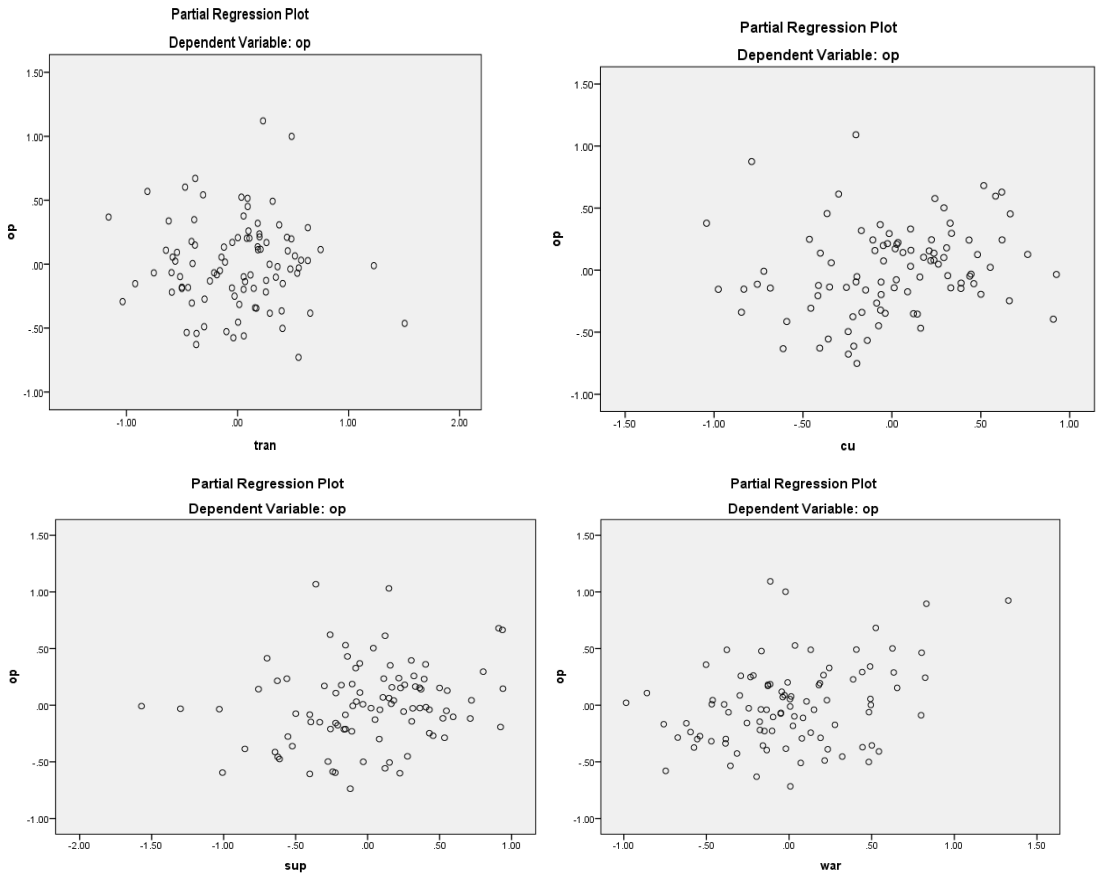

4. Homoscedasticity Test