AL al_Bayt University

Faculty of Economics and Administrative Sciences

Business Administration Department

Lean Supply Chain Management and its Impact on the Performance Quality of Jordanian Pharmaceutical Firms

(إدارة سلسلة التزويد وأثرها في جودة الأداء في شركات الأدوية الأردنية)

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جامعة آل البيت

عمادة الدراسات العليا

التفويض

أنا رجاء عبد الرحمن حسن أبو زينه أفوض جامعة آل البيت بتزويد نُسخ من رسالتي ورقياً و الكترونياً ، للمكتبات أو المؤسسات أو الهيئات أو الأشخاص عند طلبهم حسب التعليمات النافذة في الجامعة.

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أعلنُ بأني قد التزمت بقوانين جامعة آل البيت وانظمتها وتعليماتها وقراراتها السارية المفعول المتعلقة بإعداد رسائل الماجستير والدكتوراه عندما قمت شخصياً بإعداد رسالتي الموسومة بعنوان:

Lean Supply Chain Management and Its Impact on the Performance Quality of Jordanian Pharmaceutical Firms

(إدارة سلسلة التزويد وأثرها في في جودة الأداء في شركات الأدوية الأردنية)

وذلك بما ينسجم مع الأمانة العلمية المتعارف عليها في كتابة الرسائل والأطاريح العلمية. كما أنني أُعلن بأن رسالتي هذه غير منقولة أو مستلة من رسائل أو أطروحات أو كتب أو أبحاث أو أي منشورات علمية تم نشرها أو تخزينها في أي وسيلة اعلامية، وتأسيساً على ما تقدم فأنني اتحمل المسؤولية بأنواعها كافة فيما لو تبين غير ذلك بما فيه حق مجلس العمداء في جامعة آل البيت بإلغاء قرار منحي الدرجة العلمية التي حصلت عليها وسحب شهادة التخرّج مني بعد صدورها دون أن يكون لي الحق في التظلم أو الأعتراض أو الطعن بأي صورة كانت في القرار الصادر عن مجلس العمداء بهذا الصدد.

التوقيع:

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Committee Decision

This Thesis (Lean Supply Chain Management and Its Impact on the Performance of Quality in Jordanian Pharmaceutical Firms) was successfully Defended and Approved on 28/ 12 / 2017.

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Dedication

I Wish to dedicate this work

TO My Parents …

TO My Brothers and Sisters …

And TO All My Academic Staff and Friends…

Acknowledgement

First and Foremost, I would like to thank Allah for giving me patience, strength and ability to continue my higher education and for making the accomplishment of this study possible.

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Meaning	Abbreviation
Supply Chain	SC
Supply Chain Management	SCM
Lean Supply Chain	LSC
Lean Supply Chain Management	LSCM
Lean Supply Chain Management Practices	LSCMP
Sales and Operations Planning	S&OP
Performance of Quality	POQ
Continuous Improvement	CI
Toyota Production System	TPS
Non Value Added	NVA
Value Added	VA
Lean Practices	LPs
Just in Time	JIT
Lean Manufacturing	LM
Research and Development	R&D

Good Management Practices	GMP
Good Transportation Practices	GTP
Good Distributed Practices	GDP
International Organization for Standardization	ISO
Statistical Package for Social Sciences	SPSS
Supply Chain Operations Reference	SCOR
Abdullah II Ibn Al-Hussein Industrial Estate	AIE
Value Stream Mapping	VSM
Total Productive Maintenance	TPM
Lean Production	LP
Kolomogrov-Smirnov Z	K-S
Variance Inflation Factor	VIF

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Lean Supply Chain Management and its Impact on the Performance Quality of Jordanian Pharmaceutical Firms

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Abstract

This study aimed to identify the extent of adaption lean supply chain management practices in Jordanian Pharmaceutical Firms which located in Abdullah II Ibn Al-Hussein Industrial Estate (AIE) and its impact on performance of quality. seven variables were selected to be studied, they represent the lean supply chain management practices, these variables are waste reduction, continuous improvement, demand signal, sales and operations planning, inventory management practice, production process standardization, and value-added activities. The instrument used in this study was structured survey questionnaire .150 questionnaires were distributed to those who occupy either supervisory or managerial positions in all departments in a firms and who qualified enough to give accurate, unbiased answers and response to these question, Out of which 120 were retrieved, only 112 were valid for conducting data analysis, which representing 74.6% response rate.

The findings indicate that there is statistically significant impact of lean supply chain management in all its dimensions on performance of quality. Sales and operation planning was the most highly impact, while continuous improvement was less impact. The study recommends that continuous efforts from managers are required to apply appropriate implementation lean practices to enhance overall performance, the management of these pharmaceutical firms needs to invest more on skill and knowledge acquisition on the management of the lean supply chain which helps them to face the competitive business environment efficiently and effectively. Also, the study recommends that the Jordanian pharmaceutical companies should adopt benchmarking techniques from leading LSC companies to improve the reputation and quality of Jordanian pharmaceutical products.

Keywords: lean supply chain management, performance of quality, pharmaceutical Firms, Jordan.

إدارة سلسلة التزويد وأثرها في في جودة الأداء في شركات الأدوية الأردنية

إعداد:

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الملخص

هدفت هذه الدراسة الى التعرف على مدى تبني ممارسات إدارة سلسلة التزويد الرشيقة في شركات الأدوية الأردنية التي تقع في مدينة الملك عبدالله الثاني الصناعية واثرها على اداء الجودة . تم اختيار سبعة متغيرات لتعبر عن ممارسات ادارة سلسلة التزويد الرشيقة وهي : الحد من الهدر ، التحسين المستمر، تخطيط الطلب ، تخطيط المبيعات والعمليات، ممارسات اداره المخزون ، توحيد العمليات الانتاجيه ونشاطات اضافه القيمة . تم تصميم الاستبيان وتوزيعه على 150 موظف في الأدراة العليا والوسطى المؤهلين لاعطاء اجابات دقيقة وغير متحيزة ، تم استرجاع 120 استبيان ، حيث بلغ العدد النهائي للأستبيانات الصالحة للتحليل 112استبانا. وهو ما يمثل معدل استجابة قدره 74.6 في المائة . وأظهرت النتائج أن هناك أثر ذو دلألة احصائية لممارسات إدارة سلسة التزويد الرشيقة بكل ابعادها على أداء الجودة ، حيث أن التخطيط للمبيعات والعمليات كان له الأثر الاكبر ، بينما التحسين المستمر هو الأقل تاثيرا . وبناءا على نتائج الدراسة ، تم تقديم التوصيات التالية : الحاجة الى الجهود المستمرة من قبل مدراء هذه الشركات لتطبيق ممارسات التزويد الرشيقة المناسبة لتحسين الأداء الكلي لشركة .

وأنه ينغي على هذه الشركات استثمار المزيد في تطبيق ممارسات إدارة سلسلة التزويد التي تساعدها على مواجهة بيئة الأعمال التنافسية بكفاءة وفعالية ، وينغي ايضا على هذه الشركات تبني وتطبيق اسلوب المقارنة مع الشركات الرائدة في ممارسة وتطبيق هذه الممارسات مما ينعكس على سمعة وجودة منتجات شركات الأدوية الأردنية.

الكلمات المفتاحية : إدارة سلسلة التزويد الرشيقه ،أداء الجودة ،شركات الأدوية, الأردن.

CHAPTER ONE
GENERAL FRAMEWORK OF THE STUDY

1.1 Introduction

Intensive competition in the business world, rapid technological changes, advances in manufacturing and information technology, changing customer requirements, and globalization of markets are forcing organizations to find and adopt improvement practices that enable them to deliver high quality products at a lower cost and in a shorter period of time, and enable them to be more flexible and adapt more quickly to these changes that make them stand out and gain a competitive advantage in the dynamic global market. So, a lean initiative is to consider one of the most effective improvement practices toward achieving these goals.

Lean philosophy (concept), which originates from the Toyota Production System (TPS), is purely about creating more value for customers by eliminating an activity that is considered waste. Hence, any activity or process that adds cost or time without creating value becomes the target for elimination. Lean philosophy is one of the initiatives that many large companies all over the world have been trying to adapt to simplify the production process, to achieve optimal resource (Schonberger, 2007; Womack et al., 1990), and to remain competitive in the expanding global market.

Therefore, major businesses around the world have been trying to reduce the total cost and wastes across their supply chain to remain competitive in the expanding global market. Suppliers, manufacturers, distributors, retailers, wholesalers, third party service providers (3PLs)

and every party involved in the supply chain are under pressure to reduce their costs, time and inventories to continue to be profitable while still meeting their customer's demands. So, the best way for them to achieve this is to implement lean supply chain management (LSCM).

Like many of today's organizations pharmaceutical industry in Jordan struggle for maintaining its competitive position in the marketplace and strive to achieve the triple aim of providing care, enhancing health, and maintaining low cost, As a result of globalization and information and communications technologies that forced them to enter a new markets, adopt different operations strategies (Al-jawazneh, 2015a). Thus these companies have been trying to introduce their products as a symbol of quality and excellence.

Therefore, pharmaceutical firms may adapt Lean Supply Chain Management (LSCM) to improve the performance of quality, sustain, and remain competitive. Smadi (2012) remarked that lean supply adoption can be one of the solutions for Jordan's firms to be competitive on the global level.

There is little documentation regarding LSC and its implementation in the middle east in general and in Jordan in particular, and therefore identifying the necessity of its implementation was identified as a gap in the existing literature. This research provides insightful information on lean supply chain practices and its impact on the performance of quality in pharmaceutical firms. So, LSCM considered as one of the emergent fields of research and one of the new founded concepts that need more effort to understand and then implement.

1.2 Research Problem & Questions

Pharmaceutical companies in Jordan have witnessed an impressive growth during the past five decades. Where it now becomes a leading industrial sector in the country, also considered as the second largest exporting industry in Jordan, in which the total exports are 626 million JD in 2014(Annual Report of Jordan Kuwait bank (JKB)). The growth strategy for the Jordanian pharmaceutical firms is to build a strong and diverse products portfolio, to expand its geographic reach, to develop and leverage its global research and development capabilities and sourcing strength, and to continue maintaining its world-class manufacturing standards.

These pharmaceutical manufacturing firms generate a variety of wastes during manufacturing, maintenance and transporting operations which poses significant health problems. and due to the importance of minimizing the process's wastes, intensive global competition, rapid changes in the products and advances in manufacturing, and in order to remain such a strategy succeeding . Therefore, these companies aim through supply chains to reach the leading positions in the quality of their products in a short period of time. Thus, managers and owners of Jordanian pharmaceuticals are looking for implementing lean practices across all their supply chain members.

The problem of the study appears through the following questions:

1) Is there any impact of LSCM practices (waste reduction, continuous improvement, demand signal, sales and operations planning, inventory management practice, production process standardization, value-added activities) on performance in terms of quality in Jordanian pharmaceutical firms?

2) To what extent pharmaceutical firms in Jordan implement lean supply chain management practices?

3) What is the level of quality provided in the Jordanian pharmaceutical firms?

1.3 Research Objectives

The general objective of the study was to explore lean supply chain management and its impact on the performance of quality in the Jordanian pharmaceutical firms. The specific objectives of this study were:

To identify the extent to which LSCM practices are adopted by pharmaceutical firms in Jordan.

To identify the level of quality provided in Jordanian pharmaceutical firms.

To examine whether LSCM practices have a significant impact on performance in terms of quality in Jordanian pharmaceutical firms.

To provide the decision maker with some recommendations according to the study.

To assess the level of practice of each LSCM elements in Jordanian pharmaceutical firms.

1.4 Research Significance

Lean supply chain management (LSCM) has become a valuable way to reduce wastes found anywhere in the supply network, standardize processes across traditional and vertical organisations, and optimize core resources (Ross, 2016).

Thus, the importance of this research stems from the following:

The researcher is aware that there is a lack of studies addresses LSCM and its impact on the performance of quality in Jordanian pharmaceutical firms.

The researcher hopes that this study will contribute to the literature by providing deep insight and more knowledge in understanding the impact of LSCM on the performance of quality. As well as, researchers will use this study for reference on future research.

The study shed lights on the importance of pharmaceutical firms which is one of the keys sources of the Jordanian economy that aids to improve economical.

The expected research finding results to contribute to better understanding of LSCM and its impact on the performance of quality in Jordanian pharmaceutical firms; that would help various shareholder to make a lean strategic decision in the different department to sustain a company in the competitive level .

This study will be useful to the manufacturing industries as it will help them to know how to apply lean supply chain management in their processes. Also, it will bring into their awareness of the challenges that they are to meet and plan how to mitigate them.

Provide companies with recommendations and suggestions that might benefit them in creating and maintaining a competitive edge.

1.5 Research Hypotheses

The study aims to study the following hypotheses:

The First Main Hypotheses H01: There is No Significant Impact of Lean Supply Chain Management Practice on the Performance of Quality in Jordanian Pharmaceutical Firms at ($\alpha \leq 0.05$) level.

The main hypotheses are divided into the following sub-hypotheses:

H01.1: There is no significant impact of lean supply chain management practice (waste reduction) on the performance of quality in Jordanian pharmaceutical firms at ($\alpha \leq 0.05$) level.

H01.2: There is no significant impact of lean supply chain management practice (continuous improvement) on the performance of quality in Jordanian pharmaceutical firms at ($\alpha \leq 0.05$) level.

H01.3: There is no significant impact of lean supply chain management practice (demand signal) on the performance of quality in Jordanian pharmaceutical firms at ($\alpha \leq 0.05$) level.

H01.4: There is no significant impact of lean supply chain management practice (sales and operations planning) on the performance of quality in Jordanian pharmaceutical firms at ($\alpha \leq 0.05$) level.

H01.5: There is no significant impact of lean supply chain management practice (inventory management practice) on the performance of quality in Jordanian pharmaceutical firms at ($\alpha \leq 0.05$) level.

H01.6: There is no significant impact of lean supply chain management practice (production process standardization) on the performance of quality in Jordanian pharmaceutical firms at ($\alpha \leq 0.05$) level.

H01.7: There is no significant impact of Lean supply chain management practice (value-added activities) on the performance of quality in Jordanian pharmaceutical firms at ($\alpha \leq 0.05$) Level.

1.6 Research Model

According to the problem of the study and review of the previous related literature. The following variables were identified:

The Independent Variable in this study is Lean Supply Chain Management (LSCM) in the following dimensions: (waste reduction, continuous improvement, demand signal, sales and operations planning, inventory management practice, production process standardization, value-added activities).

The Dependent Variable is the Performance of Quality (POQ).

The conceptual framework of the study was developed based on (Manzouri at el., 2014), Shown in the figure (1.1) below.

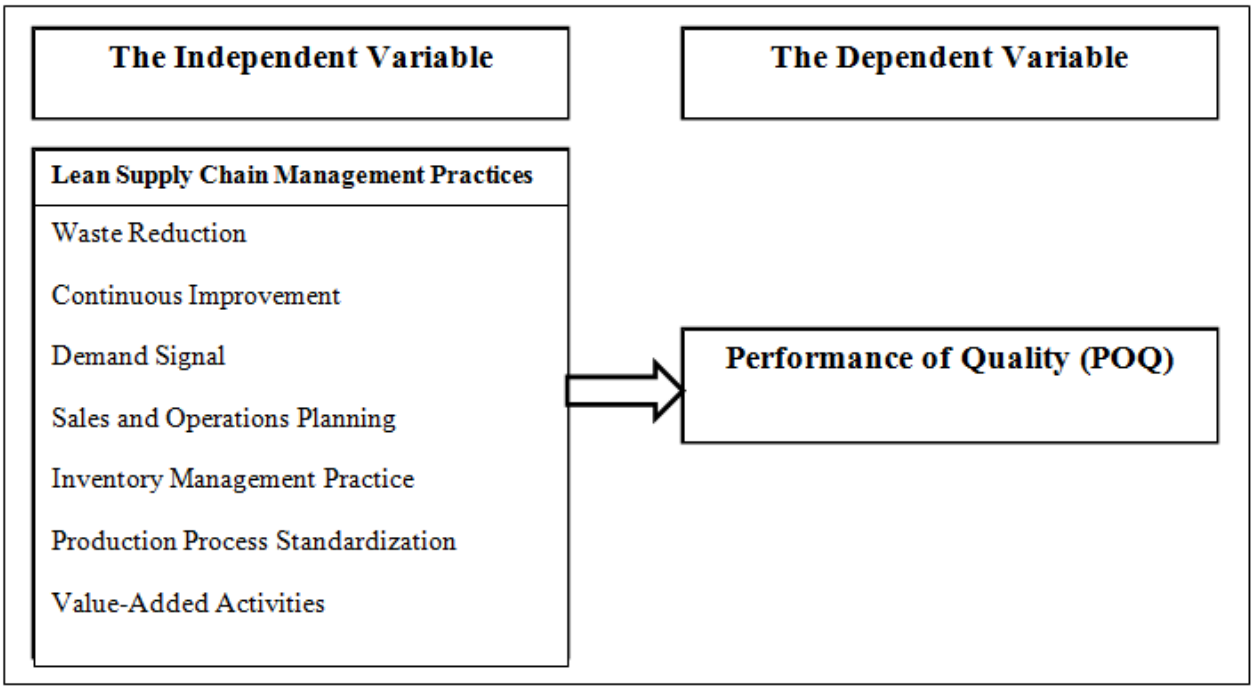


Figure (1.1): Research Model, Source: Prepared by the researcher using a study (Manzouri, et al., 2014),(Wee & Wu, 2009),(Farah, 2015).

1.7 Operational Definitions of the Study Variables

The Operational definitions below developed based on the literature review that was conducted for this research.

1.7.1 Independent Variables Definitions:

Lean Supply Chain Management (LSCM)

Is a new way of thinking that aims to satisfy the customer demand through waste elimination and continuous improvement, Simply lean means to create more value for customers with fewer resources. The term “lean” means a series of activities or solutions to eliminate waste, reduce non-value added (NVA) operations, and improve the value added (Wee & Wu, 2009).

Waste Reduction

Is defined as the process and the policy of reducing the amount of waste produced by an entity and an efforts to minimize resource and energy use during manufacturing (Ochiriat el.,2015). This variable was measured through items (1-8) in the questionnaire.

Continuous Improvement

Continuous Improvement (CI) or Kaizen is an ongoing effort to improve products, services, or processes.CI is one of the important alternatives to improve organizational performance. This variable was measured through items (9-12) in the questionnaire.

Demand Signal

Concerned with balancing the requirement of customers with supply chain capabilities. This variable was measured through items (13-18) in the questionnaire.

Sales and Operations Planning(S&OP)

is a process where executive level management regularly meets and reviews projections for demand, supply, and the resulting financial impact. This variable was measured through items (19-25) in the questionnaire.

Inventory Management Practice

Is a set of techniques and practices that are used to manage the inventory levels and stock with minimum cost and high service level within different companies in a supply chain. This variable was measured through items (26-31) in the questionnaire.

Production Process Standardization

Standardization is the process of implementing and developing technical standards in production processes across the supply chain that means unify the procedures of the production process.This variable was measured through items (32-37) in the questionnaire.

Value-Added Activities (VA)

Value-Added Activities are a business activity that improves a product or service at a cost that the customer is willing to pay. Another definition is an activity that increases the value of a product at a given stage in a production cycle or supply chain. This variable was measured through items (38-41) in the questionnaire.

1.7.2 Dependent Variables Definition

Performance of Quality (POQ)

A numerical measurement of the performance of an organization, division, or process. quality of performance can be accessed through measurements of physical products; a statistical sampling of the output of processes, or through surveys of purchasers of goods.This variable was measured through items (42-46) in the questionnaire.

1.8Limitations of the Study

The study has several limitations, which can be summarized as follows:

Lack of cooperation from some firms to answer the questionnaires to avoid bear responsibility.

The study also covers only pharmaceutical firms in Jordan, which means the findings and conclusions, can be only applied to the target population of the study.

This study is considered as one of the earliest studies of its kind that explores an issue such as lean supply chain management in Jordan, thus the researcher had difficulty in finding a similar studies which have been applied to similar or different industries or countries. Therefore, The researcher relied mostly on related studies on the topic of lean production.

1.9 Research Outline

In order to achieve the aforementioned objective, this study is structured into five chapters; the first Chapter, which is current introduction chapter, presents the research question in addition to the research problem, objectives, importance, as well as the model.

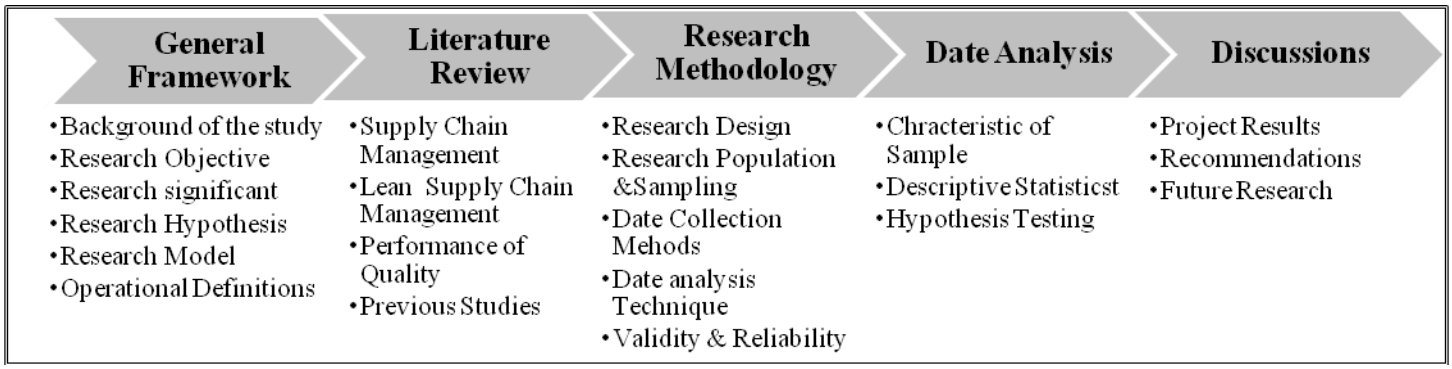
Chapter 2: is the Literature Review, which presents a comprehensive and extensive review of the prior and latest studies that used to support the improvement model. Also, define the main concepts that used in this study.

Chapter 3: is the Methodology, which focuses on the research design and approach undertaken as well as the methodology employed to test the hypotheses and data collection tools, techniques, and population and sample of the study.

Chapter 4: is the Data Analysis, which describes the characteristics of the sample including response rate and demographic characteristic of participating respondent and companies. Also, the descriptive statistics of the study variable will be discussed .in the end of this chapter; the result of testing the research's hypotheses will be presented.

Chapter 5: concerns in discussing the results of data analysis, draw a conclusion, practical recommendation for manufacturing companies, and finally suggest a number of future research. The following figure (1.2) summarized the thesis structure.

Figure (1.2): Outline of the thesis



Source: the researcher (2017)

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter explains some concepts that are relevant to the thesis. The covered areas are supply chain concept, supply chain management, lean concept, lean supply chain management concept, lean principles, practices, tools and techniques, and performance of quality, As well as benefits and challenges of adopting lean supply chain management. At the end of this chapter is illustrated the outline of the theories and previous studies.

2.2 The Supply Chain Concept

2.2.1 Overview of Supply Chain Concept

A supply chain is a collaboration of a network of retailers, distributors, transporters, storage facilities, and suppliers that participate in the production, delivery, and sale of a product to the consumer (Kouveliset al., 2006). Beamon (1998) defined supply chain as "An integrated process of various business entities working together to acquire and transform raw materials and deliver value-added products to customers ". According to Agarwal and Shankar (2002) a supply chain is an inter-linked set of relationships connecting customer to supplier, perhaps through a number of intermediate stages such as manufacturing, warehousing and distribution processes.

A studys conducted by (Swaminathan & Tayur, 2003; Beamon, 1998), showed that supply chain consists of a set of business entities that are involved in the design and development of new products and services, their manufacture through procurement of raw materials and transformation to finished goods, and the distribution of goods to end customers .A concise definition for supply chain can be found in Hugos's book titles "Essentials of supply chain management ": "A supply chain consists of all stages involved, directly or indirectly, in fulfilling a customer request. The supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves".(Hugos, 2011).

Another definition of supply chain as "The global network used to deliver products and services from raw material to end customers through an engineered flow of information, physical distribution and cash".—APICS Dictionary, 12th edition. A supply chain may be considered to be a set of linked processes connecting downstream customers to upstream suppliers, factories, distribution centres and retailers (Chan & Lee, 2005).

2.2.2 Supply Chain Members & Their Roles

In any given supply chain there is some combination of companies who perform different functions. The companies are producers, distributors or wholesalers, retailers, and companies or individuals who are the customers, the final consumers of a product.

According to (Beamon, 1998; Chopra & Meindl, 2001; Stevens, 1989), supply chain scope or members are: raw material suppliers, manufacturers, retailer/ wholesalers distributors, and end customers.

The supply chain is characterized by its members and various functions performed by the members. The members of a supply chain and their functions may vary for different organizations. The figure (2.1) below shows the members of sample supply chain and their functions.

Suppliers: Suppliers are the supply chain members who supply raw materials or components to the manufacturers or focal organizations for value creation (Ugochukwu et al., 2012). The suppliers ensure that the required quantities of products are delivered to manufactures at the correct time and quality, obtain information from manufacturing about its requirements and work to satisfy the requirements.

Manufacturing (Focal Organization): Focal organizations occupy central role or critical position in the supply chain as product or service originators (Ross, 2013). Its produce the core values or products for the end customers, and it undertakes production of goods and services, product development, supplier management.

Distributors: Supply chain members that ensure delivery of products from focal organizations to the customers. There are two type of distribution are wholesale or retailer. Their activities involve inventory, warehouse and transport management (Hugos, 2011).

Customers or Consumers: are any organization that purchases and uses a product (Hugos, 2011). They contribute to the capital flow within the supply chain by purchasing the products or services. Their feedbacks to the focal organizations help for improvements.

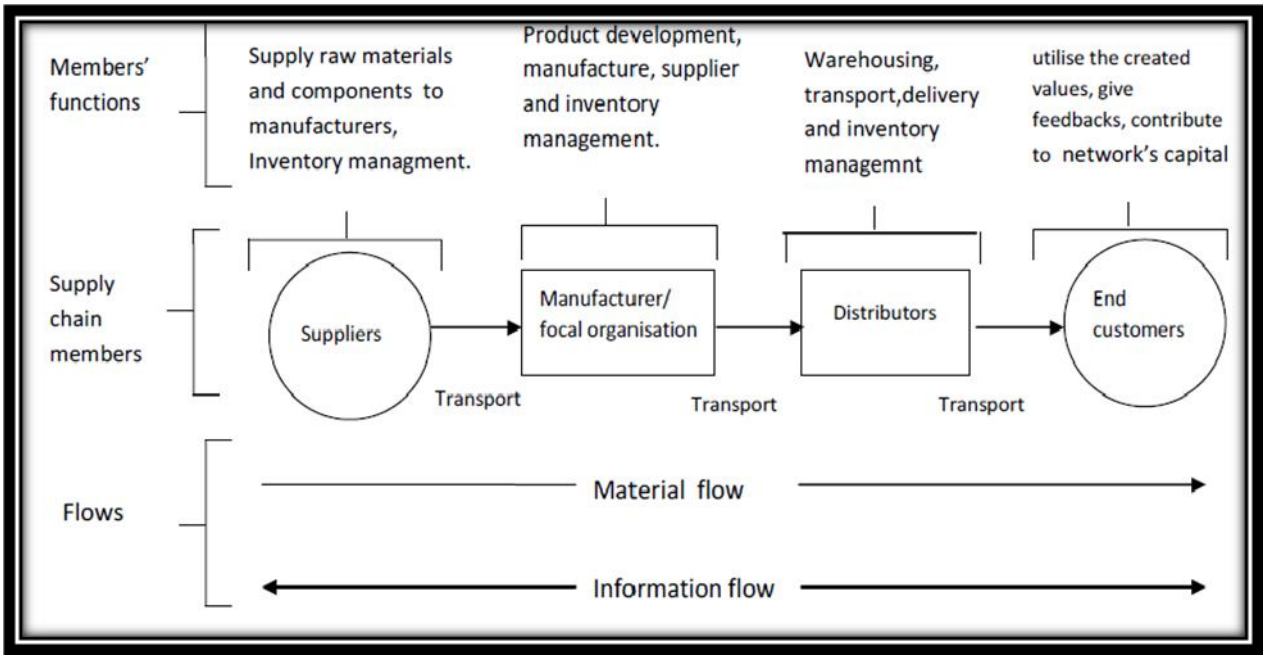


Figure (2.1): Supply Chain Scope and Functions. Sources: (Beamon, 1998)

Within the supply chain, Information flow in the supply chain network follows two ways: upstream to downstream and downstream to upstream. While, materials flow from upstream (supplier) to downstream (end customer) involve the flow of raw materials and components to the focal organization, finished or semi-finished goods flow from the focal organization to distribution centers or warehouse. Then, the goods flow from the warehouse to the end customers.

2.2.3 Functions within the Supply Chain

The functions being performed within the supply chain in order to achieve the aim of the network include: marketing, product development, supplier management, production management, inventory management, demand management, and flow management (Beamon, 1998; Ross, 2013).

2.2.4 Supply Chain Strategies

Supply chain strategies can be divided roughly into three different categories. One is lean supply chain strategy, the second strategy is agile supply chain, and the third category is a combination of the lean and agile supply chain which is called leagile (Hybrid) supply chain.

2.2.4.1 Lean Supply Chain Strategy

Lean Supply Chain is a term referring to supply chain where all waste, i.e. non-value added activities which do not give any value to the customer are eliminated. Main benefits are low costs and high quality. A lean supply chain, which employs continuous improvement efforts which focuses on eliminating waste or non-value steps along the chain (Vonderembse et al., 2006).

2.2.4.2 Agile Supply Chain Strategy

An agile supply chain, which responds to rapidly changing, continually fragmenting global markets by being dynamic, context-specific, growth-oriented, and customer focused (Lee, 2004; Vonderembse et al., 2006). Agile strategy focus on inducing velocity and flexibility in the manufacturing supply chain.

2.2.4.3 Leagile (Hybrid) Supply Chain Strategy

Leagile supply chain is a concept where best parts of lean and agile supply chain are combined. The leagile supply chain enables the upstream part of the chain to be cost-effective and the downstream part to achieve high service levels in a turbulent market (Christopher & Towill, 2001). The leagile strategy has many benefits compared to lean or agile strategies.Goldsby et al. (2006) Point out that the leagile strategy holds less raw material inventory costs than the pure agile or lean strategies and this is directly proportional to the operational benefits. The table (2.1) below summaries the three types of supply chain strategies.

Table (2.1): Main differences between lean, agile and hybrid supply chains.

	Lean supply chain	Aglie supply chain	Hybrid supply chain
Purpose	Focus on cost reduction and flexibility for already available products. Employs a continuous improvement process to focus on the elimination of waste or non- value added activities	Responding to rapidly changing, continually fragmenting global markets by being dynamic and context specific ,aggressively changing and growth oriented.	The combination of lean and agile paradigms within a total supply chain strategy by positioning the decoupling point so as to best suit the need for responding to a volatile demand downstream yet providing level scheduling upstream from the marketplace.
Typical Product	Commodities	Fashion goods	mixed
Product Variety	low	High	Use modular design in order to postpone product differentiation for a long as possible.
Product Life cycle	Long > 2 years	Short (3 months - 1 years)	Assemble to order products, which stay in the maturity phase of life cycle for a long time.

Demands Patterns	Demand accurately forecasted	Demand unpredictable	The average product demand can be forecasted .the component level forecasting may involve larger errors.
Alliances	Traditional	Dynamic	Strategic
Markets	Stable, serve only the current market segments	Unstable, acquire new competencies, develop new product lines ,and open up new markets.	Respond to customer requirements with innovative features in existing products.

Source: (Mason et al., 2000; Vonderembse et al., 2006)

2.3 Supply Chain Management (SCM)

2.3.1 Overview of Supply Chain Management (SCM)

Supply Chain Management (SCM) is an integrated philosophy to manage the flow of materials, information, and funds across the entire supply chain, from suppliers to component producers to final assemblers to distribution (warehouses and retailers), and ultimately to the consumer (Ellram & Cooper, 1990; Houlihan, 1988; Tyndall et el., 1998). SCM refers to the set of decisions , activities and approaches efficiently used to integrate suppliers, manufacturers, warehouses, and distributors so products are produced and shipped to the right locations at the right time in order to minimize overall costs while still meeting the service level requirements (Simchi et al., 1999; Singh et al., 2013).

SCM can be defined as “the management of the interconnection of organizations which relate each other through upstream and downstream linkages between the different processes that produce value in the form of products and services to the ultimate consumer (Williamson et al., 2004).

In today’s uncertain and fast moving business environment supply chain management is playing an important role in the success of a firm’s product and market growth strategy (Sharifi et al., 2013), SCM considered as one of the key areas to determine the success and failure of the organization with respect to customers (Christopher & Towill, 2001; Johnson & Pyke, 2000; Jørgensen & Emmitt, 2009). According to Agus and Shukri Hajinoor (2012), SCM seeks to enhance performance by closely integrating the internal functions within a company and effectively linking them with the external operations of suppliers and chain members.

2.3.2 Supply Chain Process

The supply chain is not a chain of businesses with one to one, business to business relationships, but a network of multiple businesses and relationships. That means SCM deals with total business process excellence and represents a new way of managing the business and relationships with other members of the supply chain. For SCM to be successfully implemented, it requires a shift from managing separate functions to integration activities into key supply chain processes (Lambert, 2008; Lambert & Cooper, 2000). The key supply chain processes are: procurement, order fulfilment, demand management, returns management, customer service management, manufacturing flow management, customer relationship management, product development and commercialization.

2.3.3 Reasons of Supply Chain Management Adoption

Supply Chain Management is one of the major activities which determine the success of a firm (Pettersson & Segerstedt, 2013). Also, SCM is one of the main leverage for companies to achieve their competitive advantage and improve their performance (Ou et al., 2010), SCM considers as a very effective approach that helps to overcome the obstacles that face the organization in sourcing, customer service, demand flow and distribution.In Stevenson's book lists the benefits of effective supply chain management to be lower inventories, lower costs, higher productivity, shorter lead times, higher profits, and greater customer loyalty (Stevenson & Hojati, 2007). According to Kazemkhanlou and Ahadi (2014) "the effective supply chain management has been associated with a variety of advantages including increased customer value, increased profitability, reduced cycle times and average inventory levels and even better product design".

2.4 Lean Supply Chain Management (LSCM)

2.4.1 Overview of Lean & Lean Supply Chain Management Concept

The lean concept originated from toyota motor company, Japan, and it was known as Toyota Production System (TPS) (Shah & Ward, 2007), which was developed in the 1950s after world war II and the concept was introduced as an alternative to mass production techniques in the toyota factory and led to increased productivity and quality levels by allowing the flexibility of "skilled" production with the volume efficiencies of "mass" manufacturing.

The concept of lean management was first coined by (Womack et al., 1990). It was first appeared in their book named "The Machine that Changed the World". According to Shah and Ward (2007) describe lean as a management philosophy that is concerned with identification and elimination of waste (or "Muda" in Japanese) within and beyond an organization's products value chain.

Lean is a production philosophy, which considers that any activity which consumes resources but not create value for the end customer is wasteful, and therefore should be eliminated (Antony, 2011; Shah & Ward, 2007; Womack et al., 1990). But the authors (Brandao de Souza, 2009; Rossiter et al,. 2011; Young & McClean, 2009) defined lean as "an improvement philosophy that focuses on continual improvement of a process by removing waste, increasing efficiency and providing a higher quality product or service".

Wee and Wu (2009) Concluded that the term lean means a series of activities or solutions to eliminate waste, reduce non value- added operations and improve the value-added operation. This value-added and non-value added concept were derived mainly from Toyota Production System (Liker, 2004). Keep in mind that, The VA activities are those that customers are willing to pay money for tangible goods or intangible functions. While, the NVA includes the wastes of TPS.

The term lean means getting rid of what is unneeded, in other words, lean means to keep inventory, waste, defects, and time required, at the minimal level (Smadi, 2012). A study conducted by Karim and Arif-Uz-Zaman (2013) Showed that lean thinking starts with customer demands and finishes with delivering values to customers removing possible wastes and NVA activities.

Liker (2004) Noted that the heart of lean can be seen as eliminating waste. Also, the lean concept was defined by Holweg (2007) as: "an operational practice that considers the expenditure of resources for any goal other than the creation of value for the end customer to be wasteful, and thus a target for elimination". Another definition of lean is about doing things in less time, inventory, space, people, and money (Agus & Shukri Hajinoor, 2012).

After that, the best defined of waste is as anything that consumes resources but does not contribute to creating value for the customer (Clark et al., 2013). While MacDuffie and Helper (1997) Defined waste as anything that interferes with the smooth flow of production. Also, viewed waste is as any use or loss of resources that does not lead directly to creating the product or service a customer wants when they want it.

There are seven categories of wastes are defined by (Ohno, 1988) namely: overproduction, inventory, the transportation of materials, unnecessary movements by employees during their work, waiting for the next process step, the production of defective products and the over processing of parts due to the poor tool and product design. While (Liker, 2004; Monden, 2011), highlighted the eight wastes in TPS are overproduction, waiting, conveyance, over processing, excess inventory, movement, defects, and unused employee creativity, and the biggest one being overproduction. These wastes, which are defined from the perspective of manufacturing, are relatively easy to identify and quantify.

Womack et al. (1990) Showed that lean has several features:

Lean is a dynamic process of change driven by a systematic set of principles and best practices aimed at continuously improving;

Lean refers to the total enterprise, from the shop floor to the executive suite, and from the supplier to customer value chain;

Lean requires rooting out everything that is non-value-added; and

Becoming lean is a complex business; there is no single thing that will make an organization lean.

Also, Hu et al. (2015) listed some of the common features that characterize lean as follows:

Continuously identifying and focusing on customers' values;

Aligning the purpose of core and support processes around providing these customer values;

Continually improving the foundations required, such as developing quality, capabilities,

Developing a system-wide mentality to continual improvement,

Ensuring the entire organization is focused on efforts to support the optimization of these processes by removing wastes;

lean is characterized by the elimination of waste, low inventories, zero defects, integrated production chains, team-working and involvement of all employees and suppliers in a continuous process to improve products and job design (Norek, 2002).

In Kerber and Dreckshage (2011) paper's showed that lean philosophy seeks to focus on flowing value to the customer, eliminate waste from all processes, right size the resources (machines, material, people, time), and provide the tools for people to improve their work continually. While Liker and Wu (2006) elaborate lean as a philosophy of manufacturing that focuses on delivering the highest quality product on time and at the lowest cost.

Regardless of the how researchers defined lean, they all share common attributes. Lean is about generating more values for buyers by removing activities that are regarded waste. Simply, lean means to create more value for customers with fewer resources. Thus, any activity or process that consume resources, adds cost or time without creating value becomes the target for elimination.

(Marchwinski et al., 2003; Womack et al. 1990) showed that lean company uses "less of everything compared with mass production –half the human effort in the factory, half the manufacturing space, half the investment in tools, half the engineering hours to develop a new product, half the time, and half capital investment". The ultimate goal of a lean organization is to create a smooth and high-quality process that is able to produce finished products and provide service to satisfy customers' demand with no waste (Holweg, 2007; Zhou, 2016).

Lean, today, is recognized as being a well-respected philosophy to help organizations in their intention' to compete more successfully (Hu et al., 2015). When the concept of lean is implemented across the entire supply chain, however, it is referred to as lean supply chain (LSC). Lean in the supply chain as a supply chain management strategy aims at applying the lean concepts to the whole functions of the entire supply chain members: suppliers, focal organizations, distributors, and customers. LSC is considerv a new concept that needs more effort to be understood and implemented.

The concept of LSC was developed by Lamming (1996) who defines lean supply as "an arrangement (which) should provide a flow of goods, services and technology from supplier to the customer without waste". In a simple term, LSC can be defined as an application of LM principles to SC to integrate the activities of all the stakeholders involved in the SC network and provide 'value' to the customers by eliminating wastes (Anand & Kodali, 2008).

Vitasek et al. (2005) defined Lean Supply Chain (LSC) as a set of organizations that are linked directly by upstream and downstream flow of services, finances, products and information that collaboratively work to reduce cost and waste by efficiently and effectively pulling what is needed to meet the needs of the individual customer. Lean in a supply chain is a term that means eliminating non-useful activities through the supply chain (Singh & Pandey, 2015).

LSCM is integrated into upstream and downstream activities that may reduce demand variation by simplifying optimizing, streamlining, and creating capabilities (Martínez-Jurado et al , 2014). That means, LSC integrates all the participants in the supply chain into one value stream, increasing value to the customer.

Lean SCM provides the know-how enabling companies to tackle the difficult task of creating the strategies, developing the cross-channel plans, and optimizing the supply network's collective capabilities that will enable them to reach superior levels of performance (Ross, 2016). Goldsby et al. (2006) Claim that objective of the lean supply chain is one that produces just the right product at the right time with as little waste as possible.

Drohomeretski et al., (2014) summarized lean supply chain objectives as the elimination of sources of waste in the supply chain, improvement of customers' value delivery, supply chain partners' involvement, collaboration with suppliers and customers, in addition to the development of effective suppliers. One of the main goals of implementing a lean strategy is the elimination of everything that does not add value to the product or service (Womack and Jones, 2010). There are many areas in the supply chain where wastes can occur so LSCM is designed to eliminate waste in every area extending from production to customer relations, product design, supplier networks and factory management.

The need for lean supply chains to become responsive arises from internal factors such as target costing, use of value engineering, use of cross-functional teams, just in time and zero defective products (Lysons and Farrington, 2006) as well as external factors such as customer lead times, demand specification, product variety, product life cycle, order to delivery time and distribution lead time (Lysons & Farrington, 2006; Reichhart & Holweg, 2007).

Hines et al., (2004) explained that lean has two levels: strategic and operational. The strategic level, which involves the five lean principles or lean thinking, addresses issues of value creation and a better understanding of customer value and has unlimited applications. But operational level, which involves lean tools, techniques and equipment often associated with lean, these associated tools results in the elimination of wastes through enhancing quality, responsiveness, capacity, variability, availability and production control.

This shown in figure (2.2) below.

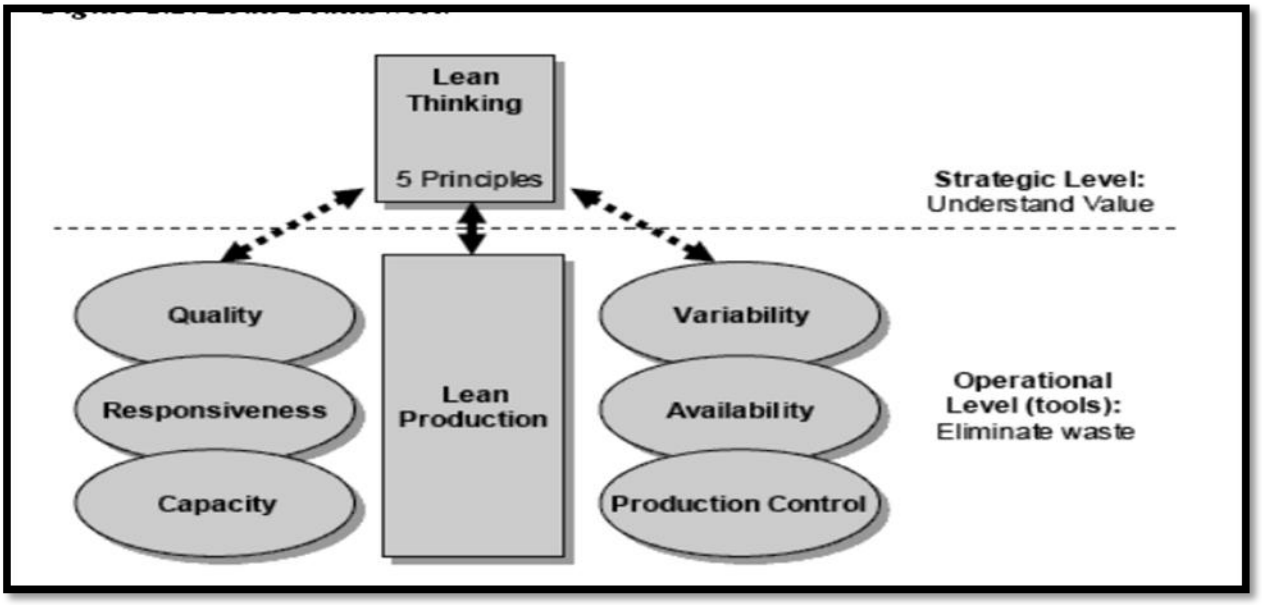


Figure (2.2): Lean Framework, Source: (Hines et al., 2004)

Lean is a management philosophy that enhances customer value through waste elimination and continuous improvement in a system by applying appropriate implementation lean principles, practices, tools, and techniques. So lean can be understood as a set of principles, practices and techniques.

2.4.2 Lean Principles

A lean philosophy designed to eliminate waste in every area extending from production to customer relations, product design, supplier networks and factory management (Karim & Arif-Uz-Zaman, 2013). This philosophy was based on lean principles that the purpose of any organization is to create value for the people it serves (its users or customers). Value is created by satisfying a need or solving a problem for the customer (Clark et al., 2013).

Five lean principles have been acknowledged according to (Womack & Jones, 1996, 2010)these principles are :

Specify what creates value from the customer's perspective,

Map value streams: Identify the value stream starting from suppliers' on the activities side to the end customers and expose waste.

Establish flow: Establishment of flow requires the organization of the system in order to avoid delays, adopt practices that will help to eliminate setbacks like scraps in the system.

Let the customer pull the products: Provide the exact amount of what is required by the customer only when it is needed.

Strive for perfection: Improve the system continuously by continuous identification of problems and solving them.

2.4.3 Lean Practices **(** LPs)

Each lean principle is implemented by applying certain practices. These practices, which are activities used to improve organizations, are implemented by a set of techniques (Dean & Bowen, 1994; Karlsson & Åhlström, 1997).

Myerson (2012) Defined lean practices as systematic and continuous strategies that aim at shortening the transaction time amid the customer's order and the package shipment to the customer by eliminating waste at the same time considering quality. While, Worley and Doolen (2006)defined lean practices as "the systematic removal of waste by all members of the organization from all areas of the value stream". lean practices identified by (Wee and Wu 2009; Zarei et al ., 2011) as: sourcing of customer need information, value stream analysis, end customers focus, waste elimination, workplace organization, strong and effective relationship, production of specific customer needs only when needed, problem search and problem-solving.

While Taylor (2006) Listed some of the practices as a part of LSC, which include: The establishment of first-tier suppliers (supplier reduction),the development of supplier associations, pull systems, the reduction of intermediary mechanisms, and closer proximity and strategic management.

The main objectives of Lean practices (LPs) is to satisfy customer demands on the highest possible level through waste reduction (Pal & Kachhwaha, 2013; Shah & Ward, 2007); to provide perfect value to the customer through a perfect value creation process that has zero waste (Rother et al., 2009), to eliminate waste in all procurement cycles, to prevent shortages, to reduce inventory investment, to reduce procurement lead time and cost, to increase inventory turnover and ensure customers satisfaction (Lewis, 2000).

2.4.4 Lean Tools & Techniques

The lean practices are supported by a set of tools and techniques which are indispensable in lean implementation. Lean tools and techniques that are systematically applied can be instrumental in defining, evaluating, and attacking sources of inefficiency in specific ways (Wong et al., 2009). These tools have enabled companies to be more flexible and more profitable (Manzouri et al., 2014). Lean techniques are detailed approaches on how to implement practices effectively (Ugochukwu et al., 2012).

Some of the widely acknowledged lean techniques/tools include: poke yoke, standardized work, setup time reduction, kanban /pull system, production leveling, just-in-time(JIT),5S/housekeeping, total productive maintenance (TPM), small lot size ,supplier involvement, employee involvement, root cause analysis (5Whys), customer involvement, value stream mapping (VSM), cellular manufacturing, kaizen/continuous improvement, and statistical quality control (Cudney & Elrod, 2011).

Lean is not only a set of tools but also a managerial approach for improving processes based on a complex system of lean concepts, principles, practices and techniques across the whole supply chain as shown in the figure (2.3).

Figure(2.3):lean principles, practice and technique .Source(Dean & Bowen, 1994; Karlsson, 1997).

Lean principles, tools and techniques have enabled organizations to become more competitive. The benefits of this application motivated managers in the expansion of lean philosophies to the entire SC, involving suppliers, distributors, producers, customers and other stakeholders in lean thinking (Afonso, 2015; Joshi, P. 2017). In the table (2.2) below summarized lean principles with corresponding practices and techniques.

Table (2.2): Lean principles with corresponding practices and techniques

Principles	Practices	Techniques
Specify value from the end customer view	Source information on customer need	Customer involvement
	Value chain analysis and end customer focus	Value stream mapping (VSM)
Map value to expose and eliminate waste	Value chain analysis	VSM
	Waste reduction	JIT,TPM,small lot size,5s
Establish flow	System organization	5s,cellurlar manufacturing
	Strong and effective relationship	Supplier integration
	Waste reduction	JIT,TPM,small lot size,5S
Let the customer pull the products	Production of exact customer needs only when needed	JIT, pull/kanban system
	Strong and effective relationship	Supplier integration
Strive for perfection	Problem search	VSM,5Whys,employee involvement
	Problem solving	Traning,5Whys, employee involvement

Source: (Ugochukwu et al., 2012).

2.4.5 Components of Lean Supply Chain Management

After explaining the definition of LSCM, the lean practices are implementing in all areas of business processes. Thus the components of lean supply chain include lean procurement, lean production, lean warehousing, and lean transportation. So, The lean supply chain system integrates all the participants in the supply chain supplier, manufacturer, and customer into one value stream, and increasing value to the customer (Sultana & Islam, 2013).

2.4.5.1 Lean Procurement

Procurement's core responsibilities have traditionally provided purchased materials and services on time, at the lowest costs, and highest quality to meet their customer demands. However, its role has expanded to play a critical part in improving the flow of information and materials throughout the entire supply chain. Designing and implementing a lean procurement process can dramatically change the way a company does business. (http://www.fourprinciples.com/solutions/lean-procurement).

Lean purchasing is the application of lean principles within the procurement part of the supply chain to help optimize the entire supply chain (Kerber & Dreckshage, 2011). Lean procurement adoption and practice help the organization have better visibility into inventory even on motion, change approach on supply chain from "push" to pull''. It also helps in eliminating long lead times.

Lean procurement is based on three core principles that are derived from demand-driven manufacturing and supply chain initiatives: migrate from "push" to "pull", develop a flexible and responsive supply chain, and eliminate all waste in the procurement cycle (oracle, 2010).

2.4.5.2 Lean Production (LP)

Every company has to invest in manufacturing management programs, methods and technologies in order to remain competitive. One very popular investment choice nowadays is lean production (LP), which consists of several manufacturing practices, including process focus, pull production, quality development, total productive maintenance, continuous improvement, worker empowerment, supplier development. The main objective of LP is to satisfy customer needs on the highest possible level through the elimination of waste.

According to Smadi (2012), Lean production is “lean” because it uses less of everything compared with the other traditional manufacturing method, such as mass production, it may use half the human effort in the factory, half the manufacturing space, half the investment in tools, half the engineering hours to develop a new product in half time. Also, it requires keeping far less than half the needed inventory on site, results in many fewer defects, and produces a greater and ever-growing variety of products.

Lean production (LP) originated from the Toyota production system (TPS) and gained ground as a best-practice manufacturing strategy and repository of increasing competitiveness in recent decades (Voss, 2005). Lean production also defined as a multidimensional approach which includes a variety of management practices that focus on quality, supplier management and reducing waste through such mechanisms as just in time (JIT), inventory management (Shah & Ward, 2003).Lean production supplies the customer with exactly what the customer wants, when the customer wants it, without waste, through continuous improvement (Smadi, 2012).

Agus and Shukri Hajinoor, (2012) indicate that lean production is a whole new way of thinking and includes the integration of vision, culture, and strategy to serve the customer with high quality, low cost and short delivery times. As well as, they argue that techniques of lean production vary from a company or country to another. however, most if not all focus on minimization and eventual elimination non-value adding activities. These include setup time reduction, continuous improvement programs (kaizen), pull production system, shorter lead time, and small lot sizes.

Lean is more than just a set of tools and techniques. It is a fundamental way of thinking about a process, which focuses on value creation and waste elimination. Hence, the effective implementation of lean production tools can give a production organization the competitive advantage in reducing and eliminating those wastes to remain functional, efficient, and profitable.

Also, Lean production makes optimal use of the skills of the workforce, by giving workers more than one task, by integrating direct and indirect work, and by encouraging continuous improvement activities. Emphasize that lean production or lean enterprise emerges when the company implements lean development, procurement, manufacturing, and distribution together.

2.4.5.3 Lean Warehousing

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). So, it means addressing and eliminating non-value added steps and waste in product storage processes. While, the warehousing functions are: receiving, put-away/storing, replenishment, picking, packing, and shipping.

A lean warehouse is a warehouse where the five lean thinking principles of Womack & Jones and a variety of lean tools are applied when we compare lean warehousing to other areas. A lean warehouse allows companies to serve customers faster with less space, less inventory, and with more accuracy (http://leanaust.com/services/lean-warehousing).

2.4.5.4 Lean Transportation

lean transportation is required when managing transportation costs in a manufacturing organization where huge inventory decisions for inbound logistics and finished goods in the form of outbound logistics have to be moved along the supply chain (Regan & Garrido, 2000).

According to Lambert and Cooper (2000) lean transport includes; core carrier programs, improved transportation administrative processes and automated functions, optimized mode selection and pooling orders, combined multi-stop truckloads, cross-docking, right-sizing equipment, import/export transportation.

2.4.6 Lean Supply Chain Management Practices (LSCMP)

Referring to Myerson (2012) who defined lean practices as systematic and continuous strategies that aim at shortening the transaction time amid the customer's order and the package shipment to the customer by eliminating waste at the same time considering quality.

While, LSCM prictices have been defined as a set of activities undertaken by an organization to promote effective management of its supply chain and encompass all activities that bring a product to market and create satisfied customers (Li et al., 2006; Musyoka, 2015).

Lean supply chain practices consider as one of the best ways to a sense of total improvements within target sectors. So, many firms have captured the benefits of practice in order to enhance quality and productivity (Al-jawazneh, 2015b).

demand management, standardization, organization behaviour and waste management were determined by (Daud, 2010; Daud and Zailani 2011; Kimani, 2013) as practices for lean SCM. while (Agus & Shukri Hajinoor, 2012) considered reduced setup time, continuous improvement programs (kaizen), pull production system, shorter lead time, and small lot size as practices for lean SCM. Lean manufacturing, lean procurement, lean supplier, lean transportation, and lean customers listed as LSCM practices by the researchers (Babu 2016; Musyoka, 2015). In addition to that, Norek (2002) study's tackled that there are four main significant practices of LSC: demand management practices, standardization practices, waste management practices and behavioural practices.

In reviewing literature, Seven distinctive dimensions are selected to measure LSCM practices; these dimensions include : waste reduction, continuous improvement, demand signal, sales and operations planning, inventory management practice, production process standardization and value-added activities (Manzouri et al., 2014). That will make the basis for this study. These seven LSCM practices are discussed in the subsections below.

Waste Reduction

The major focus in lean is the identification and elimination of waste from the whole value chain (Cudney & Elrod, 2011; Shah & Ward, 2007; Womack & Jones, 1996). Most of the activities on the implementation of lean revolve around waste elimination. Thus, the early step in the implementation of lean is through identification of waste. So, the best defined of waste is as anything that consumes resources but does not contribute to creating value for the customer (Clark et al., 2013).

While MacDuffie and Helper (1997)defined waste is as anything that interferes with the smooth flow of production. Also, Singh et al. (2013) viewed waste is as any use or loss of resources that does not lead directly to creating the product or service a customer wants when they want it. While scrap refers to defective product or material that cannot be repaired, used or sold. Melton (2005) Defined waste as an activity in a process that adds costs and time but not value to product/service from customers' view.

Toyota defines waste as; "anything other than the minimum amount of equipment, materials, parts, and working time absolutely essential to production. There are seven categories of wastes are defined by (Ohno, 1988) namely:

Over-production: production that exceeds demand. Any product that is not immediately sold, or built into the final product, takes space, reduces the financial resources.

Over-processing: it is the processing of the product that does not contribute to its value, and the buyer will not recognize it as a higher quality resulting from poor component design and poor maintenance.

Excessive Inventory: is an unnecessarily high level of raw materials, unfinished manufacturing or parts. All this increases the cost of storage as well as the percentage of defects in production.

The production of defective products: Items or products produced are below the quality standards, rework or scraping.

The transportation of materials: any movement of materials that do not add value to products.

Unnecessary movements by employees during their work: any unnecessary walking or unnecessary movements of workers or employees which hinder workers while working that reduces efficiency and productivity.

Waiting for the next process step: means idle machine time and workers who do not do anything until the part for processing arrives. This happens because of bottlenecks, bad compliance or delay in transportation.

While (Liker, 2004; Monden, 2011) highlighted the eight wastes in TPS are overproduction, waiting, conveyance, over processing, excess inventory, movement, defects and unused employee creativity, and the biggest one being overproduction. These wastes, which are defined from the perspective of manufacturing, are relatively easy to identify and quantify.

Li and Olorunniwo (2008) define waste reduction as the process and the policy of reducing the amount of waste produced by an entity. This is shared by (Wang, 2005) who added that waste reduction involves efforts to minimize resource and energy use during manufacture. Waste reduction usually requires knowledge of the production process and detailed knowledge of the composition of the waste. In any manufacturing process, there will always be wastes and scraps. Lean wastes can affect on products, and cause excessive inventory, excessive lead-time, excessive scrap and excessive transportation (Singh et al., 2013).

A simple and easy method for waste reduction is the 5S method that is a series of five main activities these activities are (sort ,sustain ,standard, shine ,and set) that systematically creates an effective workplace by discipline, cleanness and well-order, and removes unneeded items(Liker, 2004). Waste elimination also helps in cost reduction by avoiding overproduction, unnecessary transportation, inventory and processing.

Continuous Improvement

Plenert (2010) Defined continuous improvement as ‘A never-ending effort to expose and eliminate causes of problems; small-step improvement as opposed to big-step or radical improvement’.

The initial radical improvement in a process does not stop at the initial achievement; instead, it is followed by continuous incremental improvements in order to pursue perfection (Womack & Jones, 1996).The authors argue that the concept of perfection in lean thinking refers to endless improvement. Thus, continuous improvement is the technique of endless creation of value and removal of waste from a value chain.

Ugochukwu (2012) indicate that continuous improvement requires a continuous search for problems within a process and proffering solutions to the exposed problems. Neely (2005) Proposes that for continuous improvement there should be a periodic re-evaluation of the appropriateness of the established performance measurement system in response to the current competitive environment.

Kaizen (continuous improvement) is another concept closely associated with lean production. If the elimination of waste is the most fundamental principle of lean production, then continuous improvement can be said to come second.

Lean production requires striving for perfection by continually removing layers of waste as they are uncovered. This, in turn, requires a high level of workers involvement in the continuous improvement process. Efforts focused on the reduction of waste are pursued through continuous improvement or kaizen events, as well as radical improvement activities.

Demand signal

Demand management is concerned with balancing the requirement of internal and external customers with supply chain capabilities. It includes forecasting demand, synchronizing supply and demand, increasing flexibility, reducing the variability of demand by means of standardization and the control of inventory (Lambert & Cooper, 2000; Lysons & Farrington, 2006).

Simply, a demand signal is a message issued within business operations or within a supply chain to notify a supplier that goods are required. Accurate demand forecasting is essential for a firm to enable it to produce the required right quantities at the right time.Forecasting helps a firm to access the potential demand for its products and plan its production accordingly. Forecasting is an important aid in effective and efficient planning (Cachon & Lariviere, 2001).

Carbonneauet al., (2008) Discussed the importance of demand forecasting in supply chain as increasing customer satisfactions, reducing inventory stock outs, scheduling production more effectively, reducing product obsolescence costs, and plan sales strategies.

They also noted that there is a need for proper understanding and coordination between the supplier and the customer so that the supplier gets to understand how the materials used and processes involved contribute to the end product structure. Therefore for a smooth flow, customers at every level in the supply must impact on the downstream demand which that agreed with the meaning of lean concept that change approach on supply chain from “push” to pull’’ which does not allow production or delivery from the upstream until a signal of need is received from downstream (Womack & Jones, 1996). Pull system helps to increase customer satisfaction and avoid waste due to overproduction.

Agus and Shukri Hajinoor (2012) Pointed the ideas “production or delivery the products based on the actual consumption, small lot delivery and low inventories ”. So, manufacturing companies invested time, money, and their efforts to collaborate and interact with its supply chain partners regarding to demand planning.

Sales and Operations Planning (S&OP)

An effective supply chain must have a highly integrated demand and supply planning process. In practice, this planning process is commonly known as the Sales and Operations Planning (S&OP) Process. S&OP was formulated by Oliver Wight in the 1980s in order to align and synchronize activities within the executive team in a manufacturing company (Ganesan, 2015). S&OP, sometimes known as aggregate planning, is a process where executive level management regularly meets and reviews projections for demand, supply, and the resulting financial impact.

Olivella Nadal (2017) Defines the S&OP process as a process led by senior management that, on a monthly basis, evaluates revised, time-phased projections for supply, demand, and the resulting financials. It's a decision-making process that ensures that tactical plans in all business functions are aligned, and in support of the business plan. the objective of S&OP is to reach consensus on a single operating plan that allocates the critical resources of people, capacity, materials time, and money to most effectively meet the marketplace in a profitable way.

The outcome of the S&OP process offers a business executive guidelines on how to use resources such as skilled labor, safety stock contracted manufacturers, finished goods inventories, facilitations, and suppliers' capacity and capability, and business options, such as outsourcing, subcontracting, third parties, inventory control and planned shortages, to meet the expected market demand. This process endeavours to balance the cost, customer service levels, opportunities, constraints,

and profit of both a business organization and its supply chain partners. A highly integrated S&OP process consists of two major planning components: demand planning and supply planning (Nothing & Everything, 2017).

Inventory Management Practice

Inventory (American English) or stock (British English) is the goods and materials that a business holds for the ultimate goals to have a purpose of resale (or repair). Inventory is a necessary component in any organization engaged in production, sale or trading of products. Inventory is held in various forms including raw materials, semi-finished goods, finished goods and spares (Cachon & Fisher, 2000).

Render and Heizer (2013) indicated to four types of inventories: raw material inventory, work in process inventory, maintenance/repair/operating, and finished goods inventory. Pibernik (2005) Discussed inventory management as a very important function that determines the health of the supply chain as well as the impacts the financial health of the balance sheet. So, every organization constantly strives to maintain optimum inventory to be able to meet its requirements and avoid over or under inventory that can impact the financial figures. In the other word, every unit of inventory has an economic value and is considered an asset to the organization irrespective of where the inventory is located or in which form it is available. Even scrap has a residual economic value attached to it.

Inventory management requires a constant and careful evaluation of external and internal factors and control through planning and review. Most of the organizations have a separate department or job function called inventory planners who continuously monitor, control and review inventory and interface with production, procurement and finance departments(http://www.managementstudyguide.com/inventory-management.htm).

Inventory management involves systems and processes that identify inventory requirements, set targets, provide replenishment techniques, report actual and projected inventory status and handle all functions related to the tracking and management of material. Also, it involves a retailer seeking to acquire and maintain a proper merchandise assortment while ordering, shipping, handling and related costs are kept in check. This would assure the monitoring of material moved into and out of stockroom locations and the reconciling of the inventory balances (Walsh et al. , 2004).

Production Process Standardization

Standardization of process or work involves making it consistent and repetitive by the provision of fixed and acceptable approach which everyone and everything must follow in performing activities. Standardization of work is based on the best ideas or approach generated by the team doing the work. Thus, for standardization to be successful, there must be existence of stability in the procedure that can be adopted as standard. Standardization helps to check against variation in quality and output; it facilitates waste elimination and continuous improvement in a process (Nicholas & Soni, 2006).

Ohno (1988), the father of the Toyota Production System, once said, “Without Standard Work, there is no Kaizen. So, Standard Work, which documents the current best practice for performing a task or process, and ensures that everyone is applying it, is a necessary for improvement. Standardization means that the production processes and procedures that describe the production stages must be detailed and precise. Procedures must describe how each operation should be performed in a clear and visually simple way. This reduces variations in the manufacturing process.

Everyone adopts or rigorously follows the same approach to perform similar tasks; hence reproducing the same acceptable result. The standardized procedure which is presented in a standard work sheet and posted on the workplace can help to facilitate training of new workers in a department (Nicholas & Soni, 2006).

Ohno (1988) States that standard work procedure is defined by cycle time, work sequence and standard inventory. Standard work procedure for every operation needs to define the standard time required to complete the operation, the sequence to be followed in the operation needs to be clearly defined as well as the minimum and maximum allowable inventory.

According to Imai (1986) defines production process standardization "a set of policies, rules, directives, and procedures for all major operations, which serve as guidelines, thereby enabling employees to perform their jobs successfully."

Standards are documents that stipulate or recommend minimum levels of performance and quality of goods and services and operational conditions in a given environment. Lysons and Farrington (2006) listed the benefits of the adapting standards process or work as they help clear specification, achieve reliability , reduce costs, accurate comparison of quotation, less depended on specialist suppliers, reduce error and conflict and, reduce cost of material handling.

Standardization practices include variety reduction, quality assurance and quality control. Variety reduction can make a substantial saving in inventory by standardizing and rationalizing the range of material, parts and consumables and has the benefits of reducing of holding costs for stocks, release of money tied up in stock, easier specification when ordering, narrows the range of inventory and reduces supplier base.

Quality assurance refer to those planned and systematic activities implemented within the quality systems and demonstrated as needed to produce adequate confidence that an entity will fulfill requirements for quality and is concerned defects prevention involves a number of approaches: quality systems (ISO 9000), new design control, design for manufacturing processes, incoming material control and supplier appraisal (Lysons & Farrington, 2006).

The supply chain council has developed the supply chain operations reference (SCOR) model which is intended to be an industrial standard that enables next-generation supply chain management. It contains a standard description of management processes, a framework of relationships among the standard processes, standard metrics to measure process performance, management practices that produce best-in-class performance, and a standard alignment to software features and functionality (Huang et al., 2005).

Value-Added Activities

Value can simply be defined as something a customer is willing to pay to receive. Hines and Rich (1997)Further break down the production activities into three categories: value adding, non-value adding and non-value adding but required:

a) Non-Value Adding Activities (NVA) are pure wastes and involve unnecessary actions which should be eliminated completely; these activities or actions add no real value to the product or service, making such activities or action a form of waste (Plenert, 2010). And these activities add costs to your product without enhancing the value.

b) Necessary but non-value adding activities (required activities) are operations that may be wasteful but are necessary under the current operating procedures. In order to eliminate them, partial changes are needed to improve the standard operating procedures; add to the definition, Required activities are those which must be done, but they do not necessarily add value for either internal or external customers. In another word, Necessary but non-value adding activities is wasteful but unavoidable under the existing operational processes.

c) Value-adding activities (VA) involve the conversion or processing of raw materials or semi-finished products to the final product. Another definition of Value-added activity is an anything that directly increases the value of the product or service being performed.

lean improves efficiency by producing products at the lowest cost and as fast as possible and involve determining the value of any process by distinguishing valued-added activities or steps from non-value added activities or steps and eliminating waste so that every step adds value to the process (Antony, 2011).

That agreed with (Wee & Wu, 2009) who defined lean as a series of activities or solutions to eliminate waste, reduce non-value added (NVA) operations, and improve the value added.

2.4.7 Benefits in Adopting Lean Supply Chain Management Practices

Lean as a business strategy is used to improve quality and service, eliminate waste, reduce time and costs, and enhance overall organizational effectiveness (Zhou, 2016).

Beerhouse and Wong (2011) observe that the implementation of lean principles, tools and techniques within single organizations has helped the organizations to be more efficient, profitable, and competitive (Behrouzi & Wong, 2011). Eliminating whole along entire value steams, instead of at isolated points, creates processes that need less human effort, less space, less capital and less time to make products and services at far less cost and with fewer defects, compared with traditional business systems. Also, Companies are able to respond to changing customer desires with high variety, high quality, lows cost and with very fast throughput times.

Evidence suggests that lean methods and tools have helped manufacturing organizations to improve their operations and processes. However, the real effect of these methods and tools on contemporary measures of operational performance, i.e. cost, speed, dependability, quality and flexibility, is still unclear (Belekoukias et al., 2014).

Sezen and Erdogan (2009) noted that "the implementation of lean principles, tools and techniques is a way to achieve cost reduction, quality and efficiency improvement with less effort ". According to Phelps et al., (2003) LSC provides value to customers by optimizing the performance of the whole supply chain as a system.

Ross (2016) Indicated some of the benefits for lean as the following: reduced lead times, improved delivery performance, increased sales revenue, lower operating costs, increased profits, improved customer satisfaction and supplier relations, increased inventory turns and a drastic reduction in inventory, better employee morale and increased employee retention and improved quality.

According to Panwar et al., (2015) listed some benefits of adopting LSC that are to elimination of wastes, decrease production costs, improve quality, facilitate JIT production, increase customer satisfaction , supply chain efficiency , demand management efficiency, and to increase utilization of space. Increase velocity, decrease working capital, increase cash flow, increase inventory turns, gain market share, increase profitability and meet customer demand .these benifits that showed why is lean being so widely adopted, and why the companies go to lean (Kerber & Dreckshage,2011).

Companies fear that implementing lean practices is costly and does not produce benefits (Nordinet al.,2011).Hence, understanding these advantages can facilitate the implementation of the tools and techniques of LPs (Nordin et al., 2011). In the table (2.3) below conducted by (Naim & Gosling, 2011) listed some Attributes for lean supply chain implementation.

Table (2.3): Attributes for lean supply chain implementation

Attributes	Lean supply chain
Integration	Purchase, manufacture, suppliers, quality
Planning	Confirmed orders and forecasts
Product life cycle	long
Product variety	low
suppliers	Involves low costs and high quality
Demand pattern	Accurately forecasted
Inventory	Minimum inventory
Lead times	Shorter lead time
Profit margin	Low

Source:(Naim & Gosling, 2011)

2.4.8 Challenges Facing Implementation of Lean Supply Chain

Although LPs are becoming popular techniques for productivity improvement, companies are still not certain of the cost of its implementation and the tangible and intangible benefits they may achieve. Most of these companies fear that implementing lean practices is costly and does not produce benefits (Nordin et al., 2011).

Researches related to the implementation of LSCM practices usually neglect the supply chain contexts, or narrowly approach it focusing on a specific industry sector (Taylor, 2006; Theagarajan & Manohar, 2015). So, The implementation of a lean strategy, like any other productivity improvement initiative, is believed to harbour enormous difficulties (Denton & Hodgson, 1997).

In order to (Panwar et al. 2015) The lack of success on lean implementation was caused by:

Lack of time, financial resources, education and expertise on lean, senior management's interest and support, cultural barriers (resistance to change), and specific characteristics of process industries (time, temperature). The researcher summaries the challenges facing implementation of lean supply chain in the table below (2.4).

Table (2.4): Summaries the challenges facing implementation of lean supply chain.

Source: researcher (2017)

Thus, in the sense that the implementation of lean can be an opportunity for the organization (if implementation succeeds) or a threat (failed implementation).

2.4.9 Process of Lean Implementation in the Supply Chain

Challenges facing implementation of Lean Supply chain	Authors
The lack of resource availability (time, skilled workers and costs)	(Achanga, Shehab, Roy, & Nelder, 2006; Bleck & Wettberg, 2012; Bonavia & Marin, 2006; Real, Pralus, Pillet, & Guizzi, 2007).
Lack of top management support for change	(Bhasin, 2011; de Souza & Pidd, 2011).
Misunderstanding the concept and purpose of LPs	(Bhasin, 2011; Wong et al., 2009)
Human barriers/resistance to change	(Boyer & Sovilla, 2003; Stanleigh, 2008).
Company culture	(Stanleigh, 2008; Wong & Wong, 2011).
Lack of interest and commitment in lean by supplier and customer	(Stewart, 2001; Wong et al., 2009)
Difficult to find expert personnel who leads the change	(Kamakura, 2006).

Implementing lean concepts means breaking old patterns and installing new ones. To accomplish this, an organization needs a whole new set of tools , a framework , and a different business model for applying them (Chiromo et al., 2015; Naim & Gosling, 2011).

One of the main goals of implementing a lean strategy is the elimination of everything that does not add value to the product or service (Womack& Jones, 1996). Hence, The implementation of the inappropriate lean strategy for a given situation can sometimes lead to an increase in waste, cost and production time of a manufacturer. Therefore, it is crucial to have a systematic method to implement appropriate lean strategies based on identifying wastes in manufacturing processes (Karim & Arif-Uz-Zaman, 2013).

During the first steps ،supply chain partners should understand the lean concept, and then implement its practices through high levels of collaboration and cooperation (Manzouri et al., 2014).

In implementing LSC, Srinivasan et al.,(2004) conducted that companies pass seven important steps. These steps are (1) develop system thinking; (2) understand customer value; (3) value stream mapping; (4) benchmark best practices; (5) design to manage demand volatility; (6) create flow; and (7) measure performance metrics.

While, The author Ugochukwu (2012) suggests six parallel actions to be taken in parallel, rather than sequential in the implementation of lean in the supply chain. The actions or initiatives are:

Education and information: In the implementation of lean in the supply chain, it is abnormal to assume that people who are involved have prior knowledge of supply chain management or lean production. It is necessary to educate everyone, especially senior and middle management on the scope of supply chain management and its major purposes, the principles of lean thinking, and possible benefits of lean implementation in the supply chain.

Analysis of waste within supply chain: Everyone, from managers to shop floor workers are encouraged to participate in the identification of waste within value streams. They also suggest possible ways to handle the identified wastes.

Creation of organizational setting for supply chain improvements: Implementation of lean in the supply chain requires creation of a small group of people that will be committed to the transformation of the supply chain to lean supply chain. The activities or tasks of the created group, senior management, and the supply chain operational team must be synchronized to complement and support one another.

Value stream mapping (VSM) : helps in the detailed assessment of supply chain activities and performance.

Increment improvement activities: The identification of waste within the SC and root causes is followed by actions to improve the value stream. The improvement actions are aimed at making the value stream more efficient.

Development of supply chain strategy: Once the developed lean approach has been proved to be successful in a particular value stream, its principles and basis are noted for adaptation to other values streams.

To make lean process success, level of thinking needs to be changed in order to focus on management from optimizing separate technologies, assets and vertical department to optimizing the flow of products and services through entire value streams that flow horizontally across technologies, and departments to customers (Lee, 2002).

2.5 Performance of Quality (POQ)

A study conducted by (Kaynak, 1997) showed three dimensions of firms' performance relevant to TQM. Financial and market performance indicators include return on investment, sales growth, profit growth, market share, and market share growth. The indicators of quality performance are product/service quality, productivity, cost of scrap and rework. Two indicators of inventory management performance are purchased material turnover and total inventory turnover.

Performance measures were classified according to Shepherd and Gunter (2006) (in terms of cost, time, quality, flexibility, and innovativeness). Yeung et al., (2003) showed that there are two ways to measure the quality of the industry that are internal quality and external quality. Quality performance is essentially a measure of internal quality. However, customer satisfaction is essentially a measure of external or marketplace quality. The researcher in this study concentrated on internal quality (performance of quality).

Quality performance of the product is composed of two dimensions: firstly, conformance quality which is defined by how well the actual product conforms to the design once it has been manufactured, and secondly, design quality which is defined as the extent to which quality is designed into the product (Clark et al., 1990). Also, a study conducted by (Flynn et al., 1994) defined conformance quality as the ability to meet targets for quality within the manufacturing unit. Design quality has been defined as the features, styling, and other product attributes that enhance fitness for use or 'utility' for the consumer.

The business dictionary defined Performance of Quality as: "A numerical measurement of the performance of an organization, division, or process. That can be accessed through measurements of physical products, statistical sampling of the output of processes, or through surveys of purchasers of goods ". Product quality performances are derived from four pertinent product quality dimensions namely (Kotler, 1994):

Product Conformance (CONFORM): is the degree to which a product's design and operating characteristics meet established standards. It reflects whether the various produced units are identically made and meet the specifications (Kotler, 1994).

B) Product Performance (PERFORM): Performance quality refers to the levels at which the product's primary characteristics operate established initially at one of four performance levels: low, average, high and superior (Kotler, 1994).

C) Product Reliability (RELIABLE): Reliability is a measure of the probability that a product will not malfunction or will operate properly within a specified time period or the consistency of performance over time during which it is subjected to a given set of the environment (temperature, humidity) and/or mechanical stress (McGaughey, 1991).

D) Product Durability (DURABLE): Durability is a measure of the product's expected operating life before it physically deteriorates or until a replacement is preferable. Buyers will pay more for a more durable product, but this is subject to some qualifications (Pascucci, 1998).

2.6 Previous Studies

2.6.1 A study by Al-Tit (2016); entitled: The Impact Of Lean Supply Chain on Productivity of Saudi Manufacturing Firms in Al Qassim Region. The objective of this study is to identify the contribution of the lean supply chain (LSC) to manufacturing firms in the Kingdom of Saudi Arabia (KSA). Out of the population of the study, 150 firms were selected from the Al Qassim region to encompass the sample of the study. Four variables include waste elimination, cost reduction, manufacture supplier relationship, and manufacture customer relationships were constructed as predictors of productivity. A questionnaire-based survey was conducted to collect the study variables. A total of 75 questionnaires were distributed in the sample, of which 69 were returned. All of them were valid for the statistical analysis.

The results of the study confirmed the hypotheses that the constructed predictor could predict the productivity of the manufacturing firms in the Al Qassim region. That is, there were statistically significant impacts of LSC dimensions on the productivity. The study contributes to the body of supply chain (SC) literature by providing evidence on the positive impact of LSC on productivity in an Arabian context, particularly in KSA. However, the study was conducted in one industrial region in the KSA. Therefore the generalization of the findings may not apply to other firms in the same country or other countries.

2.6.2 A study by Al-jawazneh (2015b); entitled: The Internal Lean Dimensions Impact on the Manufacturing Based Product Quality of Food Processing Companies in Jordan. This paper studies the impact of internal lean dimensions on the manufacturing based quality of food processing companies in Jordan, variables such as, pull systems, continuous flow, setup time reduction, total productive maintenance, statistical process control, and employee involvement were chosen to represent the internal lean dimensions, and were assumed to have an affect manufacturing based quality. A survey questionnaire was distributed for that purpose to those who occupy positions in the production department and eligible enough to give accurate and unbiased responses to the items of the questionnaire. The results of the study revealed that; the Internal Lean Dimensions have a significant impact on the manufacturing based product quality, manifested by, lower food products reprocessing, conforming to high quality standards, lower defects rate, less interruptive breakdowns, which helped food processing companies in delivering their products according to agreed upon schedule and the optimization of the utilization of their manufacturing resources, such as machines and equipments, raw materials, and labor force.

2.6.3 A study by Farah(2015); entitled: Lean Supply Chain Management Practices and Organizational Performance in the Public Water Sector in Kenya. The purpose of the study was to assess the lean supply chain management practices and organizational performance in the public water sector in Kenya. The variables under study were demand management practices, Waste management practices, Standardization practices and Behavioural practices. The target population for the study was the 117 Water Service Providers which were linked to 8 Regional Water Services Boards in charge of asset management through Service Provision Agreements .The study concluded that the lean supply chain practices used by the public water companies in Kenya were demand management practices, waste management practices, standardization practices, behavioural practices, inspection activities and assurance activities. Also, the study concluded that the companies have been embracing lean supply chain management strategies despite the challenges experienced from the internal and external environment.

2.6.4 A study by Manzouri et al. (2014), entitled: Increasing Production and Eliminating Waste through Lean Tools and Techniques for Halal Food Companies. This study aims to identify the effective lean tools required for eliminating wastes in the supply chain. And to investigate how the lean concept can be adapted in manufacturing Halal food products to improve the overall performance of companies. Because of a large number of consumers and the Global market for Halal products, this study focuses on Halal food supply chains. Out of the Questionnaires distributed to 300 Halal food firms in Malaysia, only 61 usable replies were obtained. The results showed that demand collaboration, continuous improvement, and inventory management practices are the most important tools in Lean Supply Chain (LSC) Implementation. Also, the results indicated that only a small percentage of Halal Food Companies are implementing LSC.

2.6.5 A study by Kimani (2013), entitled: Lean Supply Chain Management in Manufacturing Firms in Kenya. The objective of the study was to explore lean supply chain management in the manufacturing sector in Kenya. The population of this study consists of 463 firms. The study findings indicate that the most prevalent practices adopted are preventative maintenance and reduction in the preliminary finishing time. The study shows that the main reasons for adoption of these practices were to reduce cost profitability and long-term survival of the firm.

2.6.6 A study by Smadi (2012), entitled: The Lean Supply Practices in the Garments Manufacturing Companies in Jordan. The purpose of this study is to identify the extent of applying lean supply practices in the Garments manufacturing companies in Jordan, five variables were selected, variables are, Supplier feedback, Just in time delivery by suppliers, Supplier development, Customer involvement and Facilitation of just in time production, a survey questionnaire was distributed for that purpose to those who occupy managerial positions in those companies, the study revealed that the Garments Manufacturing Companies in Jordan adoption to the lean supply practices is considerably high at all aspects, except for supplier development which was given an average rating.

2.6.7 A study by Agus and Shukri Hajinoor (2012), entitled: Lean production supply chain management as driver towards enhancing product quality and business performance(Case study of manufacturing companies in Malaysia).The purpose of this paper is to obtain a better understanding of the extent to which lean production permeates manufacturing companies in Malaysia by drawing on supply chain management (SCM) managers' or production managers' perception of lean production practices and level of performances in the industry. The instrument used in this study is a structured survey questionnaire consisting of two major parts. The first part comprises several variables measuring lean production practices,

and the second part consists of several performance measurements. Sample companies are chosen from Malaysian manufacturing companies listed in the Federation of Malaysian Manufacturers directory. From the 300 companies sampled, 200 responses were completed, representing a 67 percent response rate. The results support the conceptual model, demonstrating a strong association between lean production, product quality performance, and business performance. The structural equation modelling results reveal that “reduced setup time” appears to be of primary importance in the linkage between lean production, product quality performance and business performance. It is also instructive, from a score of 67.21 on the Malaysian Lean Production Index (MLPI), that manufacturing companies in Malaysia must marshal their effort to implement a more effective lean production SCM in order to improve on product quality performance and business performance.

2.6.8 A study by Taj and Morosan (2011), entitled: The impact of lean operations on the Chinese manufacturing performance. The purpose of this study is to investigate the impact of lean operations practice and design on the Chinese manufacturing performance, using lean assessment data from 65 plants in various industries. Exploratory factor and regression analyses are used to examine the associations among operations practice, production design, and operations performance. Three constructs are developed, two for operations practice (human resources and supply chains) and one for production design. Factor analysis shows that three factors are sufficient to represent the lean performance dimensions of flow, flexibility, and quality. Regression analysis shows that the lean performance factors are strongly related to operations practice and production system design. Using lean factors and operations practice/design, our results indicate significant gaps in lean manufacturing practices among different industries, with the petroleum

and hi-tech industries performing relatively best. Also, the garment industry performs very well in flexibility, indicating it does not compete just on price, but also on rapid response. Finally, all industries perform well in quality, underlining the emerging economy character of China. These results support other recent findings of the positive impact of lean operations on the performance of the Chinese manufacturing sector.

2.6.9 A study by Rahman et al., (2010), entitled: Impact of lean strategy on operational performance: a study of Thai manufacturing companies. The purpose of this paper is to examine the extent to which manufacturing organizations adopt lean management practices in Thailand and their impact on firms' operational performance. Using a survey questionnaire, data were collected against 13 lean practices from 187 middle and senior managers belonging to 187 Thai manufacturing firms. Using factor analysis, these lean practices were then clustered into three higher level constructs namely just in time (JIT), waste minimization and flow management. The responding firms were categorized into small and medium enterprises and large enterprises based on size and Thai-owned, foreign-owned and joint venture firms based on ownership. The multiple regression models were employed to investigate the effects of three lean constructs on operational performance in different categories of firms. The operational performance is measured by four parameters such as quick delivery compared to competitors, unit cost of products relative to competitors, overall productivity and customer satisfaction. The results indicate that all three lean constructs are significantly related to operational performance. JIT has a higher level of significance in LEs compared with SMEs, whereas for waste minimization there is a higher level of significance for SMEs compared with LEs. Flow management has a much lower level of significance for both SMEs and LEs. With respect to ownership, JIT is highly significant to operational performance for all three ownership groups (Thai, foreign and joint venture). Foreign-owned companies show a higher level of significance on operational performance for both waste management and flow management than Thai and joint venture companies.

2.6.10 A study by Wee and Wu (2009), entitled: Lean supply chain and its effect on product cost and quality: a case study on Ford Motor Company. The purpose of this study is to address "how Toyota can continuously and consistently achieve its dramatic success through its competencies - continuous waste elimination and the objective of long-term philosophy"; the study aims to summarize some solid suggestions and comprehensive ideas for those industries planning to implement lean production. Using VSM case study to demonstrate LSC, all the measurable indices helpful for cost reduction, quality enhancement and lead time reduction are shown. The study also provides some recommendations and basic principles to implement VSM successfully through P-D-C-A improving cycle.

2.6.11 A study by Lee and Peccei (2007), entitled: Lean production and quality commitment(A comparative study of two Korean auto firms). The purpose of this study is to examine antecedents of employee quality commitment at two Korean auto firms. Data were collected from 644 employees at two auto plants 331. At the high lean plant and 313 at the low lean plants. Hierarchical regression analyses were employed. This research showed that intrinsic rewards factors were significant determinants of quality commitment in the high lean plant sample, whereas those relating to extrinsic rewards were major antecedents in the low lean plant sample. The study finds that the tested antecedents to quality Commitment differ in relative importance at different stages of lean production implementation.

2.6.12 A study by Fynes et al., (2005)entitled: The impact of supply chain relationship quality on quality performance. This study discussed interaction between the various dimensions of the supply chain (SC) relationships (such as trust, commitment, adaptation, communication and collaboration) and it's the impact on quality performance. This paper considers (a) whether or not it is possible to measure the multi-dimensional nature of SC relationships and (b)

if so, what is the effect of SC relationships on quality performance? To address these questions, the researchers developed a conceptual framework incorporating dimensions of SC relationships and quality performance. The model was tested with data collected from 200 suppliers in the electronics sector in the republic of Ireland. Our findings provide considerable support for our conceptual model. Resulting from this interaction, improved design quality can impact significantly on other performance measures such as conformance quality and customer satisfaction.

The researcher summaries previous studies in the table (2.5) below as:

Author	Variable	Key Finding
(Al-Tit, 2016)	Waste elimination, cost reduction, manufactures supplier relationship and manufactures customer relationships.	The findings of the research accepted the hypotheses that relationships with suppliers, relationship with customers, cost reduction and waste elimination have significant impacts on the productivity of manufacturing firms in the Al Qassim region in Saudi Arabia.
(Al-jawazneh, 2015b)	Pull System, Continuous Flow, Statistical process control, Setup time reduction, Manufacturing Based Quality, Total productive maintenance.	The results of the study show a strong effect for internal lean system elements on manufacturing based quality, which is manifested by, lower food products reprocessing, conforming to high quality standards, lower defects rate, less interruptive breakdowns that help food processing companies in delivering their products according to agreed upon schedule, in addition to that, companies are able to optimize the utilization of their manufacturing resources, such as machines and equipments, raw materials, and labor force.

(Farah, 2015)	Demand Management Practices, Waste Management Practices, Standardization Practices, Behavioral practices&& Performance in the water sector in terms of: Minimal costs of operation Customer satisfaction Minimal wastage	The study concluded that the lean supply chain practices used by the public water companies in Kenya were demand management practices, waste management practices, standardization practices, behavioral practices, inspection activities and assurance activities. The study concluded that the companies have been embracing lean supply chain management strategies despite the challenges experienced from the internal and external environment.
(Manzouri et al., 2014)_ENREF_69	demand collaboration, continuous improvement, inventory management practices, value-added activities, waste reduction, company and industry standard, human resource, data standard, planning and production process standardization, sales and operations planning, and demand signal	Most companies aim for the full implementation of demand collaboration, inventory management, and value-added activities tools at the highest rate, which indicates the importance of adapting these activities across the supply chain., and showed that Malaysian Halal food companies do not succeed in the adoption of LSC practices.

(Kimani, 2013)	Preventative maintenance, Reduction in the preliminary, Balance of working process in production, Reduction in series, Manufacturing plant layout, Overall equipment efficiency, Total preventative maintenance, Kaizen, Total quality management, Takt time, Lean procurement , Demand-driven supply chain.	The study findings indicate that the most prevalent practices adopted are preventative maintenance and Reduction in the preliminary finishing time. The study shows that the main reasons for adoption of these practices were to reduce cost, profitability and long-term survival of the firm.
(Smadi, 2012)	Supplier feedback, Just in time delivery by suppliers, Supplier development, Customer involvement and Facilitation of just in time production.	The study revealed that the Garments Manufacturing Companies in Jordan adoption to the lean supply practices is considerably high at all aspects, except for supplier development which was given an average rating.
Agus, A., &ShukriHajinoor, M. (2012).	lean production; product quality performance (PQP); and business performance	Lean practices such as reduced setup time, pull production system, and shorter lead time have strong positive structural contributions toward PQP. There is a statistically significant but relatively moderate direct link between lean production and business performance, PQP especially product conformance, product performance, product reliability, product feature, and product durability have positive and direct effects on business performance of the manufacturing.

(Taj & Morosan, 2011)	just in time (JIT),human resource management (HRM),total quality management(TQM),total productive maintenance (TPM).	The results showed that three factors are sufficient to represent the lean performance dimensions of flow, flexibility, and quality. All industries perform well in quality, underlining the emerging economy character of China. The positive impact of lean operations on the performance of the Chinese manufacturing sector.
(Rahman et al., 2010)	Just in time (JIT), waste minimization and flow management.The operational performance is measured by four parameters such as quick delivery compared to competitors, unit cost of products relative to competitors, overall productivity and customer satisfaction.	The results indicate that all three lean constructs are significantly related to operational performance. JIT has a higher level of significance in LEs compared with SMEs, whereas for waste minimization there is a higher level of significance for SMEs compared with LEs. Flow Management has a much lower level of significance for both SMEs and LEs. With respect to ownership, JIT is highly significant to operational performance for all three ownership groups (Thai, foreign and joint venture). Foreign-owned companies show a higher level of significance on operational performance for both waste management and flow management than Thai and joint venture companies.
Wee, H., & Wu, S. (2009)	Value stream mapping (VSM), product cost and quality	This study shows how VSM supports the lean supply chain and identifies potential opportunities for continuous improvement to eliminate waste.
(J. Lee & Peccei, 2007)	Lean production and quality commitment.	This research showed that intrinsic rewards factors were significant determinants of quality commitment in the high lean plant sample, whereas those relating to extrinsic rewards were major antecedents in the low lean plant sample. The study finds that the tested antecedents to quality commitment differ in relative importance at different stages of lean production implementation.

Source: Researcher (2017)

After reviewing these studies, the present study differs from previous studies in terms of:

None of them has tried to address the relationship between lean supply chain practices and performance of quality. Therefore, this project sought to bridge this gap by creating a reasonable model of the relationship between the two. This study sought to answer the question “what is the relationship between lean supply chain practices and performance of quality in Jordanian pharmaceutical firms?

Since that information from the literature review findings is lacking, this study can add considerable information in this area and provide a fundamental for future studies about the issue.

Only very few of the articles discuss lean in the supply chain in relation to all supply chain members. That means most research papers have investigated supply chain management (SCM) and lean management separately.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

In this chapter, the researcher describes the study methodology (which means an approach that used to address the research questions listed in the chapter (1)), also define population , study samples, data collection methods, and instruments (study tools), as well as validity and reliability of the tools.

3.2 Research Design

Research Design is the general plan of how the researcher answered the research questions.

This study adopted the descriptive statistical approach to identify the lean supply chain management and its impact on the performance of quality in Jordanian pharmaceutical firms. As this approach is based on the description of the problem and determine its dimensions and includes the analysis of data, measurement and interpretation to arrive at a precise description of the phenomenon, depending on the variables and previous studies. Glass and Hopkins (1970) Maintained that descriptive research involves gathering data relevant to an event and then performing statistical analysis in an effort to describe the event. In line with that, argued that descriptive research helps discover answers to questions like what is, how many, and who.

Cooper et., (2006) Argued that there are two approaches could be applied; these approaches are divided into quantitative and qualitative approaches. Qualitative approaches obtained data by interviewing individuals may help the understanding of phenomena at the exploratory stage of the study. While, in a quantitative approach, you ask specific, narrow questions to obtain measurable and observable data .This study used the quantitative approaches for the purpose of collection the required data by relying on the questionnaires designed to fit the research variables and referring to the literature review and previous study.

3.3 Research Population

Pharmaceutical manufacturing in Jordan is considered one of the major pioneer industries in the Middle East, where the Jordanian medicinal products have a good reputation in the region. And this manufacturing industry is considered one of the major national enterprises that compete with foreign medicine companies besides being exported to the overseas. The reason for selecting the pharmaceutical sector is because it is the most implementing sectors for supply chain management practices (Appendix E).

The target population for this study consists of all manufacturing pharmaceutical operating firms in Abdullah II Ibn Al-Hussein Industrial Estate (AIE) in Sahab City. The total number of pharmaceutical companies in the Industrial City is (11), According to Industrial City report (2017) , but one of these companies refused to participate and receive the questionnaire due to different reasons some of that internal policy and not having the time to fill the questionnaire .upon that , the number of pharmaceutical manufacturers in this study were finally (10)(see Appendix B).

3.4 Research Sampling

The target respondents were high & middle-level management employees (managers, head of departments, supervisors, engineers, and team leader) who work in the departments: purchasing, production, quality, R&D, distribution, logistics and warehouse, finance, and marketing and sales in those firms.

The internal policies of their companies and lack of time for employees to fill out the questionnaires. The researcher accessed only (150), out of which (120) questionnaires were returned and only (112) questionnaires were suitable and valid for statistical analysis, (74.6%) were valid.

3.5 Data Collection Methods

The researcher used both primary and secondary data to achieve the objectives of the study:

Primary data: data collected from respondents by the use of questionnaires as the main instruments of data collection.

Secondary data: data collected from other resources such as; textbook, journals, articles, internet websites, previous research and literature, references, and published and unpublished researches in the field of the lean supply have contributed to the development of the theoretical framework and allowed researchers gain more deep understanding on the topic.

3.6 Data Collection Instruments

The main research instrument is a questionnaire. The majority of the questions were adapted and developed from different previous questionnaires in previous studies (Green et al., 2014; Manzouri et al., 2014; Li & Lin, 2006; Agus & Shukri Hajinoor, 2012), some questions were suggested from the researcher and then some of the items of the questionnaire were modified based on the suggestions of some academicians and industural experts specialized in this field.

A questionnaire method was designed to investigate the impact of lean supply chain management practices (independent variable) on the performance of quality (dependent variable).The main variables of the research consist (46) paragraphs.The researcher used typically the Likert's scale, that is designed to examine how strongly subjects agree or disagree with the statement on a five-point scale.

(Strongly Agree=5, Agree=4, Neutral=3, Disagree=2, Strongly Disagree=1)

The questionnaire was divided into three sections (See Appendix C) as shown in the table (3.1) below:

Section One: Was used to collect the demographic variables of gender, age, education level, years of experience, age of the company, number of employees, product market, ISO certificate, and source of raw material.

Section Two: Was used to examine the independent variable (lean supply chain management practices).

Section Three: Was used to examine the dependent variable (performance of quality).

Part1:demographic data	Questionnaire Number
gender, age, years of experience, etc.	Q:1-11
Part2: The Independent Variable	Questionnaire Number
Waste Reduction	Q:1-8
Continuous Improvement	Q:9-12
Demand Signal	Q:13-18
Sales and Operations Planning(S&OP)	Q:19-25

Table (3.1): The Questionnaire components

Inventory Management Practice	Q:26-31
Production Process Standardization	Q:32-37
Value-added Activities	Q:38-41
Part3: The Dependent Variable	Questionnaire Number
performance of quality	Q:42-46

Source: the researcher (2017)

The instrument was translated carefully to arabic to allow those respondents who are not proficient enough in english (if any) to give accurate and reliable responses and to avoid any misinterpretation (See Appendix D). Also; it was distributed by hand to the target population.

3.7 Statistical Method Used

The researcher used Statistical Package for Social Sciences (SPSS) to analyze the data which were collected by questionnaires. The following statistical tests were used:

1. Normal distribution test.

2. Correlation and Multicollinearity.

3. Consistency Reliability Test (Cronbach's Alpha): to ensuring the consistency of the results and its ability to predict.

4. Descriptive Statistical (Means &Standard deviation) to measure the relevant importance for each of the independent and dependent variables.

5. Multiple Regression Analysis to test the first main hypotheses.

3.8 Validity

Validity can be defined as “a test of how well an instrument that is developed measures the particular concept it is intended to measure” (Sekaran & Bougie, 2016). In the other word, validity is about the level of accuracy of the instrument measures, and is intended to measure.

3.8.1 Content and Face Validity

The survey items and questions were adopted from previous studies and developed from the researcher after conducting an extensive review of the existing literature. To ensure the validity of these constructs, the questionnaire was evaluated and reviewed by five academic experts in business administration and industrial engineering who have knowledge and experience in this field assessed the content validity of the questionnaire, and their comments and amendments were taken in consideration in drafting the final version (See appendix A).

3.8.2 Construct Validity

This section presents the result of testing construct validity by using spearman coefficient. That measures the correlation between one variable and all other variables.

Table (3.2): Construct Validity

Dimension	Spearman coefficient	P-value
Waste reduction	0.551**	0.000
Continuous improvement	0.700**	0.000
Demand signal	0.516**	0.000
Sales and operation planning	0.536**	0.000
Inventory management practice	0.622**	0.000
Production process standardization	0.404**	0.000
Value added activities	0.401**	0.000

Table (3.2) shows that the values of Spearman coefficient are more than 0.4 and less than 1, which indicate that there is a strong correlation between each variable and other variables. Also, the p-values were less than 0.05. Hence, there is a statically significant correlation between each variable and other variables.

3.9 Reliability

Reliability refers to how well stable and consistent the measure is in obtaining the similar results if the research instrument reevaluated under the same situations and conditions (Cornbach, 2004).Reliability is the internal consistency of a set of measurement items that refers to the degree to which the items in the set are homogeneous (Saraph et al.,1989).Cronbach's alpha coefficient is widely used to measure the internal consistency of statements in questionnaires. It ranges from (0-1), but the closer alpha to one, the greater the internal consistency of the statements in the questionnaire as shown in the table (3.3) below.

Table (3.3): Cronbach- Alpha coefficient test for research variable

Variables	Cronbach- Alpha	No of items
Independent variables		
Waste reduction	0.851	8
Continuous Improvement	0.631	4
Demand Signal	0.789	6
Sales and Operations Planning(S&OP)	0.905	7
Inventory Management Practice	0.784	6
Production Process Standardization	0.803	6
Value-added Activities	0.879	4
Dependent variables		
Performance of quality	0.827	5
All variables	0.806	46

Table (3.3) shows that the values of Cronbach's' Alpha Coefficient ranged between 0.631 and 0.905. Another point worth mentioning is that the overall score of Cronbach's' Alpha Coefficient of all factors is 0.806 indicating the internal consistency of the statements in the current questionnaire. The result is 80.6 % which is acceptable and reliable since it is more than the minimum required percentage which is 60 % for social science researches.

CHAPTER FOUR

DATA ANALYSIS

4.1 Introduction

This chapter shows the results that come out after analyzing the data collected through a questionnaire from the study sample. The data analysis process involves three stages that began with the normal distribution test using (K-S) (Kolmogorov-Smirnov Z), then the internal consistency test for the research instrument by applying Cronbach's alpha, and lastly the hypothesis test using multiple regressions. At first, the researcher will discuss the descriptive analysis of the sample demographic data.

4.2 Demographic Characteristics of the Respondents

This section presents the demographic characteristics of the survey respondents, including age, gender, educational level, and years of experience. It also presents the characteristics of participating companies, including the company age, number of employees, job position, department, product market, ISO certificate, the source of raw materials and components, as shown in the table (4.1).

Table (4.1) Research respondent's demographic characteristics (n=112)

Variable		Frequency		Percentage	
Gender	Male	62		55.4%	100%
	Female	50	112	44.6%	
Age	<30	19		17.0%	
	31-40	42	112	37.5%	100%
	41-50	36		32.1%	
	>50	15		13.4%	
Educational level	Diploma	14		12.5%	
	Bachelor's Degree	58	112	51.8%	100%
	Postgraduate	40		35.7%	
Years of Experience	<=5	17		15.2%	
	6-10	35	112	31.3%	100%
	11-15	38		33.9%	
	>=16	22		19.6%	

Company age	<=5	2	112	1.8%	100%
	6-10	15		13.4%	
	11-15	34		30.3%	
	>=16	61		54.5%	
Number of Employees	<50	9	112	8.0%	100%
	50-100	11		9.8%	
	101-200	30		26.8%	
	201-300	28		25.0%	
	301-500	27		24.1%	
	>=500	7		6.3%	
Job Position	Head of the department	26	112	23.2%	100%
	Production manager	19		17.0%	
	Supervisor	27		24.1%	
	Engineer	21		18.8%	
	Team leader	8		7.1%	
	Other	11		9.8%	

Department	Purchasing	7	112	6.27%	100%
	R&D	15		13.4%	
	Production	22		19.6%	
	Distribution	6		5.4%	
	Quality	9		8.03%	
	Sales	11		9.8%	
	Other	42		37.5%	
Product Market	Local	32	112	28.6%	100%
	International	12		10.7%	
	Local and international	68		60.7%	
ISO Certificate	Yes	102	112	91.1%	100%
	No	10		8.9%	
Source of raw materials and components	Local	32	112	28.6	100%
	International	8		7.1	
	Local and international	72		64.3	

The Table (4.1) above, shows that:

It's clear that most of the respondents were male, where numbered (62), formed (55.4%), while female percentage (44.6%). 42 respondents aged fall between 31 to 40 years old. The number of respondents aged between 41 and 50 years were 36. The number of respondents aged less than 30 years were19 and who are more than 50 were 15. Probably the reason for rising of this ratio that the Jordanian pharmaceutical firms believe that this rang of age has the ability to adopt new technology and to develop their work.

Most of the study samples are a bachelor holders accounted for 51.8%, and 35.7% are postgraduate holders. The results also show that 12.5% of respondents are a diploma holder. The researcher believes that Jordanian pharmaceutical firms rely on the educational level in the recruitment of employees to improve the quality of work as its sensitive industry.

38 respondents representing (33.9%) have experience fall between 11 to 15 years. Whereas 35 respondents representing (31.3%) have an experience 6-10 years, 22 respondents representing (19.6%) have an experience (>=16) years, and 17 respondents have an experience less than 5.The highest percentage of respondents have (11-15) years' experience due to excellence that the employees have it.

61 respondents company representing (54.5%) have an age more than 16 years and 34 companies age fall between 11 to 15 years while 15 companies representing (13.4%) have an age ranged between 5 and 10 years and finally 2 companies which represent (1.8%) consider to be a new company with an age less than 5 years.

The majority of company employed more than 101 workers and less than 200 (26.8%) followed by companies which have from 201 to 300 employees (25%) than companies with employment capacity between 301 and 500 worker (24.1%).

42 respondents representing (37.5%) belong to various departments such as planning, logistic and warehouse, supply chain, human recourses and operation departments. 22 respondents representing (19.6%) belong to production, 15 respondents representing (13.4%) belong to R&D, and 11 respondents representing (9.8%) belong to sales.

The majority of companies representing (60.7%) distributed its production inside and outside Jordan. Moreover, 28.6% respondents of companies buy its production in Jordan only while 10.7% of companies exported its production outside Jordan. The researcher believes that high percentage of export the product outside the Jordan refers to the good image of the product, its high quality, excellent reputation and affordable prices.

The majority of companies representing (91.1%) have ISO certificate such as ISO 9002, 9001, GMP, GTP, and GDP. That showed how the companies appreciate the standard can improve their business processes and reduce scrap, rework and cost, and these companies use the certification to differentiate themselves from their competitors.

The majority of companies representing (64.3%) imported its raw materials from the local and international market. Moreover, 28.6% of them used local sources to obtain its raw materials. Finally, 7.1% of companies imported its raw materials from international sources.

4.3 Descriptive Statistics

Descriptive statistics is a method to know how well the respondents have answered and reacted to items in the questionnaire and then used to describe the respondents' attitudes toward each variable. This analysis includes means and standard deviation. The mean (μ) is a measure of central tendency that gives a general picture of the data. Therefore, it offers a general idea about the answers given by the respondents for each variable.

The standard deviation(ɕ) is a measure of dispersion, which offers an index of the spread or variability in the data. Hence, the mean (μ), standard deviation (ɕ), and relative importance are obtained to describe the respondents' attitude toward each variable.

Relative importance, assigned due to:

Class Interval = (Maximum Class-Minimum Class) /Number of Levels …….(4 .1)

Class Interval = $\frac{5 - 1}{3}$ = 1.33

Low level ranges between 1.00 and less than 2.34.

Moderate level ranges between 2.34 and less than 3.67.

High level ranges between 3.67 and 5.00.

Mean of scale = the weight of Likert answer/5 = (1+2+3+4+5)/5=3……(4.2)

4.3.1 Descriptive Analyses of Independent Variable (LSCM)

Means, standard deviation, and relative importance were calculated for each lean supply chain management practices, as shown in the tables below.

Waste Reduction

Table (4.2) means, standard deviation, and relative importance for waste reduction

Statement		Mean	Std. Deviation	Description
1	Our company has an extra care to reduce waste of over -processing.	4.384	0.604	High
2	Our company has an extra care to reduce waste of over-production.	4.271	0.632	High
3	Our company works together with other supply chain partners to eliminate waste throughout the supply chain.	4.143	0.746	High
4	We have a plan and strategy to eliminate waste.	4.196	0.781	High
5	Our company analyzes internal processes to minimize waste.	4.188	0.742	High
6	Our company reduces unnecessary movements by employees during their work.	4.089	0.789	High
7	Our company reduces waiting time between process and another.	4.161	0.679	High
8	Our company uses just in time (JIT) to eliminate waste.	4.027	0.925	High
Waste Reduction		4.183		High

Table (4.2) lists the means of statements used to measure this dimension. It was found there were positive high-level attitudes toward the statement because their means were above the mean of scale (3). Furthermore, the results indicate that pharmaceutical firms have an extra care to reduce waste of over –processing (mean =4.384) to eliminate cost.

Continuous Improvement

Table (4.3) means, standard deviation, and relative importance for continuous improvement

Statement		Mean	Std. Deviation	Description
9	Our company has continuous improvement programs in place	4.393	0.676	High
10	Our company has ongoing efforts to improve products, services, or processes.	4.322	0.647	High
11	Our company developed published culture of continuous improvement exists across the supply chain.	4.223	0.719	High
12	Our company strives to hold regularly training Programs for latest techniques and production methods.	4.705	0.774	High
Continuous improvement		4.411		High

Table (4.3) shows the values of means, standard deviation for each item in the domain of continuous improvement. It was found there were positive high-level attitudes toward the statement because their means were above the mean of scale (3).also, it was found that statement (12) has the highest means (4.705), while; the statement (11) has the lowest mean (4.223).The overall mean was (4.411).

Demand Signal Table (4.4) means, standard deviation, and relative importance for demand signal

Statement		Mean	Std. Deviation	Description
13	Our company manufactures its Product based on the forecast.	3.991	0.691	High
14	Our company has an ability to forecast its demands accurately based on actual uses of products.	4.188	0.593	High
15	Our company has invested time and money to collaborate with its supply chain partners regarding demand planning.	4.402	0.919	High
16	Our company always conducts annual production and purchasing planning	4.188	0.742	High
17	Our company always communicates its demand forecasts to its supply chain partners.	4.196	0.757	High
18	Our company has an ability to deal with different levels of demand.	4.348	0.885	High
Demand signal		4.219		High

Table (4.4) indicates that the grand mean of the demand signal is 4.219. This is more than the virtual mean (3). The table also indicates that the means of all statements ranged from (3.991- 4.402). All of which indicate the positive attitudes of respondents. The table also indicates that the statement 'Our company has invested time and money to collaborate with its supply chain partners regarding demand planning'. Ranked the first, and 'Our company manufactures its product based on forecast' ranked the last.

Sales and Operation Planning

Table (4.5) means, standard deviation, and relative importance of sales and operation planning

Statement		Mean	Std. Deviation	Description
19	Our company has developed S&OP system internally.	3.473	0.889	**Moderate**
20	S&OP is a fully integrated planning process between the organization and its all supply chain partner.	3.304	0.957	**Moderate**
21	S&OP is a collaborative process using online tools available with all supply chain partner.	3.277	0.979	**Moderate**
22	All key supply chain partners share data and plan to develop S&OP programs.	3.223	0.927	**Moderate**
23	Our company has fully integrated processes for S&OP that are aligned with customer requirement.	3.384	0.933	**Moderate**

24	Our company rigorously follows S&OP processes.	3.205	0.922	**Moderate**
25	Our company allows all its supply chain partners to participate regularly in S&OP meetings.	3.134	0.963	**Moderate**
Sales and operation planning		3.286		Moderate

Table (4.5) shows the overall mean was (3.286). It was found there were positive moderate level attitudes toward the statement because their means were above the mean of scale(3).also , it was found that statement (19) has the highest means(3.473) , while the statement (25) has the lowest mean (3.134).

Inventory Management Practice

Table (4.6) means, standard deviation, and relative importance of Inventory management practice

Statement		Mean	Std. Deviation	Description
26	Supply chain partners have implemented inventory visibility systems and processes to reduce excess inventory throughout the supply chain.	3.875	0.853	**High**
27	Inventory is managed independently, and their focus is on the cost of the total purchase.	3.911	0.823	**High**
28	Supply chain partners strive to reduce lead time.	3.857	0.793	**High**
29	Our company can determine the appropriate maximum and minimum inventory levels for raw material.	4.071	0.667	**High**
30	Our company uses the most current technology in managing inventory.	4.116	0.756	**High**
31	Our company employs a set of techniques to manage the inventory levels within different companies in a supply chain.	4.107	0.787	**High**
Inventory management practice		3.989		**High**

Table (4.6) shows the values of means, standard deviation, and relative importance for each item in the domain of Inventory management practice. The means of the statement ranged from (3.857- 4.116). The overall mean was (3.989). This means that respondents have a positive attitude toward all statements that measure this dimension.

Production Process Standardization

Table (4.7) means, standard deviation, and relative importance for Production Process Standardization

Statement		Mean	Std. Deviation	Description
32	Our company has defined and standardized Planning, production, and stock management processes across the supply chain.	4.108	0.824	**High**
33	Our company attempts to standardize internal or external processes.	4.134	0.729	**High**
34	Processes can be documented by the operator and shared with supply chain partners.	4.036	0.869	**High**
35	Our company had standardized and rationalized the range of materials and consumables.	4.179	0.738	**High**

36	Our company has an extra care to reduce and eliminate task time variation by establishing standard work procedures.	4.116	0.803	**High**
37	Our company has a high level of the process standardization that enables it to expand its capacities without impairing production.	3.911	0.812	**High**
Production process standardization		4.08		**High**

Table (4.7) shows that means of statements that measure production process standardization ranged from 3.911 to 4.179, all of which are more than the virtual mean (3). The grand mean of this dimension is 4.08, with a high relative importance. The statements' mean indicates that the respondents have positive high attitudes towards this dimension.

Value Added Activities

Table (4.8) means, standard deviation, and relative importance for value-added activities

Statement		Mean	Std. Deviation	Description
38	Our company is aware of what activities are added value- to the process.	3.348	0.877	**Moderate**
39	Our company has the capabilities to clear distinction between value-added and non-value-added activities.	3.295	0.917	**Moderate**

40	Our company is actively performing collaborative practices with suppliers to eliminate non-value-added activities.	3.107	0.914	**Moderate**
41	Our company is actively performing collaborative practices with customers to eliminate non-value-added activities.	3.071	0.835	**Moderate**
Value added activities		3.205		Moderate

Table (4.8) shows the values of means, standard deviation, and relative importance for each item in the domain of value-added activities. It was found there were moderate level attitudes toward the statement because their means were above the mean of scale(3).the means of the statement ranged from(3.071 -3.348).The overall mean was (3.205).

The researcher summarizes the means and standard deviations of research independent variables in the table below (4.9).

Table (4.9) means of research independent variables

Independent Variable	Mean	Classification
Waste Reduction	4.1826	High
Continuous improvement	4.4107	High
Demand signal	4.2188	High
Sales and operation planning	3.2857	**Moderate**
Inventory management practice	3.9896	**High**
Production process standardization	4.0804	**High**
Value added activities	3.2054	**Moderate**
Lean supply chain management	3.9104	**High**

Table (4.9) indicated that the mean value of independent variables was 3.9104, with the high agreement. Continuous improvement ranked the first, while value-added activities ranked the last. The results indicated that the surveyed manufacturing companies have a positive manner towards these measurements.

4.3.2 Descriptive Analyses of Dependent Variables (POQ)

The following table (4.10) illustrates the means and standard deviations of statements used to measure the dependent variable (performance of quality).

Table (4.10): mean and standard deviation for dependent variables

Item	Mean	Std. Deviation	Description
Our workers on the shop floor have developed the ability to correct and diagnose the problem without the intervention their manager.	3.893	0.874	High
Our company has developed the ability to manufacture zero defect products.	3.955	0.821	**High**
Our company has developed the capability of conforming to the standard of specifications.	4.098	0.759	**High**
The rate of rework and scrap has dramatically decreased in our company.	4.107	0.775	**High**
The time spent on remedial maintenance has decreased in our company.	3.991	0.788	**High**
Performance of quality	4.009		**High**

Table (4.10) showed that, the mean of all statements are more than 3 which means that respondents' attitude toward dependent items was high, the standard deviation of all dependent statements is reasonable. Also indicate that the majority of respondents have a good impression toward the performance of quality and toward the ability of quality to help the employee to enhance their work and to minimize defect.

4.4 Normal Distribution Test

The test on how close the data of the study to normal distribution using (K-S)(Kolomogrov-Smirnov Z).

Table (4.11): Normal distribution test of the study variables

Variables	K- S	
	Statistic	Sig.
Waste reduction	.144	0.101
Continuous improvement	.172	0.795
Demand signal	.198	0.626
Sales and operation planning	.157	0.966
Inventory management practice	.128	0.225
Production process standardization	.199	0.681
Value added activities	.101	0.897
Performance quality	.105	0.634
Lean supply chain management	.134	0.760

Table (4.11) shows that the significant of all variables more than 0.05 which mean that the distribution of all variable's data followed the normal distribution.

4.5 Correlation & Multicollinearity

Independent variables should be tested for Multicollinearity. Multicollinearity refers to a situation in which a number of independent variables in a multiple regression models are closely correlated to one another (Brown et al., 2010). In general, Multicollinearity can lead to wider confidence intervals and less reliable probability values (p-values) for the independent variables. Two widely used tests for Multicollinearity are the variance inflation factor (VIF) and tolerance. As shown in table (4.12) below.

Table (4.12): Multicollinearity Test

Factors	Tolerance	VIF
Waste reduction	0.712	1.405
Continuous improvement	0.849	1.178
Demand signal	0.865	1.157
Sales and operation planning	0.734	1.362
Inventory management practice	0.573	1.744
Production process standardization	0.749	1.335
Value added activities	0.791	1.265

Table (4.12) indicated that the tolerance values for the independent variable ranged from (0.573 to 0.865). Also, VIF values ranged from (1.157 to 1.744).These results indicate that NO Multicollinearity exists in the current study.

4.6 Hypotheses Testing

The first main hypotheses and seven sub-hypotheses were generated for this study as stated earlier to test the impact of lean supply chain management practices on performance of quality. Multiple regressions were used to test the study hypotheses. Regression test includes three tables: Model Summary, ANOVA and Coefficients tables.

The First Main Hypothesis

H0: There is NO significant impact at (a<=0.05) of lean supply chain management practices in all its dimensions (waste reduction, continues improvement, demand signal, sales and operation planning, inventory management practice, production process standardization, value-added activities) on the performance of quality. Multiple regressions were used to test the hypotheses.

Table (4.13): Multiple regression analysis for first main hypotheses

Variable	Model Summary			ANOVA		Coefficients		
	R	R2	Adjusted R2	F	Sig.	β	t	Sig
Waste reduction	0.745	0.555	0.549	82.564	0.000	0.314	3.27	0.000
Continuous improvement						0.139	2.71	0.007
Demand signal						0.152	2.819	0.005
Sales and operation planning						0.571	14.181	0.000

Inventory management practice						0.292	4.919	0.000
Production process standardization						0.547	11.435	0.000
Value-added activities						0.191	2.828	0.005

The results from the above table (4.13) can be illustrated as follows;

As reflected by the model summary table, R-value (0.745)that indicated there is the positive correlation between LSCM practices in all its dimensions (waste reduction, continues improvement, demand signal, sales and operation planning, inventory management practice, production process standardization, value-added activities) and performance of quality. This positive relationship suggests that the independent variable and dependent variable move in the same direction.

The adjusted R2=0.549 indicates that 54.9% of the variation in the dependent variable (performance of quality) is explained by the independent variable (LSCM practices). And the percentage (45.1%) As a result of other factors not covered by the study. If the adjusted R2 is excluded from R2, the value will be 0.555–0.549 = 0.006. This amount of reduction means that if the whole population participates in the study and the model has been fitted; there will be 0.6% less variance in the outcome.

The ANOVA table shows that F = 82.564 and p-value = 0.000 (less than 0.05 (the level of significance)). However, the null hypothesis is accepted at P > 0.05 and is rejected at P< 0.05.Hence, the null hypothesis was rejected and the alternative hypothesis is accepted. Thus, there is a significant impact of lean supply chain management in all its dimensions (waste reduction, continues improvement, demand signal, sales

and operation planning, inventory management practice, production process standardization, value-added activities) on the performance of quality.

According to the coefficients table, the t values are significant at 0.05 level for lean supply chain management in all its dimensions (waste reduction, continues improvement, Demand signal, sales and operation planning, inventory management practice, production process standardization, value-added activities). This indicates that there is a significant effect of lean supply chain management in all its dimensions on the performance of quality.

Reflected to a β value which indicates how strongly a unit change in independent variable affects the dependent variable. As shown in the table (4.13) one unit increase in waste reduction, continuous improvement, demand signal, sales and operation planning, inventory management practice, production process standardization and value-added activities can significantly predict a 0.314, 0.139, 0.152, 0.571, 0.292, 0.547, 0.191 respectively increase in performance of quality.

CHAPTER FIVE

DISCUSSIONS & CONCLUSIONS

5.1 Introduction

This chapter presents results of data analysis, conclusions, recommendations, and suggestions for future studies in the related field.

5.2 Results & Discussions

To achieve the main objective of this study, the researcher was developed a questionnaire which distributed to employees who occupy the managerial and supervisory positions in 10 pharmaceutical firms with a response rate 74.6%. Data collected from the questionnaires that 62 of samples were male and 50 females. The majority of the age of participant samples were 31-40 years, the education level of target employees was bachelor's degree was the highest percentage (51.8%), also indicate that 91.1% of these companies have ISO certificated.

Firstly, Discussion the results that related to means of the respondents' attitude toward LSCM practices. The results showed that the mean of all statements is more than three which means that respondents' attitude toward independent items, dimensions and variables was high. continuous improvement was the highest mean (4.4107), followed by demand signal, waste reduction, inventory management practices, sales and operational planning, and value-added activities with the lowest mean (3.254).That was the answer for this question (To what extent pharmaceutical firms in Jordan implement lean supply chain management practices?)

Employees and managers of pharmaceutical companies recognized the importance of continuous improvement. This study showed that continuous improvement practice, which has a mean score (4.4107), was implemented at the highest level during the adoption of LSC. This is due to the fact that most of these pharmaceutical companies seek to use the latest tools, methods and different ways to achieve continuous

development and improvement of all the processes and activities associated with it, to maintain an advanced position in this industry internally and externally, to improve and develop its products in quantity and quality, and to try to reach excellence in performance. Therefore, continuous improvement in pharmaceutical companies helps to reduce and eliminate defects in products, to help to enhance their competitiveness and also helps to reduce production costs and thus the total costs reduced.

Providing high quality products and competitive prices helps to win customer satisfaction. Renewal, change and continuous improvement are necessary to build and distinguish this sensitive sector, and these pharmaceutical companies are in constant search for the best. implementing a continuous improvement program in the entire supply chain cannot be accomplished unless all partners join in the problem solving and sharing of goals, experiences, information, and values.

Demand Signal plays a critical role in the management of pharmaceutical companies. It helps organizations to reduce risks involved in business activities and make important business decisions. These companies estimate the current demand for its products and services in the market based on actual uses of products and plan its production accordingly and then move forward to achieve the set goals. Pharmaceutical companies concentrate to achieve accurate demand forecasting to enable them to produce the required quantities at the right time and arrange well in advance for the various factors of production, e.g., raw materials, equipment. Also, demand signal is an important aid in effective and efficient planning. Further, the study found out that the firm had invested time and money in collaborative demand planning, the firms always conduct annual demand forecasting, the firm always conducts annual production and purchasing planning and that the firm always communicates its demand forecasts to its supply chain partners.

Waste Reduction is the third important practice in LSC implementation. Pharmaceutical firms give extra attention to reduce and eliminate wastes .Eliminating wasted resources from any manufacturing or service system that means reduce over-production, over processing, unnecessary movements, waiting, defect products, and inventory. Eliminating these wastes can immediately increase that system's productivity. If we increase productivity while reducing the resource inputs into the system, we reduce costs, which are passed along to the customer in terms of lower prices, increasing market share that will improve profitability in the long-term and produce high-quality products. Also, these results indicated a good level of awareness of the basic concept of LPs among pharmaceutical companies. These companies are expected to implement LSC practices fully and successfully.

Production Process Standardization was the fourth important practice in LSCM implementation. Pharmaceutical firms standardizing their process to a better understanding about how the business operates, to help clear specification, to facilitate communication and coordination between exchange partners, to allow realigning disparities goals,and help to solve day-to-day problems. These companies recognize the importance of processes standardization that reflect to increase their reliability and help to reduce costs.

Respondents of this study have a positive attitude toward implementing Inventory Management Practices. They recognized the importance of applying and using the latest and current technology in managing inventory such as using the ABC, JIT system. Therefore, inventory management requires a strong bond among suppliers and customers to send and to receive information and products on time. The sensitivity of drugs requires special storage conditions and environment, which causes them to become expensive and potentially damage the products.

Therefore, these companies are trying to reduce the amount of stock to a large extent (zero inventories). The firm stores what is needed and required by the firm and has updated inventory that ensures the flow of product to avoid overstocking.

This study showed the mean of Sales and Operation Planning(S&OP) was moderate level. That revealed that these companies are not aware of the advantages of using this data or they do not trust their partners with the information. Although this data and plans help these companies to decrease demand variation and order fluctuation by receiving relevant S&OP information, a company can also gain a competitive edge because the S&OP information of competing products can be tracked to improve the sales strategy for its own products. S&OP data sharing shows the amount of gross product and clarifies local demand patterns, costs, and promotion schedules.

Value-Added Activities have a lowest mean score (3.2054) compared with other LSCM practices, which indicates that this practice is less important for respondents. Pharmaceutical companies are not aware of what activities are added values to the process, and these companies do not have a clear distinction between value-added and non-value-added activities.

According to above, These results indicate that the majority of respondents have a good impression toward process and procedure that their company follow to implement LSCM practices and they have a good perspective toward the value that added by this system to their work and to their strategies and then improve their performance. Furthermore, these results indicate that employees believe that LSCM practices help them and their company to achieve long and short-term goals.

Secondly, Discussion the results that related to means of the respondents' attitude toward dependent variable (performance of quality). The results indicate that the majority of respondents have a good impression of the performance of quality and toward the ability of quality to help the employee to enhance their work. These companies have developed the capabilities of conforming to the standard of specifications; also have the ability to manufacturing zero defect products.That was the answer to the question (What is the level of quality provided in the Jordanian pharmaceutical firms?)

Thirdly, Discussion the results that related to hypotheses testing to answer the research questions on the problem regarding the impact of LSCM practices on performance of quality. The findings from the statistical analysis indicated that a significant and positive impact of lean supply chain management practices on performance of quality in pharmaceutical firms in Jordan. This result is consistent with previous related studies:(Agus & Shukri Hajinoor, 2012; Al-jawazneh, 2015b; Mansouri et al., 2014; Taj & Morosan, 2011). That was the answer for the question (Is there any impact of LSCM practices (waste reduction, continuous improvement, demand signal, sales and operations planning, inventory management practice, production process standardization, value-added activities) on performance in terms of quality in Jordanian pharmaceutical firms?)

Sales and operation planning(S&OP), Production process standardization, and waste reduction practices had the strongest impact on POQ. Followed by inventory management practices, value-added activities, demand signal and continuous improvement.

The respondents indicate that LSCM practices help pharmaceutical manufacturing firms to improve their operations and process, achieve cost reduction, and improvement of quality and efficiency with less effort, also, the adoption of these practices will allow the manager to develop appropriate strategies to take advantage of opportunities that present in the global market.

However, the adoption of lean supply chain management components has helped in reducing the operational cost which is as a result of reducing waste in terms of material, time as well as space in order to ensure that quality products are delivered to the customers in a shorter period, and low price. This has contributed positively to the performancence of these factories.

In order to realize the full benefits of LSCM practices, the management needed to make sure that their suppliers were well communicated to and that they adhered to supply goods that were of high quality in order to ensure that quality of the final product has been enhanced and that order time has been reduced to meet the customer needs and hence improve on operational performance.

5.3 Recommendations

Based upon the concluded result a set of recommendations were presented, the most important of these are:

These organizations can organize more training and seminars to smaller pharmaceutical manufacturing companies to expose the concept of lean supply chain upfront, as the concept can consider new, limits to insufficient resources.

To implement lean supply chain management successfully, the firms require to share information effectively with their partners in the supply chain, also to share information of markets and customers requirement to secure delivery the final product at right time, and right quantity and this result lead to add a competitive advantage to firms.

Continuous efforts from managers are required to apply appropriate implementation lean practices to enhance overall performance.

The pharmaceutical manufacturing companies are recommended to conduct researches regularly on LSCM, to make it sure that their sector is moving in the right direction of competitiveness.

The adoption of LSCM practices will help efficiently and effectively meet the challenges arising from a dynamic global business environment.

The Jordanian pharmaceutical companies should adopt benchmarking techniques from leading LSC companies, and facilitate the work of benchmarking teams to improve the reputation and quality of Jordanian pharmaceutical products.

The Jordanian pharmaceutical companies should develop their sales and operation planning and should utilize S&OP data and implement this practice across the entire supply chain.

The government can assign some sort of awards for those companies that make best efforts to apply LSC practices and are successful.

The management of these pharmaceutical firms needs to invest more on skill and knowledge acquisition on the management of the lean supply chain management.

These firms should communicate its demand forecasts to its supply chain partners.

5.4 Suggestions for Further Research

Future research should consider other LSCM practices not considered in this research study such as just in time (JIT), human resource management (HRM), total quality management (TQM), and data standard.

Future research should also examine the present practices of LSCM, and its impact on other dimensions such as competitive advantage, productivity, customer satisfaction and performance of the company.

Future research can improve on this study by allowing for data gathering from multiple SC partners; data from suppliers as well as buyers would have improved the assessment of LSCM.

This study covers only pharmaceutical manufacturing in Jordan, which means the findings and conclusions, can be only applied to the target population of the study. So, the future research can do this study on the other companies or another field such as food processing companies, electronic, and furniture sectors.

In the future, one should research how the mediating effect of technological uses on the relationship between LSCM and performance of quality.

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APPENDIX

Academic Referees	University
Dr. Adnan Al bashir	The Hashemite University https://www.google.jo/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwiCh5G8qNfXAhXJhqQKHdukBjkQFggkMAA&rl=https%3A%2F%2Fhu.edu.jo%2F&usg=AOvVaw2WZpNj3fC8zI2xblzE0P9a
Dr. Morad Etier	https://www.google.jo/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwiCh5G8qNfXAhXJhqQKHdukBjkQFggkMAA&rl=https%3A%2F%2Fhu.edu.jo%2F&usg=AOvVaw2WZpNj3fC8zI2xblzE0P9aThe Hashemite University
Dr. Marwan al Shamry	The Hashemite University

APPENDIX (A)

ACADEMIC REFEREES

APPENDIX (B)

NAMES OF PHARMACEUTICAL FIRMS THAT PARTICIPATED IN THE STUDY

No.	Pharmaceutical Manufacturers Name
1	3R Pharmaceuticals & Cosmetics' Industries Co.Ltd.
2	Ram Pharmaceuticals Co. Ltd.
3	Philadelphia Pharmaceutical Co.
4	Arab Center For Pharmaceutical & Chemical Industries Co **(**ACPC**)**
5	Amman pharmaceutical industries company (API)
6	Tayseer al halawani Co.
7	United Pharmaceuticals Manufacturing Co UPM
8	MS Pharma Injectable
9	Al-Kindi Pharmaceutical Manufacturing Co.
10	Al-Rahma Pharmaceutical Co.

APPENDIX(C)

QUESTIONNAIRE IN ENGLISH

Dear participant,

This study will be conducted to examine the impact between lean supply chain management practices and performance of quality in the Jordanian pharmaceutical firms

As a fulfilment to get the master's degree in business administration at Al-al-Bayt University, you are kindly requested to participate in by responding to the questionnaire. All the information will be kept confidential and will be used for scientific research. Your participation will be highly appreciated, and if you have any question related to this study, please contact the researcher at the following address.

Thank you for your collaboration.

Researcher: Supervisor

Rajaa Abuzainah prof.Bahjat Eid Al-Jawazneh

Business Administration Master Student Faculty of Business Administration

Telephone: 0776624737 Al-al-Bayt University, Mafraq, Jordan

Email address:eng_rajaa49@yahoo.com E-mail: jawazneh9@yahoo.com

Section One: Demographic Data

Please put (√) in the box that represents your answer on each of the following questionnaires:

1) Gender:

Male ☐ fem☐

2) Age :

30 years and less ☐ 31-40 years o☐

41-50 years old ☐ 51 years and above ☐

3) Educational level :

diploma ☐

Bachelor's degre☐ ☐ postgraduate

4) The number of years of experience in their current position:

five years and less 6-10 years

11-15 years ☐ 16 years an☐ove

5) Company age :

five years and less 6-10 years

11-15 years 16 years and☐ve

6)A number of employees within the organization:

Less than 5☐ 50-1☐ 101-☐

201-300 ☐ 301-500 ☐ 500-and ☐ more

7) Job Position:

Head of department ☐ Production mana ☐

Supervisor ☐ Engineer ☐

Team leader ☐

other……

8) Department:

Purchasing ☐ R&D ☐

Production ☐ Distrib ☐

Quality ☐ Sales ☐

Other ……

9) Product market:

Local ☐ international ☐ Local and international ☐

10) Has your company received any ISO certificate?

Yes ☐ N ☐ ,if yes which one…….

11) Source of raw materials and components?

Local ☐ international ☐ Local and international ☐

Section two: this section contains statements that measure the lean supply chain management practices on your firms, please mark (√) only on an appropriate answer on the scale.

Waste Reduction		Strongly agree	Agree	Natural	Disagree	Strongly disagree
1	Our company has an extra care to reduce waste of over - processing**.**					
2	Our company has an extra care to reduce waste of over-production.					
3	Our company works together with other supply chain partners to eliminate waste throughout the supply chain.					
4	We have a plan and strategy to eliminate waste.					
5	Our company analyzes internal processes to minimize waste **.**					
6	Our company reduces unnecessary movements by employees during their work.					
7	Our company reduces waiting time between process and another**.**					
8	Our company uses just in time (JIT) to eliminate waste.					

Continuous Improvement		Strongly agree	Agree	Natural	Disagree	Strongly disagree
9	Our company has continuous improvement programs in place					
10	Our company has ongoing efforts to improve products, services, or processes**.**					
11	Our company developed published culture of continuous improvement exists across the supply chain.					
12	Our company strives to hold regularly training Programs for latest techniques and production methods.					
Demand Signal		Strongly agree	Agree	Natural	Disagree	Strongly disagree
13	Our company manufactures its Product based on the forecast**.**					
14	Our company has an ability to forecast its demands accurately based on actual uses of products.					

15	Our company has invested time and money to collaborate with its supply chain partners regarding demand planning.					
1**6**	Our company always conducts annual production and purchasing planning					
1**7**	Our company always communicates its demand forecasts to its supply chain partners.					
18	Our company has an ability to deal with different levels of demand**.**					
Sales and operations Planning(S&OP)		Strongly agree	Agree	Natural	Disagree	Strongly disagree
19	Our company has developed S&OP system internally.					
20	S&OP is a fully integrated planning process between organization and its all supply chain partner.					

2**1**	S&OP is a collaborative process using online tools available with all supply chain partner.					
2**2**	All key supply chain partners share data and plan to develop S&OP programs.					
2**3**	Our company has fully integrated processes for S&OP that are aligned with customer requirements.					
2**4**	Our company rigorously follows S&OP processes.					
2**5**	Our company allows all its supply chain partners to participate regularly in S&OP meetings.					

Inventory Management Practice		Strongly agree	Agree	Natural	Disagree	Strongly disagree
2**6**	Supply chain partners have implemented inventory visibility systems and processes to reduce excess inventory throughout the supply chain.					
2**7**	Inventory is managed independently, and their focus is on the cost of the total purchase.					
2**8**	Supply chain partners strive to reduce lead time.					
29	Our company can determine the appropriate maximum and minimum inventory levels for raw material **.**					
3**0**	Our company uses the most current technology in managing inventory.					
3**1**	Our company employs a set of techniques to manage the inventory levels within different companies in a supply chain.					

Production Process Standardization		Strongly agree	Agree	Natural	Disagree	Strongly disagree
32	Our company has defined and standardized Planning, production, and stock management processes across the supply chain.					
33	Our company attempts to standardize internal or external processes.					
34	Processes can be documented by the operator and shared with supply chain partners.					
35	Our company has standardized and rationalized the range of materials and consumables.					
36	Our company has an extra care to reduce and eliminate task time variation by establishing standard work procedures.					
37	Our company has a high level of the process standardization that enables it to expand its capacities without impairing production.					

Value-added Activities		Strongly agree	Agree	Natural	Disagree	Strongly disagree
38	Our company is aware of what activities are added value- to the process.					
39	Our company has the capabilities to clear distinction between value-added and non-value-added activities.					
40	Our company is actively performing collaborative practices with suppliers to eliminate non-value-added activities.					
41	Our company is actively performing collaborative practices with customers to eliminate non-value-added activities.					

Section Three: This section contains statements that measure the performance of quality on your firms, please mark (√) only on an appropriate answer on the scale.

performance of quality		Strongly agree	Agree	Natural	Disagree	Strongly disagree
42	Our workers on the shop floor have developed the ability to correct and diagnose the problem without the intervention their manager.					
43	Our company has developed the ability to manufacture zero defect products.					
44	Our company has developed the capability of conforming to the standard of specifications.					
45	The rate of rework and scrap has dramatically decreased in our company.					
46	The time spent on remedial maintenance has decreased in our company.					

THANK YOU

APPENDIX (D)

استبيان

عزيزي الموظف،

تقوم الباحثة بإجراء دراسة حول (إدارة سلسلة التوريد الرشيقه وأثرها على أداء الجودة في شركات الأدوية الأردنية)وذلك استكمالا لمتطلبات الحصول على درجة الماجستير في إدارة الأعمال من جامعة آل البيت .

لذا نرجو بالتكرم بالإجابة على فقرات الاستبيان بدقة وموضوعية ،علماً بإن جميع الاجابات ستستخدم لاثراء هذه الدراسة ولاغراض البحث العلمي .

شاكراً لكم حسن تعاونكم

الباحثة :رجاء عبدالرحمن ابوزينه

eng_rajaa49@yahoo.com

المشرف :أ.د بهجت عيد جوازنة

jawazneh9@yahoo.com

القسم الاول : البيانات الديموغرافيه

أرجو وضع (√) في الصندوق الذي يشير الى اجابتك عن هذه الاسئلة :

الجنس :

ذكر ☐ انثى ☐

العمر :

30 سنه واقل ☐ 31_40 سنه ☐ 41_50سنا ☐ 51 سنه واكبر ☐

3) المستوى التعليمي :

دبلوم ☐ البكالوريوس ☐

الدراسات العليا ☐

4)عدد سنوات الخبرة في الموقع الحالي :

5خمس سنوات واقل ☐ 6-10 سنوات ☐

11-15 سنة ☐ 16سنة واكثر ☐

5) عمر الشركة :

5خمس سنوات واقل ☐ 6-10 سنوات ☐

11-15 سنة ☐ 16سنة واكثر ☐

6) عدد الموظفين :

101- 200 50-100 ☐ اقل من 50 ☐ ☐

201-300 ☐ 301- 500 ☐ اكثر من 500 ☐

7) المسمى الوظيفي:

مدير الانتاج ☐ رئيس قسم ☐ مهندس ☐ ☐

مشرف ☐ قائد ☐

غير ذلك .....

8) القسم:

قسم المشتريات ☐ قسم البحث والتطوير ☐

☐

قسم الانتاج ☐ قسم التوزيع

☐ ☐

قسم الجودة قسم المبيعات

غير ذلك .....

9) سوق المنتج:

محلي ☐ عالمي ☐ محلي وعالمي ☐

10) هل حصلت شركتك على اي شهادة للISO:

☐

نعم ☐ لا ماهي

.....

11) مصدر المواد الاولية والمكونات :

محلي ☐ عالمي ☐ محلي وعالمي ☐

القسم الثاني : يحتوي هذا القسم على بيانات تقيس ممارسات إدارة سلسلة التوريد الرشيقة ، يرجى وضع علامة (√) فقط على الإجابة المناسبة.

	الحد من الهدر	أوافق بشدة	أوافق	محايد	لا أوافق	لا أوافق بشدة
1	لدى شركتنا اهتمام شديد للحد من الهدر خلال الانتاج.					
2	لدى شركتنا اهتمام شديد للحد من الهدر خلال العمليات.					
3	شركتنا تعمل جنبا إلى جنب مع شركاء سلسلة التوريد الأخرى للتخلص من الهدر في جميع مراحل سلسلة التوريد.					
4	شركتنا لديها خطة واستراتيجية للتخلص من الهدر.					
5	تحلل شركتنا العمليات الداخلية للتقليل من الهدر. .					
6	تقلل شركتنا من حركات الموظفين الغير ضرورية التي تكون اثناء عملهم.					
7	تقلل شركتنا من وقت الانتظار بين العملية والاخرى.					
8	شركتنا تستخدم JIT للتخلص من الهدر.					

التحسين المستمر		أوافق بشدة	أوافق	محايد	لا أوافق	لا أوافق بشدة
9	.. لدى شركتنا برامج للتحسين المستمر					
10	لدى شركتنا جهود مستمرة لتحسين المنتجات والخدمات، أو العمليات.					
11	نشرت شركتنا ثقافة التحسين المستمر عبر جميع مراحل سلسلة التوريد.					
12	تسعى شركتنا جاهدة لعقد برامج التدريب بشكل منتظم لأحدث التقنيات والطرق الانتاجية .					
اشارة الطلب		أوافق بشدة	أوافق	محايد	لا أوافق	لا أوافق بشدة

13	تقوم شركتنا بتصنيع منتجاتها بناءا على التوقعات(التنبؤات).					
14	لدى شركتنا القدرة على التنبؤ للطلبات بشكل دقيق وذلك اعتماداً على مدى الاستخدام الفعلي للمنتجات.					
15	ستثمر شركتنا الوقت والمال للتعاون من شركائها في سلسله التوريد فيما يتعلق بتخطيط الطلب.					
16	تقوم شركتنا بشكل دائم وسنوي بعمل تخطيط لعمليات الشراء والانتاج .					
17	تقوم شركتنا بشكل دائم بتوصيل توقعات الطلب لشركائها في سلسلة التوريد.					
18	لدى شركتنا القدرة على التعامل مع المستويات المختلفة من الطلب.					
تخطيط المبيعات والعمليات		أوافق بشدة	أوافق	محايد	لا أوافق	لا أوافق بشدة

19	طورت شركتنا نظاما داخليا لتخطيطالمبيعات والعمليات .					
20	تخطيط المبيعات والعمليات هي عملية تخطيط متكاملة تماما بين المنظمة وكل شركاء سلسلة التوريد.					
21	تخطيط المبيعات والعمليات هي عمليه تعاونيه تستخدم الادوات المتاحة عبر الانترنت لربطها مع شركاء سلسلة التوريد.					
22	جميع شركاء سلسلة التوريد الرئيسية تتبادل البيانات والخطط لتطوير برامج لتخطيط المبيعات والعمليات.					
23	لدى شركتنا عمليات تخطيط متكاملة بشكل تام والتي تتماشى مع متطلبات الزبائن.					
24	تتبع شركتنا بدقة عمليات تخطيط المبيعات والعمليات.					
25	تسمح شركتنا لجميع شركائها في سلسلة التوريد المشاركة بشكل منتظم في اجتماعات S&OP.					

	ممارسات إدارة المخزون	أوافق بشدة	أوافق	محايد	لا أوافق	لا أوافق بشدة
26	يستخدم شركاء سلسلة التوريد انظمة التخزين المرئية من اجل الحد من المخزون الزائد على امتداد سلسلة التوريد.					
27	يتم إدارة المخزون بشكل مستقل ويكون التركيزعلى تكلفة الشراء الكلي.					
28	يسعى شركاء سلسة التوريد الى تقليل الوقت اللازم من استلام الطلب الى وصوله الى الزبون(وقت المهلة).					
29	تستطيع شركتنا تحديد الحد الأقصى المناسب والحد الأدنى من مستويات المخزون للمواد الخام.					
30	تستخدم شركتنا أحدث التكنولوجيا في إدارة المخزون.					
31	توظف شركتنا مجموعة من التقنيات لإدارة مستويات المخزون داخل الشركات المختلفة في سلسلة التوريد.					

	توحيد عمليات الانتاج	أوافق بشدة	أوافق	محايد	لا أوافق	لا أوافق بشدة
32	حددت شركتنا ووحدت عمليات التخطيط والإنتاج، وإدارة المخزون عبر جميع مراحل سلسلة التوريد.					
33	تحاول شركتنا توحيد العمليات الداخلية و الخارجية.					
34	يمكن توثيق العمليات من قبل المشغل ومشاركتها مع شركاء سلسلة التوريد.					
35	وحدت شركتنا المواد المستخدمة في عمليات الانتاج.					
36	تبذل شركتنا اهتماما شديد من اجل تقليل من وقت المهام الزائد وذلك عن طريق وضع اجراءات العمل القياسية.					
37	شركتنا لديها مستوى عال من عملية التوحيد التي تمكنها من توسيع قدراتها دون إعاقة الإنتاج.					

	نشاطات اضافة القيمة	أوافق بشدة	أوافق	محايد	لا أوافق	لا أوافق بشدة
38	شركتنا تدرك ما هي الأنشطة التي تضاف قيمة إلى العملية.					
39	لدى شركتنا القدرة على التمييز بين الأنشطة ذات القيمة المضافة والأنشطة غير ذات القيمة المضافة.					
40	تؤدي شركتنا بنشاط الممارسات التعاونية مع الموردين للتخلص من الأنشطة غير ذات القيمة المضافة.					
41	تؤدي شركتنا بنشاط الممارسات التعاونية مع العملاء للتخلص من الأنشطة غير ذات القيمة المضافة.					

القسم الثالث : يحتوي هذا القسم فقرات لقياس اداء الجودة ، يرجى وضع علامة (√) فقط على الإجابة المناسبة.

	اداء الجودة	أوافق بشدة	أوافق	محايد	لا أوافق	لا أوافق بشدة
42	عمالنا على أرضية المحل لديهم القدرة على تصحيح وتشخيص المشكلة دون تدخل مديرهم.					
43	لدى شركتنا القدرة على تصنيع منتجات عيب صفر اي منتجات خالية من العيوب.					
44	لدى شركتنا القدرة على مطابقة معايير المواصفات.					
45	معدل إعادة العمل والخردة انخفض بشكل كبير في شركتنا.					
46	الوقت الذي تقضيه الشركة في الصيانة العلاجية قد انخفض.					

APPENDIX (E)

PHARMACEUTICAL SECTOR IN JORDAN

Jordan is considered a pioneer among the countries in the Arab world in terms of the pharmaceutical industry. The first Jordanian pharmaceutical factory was founded in 1962 with the establishment of Arab Pharmaceutical Manufacturing Company, and since then, the industry grew significantly. The pharmaceutical industry is the second largest exporting industry in Jordan, which included 84% human medication. The total exports are $8.385 billion. Accordingly, contributing strongly to reducing the deficit in Jordan's trade balance (Jordan Kuwait Bank Annual Report 2012).

The Jordanian pharmaceutical industry has grown impressively over the past five decades. The high quality, splendid reputation and affordable price of the Jordanian pharmaceutical products led this industry into exporting about 75% of their production to 70 Arab and foreign countries, and the largest part is exported to Arab countries (The High Health Council, 2015).

Recently, some of these pharmaceutical companies have shown a willingness to restructure their operations and processes to reduce unnecessary time and to create a culture that helps sustain high quality while reducing costs to achieve greater profits.

The Jordanian pharmaceutical sector is considered to be an advanced sector that has marked Jordan on the map. Nevertheless, companies that have participated in doing so are numbered while the remaining has been struggling to grow among their peers. Pharmaceutical producers are classified into two categories; originators, developing original molecules of the medicine, and generics, manufacturers of similar drugs molecules of the originators, which most of the Jordanian and regional drug manufacturers fall under (the Jordanian association of pharmaceutical manufacturers (JAPM)).

Like many of today's organization's Pharmaceutical industry in Jordan fight for maintaining its competitive position in the marketplace, As a result of globalization and information and communications technologies that forced them to enter new markets, adopt different operations strategies, and deal with different human cultures at work. Therefore, for these organizations, conflict handling and resolution is becoming a non-ending activity to meet the demands of the new wave of competitiveness(Al-jawazneh, 2015a).

The sector is subject to the supervision of the Jordanian Food and Drug Association (JFDA), which approves the release and use of drugs manufactured after passing through the appropriate testing channels. The JFDA is a financially independent department from the Ministry of Health that reports directly to the Minister. The collaboration between regulatory and advisory bodies is apparent, and one can conclude that the sector is efficiently governed.

In regards to manufacturers' level, and despite its progression, room for expansion remains wide. Although the sector faces cost challenges, it is the most competitive in the region with sales concentrated in Saudi and Algeria. Al Hikma Pharmaceuticals is the only Jordanian company that managed to acquire the US Food and Drug Association approval to export its products into the United States of America. The financial performance of the producers got hit in 2008 and 2009 on the back of weak growth rates and losses realized from financial portfolios. ((http://www.amwalinvest.com/sites/default/files/Pharmacuetical_Report.pdf)))