جامعة الشرق الأوسط
MIDDLE EAST UNIVERSITY
Amman - Jordan

The Effect of Total Just in Time Implementation on Lean Operations in Jordanian Pharmaceutical Manufacturing Companies

أثر تطبيق الإنتاج الكلي الآني على العمليات الرشيقة في شركات الصناعة الدوائية الأردنية

Prepared by:

Riman Amin Jabirou

Supervised by:

Dr. Abdel-Aziz Ahmad Sharabati

Thesis Submitted in Partial Fulfillment of the Requirements for Master's Degree in MBA

Management Department

Business Faculty

Middle East University

June, 2020

Authorization

I **Riman Amin Jabirou**, hereby grant Middle East University the authorization and the right to provide copies of my thesis and/or distribute it worldwide, in whole or in part, and/or my abstract, in whole or in part, to Libraries, Institutions and other entities requesting it.

Name: Riman Amin Jabirou

Date: 23/06/2020

Signature:

Examination Committee's Decision

This thesis of the student Riman Amin Jabirou, which study "The Effect of Total Just in Time Perceived Practices on Lean Operations in Jordanian Pharmaceutical Manufacturing Companies" has been defined, accepted, and approved on 23/06/2020.

Committee Members:

No.	Name	Title	Signature
1	Dr. Abdel-Aziz Ahmad Sharabati	Supervisor, MEU	
2	Dr. Faiz Ahmad Albadri	Internal Examiner, MEU	
3	Dr. Nidal Amin Alsalhi	External Examiner, Petra University	

Acknowledgment

To start, I would like to thank God. His help is what got me motivated and gave me the push that I needed to get my work over the line.

Moreover, I am extremely appreciative and thankful to my supervisor, Dr. Abdel-Aziz Ahmad Sharabati. Without his suggestions, patience, virtue, dedication, commitment, and inspiration this work would not be completed.

I would also like to thank many of the individuals and organizations whose help and information played a vital role in completing this work.

Finally, I want to thank the examination committee for taking the time to review and examine the material of the study.

Riman Amin Jabiro

Dedication

I would like to dedicate this thesis to my beloved father, may his soul rest in peace, and my lovely mother for all of her prayers and encouragement.

Special thanks to my dear husband, Dr. Abdulnaser Sijari, for all his support and love, and my precious children Ranim, Yumen, Rawan, Muhammad, Omair, Karam, and Ayla who have shown nothing but support throughout this journey.

To each and everyone who has helped in my thesis, I cannot describe how thankful I am and would like to dedicate my appreciation to them.

Riman Amin Jabirou

Table of Contents

List of Tables

List of Models

List of Figures

List of Appendices

The Effect of Total Just in Time Implementation on Lean Operations in Jordanian Pharmaceutical Manufacturing Companies

Prepared by: Riman Amin Jabirou

Supervised by: Dr. Abdel-Aziz Ahmad Sharabati

Abstract

This study aims to investigate the effect of Total Just in Time (JIT) (JIT purchasing, JIT operation, JIT Selling) on Lean operations in the Jordanian Pharmaceutical Manufacturing Companies (JPMC) to eliminate the following types of waste (overproduction, inventory, motion, transportation, over-processing, defects, waiting time, and underutilization).To achieve this object a questionnaire is developed, and distributed among the managers working at 14 Pharmaceutical Manufacturing companies (JPMC)that are registered in the Jordanian Association of Pharmaceutical Manufacturers. in addition to one company in the free zone, which negates the need for sampling. Data is collected from 107resived complete answered questionnaire, after data analysis, the normality, validity, and reliability of the tool are confirmed, descriptive analysis carried out, and the correlation between variables checked. Finally, the hypothesis impact tested by multiple regressions. The results show that there is a high implementation of Total Just in Time practices in Jordanian Pharmaceutical Manufacturing Companies (JPMC). The JIT Selling has the highest rate of implementation, then JIT Operation, finally JIT Purchasing. Furthermore, the findings depict the high implementation of Lean Operations' sub-variables, The Inventory waste had the highest mean, then Over Production waste, then Over-processing waste, then Transportation waste, then Defect waste, then Waiting waste, then Motion waste, and finally Underutilization Waste. Moreover, the results indicated that Total JIT practices affected Lean Operations significantly, and indicated that the relationships between total JIT sub-variables (JIT Purchasing, JIT Operation, JIT Selling) and Lean Operations are strong in Jordanian Pharmaceutical Manufacturing Companies. The study recommends the (JPMC) to pay more attention to Total JIT implantation in the industry for their important role in waste reduction.

Keywords: Just in Time, Lean Operations, JIT Purchasing, JIT Operation, JIT Selling, Jordanian Pharmaceutical Manufacturing Companies.

أثر تطبيق الإنتاج الكلي الآني على العمليات الرشيقة في شركات الصناعة الدوائية الأردنية

إعداد: ريمان أمين جبيرو

إشراف: د. عبد العزيز أحمد شرباتي

الملخص

تهدف هذه الدراسة إلى بيان أثر الإنتاج الكلي الآني (الإنتاج الآني للمشتريات، الإنتاج الآني للعمليات، الإنتاج الآني للمبيعات) على العمليات الرشيقة في شركات الصناعة الدوائية الأردنية ودورها في إزالة هذه الأنواع من الهدر (الهدر في زيادة الإنتاج، الهدر في المستودعات، الهدر في الحركة، الهدر في النقل، الهدر الناتج عن الانتظار، الهدر الناتج عن نقص الاستخدام، الهدر في المعالجة، الهدر في الأعطال). تعتبر هذه الدراسة وصفية وقد تم إجراء الدراسة على 14 شركة مسجلة في الاتحاد الاردني لمنتجي الدواء بالإضافة إلى شركة تعمل في المنطقة الحرة من أجل هذا الغرض تم تطوير وثم اشتقاق الاستبيانية وتطويرها بناءً على الدراسات السابقة وبمساعدة لجنة محكمين. تم توزيع الاستبانة بواسطة البريد الالكتروني نظراً لظروف جائحة فيروس كورونا وتم استلام 107 استبانة فقط. وبعد التأكد من التوزيع الطبيعي والصدق والثبات للأداة والعلاقة بين المتغيرات تم إجراء تحليل وصفي وفحص العلاقة بين المتغيرات وأخيراً تم استخدام الانحدار المتعدد لفحص المتغيرات. أظهرت نتائج هذه الدراسة أن هناك تطبيق عالي للإنتاج الكلي الآني في شركات الصناعة الدوائية الأردنية. سجل الإنتاج الآني للبيع أعلى نسبة تطبيق يليه الإنتاج الآني للعمليات وأخيراً الإنتاج الآني للمشتريات. كذلك وجدت أن هنالك تطبيق عالي لمرتكزات العمليات الرشيقة حيث سجل الهدر في المستودعات أعلى تطبيق يليه الهدر في زيادة الإنتاج ثم الهدر في زيادة العمليات ثم الهدر في النقل ثم الهدر في الأعطال ثم الهدر الناتج عن الانتظار ثم الهدر في الحركة وأخيراُ الهدر الناتج عن نقص الاستخدام. كما أشارت النتائج إلى أن الإنتاج الكلي الآني يؤثر بشكل واضح على العمليات الرشيقة وعلى وجود علاقة قوية بين مرتكزات الإنتاج الكلي الآني (الإنتاج الآني للمشتريات، الإنتاج الآني للعمليات، الإنتاج الآني للمبيعات) والعمليات الرشيقة في شركات الصناعة الدوائية الأردنية. أوصت الدراسة شركات الصناعة الدوائية الأردنية بأن تعطي اهتماماً أكبر لمفهوم التصنيع الآني الكلي لأنها تؤثر على بعضها البعض وأثرها واضح في تخفيض الهدر.

الكلمات المفتاحية: الإنتاج الكلي الآني، العمليات الرشيقة، الإنتاج الآني للمشتريات، الإنتاج الآني للعمليات، الإنتاج الآني للمبيعات، شركات الصناعة الدوائية الأردنية.

Chapter One: Background of the Study

Introduction

In light of the rapid industrial and technological advancement, the intensification of fierce global competition between corporations, and the different crises which have influenced companies in many sectors, it has become crucial for organizations to explore all accessible opportunities to improve their operations practices, without affecting customer satisfaction, and adopt contemporary management concepts to maintain their survival in the market and improve their efficiency and productivity. Therefore, many organizations are striving hard to provide their customers with the right product in the right quality, at the right place, price, and time. This can be achieved by giving more attention to Just in Time (JIT), Toyota Production System (TPS) and Lean operations concepts, which are considered as powerful systems to improve productivity. These Japanese techniques have been established by Taiichi Ohno- the former executive vice president of Toyota- who set his goal to perfect every manufacturing aspect of the automotive industry: no defective parts or bad quality, no inventories, no activities that have no added value in the eyes of customers, and no waste Heizer, et. al. (2013). Toyota Motor Corporation became a standard and was the pioneer in JIT with many industries following its lead by making essential changes in managing its operations, one industry following the other.

Many authors consider Just in Time as a system to increase productivity, improve quality, decrease costs, and make delivery in time as capable as possible through the elimination of all kinds of waste, others consider it as a tool for lean operations, while others use the terms Just in Time and lean operation for the generic name of pull–system manufacturing Heizer, et. al. (2013); Goetsch and Davis (2014); and Simanjuntak and Yudy (2017).

Traditionally, most research focuses on studying the effect of Just in Time, and Lean operations on organizational performance, production activities related to quality improvements, and search for increased efficiency Green, et. al (2014); Negrão, et. al. (2017); and Simanjuntak and Yudy (2017). While others studied the relationship among the Total JIT elements JIT Purchasing, JIT operation, and JIT Selling or one of them and their impact on performance such as Inman, et.al. (2011); Danese, et.al. (2012); Kulkarni, et.al. (2014); and Ramlawati (2018)

Additionally, many researchers studied the impact of total JIT application on organization competitive advantage and found it to be effective in enhancing competitiveness Jadhav, et. al. (2015a); Darwish (2018); Al-Shourah, et. al. (2018); and Ramlawati (2018).

Gupta (2011); Sternberg, et. al. (2013); and Resta, et. al. (2015) seek to identify the types and causes of waste and develop a waste framework for operations by adjusting the classical 7 wastes in services sectors.

Furthermore, Wu, et. al. (2012), mentioned the main aim of implementing just-in-time (JIT) principles is to reduce and eliminate all kinds of waste. Qureshi, et.al (2013) identified the key strategies of Just-in-Time (JIT) management philosophy for its successful implementation in the cement industry in Pakistan. Singh, et. al. (2013) stated that the main goal for lean operations is the elimination of all kinds of error sources, defects, and variation's contributors throughout the production processes to improve quality. While Kumar, et. al. (2015) explained how to eliminate waste through lean implementation. Negrão, et. al. (2017) mentioned that the Lean implementation is still occurring in a fragmented way since some results indicate that there is a positive effect of lean practices on operational, financial, and/or environmental performance, while other results showed a negative effect on operational or financial performance. In addition, it was found that many JIT practices showed a positive effect on organization performance while others did not. AL-Manei, et. al. (2017) studied the extent of the implementation of the lean system in small and medium enterprises and the effect of JIT as one of its tools on productivity.

However, the pharmaceutical industry has been very late to adopt these concepts and began its journey almost in 2003. Multinational companies like Novartis started to implement JIT techniques since 2004, to become " the Toyota of pharmaceutical industries " Dreamer and Niewiarowski (2013), also Eisai Knowledge Centre adopted JIT philosophy during designing its production space to facilitate the smooth flow of materials, equipment, and people, which lead to low inventories, shorter lead and cycles times, high performance through slightest deviations in the production process, less rejected products, less release time and fewer customer complaints. Lamba, (2013). According to Friedli, et.al. (2013), several pressures forced the industry to look for new ways to increase their effectiveness and efficiency; increased cost and productivity crisis in pharmaceutical research and development, and the industry’s strict regulations. Thus, the pharmaceutical companies began to work more efficiently by implementing (JIT) principles which require reasonable management of resources to allow the flow of production prompted by customers’ pull to eliminate overproduction, avoid excess inventories and eliminate waste. Friedli and Lembke (2013) mentioned that in the JIT system, the culture of teamwork prevails, and the training in maintenance and quality control areas becomes essential. Singh, et. al. (2017) considers Just in Time as the process which will pave the way for Lean Operations. Sieckmann, et. al.

(2018) mentioned that the implementation of Lean Production System (LPS) is still difficult in the pharmaceutical industry, especially in small and medium-sized enterprises (SMEs), since these enterprises have special features, also due to the absence of sufficient knowledge to implement LPS feasible with the high regulatory requirements that prevent applying Lean Production System. On the other hand, the current Good Manufacturing Practices cGMP is integrated with the LPS approach as a quality-oriented system making the implementation of LPS in the pharmaceutical industry possible. Karam, et.al. (2018) mentioned that for the successful Lean Manufacturing technique implementation in the pharmaceutical industry effective communication is required between operators and between operator-supervisor, discipline, and process control are also needed. Reyes, et, al (2018) mentioned that the level of Lean Readiness in the European pharmaceutical manufacturing industry is insufficient.

The Jordanian pharmaceutical industry is considered as one of the most important manufacturing industries since it contributes 7% of the gross domestic product of the industrial sector in Jordan, 80% of the total Jordanian exports and provides 27 thousand job opportunities Al-Kurdi (2020). Several researchers have investigated the level of Just in Time and its effects such as Al-Matarneh (2012) studied the requirements elements for the application of JIT system and the obstacles in industrial companies, Al-Maani, (2016) mentioned that Jordanian public industrial companies don’t implement JIT production system, and many obstacles hinder the implementation of JIT production systems such as the lack of experience and lack of awareness in low and top management. Al Haraisa (2017) mentioned that the Just in Time system has a positive effect on the operational excellence in Jordanian industrial companies. Darwish (2018) studied the impact of Total Just in Time on Competitive Advantage in Jordanian International Fast Food Restaurants.

Although the JIT system is widely implemented by multinational companies, it has been missed by pharmaceutical companies in developing countries such as Jordan. Al Kunsol (2015) studied the impact of Lean Six Sigma on the Business Performance in the Pharmaceutical Manufacturing Organization in Jordan. Khaireddin, et. al. (2015) found that JIT practice has an impact on the strategic performance of Jordanian pharmaceutical companies. Saleh, et. al. (2018) mentioned that lean practices have a significant effect on productivity, whereas reduction of waste did not have a significant effect. Al-Shourah, et. al. (2018) mentioned that there was a statistically significant effect of Just in Time on improving the Production Performance in Pharmaceutical Companies in the Amman Stock Exchange. Alkhalidi and Abdallah (2018) mentioned that in a pharmaceutical company in Jordan the total quality management bundle is excellent, the human resource bundle is good, the Just in Time bundle is acceptable while the total preventive maintenance bundle is weak.

The necessity behind this study is to shed light on Total Just in Time implementation in Jordanian pharmaceutical companies and help overcome operational problems such as high level of inventories, underutilization of capacity, product quality, etc. Therefore, this study will be dedicated to investigating the effect of total JIT practices (JIT purchasing, JIT operation, and JIT Selling) and their effect on Lean Operations in the elimination or reduction of these types of waste (overproduction, inventory, motion, transportation, over-Processing, defects, waiting time, and underutilization.) on the Jordanian Pharmaceutical Manufacturing Companies (JPMC).

Study Purpose

This study aims to investigate the effect of Total JIT practices on Lean Operations in the Jordanian Pharmaceutical Manufacturing Companies (JPMC). It focuses on the role of

Total JIT practices (JIT purchasing, JIT operation, JIT Selling) and their effect on Lean Operations (overproduction, inventory, motion, transportation, over-processing, defects, waiting time, and underutilization.)

The objective of this study:

- 1-Evaluate how the Jordanian Pharmaceutical Manufacturing Companies (JPMC) implement the Total JIT items.
- 2-Enhance awareness for the deployment of the JIT concept in the pharmaceutical manufacturing sector and other sectors related to JIT implementation.
- 3-Introduce supposed model to managers working in the pharmaceutical industry and other industrial sectors.
- 4-Provide guidelines to decision-makers and authorities to make total JIT applications more viable.
- 5-Develop a framework for Total JIT future studies. Due to the limited number of previous studies on the effect of Total JIT applications on Lean Operations.

Study Significance

This study might be considered as one of the few studies that investigate the impact of Total JIT on Lean Operations in the Jordanian Pharmaceutical Manufacturing companies (JPMC).

Moreover, the study aims to draw valuable understanding guidelines about the effect of Total JIT implementation on Lean Operations (Overproduction, Waiting time, Transportation, Inventory, Motion, Over-processing, Defective products, and Underutilization talent wastes), in the Jordanian pharmaceutical Manufacturing Companies (JPMC), other manufacturing companies, organizations, and decisions makers.

JIT is important for achieving high-level performance, it will also contribute to the development of the Jordanian Pharmaceutical Manufacturing companies (JPMC) which will enable these organizations to work effectively in the global competitive market. Moreover, it will help other researchers to study JIT and lean operations systems in the pharmaceutical sector and other sectors.

Therefore, the value of this study comes from this scientific and practical points:

1-Drive attention to Total JIT concept and its effect on reducing waste to achieve high levels of performance on Jordanian Pharmaceutical Manufacturing companies.

2-. Contribute to the development of the Jordanian Pharmaceutical Manufacturing Companies to keep and maintain working effectively and efficiently that help on the public benefit.

3-Support other researches that related to JIT implementations, and its importance either on pharmaceuticals manufacturing industry or on other industries.

4- Help decision-makers to gain the benefit of implementation Total JIT in the pharmaceuticals industry or even other industries, and give the appropriate recommendation.

Study Problem Statement

Jordanian Pharmaceutical Manufacturing companies (JPMC) facing severe competition, locally and globally, forced them to adopt suitable strategies to face the market challenges.

From the researcher’s experience for more than twenty years as a pharmacist in the pharmaceutical manufacturing sector, there are several major problems such as inventory problems (raw materials, packaging materials, finished products), expiry date (raw materials, finished products), recalled products due to manufacturing defects; these problems from the researcher's point of view can be overcome by implementing JIT system to make the operations faster and more flexible.

Many previous studies mentioned the benefits of JIT system implementation. Singh and Singh (2014) explained the inter-relationship between JIT implementation and manufacturing performance measures. Jadhav, et.al. (2015a) mentioned that the most observable result gain from applying JIT is inventory reduction. Al Kunsol (2015) studied the impact of lean six sigma dimensions on the Jordanian pharmaceutical manufacturing organization's business performance. Abu Zaid, et al. (2016) stated that there is a direct and positive impact between JIT manufacturing and operational performance. Ramlawati (2018) found that JIT has a significant impact on competitive advantage and operational performance.

Therefore, this study is directed to answer the following question: does the total JIT sub-variables affect Lean Operations at Jordanian pharmaceutical companies?

Problem Questions:

The study problem can be perceived by having detailed and scientific answers to the subsequent questions:

The main question is:

1. Do Total Just in Time practices (JIT purchasing, JIT operations, JIT selling) affect the Lean Operations of Jordanian Pharmaceutical Manufacturing companies (JPMC)?

Based on Total JIT practices the main question can be divided into the following three sub-questions:

1.1. Does JIT Purchasing affect Lean Operations of Jordanian Pharmaceutical

Manufacturing companies (JPMC)?

1.2. Does JIT Operation affect Lean Operations of Jordanian Pharmaceutical Manufacturing companies (JPMC)?

1.3. Does JIT Selling affect Lean Operations of Jordanian Pharmaceutical Manufacturing companies (JPMC)?

Study Hypotheses:

The mentioned above questions can be answered by testing the following hypothesis:

Main hypothesis:

H_0: Total Just in Time practices (JIT Purchasing, JIT Operations, and JIT Selling) do not affect lean operations of Jordanian Pharmaceutical manufacturing companies. (JPMC), at $\alpha \leq 0.05$.

Based on Total JIT practices the main hypothesis can be divided into the following three sub-hypotheses:

$H_{0.1}$: JIT Purchasing does not affect lean operations of Jordanian Pharmaceutical manufacturing companies (JPMC), at $\alpha \leq 0.05$.

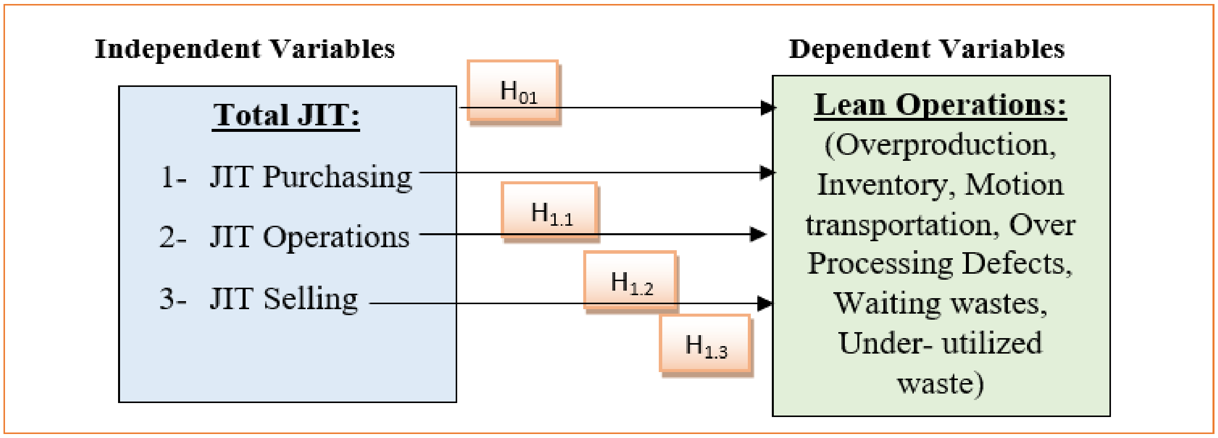
$H_{0.2}$: JIT Operation does not affect lean operations of Jordanian Pharmaceutical manufacturing companies (JPMC), at $\alpha \leq 0.05$.

$H_{O.3}$: JIT selling does not affect lean operations of Jordanian Pharmaceutical manufacturing companies (JPMC), at $\alpha \leq 0.05$.

Study Model:

This model was developed based on previous studies and theories in the literature for testing the effect of Total JIT practices (JIT purchasing, JIT operation, and JIT selling) on lean operations dimensions: overproduction, inventory, motion, transportation, over-processing, defects, waiting time, and underutilization in Jordanian Pharmaceutical Manufacturing companies. The model was developed according to, previous studies, problem statement, previous models, and research hypothesis.

Model 1. 1: Study Model



Sources: The model is developed based on the following previous studies: for independent variables: (Friedli, et. al. 2013; Singh and Singh 2014; Green, et. al 2014; Khaireddin, et. al. 2015; Abu Zaid et al 2016; Othman, et.al.2016; Darwish 2018; Ramlawati 2018; For dependent variables: Troy, 2013; Al-Kunsol 2015; Al-Shourah, et. al. 2018; Nimeh, et.al. 2018.

Procedural Definitions of Study Terms

Just in Time (JIT): In this research Just in Time is defined as a pull strategy that aims to enhance the procedures required to all purchasing, operations, and selling processing.

JIT Purchasing: JIT purchasing is the purchasing of the right materials, at the right time, at the right quantities with high quality, at the right price, and from right suppliers, this purchasing should be based on a specific schedule set according to customer demands and forecasting based on data. (minimum raw material inventory).

JIT Operations: JIT operations is a flexible demand-oriented material flow operation to produce on in-demand items, in-demand quantities, and at the demanded time, to eliminate unneeded production, unneeded inventory (minimum semi-finished goods), and all wastes related to them, eventually minimizing all production processes that are not adding actual value.

JIT Selling: JIT selling is the delivery of goods to the customer at the right time (directly from production site to the customer, minimum inventory of finished goods.) and at the right quality and quantities.

Definitions of Dependent Variable (Lean operations):

Lean Operations: is focusing on reducing and eliminating these types of waste: Overproduction waste, Inventory waste, Motion waste, Transportation waste, Over-processing waste, Defects waste, Waiting waste, and Underutilization waste.

Overproduction waste: is to produce more, earlier, and/or faster than is required by the next process or customer orders.

Inventory waste: is defined as any excessive storing of raw material, work in process (WIP) semi-finished and finished goods, and excess operating supplies add no value.

Motion waste: is defined as any unnecessary physical movement of people or equipment into the production process that adds no value.

Transportation waste: is defined as the moving of materials among plants or among work centers for handling more than once.

Over-processing waste: is defined as the additional work or effort which adds no value to the product or from the customer's viewpoint.

Defects waste: is defined as all the mistakes which lead to rework, rejected work, returns, re-inspection, and scrapping products or materials.

Waiting time waste: is defined as the idle time that results from stopping the production process because people, materials, machines, information, and processes are not available.

Underutilization waste: Underutilization waste defined as incomplete use of people's skills, knowledge, talent, and technology capabilities.

Study Limitations and Delimitations:

Human Limitation: This study was carried out on managers working in JPMC.

Place Limitation: This study carried on Jordanian Pharmaceutical Manufacturing companies located in Amman.

Time Limitation: This study was carried out in the second semester of the academic year 2019/2020, which coincided with the COVID-19 pandemic.

Study Delimitation: Although this study reached some important findings, it cannot be generalized, because it was conducted in one manufacturing sector and a specific geographical area. Therefore, future research should extend the analyses to other industries and countries which can be done by further testing and larger samples within the same industry, while studying other industries will help generalize conclusions on other organizations and industries, the study was limited just to the manufacturing field of the pharmaceutical sector, future research should be conducted on the other activities of the pharmaceutical industry, the control imposed on data collection through questionnaires limits the quality and quantity of collected data. Furthermore, there is a lack of similar studies in Jordan and other Arab countries. There are many areas of future research related to other Lean Operation tools that can play a role in eliminating waste. Finally, only 107 responses were received from the targeted sample, because of Corona pandemic circumstances.

Chapter Two: Theoretical and Conceptual Framework and Previous Studies

Introduction:

This chapter includes four main themes: definitions and components of Total Just in Time and lean operations, the relationships between Total Just in Time JIT and lean operations variables; previous models; previous studies; and what differentiates this study from previous studies.

Definitions of Independent Variable (Total Just in Time):

It seems that both scholars and practitioners have an agreement upon Total JIT elements definitions but it may be varied according to their perspective, experience, and profession, such as Friedli, et. al. (2010) mentioned that JIT manufacturing is a critical element for most companies to increase flexibility without increasing inventories Gupta (2011) defined JIT as a planning concept to eliminate waste. which is considered as any amount of equipment, materials, parts, space, and workers' time, which are add no value to the product or service. Danese, et.al. (2012) considered that just-in-time practices, as a powerful tool to reduce waste and increase efficiency, accelerate production processes, and increase delivery performance. Similarly, Heizer, et. al. (2013) defined just in time as a philosophy of continuous improvement depended on continuous and forced problem solving by an emphasis on throughput and reduced inventory. Jones (2013) defined the JIT system as the required inputs and components needed for production to be delivered to the conversion process just as they are needed, at the time needed, and that lead to kept the inputs inventories at minimum levels. Singh, et. al. (2013) mentioned that the name JIT is the utilization of all refers to resources, to arrive in a manufacturing setting "Just in Time" for their use. Goetsch and Davis (2014) mentioned Just in Time as a tool and a technique of Lean system, which ensures that the items are delivered to the next cellular step in the process just in time to be used. Green, et. al. (2014) defined Total JIT (T-JIT) as an integrated supply chain strategy contain the previous elements of JIT-production, JIT-purchasing, JIT-selling, with an important new element, JIT-information. On the other hand, Kotler and Keller (2016) mentioned that just in time is caring near-zero inventory by building for order Simanjuntak and Yudy (2017) Just in Time (JIT) is a system aims to increase productivity, gain quality, reduce costs, and make delivery time-efficient as possible by eliminating all types of waste contained in the construction process. Darwish (2018) described the Just in Time (JIT) concept as a system that improves all processes; purchasing, operations, and selling to satisfy customers' requirements and to gain Competitive Advantage. Ramlawati, (2018) stated that Just in Time is the time base marketing pull strategy combined with total process minimization. Noe, et.al. (2019) defined just in time as the inventory control procedures.

In this research, Just in Time is a pull strategy system that aims to enhance the procedures required for all purchasing, operations, and selling processing.

JIT Purchasing:

There are different definitions among authors about JIT purchasing: Gupta (2011) JIT purchasing depend on small lot purchasing, development of vendor, long term buyer-seller relationships, the involvement of vendor in product design, purchased high-quality material the delivery of, part frequently, cooperative transport systems, etc. eventually This led to cost reduction and increases product quality. Benton (2010) mentioned that JIT purchasing is the frequent, small lot sizes, high-quality materials, and on-time delivery schedules purchasing from reliable suppliers. Aksoy and Öztürk (2011) stated that applying JIT purchasing needs smaller order quantities and accurate delivery times, also, to build a close relationship with suppliers as a strategic partner. Danese, et, al. (2012) considered JIT purchasing is deliveries from suppliers according to a pull system, which depends on frequently filling small Kanban containers instead of purchasing orders, and inbound logistics schedule on daily shipment. Singh, et. al. (2013) mentioned that JIT purchasing is given a certification in quality of items purchased by suppliers in quality, which ensures that they have already passed some quality inspection. Kulkarni, et. al. (2014) defined JIT purchasing is the continuous stream of 100 percent appropriate material delivered on due dates at best costs, 100 percent of the time. Abu Zaid, et.al. (2016) defined JIT Purchasing as a form of managing the purchasing function that aims on reducing waste and inefficiency in the purchasing process. This definition recognizes the necessity to consider purchasing as an integrated function of an organization. Othman, et.al. (2016) mentioned that JIT Purchasing is a critical initiative to meet the demand of customers on price, quality, and lead times. Darwish (2018) defined JIT purchasing is buying materials from the right supplier on the right price, right time, right quantity, and right quality as a customer variable need.

In summary, the definition of JIT Purchasing is the purchasing of right materials, during the right time, at right quantities with high quality, at the right price, and from right suppliers, this purchasing should be based on a specific schedule set according to customer demands and forecasting based on data. (minimum raw material inventory).

JIT Operation

There is no agreement upon the definition of JIT operation such as, Milovanovic, et. al. (2011) mentioned that JIT operation is an implementation of inventory strategy, to increase profitability. While Singh, et. al. (2013) defined JIT operation as a mean to create a balance between demand and production, in a way that eliminates unneeded production, unwanted inventory, and all waste related to them, JIT aim to schedule the production operations to make supplier deliver materials just in time to their production site just in time for shipping to the customer . Danese, et. al. (2012) adopted a set of practices related to JIT production programs that consisted of a reduction of set-up time, JIT scheduling, reduction of lot size, Kanban, production according to a pull system and layout for the first throughput. In addition, Friedli, et. al. (2013) considered JIT production sub-elements as “pull production”, “setup time reduction”, “layout optimization” and “planning adherence” While Kulkarni, et. al. (2014) defined JIT operation as a system of producing only the necessary units in the necessary quantities at the necessary time by bringing production rates exactly in line with market demand to improve and run a manufacturing system. On the other hand, Jadhav, et. al. (2015a) mentioned that global organizations are going to adopt just-in-time (JIT) production to enhance the competitiveness of their business. Moreover, Abu Zaid, et. al. (2016) mentioned that JIT Production as improving delivery performance and reducing manufacturing cost. Darwish (2018) mentioned that JIT Operation: is to remove all non-valuable activities associated with the production process. Pheng and Meng (2018) said that: JIT operation is the efficiently control the allocation and management of scarce resources to reduce wastage and idle time on operations

In brief, JIT Operation can be defined as a flexible demand-oriented material flow operation to produce on in-demand items, in-demand quantities, and at the demanded time, to eliminate unneeded production, unneeded inventory (minimum semi-finished goods), and all wastes related to them, eventually minimizing all production processes that are not adding actual value.

JIT Selling

Research in the area of JIT Selling is limited. Friedli, et.al. (2010) stated that JIT Selling is customer demand-oriented delivery approach instead of a stock-oriented approach. Comparatively, Green, et. al. (2011) considered JIT Selling as a way to build value through the selling process, depending on the organization's ability to deliver zero-defect quality, zero difference quantity, just on-time delivery and to minimize all kinds of waste and minimize the total cost from the production and marketing processes. Also, Green, et.al. (2011) mentioned that: JIT Selling is a marketing capability built upon an organization's existing JIT-manufacturing and JIT-delivery capabilities. However, Kairu (2015) mentioned that JIT selling is only considering the client's wishes and striving to succeed by regularly eliminating sequent layers of waste. Abu Zaid, et.al. (2016) mentioned that JIT Selling depends on the right delivery, right quality, and quantity, and to minimize waste and costs. Marhamati, et. al. (2017) said all activities should be integrated to get the benefit from JIT-Selling. On the other hand, Darwish (2018) stated that JIT Selling is the response to customer's growing needs and wants on time with zero complaints. As mentioned, Total JIT strives for zero inventory of any kind (raw material, semi-finished goods, finished goods) so JIT Selling depends on customer demand rather than sales forecasts.

In summary, JIT Selling is the delivery of goods to the customer at the right time (directly from production site to the customer, minimum inventory of finished goods.) and at the right quality and quantities.

Definitions of Dependent Variable (Lean Operations):

Authors use Lean operation, Production, and Manufacturing terms to explain the Lean concept, but all of the themes agree that waste reduction is one of the main principles of Lean

Operations. Lewis (2000) described Lean production: “Lean production is a reduced level of input resources in the system for a given level of output, this is achieved by removing waste (Muda) from the system, this primarily waste that are transformed in manufacturing but also includes transforming resources such as people, process technology, facilities, etc. Singh, et. al. (2013) defined Lean is a dynamic process of continual improvement to get more efficiency, by using systematic elimination of waste from all organization's operations, to maximize the use of limited resources available at a certain time. Jones (2013) defined Lean production: a new technological development that has allowed an organization to make it flexible enough to respond to customers while controlling costs. As Heizer, et. al. (2013) defined Lean Operations, as the eliminate waste through focusing on exactly what the customer wants. Goetsch and Davis (2014) mentioned that Lean Operation is one in which a better product is developed, or better service is delivered, using less of everything required (people, financial, technological, and physical resources). Taiichi Ohno created the JIT/Lean system to eliminate seven wastes that rose from Ford's mass production: overproduction, inventory, motion, transportation, over-processing, defects, and waiting wastes. Dr. Myers made the case of an eighth waste: underutilization of talent. Al Kunsol (2015) stated that Lean manufacturing is a continuous improvement tool used to eliminate wastes to get better performance results and creating more value for customers with fewer resources. Kotler and Keller (2016) mentioned that Lean manufacturing: is producing goods, with minimal waste of time, materials, and money. Thürer, et.al. (2017) mentioned that the main principle of Lean Production is waste reduction, the study distinguished between two waste types: obvious waste (waste that can be reduced without creating another form of waste); and buffer waste (waste that cannot be reduced without creating another waste). Camuffo, et, al. (2017)

defined Lean Production as an integrated system that aims to eliminate waste by reducing variability with suppliers, customer, and internal processes. Moreover, Noe, et. al. (2019) mentioned that Lean Production is manufacturing goods with a minimum amount of time, materials, money, and people.

In summary, Lean Operation focuses on reducing and eliminating these types of waste: Overproduction waste, Inventory waste, Motion waste, Transportation waste, Over-processing waste, Defect waste, Waiting waste, and Underutilization waste.

Overproduction Waste

According to Villa (2010), Overproduction is making more, earlier, and/or faster than is required by the next process, As Heizer, et.al. (2013) is to produce more than the customer orders, or early before it's demanded, any kind of excessive inventory is a waste. Friedli, et.al. (2013) mentioned that overproduction is to produce too many goods, too early or too late, to meet customer’s demand. Goetsch and Davis, (2014) said that Overproduction waste is making more of a product than is needed or more than is needed at the moment. Similarly, Pieńkowski (2014) defined Overproduction as producing ahead of what’s needed by the next process or customer. Fercoq, et.al. (2016) mentioned that overproduction causes spoilage to the extra products which may require disposal. Wright, (2017) defined Overproduction as producing too much than what is needed which leads to an increase in work, capital, or any resource that can be utilized more efficiently elsewhere. Chahal and Narwal (2017) mentioned that overproduction is any excess production that needs extra time, extra money, extra employee’s efforts, and extra inventory, etc.

In summary, overproduction waste is to produce more, earlier, and/or faster than is required by the next process or customer orders.

Inventory Waste

Villa (2010), Inventory waste: Any supply above what is required. As Heizer, et.al. (2013) unnecessary raw material, work in process (WIP), finished goods, and excess operating supplies add no value Friedli, et.al. (2013) stated that excess inventory appeared in storing excessive raw material, excessive work in process or finished goods. Goetsch and Davis (2014): carrying more inventory than is needed at a given time is inventory waste. Pieńkowski (2014) considered it as handling unnecessary stocks. Fercoq, et.al. (2016), defined Inventory waste is to store more packaging in working-in-process (WIP) and to store waste products result from deterioration or damage. Wright, (2017) stated that excess inventory, which results from poor production planning appears in excessive storing of components or finished products. Chahal and Narwal (2017) mentioned that the push system will produce waste in the form of excess inventory which requires excessive time and money to carry out this waste which doesn't add any value to the work.

In summary, Inventory waste is any excessive storing of raw material, work in process (WIP)semi-finished, finished goods, and excess operating supplies that add no value.

Motion Waste

Villa (2010) mentioned it is as the movement of people that do not add value to the product or service, as Heizer, et. al. (2013) any movement of equipment or people and added value is waste. Friedli, et.al. (2013) considered that MotionWaste as the movement of the body without adding any value. Pieńkowski (2014): Motion – making movements that are wasteful or unnecessary. Goetsch and Davis, (2014) defined movement waste as an unnecessary movement into the production process or the delivery of services. Fercoq, et.al. (2016) Transportation and motion waste result from that more packaging material well need to protect components during movement. Chahal and Narwal (2017) mentioned that motion waste is the kind of a strong relationship between the man and machine, and it occurs when moving from one workstation to another.

In summary, motion waste is any unnecessary physical movement of people or equipment into the production process that adds no value.

Transportation Waste

According to Villa (2010): Movement of patients and materials that add no value. Heizer, et.al. (2013): moving material among plants or work centers and handling more than once is waste. Friedli, et.al. (2013) considered that the movement of products between the processes is Transportation waste. Goetsch and Davis, (2014): the excess movement of parts in the manufacturing setting. Fercoq, et.al. (2016) Transportation and motion waste result from that more packaging material well need to protect components during movement. Chahal and Narwal (2017) defined Transportation as any progress in the workstations using different machine tools, parts, etc. which not added any value to work, which will cause more cost and time, and also may sometimes cause a disaster.

In summary, Transportation waste is the moving of materials among plants or among work centers for handling more than once.

Over-Processing Waste

According to Villa (2010): Additional effort that adds no value to the product or service from the customer's viewpoint. Heizer, et.al. (2013) work performed on the product that adds no value is waste. Friedli, et.al. (2013) Defined Over-processing is any incorrect processing, or to produce over the customer requirements. Goetsch and Davis, (2014): to give a part tighter tolerance than required when the application of the part will not improve by tighter tolerances. Fercoq, et.al. (2016) Over-processing waste is any unneeded processing increases waste. Chahal and Narwal (2017) stated that over-processing or inappropriate processing is any extra work that takes place in the workplace or in the machine to avoid rejection or for perfectly doing work, which is sometimes very pricey.

In summary, Over-processing waste**:** the additional work or effort which adds no value to the product from the customer's viewpoint.

Defects Waste

According to Villa (2010) Defects: Work that contains errors, rework, mistakes, or lacks something necessary. Heizer, et. al. (2013) mentioned that defects waste includes returns, warranty claim, rework, and scrap. Friedli, et.al. (2013) defined Defects Waste is any "Non-conforming products" Goetsch and Davis (2014) classified rejected work, and rework errors as a waste of defects. Fercoq, et.al. (2016) Defects waste the defective components will require recycling or throwing away Chahal and Narwal (2017) defined Defects as any work that doesn't add value which is caused by different reasons, such as poor worker attention, poor quality of tools, poor inspection, etc. which will give poor quality, and that will affect customer satisfaction negatively.

In summary, Defects waste: all the mistakes which lead to rework, rejected work, returns, re-inspection, and scrapping products or materials.

Waiting Waste

According to Villa (2010) Waiting waste: is the idle time created when material, information, people, or equipment are not standby. Heizer, et.al. (2013): all kinds of non-add value time, like the ideal time, storage, and waiting. Friedli, et.al. (2013) stated that "Time on hand" time is needed to start the next activity is Waiting Waste. Goetsch and Davis, (2014) people, machines, or processes idling because the needed thing is not available. Fercoq, et.al. (2016) Waiting waste is any potential spoilage of material or any damage that occurs to the component. Chahal and Narwal (2017) mentioned that Waiting waste is any ineffective process and time consumption that happens during the transition from one process to another, like job plan, machine parts, orders, and e-mails, etc.

In summary, waiting waste is the idle time that results from stopping the production process because people, materials, machines, information, and processes are not available.

Underutilization Waste:

According to Villa (2010) not exploit employee's knowledge, skills, and abilities: full talents and capabilities. Friedli, et.al. (2013) considered Non-Utilized talents as the waste of human talent. Goetsch and Davis, (2014) defined Underutilization as the insufficient use of the talent, skills, and creativity of people and the capabilities of technology. Wright, (2017) considered the use of staff ‘skills, talents, or knowledge in an efficient way is Underutilization Waste.

In summary, Underutilization waste is the incomplete use of people’s skills, knowledge, talent, and technology capabilities.

Relationships between Variables

It seems there is nearly an agreement among authors and researches that JIT is a key ingredient of Lean Operations and one of its tools. Most researchers studied the relationships between Total JIT implementation or one of its elements (JIT Purchasing, JIT Operation, JIT Selling) and Business Performance, or Competitive Advantages, others studied the relationship between Lean operations and Business Performance. However, few researchers studied the relationship between Total JIT and Lean operations, for example, Inman, et. al.

(2011) studied the impact of JIT-purchasing and JIT-production on Agile manufacturing and operational, marketing, and financial performance. Danese, et. al. (2012) studied the impact of JIT production practices, on efficiency, moderate by just in time (JIT) supply practices, and the impact of JIT production practices on delivery performance moderate by just in time (JIT) supply practices. Al-Matarneh (2012) the study has been identified the availability of important elements for the application of JIT system industrial companies in Jordan, and the problems which faced this application. Fridi, e t.al. (2013) considered the sub-elements of a JIT production are "pull production", "setup time reduction", "layout optimization" and "planning adherence and mentioned its roll in elimination waste. Green, et. al (2014) studied the impact of Total JIT (T-JIT) on supply chain competency and organizational performance, as T-JIT, a strategy focuses on waste elimination and the utilization of resources. Belekoukias, et, al. (2014) studied the effect of lean tools on the operational performance of manufacturing organizations.

Kumar, et. al. (2015) identify the waste in an automotive part in the manufacturing industry and how to eliminate them through lean implementation. Jadhav, et. al. (2015a) mentioned the effect of adopting just-in-time (JIT) production is to enhance competitiveness. Al Kunsol (2015) studied the relationship between Lean Six Sigma elements and Business performance on Jordanian Pharmaceutical Manufacturing Companies. Abdallah and Al-Ali (2016) A Case Study in Al- Hikma Pharmaceuticals Jordan Company developed a conceptual framework for a lean organization throw various levels of the organization operations to improve the organization's performance. Othman, et. al. (2016) studied The relationship between supply chain integration, just-in-time purchasing, and just-in-time manufacturing and their effect on logistics performance: on the automotive industry in

Malaysia Abu Zaid, et. al. (2016) the effect of total just-in-time on operational performance in the developing country. AL-Maani (2016) studied the application of JIT in the Jordanian public industrial companies, others investigated the relationship between JIT and Operational performance. Simanjuntak and Yudy (2017) mentioned the role of Just in Time (JIT) in improving the process's performance of Gathering Station in Tarakan, East Kalimantan, Indonesia. However, AL-Manei, et.al. (2017) studied the extent of implementation of the Lean system in small and medium enterprises, and the effect of JIT as one of its tools on productivity. Otherwise, many researchers studied the impact of total JIT application on organization competitive advantage Darwish (2018). Al-Shourah, et. al. (2018) identify the relationship between lean management and Six Sigma strategies and the improvement of production performance in a pharmaceutical company. Many researchers studied the impact of total JIT application on organization competitive advantage Darwish (2018). Al-Shourah, et. al. (2018) identify the relationship between lean management and Six Sigma strategies and the improvement of production performance in pharmaceutical companies. Karam, et, al. (2018) studied the impact of Lean manufacturing tools in decreasing the time of changeover in the pharmaceutical industry. Ramlawati (2018) studied the impact of Just in Time on competitive advantage and operational performance.

In summary, very few literatures investigated the effect of Total Just in Time on Lean Operations. Furthermore, most of the previous relationships conducted the effect of JIT on competitive advantage, or on organization, and operational performance. Few studies were conducts in the pharmaceutical sector. Hence, the current study examines the effect of Total JIT perceived practices on Lean Operations in Jordanian Pharmaceutical Manufacturing Companies.

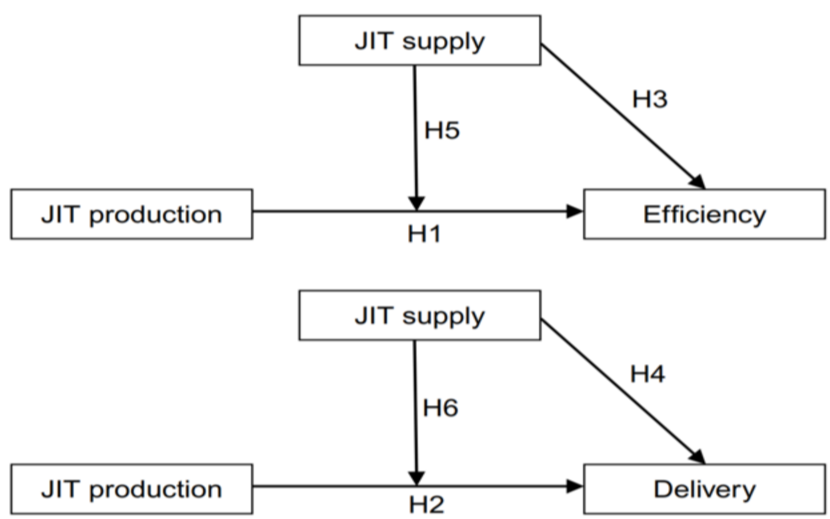
Previous Models:

After reviewing related literature, it has been found that not only the definition and classification of each sub-variable was not clear nor unified. Furthermore, the measurement methods and models were not unified as well. Scholars and practitioners have used different methods and models to measure Just in Time and lean operation. After screening hundreds of studies, only related models were selected such as:

Danese, et.al. (2012) model:

The model showed the effect of JIT production elements, on efficiency, moderate by Just in Time supply practices, and the effect of JIT production elements, on delivery performance moderate by just in time supply practices.

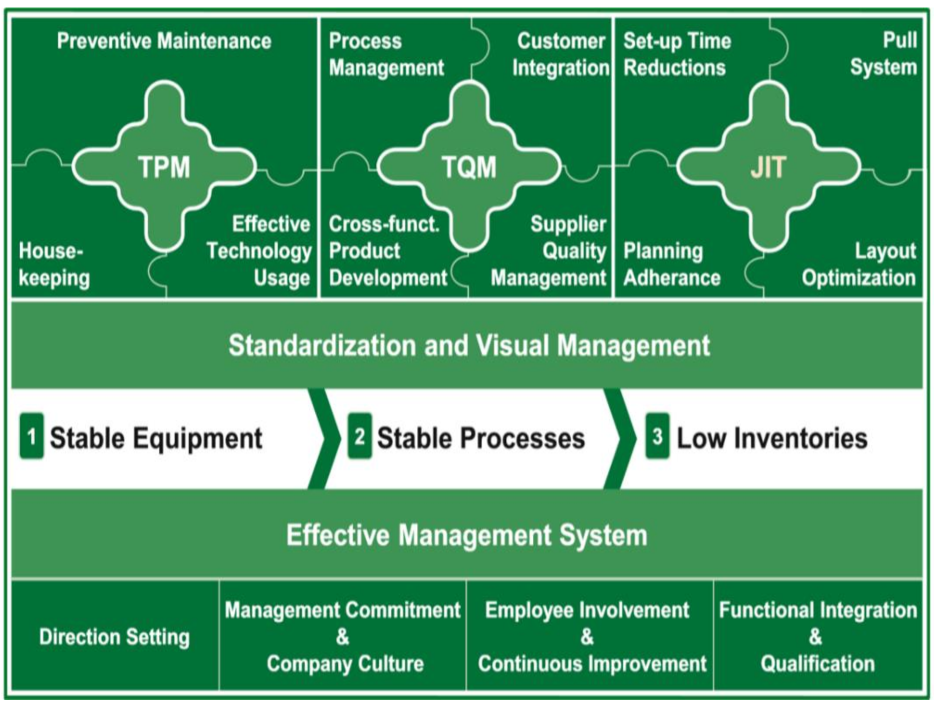
Model 2. 1Danese, et.al. (2012)



Friedli, et. al. (2013) Model:

In this model, JIT has been considered as a core principle of OPEX because it's rolls of eliminating waste. The study mentioned that since the objective is to identify the ways to sustainably improve the operational performance of pharmaceutical companies OPEX model has been embedded in a set of questions to describe the organizational profile. The consideration of the structural factors will allow the comparison of pharmaceutical operations of production plants from all over the world, and of all sizes. The OPEX reference model has been divided into two greater sub-systems: First, the technical sub-system contains Total Productive Maintenance (TPM), Total Quality Management (TQM), and Just-in-Time (JIT), which has been structured reliably. Second, the “social” sub-system which has taken up the search for an operational management quality and work organization. To achieve the aim of “one-piece flow” and minimal buffer inventory, the JIT concept needed stable and reasonable resources.

Model 2. 2 Friedli, et. al. (2013)

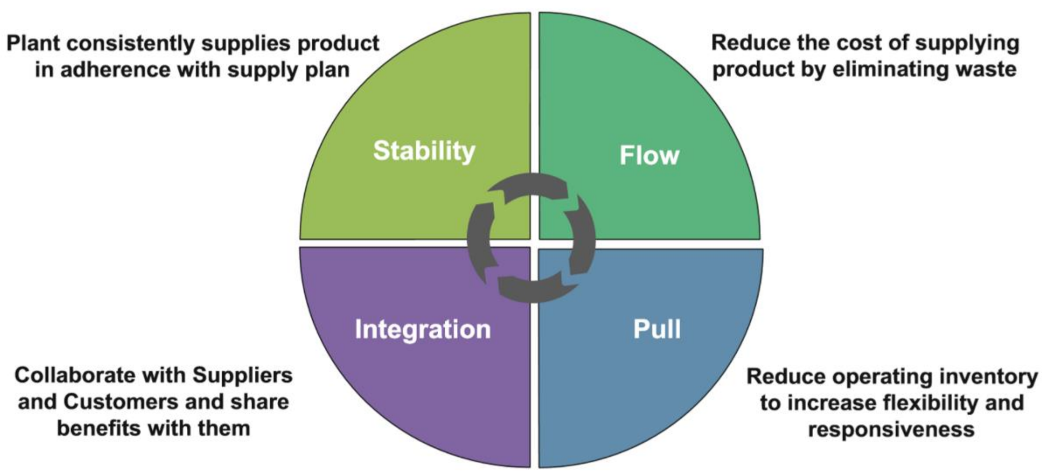


Troy, (2013) Model:

In this study, The Manufacturing Lean Transformation Roadmap had been developed. The roadmap contains four interdependent phases. Each phase emphasizes on creating definite capabilities. to create the holistic approach, Elements of High-Reliability Performance were added to let Operations to achieve their long-term strategy. the phases are

Stability, Flow, Pull, and Integration. The practices in one phase should be implemented as a system that is used to gain the required performance results. In this means, the practices have been directly linked to the results they permit.

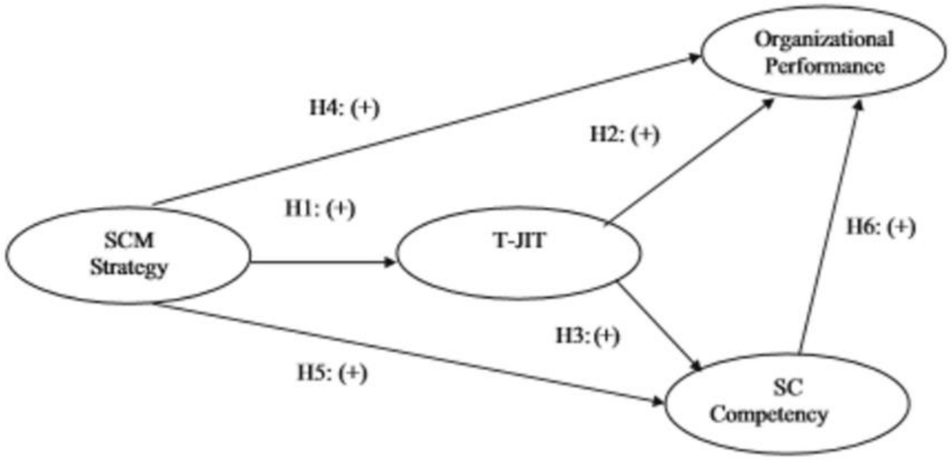
Model 2. 3 Troy, (2013)



Green, et. al (2014) model:

This research examined the effect of T-JIT strategy within a supply chain context. Data was collected from manufacturing managers and the model was assessed using a structural equation modeling methodology The results were there is a significant, positive relationships between a supply chain management strategy and T-JIT, there is a significant, positive relationships between T-JIT and supply chain competency, and there is a significant, positive relationships between supply chain competency and organizational performance, the T-JIT moderate the relationship between Supply Chain Management and organizational performance. Otherwise, he hypothesized the relationship between T-JIT and organizational performance was not reinforced.

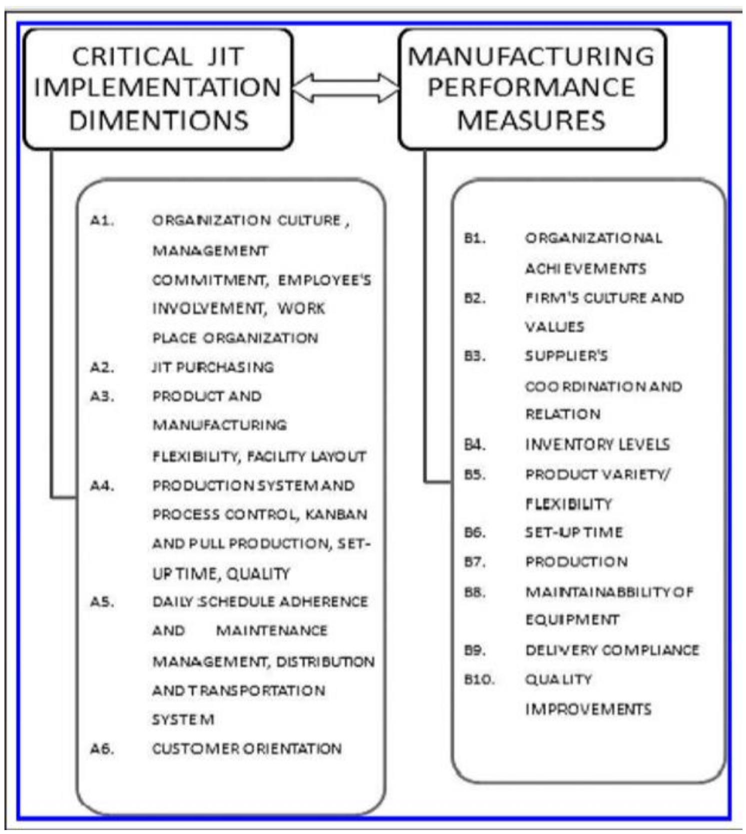
Model 2. 4 Green, et. al (2014)



Singh and Singh (2014) Model:

This study explained the inter-relationship between JIT implementation factors and manufacturing performance measures.

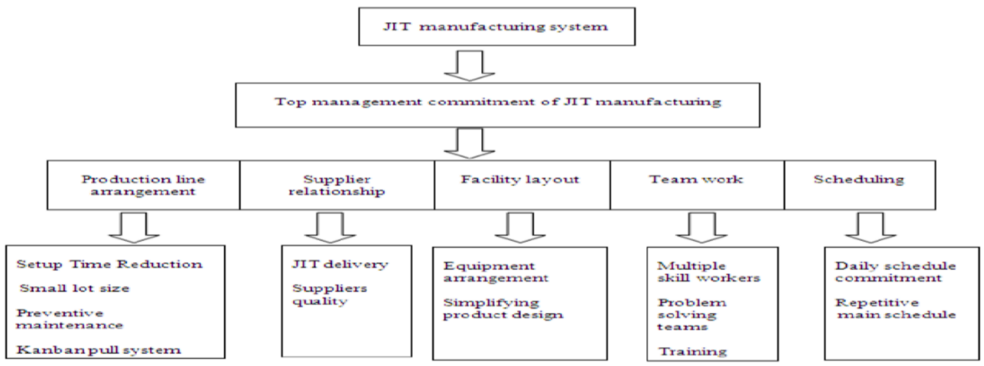
Model 2. 5 Singh and Singh (2014)



Khaireddin, et. al. (2015) Model

In this study, the necessary practices for successful JIT application have been categorized into five main groups: production line arrangement, supplier relationship, facility layout, teamwork, and scheduling. and each of them contains branch practices, it has founded that the most important practices for JIT manufacturing implementation success are, equipment layout, supplier's quality, adopting pull strategy, and Kanban system.

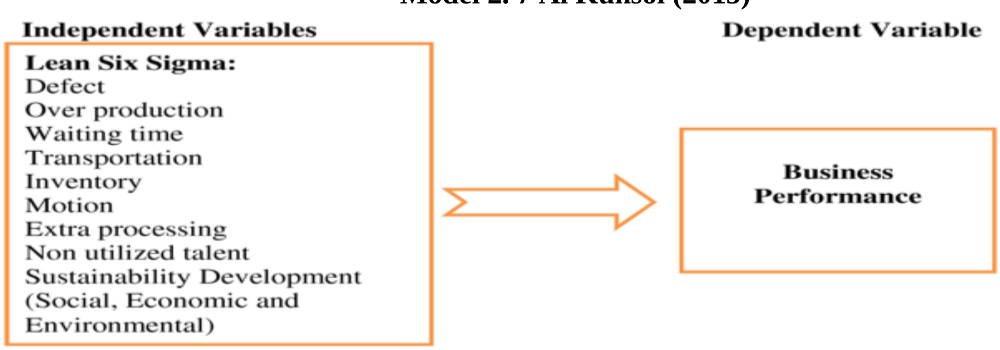
Model 2. 6, Khaireddin, et. al. (2015)



Al Kunsol (2015) model

This study had explained the impact of Lean Six Sigma dimensions (Defects, overproduction, waiting time, Transportation, Inventory, Motion, Extra processing, Non utilized talent, and sustainability Development Social, Economic, and Environmental) on the Jordanian Pharmaceutical Manufacturing Organizations' Business Performance.

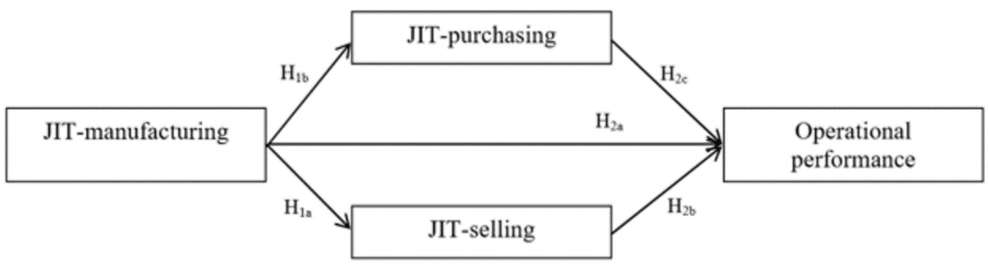
Model 2. 7 Al Kunsol (2015)



Abu Zaid (2016) Model

Studied the relationship between JIT practices (JIT -manufacturing, JIT -purchasing, JIT -selling) and operational performance. The results were JIT production affected directly both; JIT purchasing and JIT selling. The results also show that JIT selling affected directly operational performance, while JIT production affected operational performance indirectly through JIT selling. Finally. The JIT purchasing practices did not mediate the relationship between JIT production and operational performance, and JIT has not a positive direct impact on operational performance.

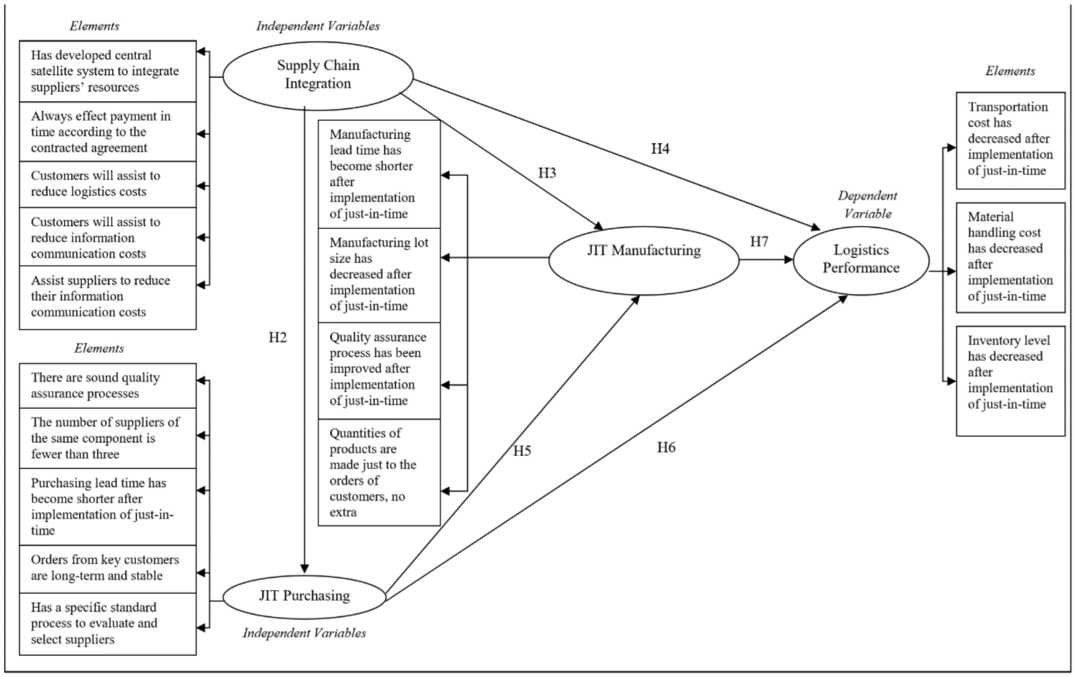
Model 2. 8 Abu Zaid (2016)



Othman, et.al. (2016) Model

This Model studies the impact of supply chain integration, just-in-time (JIT) purchasing and JIT manufacturing on the logistics performance of suppliers in the automobile industry in Malaysia. The results showed that supply chain integration, JIT purchasing, and JIT manufacturing had a direct and significant effect on logistics performance, and Transportation cost, Material handling cost, and Inventory level had decreased after Just-in-time implementation. It was also found that the implementation of Just-in-time shorter the Manufacturing Lead time, decreased Manufacturing lot size, improved Quality assurance process, and quantities of products are just made according to the demand. After applying JIT purchasing there were solid quality assurance processes, the number of suppliers became fewer than three, purchasing lead time had become shorter, and there was a specific standard process for supplier selection and evaluation.

Model 2. 9, Othman, et. al. (2016)



Al-Shourah, et. al. (2018) model:

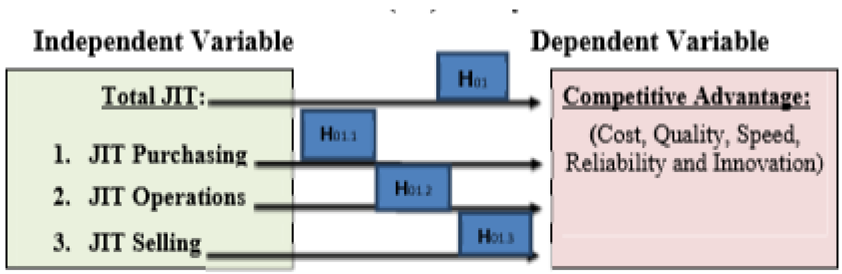
This study explained the relationship between lean management and Six Sigma strategies and production performance in pharmaceutical companies in Jordan. the results have been shown as follows: There was a statistically significant effect of lean management and Six Sigma in Improving the Performance of Production in Pharmaceutical Companies in the Amman Stock Exchange. There was a statistically significant effect of quality programs on improving the performance of Production in Pharmaceutical Companies in Jordan. There was a statistically significant effect of just in time in Improving the Performance of Production in Pharmaceutical Companies in Jordan. There was a statistically significant effect of Manufacturing Systems in Improving the Performance of Production in Pharmaceutical Companies in Jordan.

Model 2. 10, Al-Shourah, et. al. (2018)

Darwish (2018) Model:

This model was developed to test the impact of Total JIT (JIT purchasing, JIT operation, and JIT selling) in Fast Food International Restaurants in Jordan, on competitive advantage (cost, quality, reliability, speed, and innovation). Results showed that there is a strong relationship between Total Just in Time and the competitive Advantage

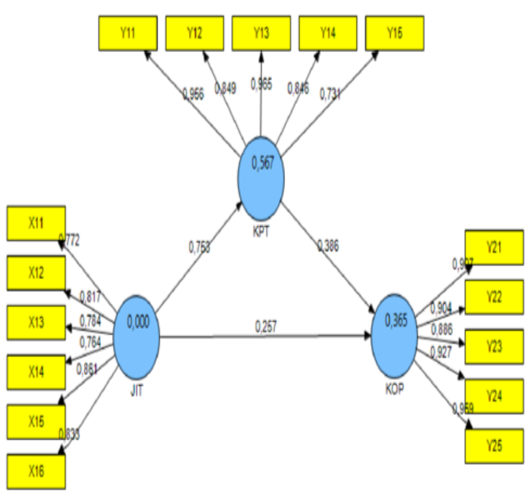
Model 2. 11, Darwish (2018)



Ramlawati (2018) Model

The study aimed to test the impact of Just in Time on competitive advantage and operational performance. The results showed that Just in Time has a significant impact on competitive advantage and operational performance.

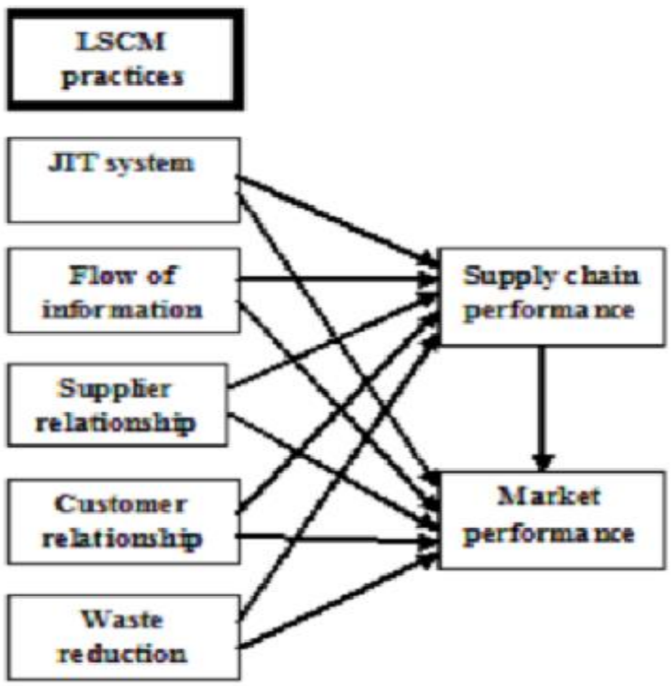
Model 2. 12, Ramlawati (2018)



Nimeh, et.al. (2018):

The study had investigated the impact of Lean supply chain management practices (JIT system, information flow, relationship with the supplier, relationship with the customer, and waste reduction) on supply chain and market performance in Jordanian manufacturing companies.

Model 2. 13 Nimeh, et.al. (2018)



Previous Studies

Friedli, et. al. (2010) titled as "**Analysis of the Implementation of Total Productive Maintenance, Total Quality Management, and Just-In-Time in Pharmaceutical Manufacturing"** This study analyzed the operational effectiveness and efficiency in developments in the industry's improvements, for this purpose a holistic model was established to build the study results basis. The data was collected from pharmaceutical production sites in surveys in 2004 and 2009. The results of the analysis were divided into four subsystems: Total Productive Maintenance (TPM), Total Quality Management (TQM), Just-in-Time (JIT), and the Effect Management System (EMS). The key performance criterion and related elements (practices and instruments) for each sub-system from 2004 to 2009 were investigated. The results were that: the pharmaceutical industry made continuous steps towards “Excellence in Operations” in the period between 2004 and 2009, worked to improve the efficiency of the quality systems, and made eliminated their former low asset utilization; but the industry is still far from the implementation of the pull-system(“continuous flow”, made to order, smooth production and scheduling). It was found that most of the pharmaceutical companies are still interested in the effectiveness side (TPM and TQM) rather than working on the efficiency side (JIT). With regards to JIT level, implementation was analyzed according to four critical elements: “Set-up time reduction”, “Pull production”, “Layout optimization”, and “Planning adherence” pharmaceutical companies are seeking to make stable processes, and stable running machines, before working to achieve the low inventory. In brief, the industry almost is not ready to take steps towards improving efficiency.

Inman, et. al. (2011) titled **“Agile manufacturing: Relation to JIT, operational performance, and firm performance”.** In this research, the impact of JIT-purchasing and JIT-production on Agile manufacturing and operational, marketing, and financial performance, were investigated. For this purpose, a national survey was conducted from production and operations managers working for large U.S. manufacturers, the gathered data was used to assess the study model, by using structural equation methodology. The model includes the primary components of JIT (JIT-purchasing and JIT-production) as lean antecedents to Agile manufacturing. The study has considered JIT as a subset of lean manufacturing which primarily aimed to eliminate waste, through scheduling, planning, and succession of operations. The study has adopted both primary components of JIT, JIT-purchasing, and JIT-production, as they focus on waste elimination and optimization of resource utilization in purchasing and production processes. It has found that JIT-purchasing has a direct and positive influence on agile manufacturing while the positive influence between JIT-production and agile manufacturing was mediated by JIT-purchasing.

Gupta (2011) titled **“A Conceptual JIT Model of Service Quality”** mentioned that the implementation of JIT in the manufacturing sector was successful, because of reducing cost and improving quality. JIT is not only a system to reduce low inventory levels, but it is also a system to eliminate waste, organize operations, enhance changeovers and close supplier relations, and responds fast to changes in the market, so in JIT manufacturing system anything does not add value to the product or service is considered waste and it should be eliminated.

Danese, et. al. (2012) titled as **JIT production, JIT supply and performance: investigating the moderating effects** The paper studied the impact of JIT production practices, on efficiency, moderate by just in time (JIT) supply practices, and the impact of JIT production practices on delivery performance moderate by just in time (JIT) supply practices. six hypotheses were developed in order to study the relationships between JIT production, JIT supply, efficiency, and delivery performance. A hierarchical regression analysis using data from a sample of 207 manufacturing companies was used to test the hypotheses. The results were – JIT production practices have a positive impact on both efficiency and delivery performance. JIT supply practices have a positively moderate impact between JIT production and delivery, while there is no significant moderating impact between JIT production and efficiency. So, when the priority is to increase the efficiency of organizations JIT production should be considered, while if they want to maximize delivery, they should direct their efforts on both JIT production and JIT supply practices. The study also recommended implementing some of JIT supply practices in early steps of JIT production planes, to achieve the required result from JIT production benefits on delivery performance.

Chowdary, and George (2012) study titled **"Improvement of manufacturing operations at a pharmaceutical company A lean manufacturing approach",** this paper is a case study aimed to share the successful experiences of lean implementation principles with current good manufacturing practices cGMP in a pharmaceutical company. In order to carry out this study, a careful literature review has been conducted. Five ways methodology has been followed, for the analysis of the existing problems in the chosen production line. After visiting the company several times and making needed computations, a value stream map (VSM) has been developed, in order to improve the system, many Lean strategies have been suggested. This methodology helped the company in the case study to reduce the lead times, cycle times, and work in process WIP inventory in the production process. Moreover, the reduction in the storage area was 38 percent and the reduction in production staff was 50 percent. the main object of the Lean implementation strategy is waste elimination and processes continuous improvement. The suggested Lean strategies have improved the production efficiency and manufacturing operations effectiveness. The result in this case study was that the waste like unnecessary inventory and set up times, improve production time.

Al-Matarneh (2012) titled as **"Requirements and Obstacles of Using Just In Time**

(JIT) System: Evidence from Jordan" the study has been identified the availability of important elements for the application of JIT system industrial companies in Jordan, and the problems which faced the application of JIT system industrial companies in Jordan. A questionnaire was developed and distributed to (72) of industrial companies in Jordan, in order to achieve the objectives of the study and testing of hypotheses. the results were that the suppliers cannot provide raw materials in the right time, the human resources which required to JIT system application are not available, but the quality assurance elements are available in industrial companies in Jordan, and there are obstacles in applying JIT system. The study recommendations were, the industrial companies in Jordan must pay more attention to training and educational workers about JIT system implementation and its benefits of waste reduction and spoilage, reduction of inventory, reduction in production costs, quality maintenance and continually improve which will result on increasing profitability and strong competition.

Troy, (2013) titled **"Structuring and Implementing an Operational Excellence Program from Scratch in the Biotech Industry"** in this study The Manufacturing Lean Transformation Roadmap had been developed. The roadmap contains four interdependent phases. each phase emphases on creating definite capabilities in order to create the holistic approach, Elements of High-Reliability Performance were added in order to let operations to achieve their long-term strategy. A plant has been considered stable when it steadily supplies products and materials in adherence with the supply plan. This can be achieved by the reduction of performance variance in manpower, materials, machines, and methods.

Singh, et. al. (2013) titled as **"Application of Lean and JIT Principles in Supply Chain Management"**, a case study aimed to identify and analyze the factors that lead to the successful implementation of lean and JIT Principles in the supply chain management systems, in Ranbaxy pharmaceuticals limited the Indian company, and to identify the Quality level and how Quality was improved after application of JIT and Lean principles. The chosen approach for this study was a qualitative nature, where data had collected from the literature review, studying several case studies, observations, and interviews. the results were: reduction in set-up time, defect, inventory, and delivery lead time, furthermore improvement in quality, on-time delivery, labor, and facility utilization.

Jaiganesh, and Sudhahar (2013) study titled "**Sketching Out the Hidden Lean Management Principles in the Pharmaceutical Manufacturing "** In this research the hidden lean management principles existing in the pharmaceutical manufacturing had been sketched out, in order to improve the products ‘quality and services, through focusing on the lean implementation principles. effectively in the cGMP environment to enhance operational excellence and product quality. For this purpose, a survey questionnaire was prepared as the requirement of research study Then, several Pharmaceutical firms were selected, identified, and visited. The questionnaire was given to the respective division peoples and was taken back with their comments. moreover, a direct interview was performed at each senior level and the information was gathered and scrutinized. The hidden lean management principles that were founded are 1- Identify the Product life cycle and Process variations 2- Implement Lean methods effectively in cGMP environment 3- Ensure effective product development 4- Implement quality systems to ensure product quality & safety 5- Reduce inventory 6- Process design the study recommended to implement the LEAN management principles in the cGMP environment for the manufacturing of the pharmaceutical products to ensure drug quality and patients safety.

Qureshi, et. al. (2013) titled as **"Critical elements in implementations of just-in-time management: empirical study of cement industry in Pakistan",** this study identified the success factors for the implementation of just-in-time (JIT) management practices on the cement sector industry in Pakistan. Data was collected from a survey response from 400 operations' managers of the cement industry, to know the advantages and benefits Just in time (JIT)implementation in the cement sector. It was found that the implementation of JIT philosophy (product quality and design, inventory management, supply chain, and production plans) enhances the competitiveness of cement industry in Pakistan, enhances performance throw reduction in inventories level, reduction in operations & inventory costs, waste elimination from the processes and reduced unnecessary production. JIT is a vital manufacturing strategy that uses the full capacity of resources and minimizes the ratio of defects in the continuous flow processes, so JIT implementation can be applied effectively. Green, et. al (2014) study titled as **"Total JIT (T-JIT) and its impact on supply chain competency and organizational performance"** stated that implementation of Total JIT is a strategy that focuses on waste elimination and the utilization of resources, which will lead to improving organizational performance. Data was collected from manufacturing managers and the model was assessed using a structural equation modeling methodology. It found that success at the supply chain level requires supply chain management strategy and competency as well as organizational management. It has founded that Total JIT is a supply chain management strategy, which allows competing at the supply chain level by applying JIT-production, JIT-purchasing, JIT-selling, and JIT-information. This adoption of Total JIT strategy will lead to delivering zero-defect, quality products to the ultimate customers of the supply chain in the right quantities and at the right time.

Kulkarni, et. al. (2014) study titled **"Supplier Evaluation and Purchasing in JIT Environment-A Survey of Indian Firms",** this study analyzed the importance of JIT purchasing and evaluation of supplier criteria basis on a survey of Indian companies. The study pointed that implementation of JIT purchasing may not be appropriate in many Indian Industries. However, it is worth trying while paying more attention to the industrial environment to identify the important attributes, to obtain the maximum benefits from JIT implementation.

Alcaraz, et, al. (2014) titled as **“A systematic review/survey for JIT implementation: Mexican maquiladoras as a case study”** one of the objects of this study was to identify the benefits obtained from JIT implementation in maquiladora industries in Mexico by clarifying the results of a survey collected from a sample of 159 interviews, from foreign companies established in the Mexican- USA border and after a structural equation model has developed .the applied activities of JIT were identify and grouped as The independent variables. They were organizational commitment, empowerment given to employees, communication channels throw the organization, the education programs applied to the different levels in the organization, and the ability to solve problems among others. While the benefits which have obtained from JIT implementation were identified and grouped as dependent variables as follows inventory management, cost, and quality. The results were that the main critical success factors were management commitment and education in JIT implementation, and the degree of success JIT implementation can be measured through quality, inventory, and cost performance measures.

Belekoukias, et, al. (2014) titled as ”**The impact of lean methods and tools on the operational performance of manufacturing organizations”** This paper studied the effect of five primary lean methods, like JIT, autonomation, kaizen, total productive maintenance (TPM) and value stream mapping (VSM), on measures of operational performance. A linear regression analysis modeled the correlation and effect of the mentioned lean practices on the operational performance of 140 manufacturing companies around the world. Also, a structural modeling equation (SME) was developed to prove the result of the regression and correlation analyses. It has been founded that JIT and automation have the strongest impact on operational performance.

Jadhav, et. al (2015b) titled "**Roadmap for Lean implementation in Indian automotive component manufacturing industry: a comparative study of UNIDO Model and ISM Model** aimed to study the United Nations Industrial Development Organization (UNIDO) – Automotive Component Manufacturers Association of India (ACMA) Model as well as Interpretive structural modeling ISM Model of Lean application. In addition, the study aimed to present a roadmap for Lean implementation in the Indian automotive component manufacturing industry. The study has depended on secondary data collected from the research articles, doctoral thesis, web articles, survey reports, and books on the automotive industry related to the Lean field, JIT, and ISM. The obvious contribution of this paper is the proposed ISM Model for sustainable Lean implementation. The ISM-based Lean implementation structure presents a greater understanding of the implementation process at more microlevel when compared with UNIDO– ACMA Model. The sustenance of Lean practices and perfection at each phase is absolutely essential for the success in Lean implementation. According to the ISM Lean model, the implementation of eight Lean practice bundles must be in sequential order.

Jadhav, et. al. (2015a) titled as" **Analysis of interactions among the barriers to JIT production: interpretive structural modelling approach"**, this study aimed to study the barriers that obstruct the implementation of JIT production successfully and to analyze the interactions among the barriers using interpretive structural modeling technique. Twelve barriers have been identified after reviewing the literature. This paper prepared a roadmap for an action plan to discuss the barriers that prevent the successful implementation of JIT production, the author focused on JIT production as a pillar of Lean system, and considered Lean as an extend or update version of JIT. For this purpose, an informal survey of experts of Lean manufacturing exposed that the production environment changes have only a 30% success rate, which mean 70% of lean implementations practices deterioration and return due to how the business is doing, also it was found that the active and timely contribution of internal stakeholders (employees and top management) as well as external stakeholders (suppliers and customers) is critical of JIT implementation successfully.

Resta, et. al. (2015) titled as: **"Towards a framework for lean operations in product-oriented product service systems"**, this study aimed to contrast and compare both lean and product-service systems (PSS) approaches, to put a framework for Lean product-service system (Lean PSS). In order to answer the question:" How can lean thinking be applied to PSS operations?" Two case studies were investigated and analyzed in order to put a framework for lean product-oriented product-service systems. The paper mentioned that the implementation of the Lean manufacturing system should be built depending on the continuous- flow process one -piece and Just-in-Time (JIT) system.

Kumar, et. al. (2015): **"Case study on identification and elimination of waste through lean implementation in an automotive part manufacturing industry"**, this research has found that using lean principles can reduce wastes, such as transportation and inventory wastes. In addition, it has been founded that using JIT principles was one of the solutions to eliminate wastes.

Al Kunsol (2015) titled as **“The Effect of Lean Six Sigma on the Jordanian Pharmaceutical Manufacturing Organization’s Business Performance”,** the study served the purpose of investigating the effect of Lean Six Sigma dimensions on the Jordanian Pharmaceutical manufacturing companies' business performance, from the perception of the managers at three levels (top, medium and low). The descriptive and analytical method was used. The questioners were collected from 120 managers working at Pharmaceutical Manufacturing Organizations in Jordan (14 organizations). The result showed that there was a significant effect on total Lean Six Sigma and Business Performance, and although all Lean Six Sigma variables have a significant effect on the Business Performance of Jordanian Pharmaceutical Manufacturing Organizations except extra processing, and waiting time.

Othman, et. al. (2016) titled as ”**The relationship between supply chain integration, just-in-time and logistics performance: a supplier's perspective on the automotive industry in Malaysia”,** aimed to investigate the effect of the supply chain integration, just-in-time purchasing, and just-in-time manufacturing on the logistics performance of suppliers in the automobile industry in Malaysia. for this purpose, an empirical study was carried out and the theoretical model was tested using regression analysis. By using mail questionnaires data were collected which were given to suppliers of

Malaysian automotive manufacturers. The results showed that supply chain integration, JIT purchasing, and JIT manufacturing had a direct and significant effect on logistics performance, and Transportation cost, Material handling cost, and Inventory level had decreased after Just-in-time implementation. It was also found that the implementation of Just-in-time shorter the Manufacturing Lead time, decreased Manufacturing lot size, improved Quality assurance process, and quantities of products are just made according to the demand. After applying JIT purchasing there were of sound quality assurance processes, the number of suppliers became fewer than three, purchasing lead time had become shorter, and there was a specific standard process for supplier selection and evaluation.

Fercoq, et.al. (2016) titled as**" Lean/Green integration focused on waste reduction Techniques"**, this is a quantitative study offered the integration of Lean/integration focused on the reduction of waste methods in manufacturing processes. The paper emphasized the convergence of the concepts of Green Management and Lean Manufacturing. It has been found that Waste Reduction Techniques are the most important areas of the interference between the Lean and Green paradigms. for that future research can develop quantitative studies on waste reduction techniques, especially techniques related to the solid waste minimization program in manufacturing processes. The design of experiments tool has been used to measures the impact of different methods, taken from each of Lean and Green approaches, on solid waste management performance, one of the results is that deadly wastes (Muda)of Lean Management improves the performance of a waste minimization program in the manufacturing process.

Al-Maani (2016) titled**" JIT in the Jordanian Industrial Companies ",** this study has investigated the application of JIT public industrial companies in Jordan. A questionnaire was designed and distributed to a sample of 55 out of 76 industrial companies. The results were that the public industrial companies in Jordan don't apply JIT production systemin, in addition to there were some obstacles that prevent the application of the JIT production system in these companies.

Abu Zaid, et. al. (2016) study titled**: "An empirical examination of the total just-in-time impact on operational performance: insights from a developing country"**, aimed to study the impact of Total JIT: purchasing, production, and selling with supply chain on the operational performance. The methodology of this research was a questionnaire, gathered from 166 industrial companies in Jordan. The structural equation model was used to test the study hypotheses. The result: there is a direct and positive impact between JIT-manufacturing and operational performance, direct and positive impact between JIT-manufacturing, JIT-purchasing, and JIT-selling. There is an indirect effect between JIT-manufacturing and operational performance, as JIT-purchasing and JIT-selling a mediator.

Negrão, et. al. (2017) study titled" **Lean practices and their effect on performance: a literature review"**, the paper investigates the degree of adoption of lean manufacturing practices around the world, and their effect on organization performance, by reviewing 83 studies, it has found that the application of lean practices applied in a fragmented way. In 41 studies there was a positive effect of lean practices in at least one operational, financial, and/or environmental performance metric, while 5 studies give a negative effect between lean practices and operational or financial performance.

Simanjuntak and Yudy (2017) study titled**:" Pilot Project Analysis Model Just In Time (Jit) In Order To Improve The Performance Of Time Construction Process Of Gathering Station In Tarakan, East Kalimantan, Indonesia ",** explored the influence of

JIT application in construction Inbound Sequenced Fusion of Diverse Management theory like Lean projects Gathering Station (GS) in improving the performance and competitiveness of the company, The results were improving in overall oil production cycle' performance, and the government and construction companies must play a major role in implementing JIT in the construction industry in Indonesia.

Singh, et. al. (2017)" **Inbound Sequenced Fusion of Diverse Management theory like Lean, JIT, TPM, ERP to Eliminate Worthless Element for Superior Productivity in Exhaustive Plant"**, this paper provided a Practical approach and systematic manner for a solution in production and manufacturing Industry, by implementation this techniques Plant Layout, Work Place Design (WPD), Ergonomics, Enterprise Resources Planning (ERP), Lean Manufacturing, Just in Time (JIT) and Total Productive Maintenance (TPM). This technique will help to solve problems in less time and less effort, which will be maximized productivity and efficiency of the overall plant.

Chahal and Narwal (2017) titled as" **Impact of Lean Strategies on Different Industrial Lean Wastes"** this study tried to know which lean manufacturing strategy is more effective for each lean waste, the non-value adding Lean Wastes (LW) were identified by using a matrix, they are; Overproduction, Waiting, Inventory, Transportation, Over-Processing, Motion, Flaw/Fault, Workforce, Worker Fatigue, Work in Process, Process Fail. The relationship model and a lean waste correlation sheet and have been developed, in order to make the Lean system more effective. According to the correlation model it has founded that JIT was the better strategy to eliminate overproduction, over-processing, and inventory wastes.

AL Haraisa (2017) titled as **"Just-In-Time System and Its Impact on Operational**

Excellence: An Empirical Study on Jordanian Industrial Companies", this study aimed to define the effect of JIT system on operational perfection in 14 of the manufacturing companies at Al –Hussein bin Abdullah II qualified industrial zone (QIZ) in Al-Karak Governorate. The sample included (168) manager and head of divisions at the production and logistic departments, a questionnaire has developed include 25 items. Multiple regression has been used to analyze and test the hypotheses. The results were that the just in time system have a positive effect on the operational excellence in Jordanian industrial companies.

Al-Manei, et. al. (2017) titled as **"Lean implementation frameworks: the challenges for SMEs",** this study aimed to assess the implementation of Lean framework from the SMEs perspective, and to discuss challenges faces the SMEs in their lean implementation journey. A structured literature review was adopted as a methodology. The results were that in India the maximum key lean practice and success factor affecting the 52 manufacturing companies was waste elimination, whereas zero defects, JIT deliveries, pull of raw materials have an impact in between. In Lebanon, lean tools implemented in the pharmaceutical industry were Kaizen, JIT, TPM, and standardization. The impact of these tools and the effectiveness of lean on productivity has been identified.

Panwar, et, al. (2018) titled as **"The impact of lean practices on operational performance – an empirical investigation of Indian process industries", the** study has provided explanations of how the adoption of lean practices will improve the performance in the manufacturing process. A survey has prepared of Indian process industries, by using of multivariate statistical analysis an empirical relationship has been developed between lean practices and performance improvement The results were that the lean practices associated positively with deliveries in time, productivity, first-pass yield, waste elimination, the reduction in inventory levels, cost reduction, reduction in defects, and improved in the management of demand.

Al-Shourah, et. al. (2018)titled as **“The Integration of Lean Management and Six Sigma Strategies to Improve the Performance of Production in Industrial Pharmaceutical”** The study aimed to identify the lean management and Six Sigma practices in order to enhance the production performance in the pharmaceutical companies through the evaluation and analysis of Six Sigma for the production performance of processes in Jordanian pharmaceutical companies.one of the result that, there was a statistically significant effect of just in time on improving the Production Performance in Pharmaceutical Companies in the Amman Stock Exchange.

Islam, et. al. (2018) titled as” **Implement Kaizen Tool 5S to Improve Workplace Condition and Pave Way for Lean Management at a Selected Pharmaceutical Factory**” A case study aimed to discover the result of 5S implementation(as a Kaizen tool) in a pharmaceutical factory before and after this implementation.in order to establish a visual control system in the work area .which will be able to deal with 8 wastes of lean production. The results appeared that 5S activities can reduce and eliminate wastes. The study stated that if the 5S process was implemented continuously the cycle time of tasks will be reduced, and these will help make the system a Just in Time process which will facilitate the way for lean management production.

Karam, et, al. (2018):" **The contribution of lean manufacturing tools to changeover time decrease in the pharmaceutical industry. A SMED project**". Mentioned that the application of the Lean manufacturing system reduced the major changeover time at the bottleneck process, by 30%in 12 months.

Darwish (2018) the study titled: **“The Effect of Total Just in Time on Competitive Advantage on International Fast Food Restaurants in Jordan"** aimed to find the impact of Total JIT on Competitive advantage in Fast Food International Restaurants in Jordan. The methodology of this study covered all five companies working in this field. Data collected by a questionnaire from 186 out of 250 managers. Results show that there is a strong relationship between Total Just in Time and the competitive Advantage.

Ramlawati (2018) study titled **“Just in time and competitive advantage: understanding their linkages and impact on operational performance.”** The study aimed to test the impact of Just in Time on competitive advantage and operational performance. The research was carried out on a manufacturing company in Makassar Industrial Area, (Indonesia) it gathered 40 respondents from marketing managers, production managers, and financial managers. The results of data analysis using Partial Least Square (PLS) showed that Just in Time has a significant impact on competitive advantage and operational performance.

Saleh, et.al (2018) study titled” **Lean Implementation in Jordanian Pharmaceutical Industry: The Case of Hikma Company”.** The study aimed to test the effect of lean practices on productivity, at Al Hikma pharmaceutical company.to investigate the impact of lean tools. A questionnaire survey was used. The result showed that visual management, 5s, and work standards a significant effect on productivity, whereas, reduction of waste did not have a significant effect.

Garza-Reyes, et, al (2018) titled as **“Lean readiness – the case of the European pharmaceutical manufacturing industry”,** aimed to evaluate the quality practices of European pharmaceutical manufacturers to determine the level of preparation of this industrial sector to execute and/or sustain lean manufacturing (LM). The lean readiness (LR) level was examined through the following quality parameters: human resources, planning and control, top management and leadership, processes, customer relations, and supplier relations. A survey questionnaire used and distributed among 310 European pharmaceutical manufacturers and responded by 37 of these organizations. The results were the level of LR for the participating firms is insufficient.

What Differentiates this Study from Previous Studies?

1- Total Just in Time concept: The current study is considered as one of the few studies that study the effect of Total Just in Time (JIT) on Lean Operations. Therefore, it aims to increase awareness about the role of Total JIT on Lean Operations in eliminating the eight wastes from manufacturing processes and improving performance in general.

2- Purpose: Most of the previous studies measured the effect on total JIT on Operational Performance and competitive advantage. However, this study investigates the effect of total JIT (JIT purchasing, JIT operation, JIT selling) on Lean Operations' dimensions (overproduction waste, inventory waste, motion waste, transportation waste, over-processing waste, defects waste, waiting time waste, and underutilization waste).

3- Environment: Most previous studies have been implemented in various countries outside the Arab region. The current study will be executed in Jordan, as one of the Arab region countries.

4- Industry: Few pieces of research were carried out about Total JIT in the pharmaceutical manufacturing companies. The current research is dedicated to pharmaceutical manufacturing companies only.

5- Variables: Most of the previous studies and research take one element of Total JIT, others considered JIT elements as “pull production”, “setup time reduction”, “layout optimization” and "planning adherence" but in this research three elements were taken; (JIT purchasing, JIT operation, and JIT selling). In addition, most of the previous studies and research took the seven elements of Lean Operation, while in this study, the eight elements of Lean Operation were examined with Underutilization Waste being added.

6- Population: almost all of the previous researches considered public shareholder companies listed in the stock markets, while the current study covered both public and private shareholder companies.

7- Methodology: Most previous researches were based on annual reports of various companies and industries. The current one is based on managers' perceptions related to actual implementation.

8- Comparison: The outcomes of this study will be compared with the outcomes of previous researches mentioned earlier to highlight similarities and differences that might be there and the reason for such differences.

Chapter Three: Study Methodology (Methods and Procedures):

Introduction

This chapter includes study design, population and sampling, data collection methods, data analysis methods, study tool and validity, and reliability test.

Study Design

The current study is considered as a descriptive and causal study. It aims to examine the effect of Total Just in Time (JIT purchasing, JIT operations, JIT selling) on Lean operations (overproduction waste, inventory waste, motion waste, transportation waste, over-processing waste, defects waste, waiting time waste, and underutilization waste) of Jordanian Pharmaceutical Manufacturing companies. The study begins with the literature review, expert interviews to develop a questionnaire, which will be used to collect the data. The collected data from the managers working at Jordanian Pharmaceutical Manufacturing organizations was checked and coded on SPSS. Then normality, validity, and reliability tested and the correlation between variables was checked and finally, simple and multiple regressions used to test the hypothesis.

Study Population, Sample and Unit of Analysis

The Pharmaceutical Manufacturing companies that are registered in the Jordanian Association of Pharmaceutical Manufacturers (JAPM) in 2018 in Jordan were 14 companies. All of the Pharmaceutical Manufacturing companies were targeted, in addition to one company in the free zone, which negates the need for sampling.

Unit of Analysis: The survey unit of analysis composed of all managers at three levels (top, middle and low level) working in the Pharmaceutical Manufacturing Companies that were available at the time of sending the questionnaires through the mail due to the COVID-19 pandemic, and were ready to fill it.

Data Collection Methods (Tools)

For fulfilling the purposes of the study, data collected from two sources secondary and primary data:

Secondary data was collected as follows: from different sources such as journals, working papers, researches, thesis, articles, Worldwide Web, and Jordanian Pharmaceutical Manufacturing Companies. Then, the questionnaire was reviewed and validated by an academic panel of judges, and highly experienced experts in the field of pharmaceutical manufacturing companies.

Primary Data was collected through a questionnaire that was distributed to the managers working in pharmaceutical companies, and which was developed based on previous literature and prior experiences.

The Questionnaire

The questionnaire has been developed based on the hypothesis and research model, which included three parts as follows:

Demographic Dimensions: Age, gender, education, experience, position, department.

Independent Variable (Total Just in Time) which includes the following sub-variables: (JIT purchasing, JIT operations, and JIT selling).

Dependent Variable (Lean Operations) which includes the following dimensions: (overproduction waste, inventory waste, motion waste, transportation waste, over-processing waste, defects waste, waiting waste, and underutilization waste) All sub-variables and dimensions measured by suitable questions rated by a five-point Likert- type scale to rate respondent's actual perceptions regarding each item as follows: 1 (strongly unimplemented) to 5 (strongly implemented) was used throughout the questionnaire.

Data Collection and Analysis Methods

Research data have been collected during the COVID-19 pandemic (Corona crisis) May / 2020. The targeted pharmaceutical manufacturing companies were 14 companies, and one company in the free zone. This study tried to survey all these companies, but due to crisis circumstances and the lack of cooperation of some, the questionnaire was mailed, data collected from 12 companies out of the 15 companies were targeted in this study and only 107 were received. All of the collected questionnaires were complete, suitable, and coded against SPSS 20.

Validity Test

Three methods were used to confirm validity: content validity, face validity and construct validity. The content validity was confirmed through collecting the data from several kinds of literary resources such as books, journals, working papers, researches, thesis dissertations, articles, Worldwide Web, and Jordanian Pharmaceutical Manufacturing Companies. However, the face validity (was mailed due to COVID-19 pandemic) confirmed by a board of judges, which judged the questionnaire (see appendix 1). Finally, construct validity was confirmed by Principal Component Factor Analysis with Kaiser Meyer Olkin (KMO).

Construct Validity (Factor Analysis)

Principal Component Factor Analysis with Kaiser Meyer Olkin (KMO) was used to test construct validity. Principal Factor Analysis was used to examine the data explanatory and conformity. If Factor loading for each item in its group is more than 0.40, it is good and accepted, and then construct validity is assumed. However, Kaiser Meyer Olkin (KMO) is also used to test construct validity in order to measure sampling adequacy, harmony, and inter-correlations, KMO values between 0.8 and 1 point to high sampling adequacy, and accepted if it is exceeding 0.6. Bartlett's Test of Sphericity indicator was used to determine the suitability of data and correlation, and for sample items harmony, whereas Variance percentage shows explanation value of each sub-variable.

Table (3.1) shows that factor loading of each item of JIT Purchasing group rated between 0.381 and 0.869 more than 40%, except one item (question number 7 in JIT purchasing) therefore, the construct validity was assumed. Moreover, KMO has rated 67,9% which indicates good adequacy, and the Chi-square is 251.467, which shows the fitness of the model. Furthermore, the explained variance is 41.128 which can explain 41.13% of the variance.

Table 3. 1 Principal Component Factor Analysis of Just in Time

Item	F1	KMO	B.T.S. Chi^2	Df	Variance	Sig.
JITP1	0.502	0.679	251.467	21	41.128	0.00
JITP2	0.419					
JITP3	0.850					
JITP4	0.869					
JITP5	0.728					
JITP6	0.545					
JITP7	0.381					

Table (3.2) shows that factors loading of each JIT operation sub- variable item within its group rated between 0.452 and 0.826 more than 40%, therefore, the construct validity is assumed. Moreover, KMO has rated 79.7% which indicates good adequacy, and the Chi-square is 254.984 which shows the fitness of the model. Furthermore, the Explained Variance value is 49.121, which can explain 49.12% of the variance.

Table 3. 2 Principal Component Factor Analysis of JIT Operations:

Item	F1	KMO	BTS – Chi^2	Df	Variance	Sig.
JITO1	0.566	0.797	254.984	21	49.121	0.00
JITO2	0.826					
JITO3	0.802					
JITO4	0.452					
JITO5	0.768					
JITO6	0.704					
JITO7	0.708					

Table (3.3) shows that factor loading of each JIT Selling sub-variable rated between 0.395 and 0.821 which is more than 40%, except one item (question number 6 in JIT Selling) therefore, construct validity is assumed. Furthermore, KMO was rated 79.7% which indicates good adequacy, and the Chi-square is 341.919, which shows the fitness of the model. Furthermore, the Explained Variance value is 51.784 which can explain 51.78% of the variance.

Table 3. 3 Principal Component Factor Analysis of Just in Time Selling

Item	F1	KMO	BTS – Chi^2	Df	Variance	Sig.
JITS1	0.709	0.788	341.919	21	51.784	0.00
JITS2	0.684					
JITS3	0.761					
JITS4	0.821					
JITS5	0.818					
JIT6	0.395					
JITS7	0.759					

Table (3.4) shows that factor loading of the Total JIT group rated between 0.558-0.825 which is more than 40%, therefore, the construct validity was assumed. Moreover, KMO was rated 83.7% which indicates good adequacy, and the Chi-square is 1252.408 which shows the fitness of the model. Furthermore, the Explained Variance value is 55.709 which can explain 55.70% of the variance.

Table 3. 4 Principal Component Factor Analysis for Total Just in Time System:

Item	Factor1	KMO	BTS – Chi^2	Bartlett's Test	Variance	Sig.
JTP	0.558	0.837	1252.408	210	55.709	0.00
JTO	0.662					
JTS	0.825					

Table (3.5) shows the loading factors of overproduction waste items scored between 0.686-0.889. Therefore, the construct validity was assumed. Moreover, KMO was rated 80.7% which indicates good adequacy, and the Chi-square is 278.559 which shows the fitness of the model. Furthermore, the Explained Variance value is 65.276 which can explain 65.28%of the variance.

Table 3. 5 Principal Component Factor Analysis for Overproduction Waste:

Item	F1	KMO	BTS – Chi^2	Df	Variance	Sig.
OPW1	0.686	0.807	278.559	10	65.276	0.00
OPW2	0.809					
OPW3	0.765					
OPW4	0.889					
OPW5	0.873					

Table (3.6) shows the loading factors of Inventory Waste items scored between 0.506-0.863 therefore the construct validity was assumed. Moreover, KMO has rated 75.7%which indicates good adequacy, and the Chi-square is 209.516which shows the fitness of the model. Furthermore, the Explained Variance value is 58.671which can explain 58.67%of the variance.

Table 3. 6 Principal Component Factor Analysis for Inventory Waste

Item	F1	KMO	BTS – Chi^2	Df	Variance	Sig.
IW1	0.836	0.757	209.516	10	58.671	0.00
IW2	0.863					
IW3	0.726					
IW4	0.841					
IW5	0.506					

Table (3.7) shows the loading factors of Motion Waste items scored between 0.632-0.860. Therefore, the construct validity was assumed. Moreover, KMO has rated 79.7%which indicates good adequacy, and the Chi-square is 221.579 which shows the fitness of the model.

Furthermore, the Explained Variance value is 61.469 which can explain 61.47%of the variance.

Table 3. 7 Principal Component Factor Analysis for Motion Waste:

Item	F1	KMO	BTS – Chi^2	Df	Variance	Sig.
MW1	0.817	0.797	221.579	10	61.469	0.00
MW2	0.837					
MW3	0.860					
MW4	0.632					
MW5	0.753					

Table (3.8) shows the loading factors of Transportation Waste items scored between 0.623-0.832. Therefore, the construct validity was assumed. Moreover, KMO has rated 74.3% which indicates good adequacy, and the Chi-square is 181.977 which shows the fitness of the model. Furthermore, the Explained Variance value is 55.733 which can explain 55.73%of the variance.

Table 3. 8 Principal Component Factor Analysis for Transportation Waste:

Item	F1	KMO	BTS – Chi^2	Df	Variance	Sig.
TW1	0.711	0.743	181.977	10	55.733	0.00
TW2	0.789					
TW3	0.760					
TW4	0.832					
TW5	0.623					

Table (3.9) shows the loading factors of Over Processing Waste items scored between 0.728-0.858. Therefore, the construct validity was assumed. Moreover, KMO has rated 81.1% which indicates good adequacy, and the Chi-square is 198.572 which shows the fitness of the model. Furthermore, the Explained Variance value is 60.734 which can explain 60.73%of the variance.

Table 3. 9 Principal Component Factor Analysis for Overprocessing waste:

Item	F1	KMO	BTS – Chi^2	Df	Variance	Sig.
OPrW1	0.789	0.811	198.572	10	60.734	0.00
OPrW2	0.858					
OPrW3	0.783					
OPrW4	0.728					
OPrW5	0.731					

Table (3.10) shows the loading factors of Defect Waste items scored between0.792-0.895. Therefore, the construct validity was assumed. Moreover, KMO has rated 82.3% which indicates good adequacy, and the Chi-square is 361.218 which shows the fitness of the model. Furthermore, the Explained Variance value is 72.834 which can explain 72.83%of the variance.

Table 3. 10 Principal Component Factor Analysis for Defect Waste:

Item	F1	KMO	BTS – Chi^2	Df	Variance	Sig.
DW1	0.792	0.823	361.218	10	72.834	0.00
DW2	0.872					
DW3	0.895					
DW4	0.817					
DW5	0.886					

Table (3.11) shows the loading factors of Waiting Waste items scored between 0.656-0.8492. Therefore, the construct validity was assumed. Moreover, KMO has rated 79.5% which indicates good adequacy, and the Chi-square is 250.218 which shows the fitness of the model. Furthermore, the Explained Variance value is 63.888 which can explain 63.89%of the variance.

Table 3. 11 Principal Component Factor Analysis for Waiting Waste:

Item	F1	KMO	BTS – Chi^2	Df	Variance	Sig.
WW1	0.656	0.795	250.218	10	63.888	0.00
WW2	0.826					
WW3	0.823					
WW4	0.849					
WW5	0.828					

Table (3.12) shows that factors loading of Underutilization Waste: each sub- variable item within its group rated between 0.779-0.883 more than 40%. Therefore, construct validity is assumed. Moreover, KMO has rated 82.3%, which indicates good adequacy, and the Chi-square is 300.428, which shows to the fitness of the model. Furthermore, the Explained Variance value is 69.025, which can explain 69.03% of the variance.

Table 3. 12 Principal Component Factor Analysis for Underutilization Waste:

Item	F1	KMO	BTS – Chi^2	Df	Variance	Sig.
UW1	0.779	0.823	300.428	10	69.025	0.00
UW2	0.883					
UW3	0.846					
UW4	0.832					
UW5	0.811					

Table (3.13) shows that factors loading of the Lean Operations group rated between 0.628-0.863more than 40%, therefore the construct validity is assumed. Moreover, KMO has rated 85.8%which indicates good adequacy, and the Chi-square is3340.008, which shows the fitness of the model. Furthermore, the Explained Variance percentage value is 71.122, which can explain 71.12% of the variation, and the significance of Bartlett's Sphericity is less than 0.05, which indicates the factor analysis is useful.

Table 3. 13 Principal Component Factor Analysis for Lean Operations:

Item	Factor1	KMO	BTS–Chi^2	Bartlett's Test	Variance	Sig.
OPW	0.712	0.858	3340.008	780	71.121	0.00
IW	0.628					
MW	0.777					
TW	0.756					
OPrW	0.712					
DW	0.784					
WW	0.863					
UW	0.681					

Reliability Test:

The reliability of data was tested through Cronbach's Alpha, (Cronbach's alpha coefficients of internal consistency) was used to test the consistency and suitability of the measuring tool. A Cronbach's Alpha > 0.70 is reliable, and acceptable if it exceeds 0.60 (Hair, et. al. 2014). Table (3.14) shows that the reliability coefficient for Total Just in Time sub-variables ranges between 0.702 and, 0.831, and for Lean operations dimensions are between 0.772 and 0.903.

Table 3. 14: Reliability Test (Cronbach's Alpha) for all Variables

Item	No. of Items	Cronbach's Alpha
JTP	7	0.702
JTO	7	0.793
JTS	7	0.831
Just in Time System	**3 Sub-variables**	**0.899**
OPW	5	0.861
IW	5	0.772
MW	5	0.835
TW	5	0.787
OPrW	5	0.830
DW	5	0.903
WW	5	0.850
UW	5	0.884
Total	**8 Sub-variables**	**0.952**

Demographic Analysis:

The demographic analysis existing in the below sections built on the characteristics of the valid respondent i.e. frequency and percentage of participants such as gender, age, experience, education, position, and division, gender, age, education, experience, and department.

Gender: Table (3.15) shows that the female respondents are 57 (53.3%) which is more than the male respondent 50 (46.7%). It is almost nearly close.

Table 3. 15: Gender Description:

Gender		Frequency	Percent
Gender	Male	50	46.7
	Female	57	53.3
	Total	107	100.0

Age: Table (3.16) shows that the respondents the group of ages (40-50 years) 40 (37.4%) and the group of ages (30- 39 years) 38 (35.5%) are very close, then above 50 years 19 responds (17.8%), finally less than 30 years old 10 responds (9.3%).

Table 3. 16: Age Description:

Age		Frequency	Percent
Valid	Less than 30	10	9.3
	30-39	38	35.5
	40-50	40	37.4
	Above 50	19	17.8
	Total	107	100.0

Experience: Table (3.17) shows that the majority of respondents are having experience between (10-20years) 40.2%(41.7%) which matches with the study sample that targets managerial` level, then respondents experience between (21-30 years)28(26.2%), followed by those with experience less than 10 years 23(21.5%), In the end, respondents have more than 30 years' experience were 13 (12.1%).

Table 3. 17: Experience Description:

Experience		Frequency	Percent
Valid	Less than 10	23	21.5
	10-20	43	40.2
	21-30	28	26.2
	Above 30	13	12.1
	Total	107	100.0

Education: Table (3.18) exhibits that the majority of respondents were in a bachelor's degree 77(72.0%), then Master degree 23 (21.5%) follows by Ph.D. 5 (4.7%), finally Diploma 2 (1.9%). the result is matching with the nature of the pharmaceutical industry, which required a high educational level.

Table 3. 18: Education Description:

Education		Frequency	Percent
Valid	Diploma	2	1.9
	Bachelor	77	72.0
	Master	23	21.5
	Ph.D.	5	4.7
	Total	107	100.0

Position: Table (3.19) exhibit that the main respondents are Managers 47(43.9%), then Supervisors 18(16.8%) which is very close to respondents of Director16(16.8%), and Department Head, finally General Manager 6 (5.6) and President 5 (4.7%).

Table 3. 19: Title/Position Description:

Title/Position		Frequency	Percent
Valid	Supervisor	18	16.8
	Department Head	15	14.0
	Manager	47	43.9
	Director	16	15.0
	Vice President	5	4.7
	General Manager.	6	5.6
	Total	107	100.0

Department: Table (3.20) exhibits that the majority of respondents come from Quality division 36 (33.6%), this result agrees with applying Good Manufacturing Practices GMP in the pharmaceutical industry, followed by the Operation division 27 (25.2%), then management division 25 (23.4%), followed by Sales and Marketing 12 (11.2%), and finally Supply Chain 7 (6.5). This result is due to the scope of this study which is related to all of the departments and related to the manger himself who received the questionnaire.

Table 3. 20: Department Description:

Department		Frequency	Percent
Valid	Operations	27	25.2
	Supply Chain	7	6.5
	Sales & Marketing	12	11.2
	Management	25	23.4
	Quality	36	33.6
	Total	107	100.0

Chapter Four: Data Analysis

Introduction

This chapter contains a descriptive statistical analysis of respondents' perception, Pearson Bivariate Correlation matrix to show the relationships among independent variables (Total JIT sub-variables) with each other, among dependent dimensions variables (Lean Operations sub-variables) with each other, and between the independent variable (Total JIT) and sub-variables with the dependent variable (Lean Operations). At last, it contains multiple regressions to test the hypothesis: the effect of Total JIT practices (JIT Purchasing, JIT Operation, and JIT Selling) on Lean Operations.

Descriptive Statistical Analysis

To describe the respondents' perception and the degree of implementation of each variable, dimension, and item; the mean, standard deviation, t-value, ranking, and implementation level were applied.

The implementation level will be assigned according to the following formula at three categories*:*

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

Therefore, Low implementation is between 1.00-2.33 Medium implementation is between 2.34-3.66, and high implementation is between 3.67-5.00.

Independent Variable (Total Just in Time)

Table (4.1) shows that the means of Total Just in Time sub-variables ranges from 3.74 to 4.00 with a standard deviation between 0.48to 0.60. This indicates that respondents agree on the high implementation of Total Just in Time sub-variables that is supported by high t-value compared to T-tabulated. The average mean is 3.86 with a standard deviation of 0.47 indicates that the respondents were highly aware and concerned about Total Just in Time sub-variables where the t-value is 84.71 >T-tabulated = 1. 960. The JIT selling rated highest mean, followed by JIT Purchasing, and finally JIT Operations

Table 4. 1: Mean, Standard Deviation, t-Value, Sig., for Total Just in Time System:

No.	Sub-Variable	M.	S.D.	t-Value	Sig	Rank	Impl.
1	JITP	3.85	0.48	83.16	0.00	2	High
2	JITO	3.74	0.60	64.86	0.00	3	High
3	JITS	4.00	0.54	76.89	0.00	1	High
Total		**3.86**	**0.47**	**84.71**	**0.00**		**High**

JIT Purchasing:

Table (4.2) shows that the means of JIT purchasing items ranges between 3.31 and 4.27 with standard deviation ranges from 0.60 to 1.08. which indicates that respondents agree on medium to high implementation of JIT Purchasing items. The average mean for total JIT purchasing is 3.85 with a standard deviation of 0.48. This means that the Jordanian Pharmaceutical Manufacturing Companies consider JIT purchasing of high implementation, where t value is 83.16 >T-tabulated = 1.960.

Table 4. 2: Mean, Standard Deviation, t-Value, Sig., for JIT Purchasing:

No.	Item	M.	S.D.	t-Value	Sig	Rank	Impl.
1	The company signs long-term contracts with the right suppliers	3.31	1.08	31.79	0.00	7	Medium
2	The company places orders based on forecasting.	3.53	0.95	38.27	0.00	5	Medium
3	The company receives materials on the right quality.	4.13	0.65	66.20	0.00	4	High
4	The company receives materials on the right specifications.	4.21	0.63	69.22	0.00	2	High
5	The company receives requested materials at the right quantity.	4.27	0.61	72.71	0.00	1	High
6	The company receives materials at the right time.	3.36	0.85	40.89	0.00	6	Medium
7	The company negotiates payment terms.	4.16	0.72	60.11	0.00	3	High
JIT Purchasing		**3.85**	**0.48**	**83.16**	**0.00**		**High**

JIT Operation:

Table (4.3) shows that the means of JIT Operations items range from 3.47 to 4.03 with standard deviation ranges between 0.67 and 1.28. which indicates that respondents semi agree on medium to high implementation level of JIT Operations items. The average mean for total JIT Operations is 3.74 with a standard deviation of 0.60Which means that the Jordanian Pharmaceutical Manufacturing Companies consider JIT Operations of high implementation, where t value is64.86 >T-tabulated = 1.960.

Table 4. 3; Mean, Standard Deviation, t-Value, sig for JIT Operations:

No.	Item	M.	S.D.	t-Value	Sig	Rank	Impl.
1	The company schedules production according to market demand priorities.	4.03	0.67	62.63	0.00	1	High
2	The company organizes the equipment to facilitate operation.	3.91	0.68	59.39	0.00	3	High
3	The company commits to continuous process improvement.	3.93	0.79	51.69	0.00	2	High
4	The company controls production activities through the ERP system.	3.55	1.28	28.63	0.00	6	Medium
5	The company implements preventive maintenance.	3.71	0.97	39.51	0.00	4	High
6	The company works to reduce set-up times of the equipment.	3.47	0.78	45.93	0.00	7	Medium
7	The company trains staff to facilitate operations.	3.59	0.93	39.87	0.00	5	Medium
	JIT Operation	**3.74**	**0.60**	**64.86**	**0.00**		**High**

JIT Selling

Table (4.4) shows that the average mean of the respondents' perception about the degree of the implementation of JIT Selling items ranges from 3.73to 4.30 with standard deviation ranges between 0.68 and 0.90. which indicates that the respondents agree on the high implementation level of JIT Selling items. The average mean for total JIT Selling is 4.00 with a standard deviation of 0.54. This means that the Jordanian Pharmaceutical Manufacturing Companies consider JIT Selling of high implementation, where the t-value is 76.89>T-tabulated = 1.960, with a standard deviation that ranges from 0.47 to 0.61. Such results indicate that there is an agreement on the high applying of over-production variable items. The mean of the total over-production variable items is 4.49 with a standard deviation 0.37 which indicates that there is an agreement on the high implementing of this variable. Finally, the overall result indicates that there is a significant degree of implementation of the overproduction variable in the Jordanian Pharmaceutical Manufacturing Organizations, where (t=43.98>1.96).

Table 4. 4; Mean, Standard Deviation, t-Value, sig for JIT Selling:

No.	Item	M.	S.D.	t-Value	Sig	Rank	Impl.
1	The company responds to customer complaints	4.14	0.69	61.80	0.00	3	High
2	The company delivers on-time.	3.73	0.78	49.21	0.00	7	High
3	The company delivers the right quantity.	3.99	0.77	53.55	0.00	4	High
4	The company delivers the right quality.	4.26	0.69	63.76	0.00	2	High
5	The company delivers the right specifications.	4.30	0.68	65.79	0.00	1	High
6	The company accepts returning expired products.	3.80	0.81	48.81	0.00	5	High
7	The company organizes inventory according to delivery times.	3.77	0.90	43.47	0.00	6	High
JIT Selling		**4.00**	**0.54**	**76.89**	**0.00**		**High**

Dependent Variables:

Table (4.5) shows that the mean of Lean Operations sub-variables ranges from 3.21to 3.86 with a standard deviation between 0.54to 0.82. This indicates that respondents semi agree on medium to high implementation of Lean Operations sub-variables that is supported by high t-value compared to T-tabulated. The average mean is 3.67with a standard deviation of 0.52indicates that the respondents were highly aware and concern about Lean Operations sub-variables where the t-value is 73.49>T-tabulated = 1. 960. The inventory waste rated highest mean, over Production waste, over-processing waste, transportation waste, defect waste, waiting waste, motion waste, and finally underutilization Waste.

Table 4. 5: Mean, Standard Deviation, t-Value, sig. for Total Lean Operations.

No.	Sub-Variable	M.	S.D.	t-Value	Sig	Rank	Impl.
1	**OPW**	3.85	0.62	63.80	0.00	2	High
2	**IW**	3.86	0.70	57.12	0.00	1	High
3	**MW**	3.53	0.68	53.35	0.00	7	Medium
4	**TW**	3.78	0.54	72.94	0.00	4	High
5	**OPrW**	3.85	0.62	63.80	0.00	3	High
6	**DW**	3.72	0.82	47.14	0.00	5	High
7	**WW**	3.71	0.68	56.26	0.00	6	High
8	**UW**	3.21	0.79	42.08	0.00	8	Medium
Total		**3.67**	**0.52**	**73.49**	**0.00**		**High**

Over Production Waste:

Table (4.6) shows that the mean of overproduction items ranges from 3.75 to 4 with standard deviation ranges between 0.71 and 0.87. which shows that the respondents agree on the high implementation level of overproduction waste items. The average mean for total overproduction is 3.85 with a standard deviation of 0.62 which means that the Jordanian Pharmaceutical Manufacturing Companies consider overproduction of high implementation, where t value is 63.80>T-tabulated = 1.960.

Table 4. 6; Mean, Standard Deviation, t-Value, sig for Over Production Waste:

No.	Item	M.	S.D.	t-Value	Sig	Rank	Impl
1	The company estimates the order quantity.	3.75	0.77	50.61	0.00	5	High
2	The company confirms the orders before starting production.	3.93	0.80	50.92	0.00	2	High
3	The company estimates the raw materials required for production.	3.95	0.87	46.85	0.00	1	High
4	The company operates its equipment efficiently.	3.82	0.74	53.63	0.00	3	High
5	The company operates its equipment effectively.	3.79	0.71	55.26	0.00	4	High
Overproduction Waste		3.85	0.62	63.80	0.00		**High**

Inventory Waste

Table (4.7) shows that the means of inventory waste items range from 3.57 to 4.21 with standard deviation ranges between 0.71 and 1.32 which means that the respondents semi agree on high and medium implementation levels of Inventory waste items. The average mean for total inventory waste is 3.86 with a standard deviation of 0.70 Which means that the Jordanian Pharmaceutical Manufacturing Companies consider inventory waste of high and medium implementation, where t value is 57.12>T-tabulated = 1.960.

Table 4. 7; Mean, Standard Deviation, t-Value, sig for IW:

No.	Item	M.	S.D.	t-Value	Sig	Rank	Impl.
1	The company provides appropriate storage conditions.	4.21	0.71	61.05	0.00	1	High
2	The company conducts stocktaking to its various inventories.	3.97	0.83	49.54	0.00	4	High
3	The company stores the materials according to the consumption rate.	3.57	0.96	38.36	0.00	5	Medium
4	The company considers an efficient warehouses location.	3.92	0.90	44.91	0.00	3	High
5	The company tracks inventory activities through the ERP system.	3.64	1.32	28.58	0.00	2	Medium
Inventory Waste		**3.86**	**0.70**	**57.12**	**0.00**		**High**

Motion Waste:

Table (4.8) shows that the mean of motion waste items ranges from 3.33to 3.62 with a standard deviation range between 0.81 and 0.95. which implies that the respondents agree on the medium implementation level of motion waste items. The average mean for total motion waste is 3.53 with a standard deviation of 0.68 which means that the Jordanian Pharmaceutical Manufacturing Companies consider motion waste of medium implementation, where t value is 53.35>T-tabulated = 1.960.

Table 4. 8; Mean, Standard Deviation, t-Value, sig for Motion Waste:

No.	Item	M.	S.D.	t-Value	Sig	Rank	Impl.
1	The company standardizes work.	3.62	0.90	41.71	0.00	1	Medium
2	The company reduces the movements of workers that are not connected with work.	3.58	0.81	45.54	0.00	2	Medium
3	The company organizes the factory to reduce excess movement.	3.58	0.84	44.29	0.00	3	Medium
4	The company uses appropriate internal means of transportation at different locations.	3.33	0.95	36.25	0.00	5	Medium
5	The company hires the appropriate number of workers.	3.54	0.90	40.55	0.00	4	Medium
Motion Waste		**3.53**	**0.68**	**53.35**	**0.00**		**Medium**

Transportation Waste:

Table (4.9) shows that the mean of transportation waste items ranges from 3.57to 3.97with standard deviation ranges between 0.60and0.82 which suggests that the respondents semi agree on medium to high implementation level of transportation waste items. The average mean for total Transportation Waste is 3.78with a standard deviation of 0.54 which means that the Jordanian Pharmaceutical Manufacturing Companies consider transportation waste of high implementation, where t value is 72.93>T-tabulated = 1.960.

Table 4. 9; Mean, Standard Deviation, t-Value, sig for Transportation Waste:

No.	Item	M.	S.D.	t-Value	Sig	Rank	Impl.
1	The company provides alternatives for transport operations	3.57	0.79	46.72	0.00	5	Medium
2	The company puts standard procedures during transportation.	3.79	0.75	52.02	0.00	3	High
3	The company schedules shipments with partners.	3.95	0.60	67.62	0.00	2	High
4	The company uses appropriate means of transportation.	3.97	0.65	63.12	0.00	1	High
5	The company develops well-skilled workers for transportation.	3.61	0.82	45.43	0.00	4	Medium
Transportation Waste		**3.78**	**0.54**	**72.93**	**0.00**		**High**

Over Processing Waste:

Table 4. 10; Mean, Standard Deviation, t-Value, sig for Over Processing Waste:

No.	Item	M.	S.D.	t-Value	Sig	Rank	Impl.
1	The company adjusts the time of the production process.	3.69	0.78	48.83	0.00	3	High
2	The company emphasizes the flow of required procedures.	3.87	0.73	54.98	0.00	2	High
3	The company commits to the production schedule.	3.65	0.85	44.58	0.00	4	Medium
4	The company describes the working procedures for workers.	3.96	0.78	52.81	0.00	1	High
5	The company uses appropriate statistical aspects.	3.44	0.99	35.86	0.00	5	Medium
Over-processing Waste		**3.85**	**0.62**	**63.80**	**0.00**		**High**

Table (4.10) shows that the mean of over Processing waste items ranges from 3.44 to 3.96 with standard deviation ranges between 0.73 and 0.99 which refer to that the respondents semi agree on medium to high implementation level of over processing waste items. The average mean for total over processing waste is 3.85with a standard deviation of 0.62Which means that the Jordanian Pharmaceutical Manufacturing Companies consider over processing waste of high implementation, where t value is 63.80>T-tabulated = 1.960.

Defect Waste:

Table (4.11) shows that the mean of defect waste items ranges from 3.50to 3.84with a standard deviation ranges between 0.90 and 1,10 which means that the respondents semi agree on medium to high implementation level of defect waste items. The average mean for total defect waste is 3.72with a standard deviation of 0.82which means that the Jordanian Pharmaceutical Manufacturing Companies consider defect waste of high implementation, where t value is 47.14>T-tabulated = 1.960.

Table 4. 11; Mean, Standard Deviation, t-Value, sig for Defect Waste:

No.	Item	M.	S.D.	t-Value	Sig	Rank	Impl.
1	The company uses criteria that are higher than the GMP guidelines.	3.50	1.10	32.81	0.00	5	Medium
2	The company implements the Product Quality Review (PQR) system.	3.79	0.94	41.56	0.00	2	High
3	The company uses quality control charts.	3.76	0.94	41.34	0.00	3	High
4	The company adapts standard quality specifications with partners.	3.84	0.91	43.53	0.00	1	High
5	The company conducts quality-training programs.	3.72	0.90	42.82	0.00	4	High
	Defects Waste	**3.72**	**0.82**	**47.14**	**0.00**		**High**

Waiting Waste:

Table (4.12) shows that the mean of waiting waste items ranges from 3.48 to 3.94 with standard deviation ranges between 0.73 and 0.98which indicates that the respondents semi agree on medium to high implementation level of waiting waste items. The average mean for total waiting waste is 3.71 with a standard deviation of 0.68 Which means that the Jordanian Pharmaceutical Manufacturing Companies consider waiting waste of high implementation, where t value is 56.26>T-tabulated = 1.960.

Table 4. 12; Mean, Standard Deviation, t-Value, sig for Waiting Waste:

No.	Item	M.	S.D.	t-Value	Sig	Rank	Impl.
1	The company provides raw materials on time.	3.48	0.89	40.23	0.00	5	Medium
2	The company manages production processes effectively.	3.65	0.73	51.91	0.00	4	Medium
3	The company performs maintenance of equipment periodically.	3.68	0.92	41.52	0.00	3	High
4	The company sets priorities for manufacturing.	3.94	0.77	52.64	0.00	1	High
5	The company takes appropriate decisions quickly when necessary.	3.80	0.98	40.33	0.00	2	High
WW		**3.71**	**0.68**	**56.26**	**0.00**		**High**

Underutilization Waste:

Table (4.13) shows that the mean of underutilization waste items ranges from 2.95 to 3.36 with a standard deviation ranges between 0.80 and 1.08 which refer to that the respondents agree on medium implementation level of underutilization waste items. The average mean for total underutilization waste is 3.21 with a standard deviation of 0.79. This means that the Jordanian Pharmaceutical Manufacturing Companies consider underutilization waste of Medium implementation, where t value is 42.07>T-tabulated = 1.960.

Table 4. 13; Mean, Standard Deviation, t-Value, sig for Underutilization Waste:

No.	Item	M.	S.D.	t-Value	Sig	Rank	Impl.
1	The company discovers talent.	3.36	0.80	43.17	0.00	1	Medium
2	The company encourages creativity thorough employees’ participation.	3.35	0.85	40.82	0.00	2	Medium
3	The company implements an incentive system to reward valuable ideas.	3.07	1.07	29.73	0.00	4	Medium
4	The company conducts innovation training continuously.	2.95	1.08	28.39	0.00	5	Medium
5	The company adopts new technologies within its processes.	3.34	0.95	36.29	0.00	3	Medium
UW		**3.21**	**0.79**	**42.07**	**0.00**		Medium

Relationships between Variables:

Table (4.14) shows that the relationships between Total JIT sub-variables are strong, where r ranging between 0.558 and 0.912. The table also shows that the relationships between Lean Operations dimensions are strong since r is ranging between 0.509and0.592. The relationships between total JIT sub-variables and Lean Operations are strong since r is ranging from 0.311 to 0.736. The relationships between each Total JIT sub-variables with total Lean operations are strong since r ranging is from 0.665 to 0.762.

Table 4. 14: Bivariate Pearson Correlation (r) Matrix between Independent and Dependent Variables:

No.	Item	1	2	3	4	5	6	7	8	9	10	11	12	13
1	JIT Purchasing													
2	JIT Operations	.558**												
		.000												
3	JIT Selling	.662**	.730**											
		.000	.000											
4	Total JIT	.825**	.888**	.912**										
		.000	.000	.000										
5	Over-Production Waste	.419**	.442**	.527**	.528**									
		.000	.000	.000	.000									
6	Inventory Waste	.311**	.490**	.513**	.507**	.509**								
		.001	.000	.000	.000	.000								
7	Motion Waste	.518**	.588**	.602**	.652**	.396**	.354**							
		.000	.000	.000	.000	.000	.000							
8	Transportation Waste	.559**	.565**	.577**	.647**	.415**	.501**	.557**						
		.000	.000	.000	.000	.000	.000	.000						
9	Over-Processing Waste	.419**	.442**	.527**	.528**	1.000**	.509**	.396**	.415**					
		.000	.000	.000	.000	.000	.000	.000	.000					
10	Defect Waste	.521**	.401**	.463**	.521**	.451**	.442**	.572**	.536**	.451**				
		.000	.000	.000	.000	.000	.000	.000	.000	.000				
11	Waiting Waste	.612**	.643**	.679**	.736**	.602**	.386**	.626**	.570**	.602**	.641**			
		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000			
12	Under-Utilization Waste	.471**	.520**	.576**	.597**	.429**	.166	.549**	.425**	.429**	.412**	.592**		
		.000	.000	.000	.000	.000	.087	.000	.000	.000	.000	.000		
13	Lean Operations	.665**	.710**	.762**	.814**	.712**	.628**	.777**	.756**	.712**	.784**	.863**	.681**	
		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	

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

Finally, the relationship between total JIT and total Lean Operations is strong, where r is equal to 0.814. This indicates that the correlation between the total JIT and total Lean Operations dimensions is very strong and can affect each other.

Hypothesis Analysis:

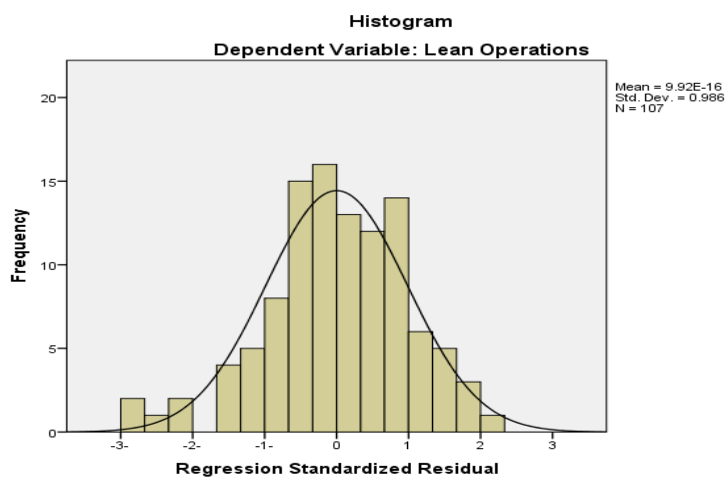
Multiple regressions are used to test the effect of Total JIT Practices on Lean Operations on Jordanian Pharmaceutical Manufacturing Companies.

After confirming validity, reliability, and the correlation between independent and dependent variables, the following tests were carried out to ensure the validity of regression analysis. (Sekaran, 2003):

Normality test:

Figure (4.1) shows that the shape follows the normal distribution, in such case the model does not violate this assumption.

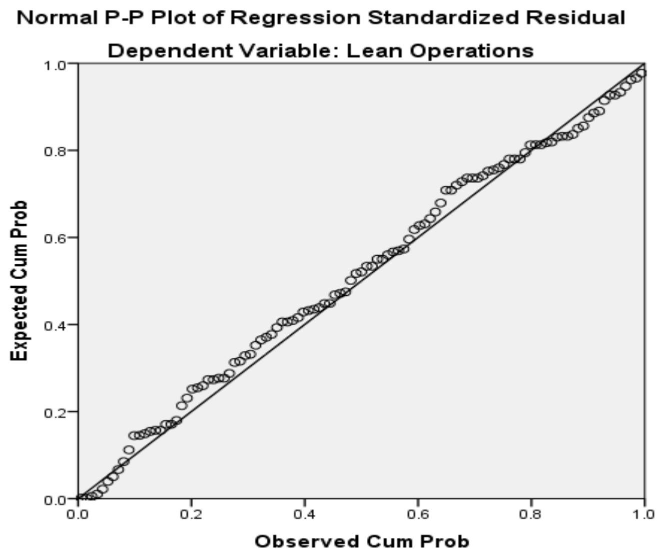
Figure 4. 1: Normality Test



Linearity Test:

Linearity test: figure (4.2) shows that there is a linear relationship between independent and dependent variables. In such a case, the model does not violate this assumption.

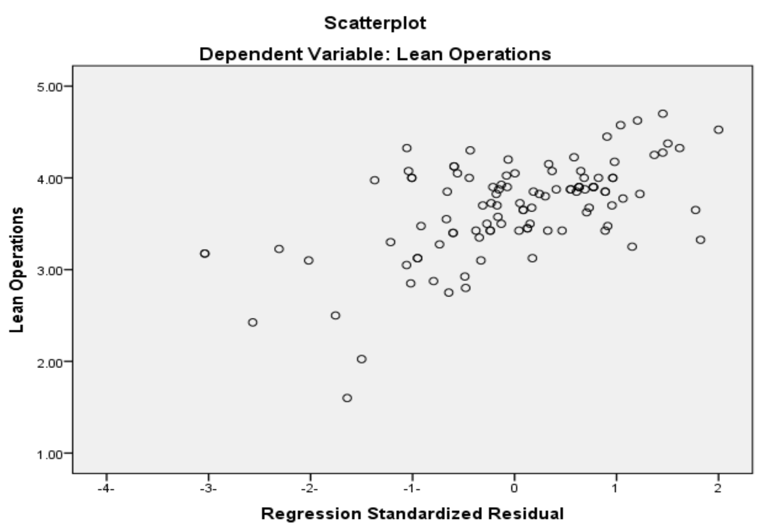
Figure 4. 2: Linearity



Independence of Errors:

Equal variance (homoscedasticity): figure (4.3) shows that the errors are scattered around the mean, Durbin-Watson used to ensure the independence of errors, If Durbin-Watson test value is about two, and the model does not violate this assumption. Table (4.15) shows that Durbin Watson value is (d=1.694) therefore, there is no relation between errors and predicted values, in such case, the model does not violate this assumption.

Figure 4. 3: Scatter Plot



Multi-Collinearity:

To test the Multi-Collinearity the VIF (Variance Inflation Factor) and tolerance are used, If VIF value is less than 10 and tolerance is more than 10%, the model does not violate the multi-collinearity assumption.

In Table (4.15) the VIF values are less than 10 and the tolerance values are more than 10%. which indicates that there is no multicollinearity within the independent variables of this study.

Table 4. 15: Multi-collinearity and Durbin-Watson Tests:

Sub-Variables	Collinearity Statistics		Durbin-Watson
	Tolerance	VIF	
JTP	0.55	1.819	1.694
JTO	0.457	2.186	
JTS	0.373	2.682	

Main Hypothesis:

$H_{0.1}$: Total Just in Time practices (JIT Purchasing, JIT Operations, and JIT Selling) do not affect lean operations of Jordanian Pharmaceutical manufacturing companies. (JPMC), at $\alpha \leq 0.05$.

Table (4.16) shows that when regressing the three sub-variables of Total JIT against the Lean Operations, the model reveals that Total JIT can explain 66.5%of the variation of Lean Operations, where (R^2=.665, F=68.188, Sig.=0.000). Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted, which states that Total Just in Time practices (JIT Purchasing, JIT Operations, and JIT Selling) affect the Lean Operation of Jordanian Pharmaceutical Manufacturing companies, at $\alpha \leq 0.05$.

Table 4. 16: Results of Multiple Regressions Analysis (ANOVA): Regressing Total Just in Time System against Lean Operations.

Model	r	R^2	Adjusted R^2	Std. Error	f	Sig.
1	.816[a]	.665	.655	.30352	68.188	.000b

a. Predictors: (Constant), JTS, JTP, JTO. b. Dependent Variable: Lean Operations

Based on the Total Just In Time components table (4.17) shows the effect of each sub-variable on Lean Operations, the highest effect was for JIT Selling with an effect of 38.7%

of the total effect, followed by JIT Operation with an effect of 28.9% on Lean Operations, finally, JIT Purchasing with an effect of 24.7% on Lean Operations.

Table 4. 17: Results of Multiple Regressions for the Effect of each Total Just in Time System on Dependent Variable (Lean Operations):

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.219	.254		0.864	0.390
	JTP	.267	.083	.247	3.214	0.002
	JTO	.251	.073	.289	3.432	0.001
	JTS	.372	.090	.387	4.149	0.000

H$_{0.1.1}$: JIT Purchasing does not affect lean operations of Jordanian Pharmaceutical manufacturing companies (JPMC), at $\alpha \leq 0.05$.

Table (4.17) shows that there is a significant effect of JIT Purchasing on Lean Operations, meanwhile (Beta=0.247, t=3.214, sig=0.002, $p<0.05$).Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted which states that: JIT Purchasing affects lean operations of Jordanian Pharmaceutical manufacturing companies (JPMC), at $\alpha \leq 0.05$.

H$_{0.1.2}$: JIT Operation does not affect lean operations of Jordanian Pharmaceutical manufacturing companies (JPMC), at $\alpha \leq 0.05$.

Table (4.17) shows that there is a significant effect of JIT Operation on Lean Operations, meanwhile (Beta=0.289, t=3.432, sig=0.001, $p<0.05$). Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted which states that: JIT Operation affects lean operations of Jordanian Pharmaceutical manufacturing companies (JPMC), at $\alpha \leq 0.05$.

H$_{O.1.2}$: JIT selling does not affect lean operations of Jordanian Pharmaceutical manufacturing companies (JPMC), at $\alpha \leq 0.05$.

Table (4.17) shows that there is a significant effect of JIT Selling on Lean Operations, meanwhile (Beta=0.387, t=4.149, sig=0.000, $p<0.05$). Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted which states that: JIT Selling affects lean operations of Jordanian Pharmaceutical manufacturing companies (JPMC), at $\alpha \leq 0.05$.

In summary, the multiple regressions analysis shows that the total JIT sub-variables together affect the Lean Operations, where ($R2=0.665$, F=68.188, Sig.=0.000). In addition, it shows that all the three sub-variables: JIT Purchasing, JIT Operations, and JIT Selling, affect Lean Operations, where JIT Selling has the highest effect, followed by JIT operation, and at the last JIT Purchasing.

Chapter Five: Results' Discussion, Conclusion, and Recommendation

Results' Discussion

The results of this study show that:

- There is a high implementation of Total Just in Time in Jordanian Pharmaceutical manufacturing companies. The JIT Selling has the highest implementation rate, followed by JIT Purchasing, while JIT Operations comes at least. The results show also that the implementation of Lean Operations dimensions is high, whereas the inventory waste has the highest implementation, followed by overproduction waste, over-processing, transportation waste, defect waste, waiting waste, motion waste, and finally underutilization waste. This result is supported by the previous studies, such as Inman, et. al. (2011); Singh, et. al. (2013); Alcaraz, et, al. (2014); Jadhav, et. al. (2015a); Al-Maani (2016); Al Haraisa (2017); Darwish (2018); Ramlawati (2018).
- There is a strong relationship among JIT sub-variables, which is supported by previous studies such as Danese, et. al. (2012); Qureshi, et. al. (2013); Green, et. al (2014); Abu Zaid, et. al. (2016). In addition, the results show that the relationships among Lean Operations dimensions are strong supported by previous studies such as Jaiganesh, and Sudhahar (2013); Jadhav, et. al (2015b); Kumar, et. al. (2015); Al Kunsol (2015); Fercoq, et.al. (2016).
- The relationships among Total JIT sub-variables and Lean Operations dimensions are strong; these results are supported by previous studies such as Inman, et. al. (2011);

Danese, et. al. (2012); Qureshi, et. al. (2013); Kulkarni, et. al. (2014); Resta, et. al. (2015); Abu Zaid, et. al. (2016); and Othman, et.al. (2016).

- All Total JIT sub-variables have an effect on Lean Operations in Jordanian Pharmaceutical Manufacturing Companies. The JIT Selling was holding the highest effect, followed by JIT Operation variable, then JIT Purchasing, which supported by previous studies like, Inman, et. al. (2011); Chowdary, and George (2012); Al-Matarneh (2012); Qureshi, et. al. (2013); Green, et. al (2014); Resta, et. al. (2015); Kumar, et. al. (2015); Singh, et. al. (2017); Chahal and Narwal (2017); and Islam, et.al. (2018).

Conclusion

The study was dedicated to answering the main question which is: Do Total Just in Time practices (JIT Purchasing, JIT Operation, JIT Selling) affect the Lean Operations of Jordanian Pharmaceutical Manufacturing Companies (JPMC)? Data was collected via a questionnaire, and the validity and reliability were tested, and the correlation and multiple regressions were used to test the hypothesis, and also to develop a framework for JIT success.

- The first contribution of this study is to add to the developing literature on JIT implementation.
- The results of this study show that there is a high implementation of each Total Just in Time variables in Jordanian Pharmaceutical Manufacturing Companies (JPMC), which indicates the high presence of these variables in Jordanian Pharmaceutical Manufacturing companies. The JIT Selling has the highest rate of implementation followed by JIT Purchasing, and finally JIT operation. This result can be explained due to the nature of the industry, strict regulations (shipping, customs clearance, and

logistic issues, bureaucracy...), applying the Good Manufacturing Practices (GMP), Quality Assurance, Quality Control, the commitment to the expiry date issues, the import of Active Pharmaceutical Ingredient (API) must be from one to three approved sources, quality certified, and esteemed suppliers from Jordanian Food and Drug Administration(JFDA), the expensive storage conditions for medicine and raw materials, and last but not least, the production process in the Pharmaceutical manufacturing is based only on campaigns. This indicates the importance of JIT implementation for managers, also it indicates that there is harmony among all department managers and successful implementation of procedures.

- The findings show the high implementation of Lean Operations sub-variables, The inventory waste rated highest mean, over production waste, over-processing waste, transportation waste, defect waste, waiting waste, motion waste, and finally underutilization waste, this indicates that there is an agreement on the high presence of these dimensions in Jordanian Pharmaceutical Manufacturing companies. The results can also be explained by the nature of the industry in the factors mentioned above that are governed by several rules and regulation (Jordanian Food and Drug Administration JFDA, Good Manufacturing Practices GMP), using the ERP system, the fact that is the manufacturing in the pharmaceutical sector is very expensive and very complex which forces JPMC to reduce or eliminate all kinds of waste.
- The results also show that the relationships between Total JIT sub-variables are strong. The relationships between Lean Operations dimensions are also strong. Moreover, the relationships between total JIT sub-variables and Lean Operations are strong. Furthermore, the correlation between the relationships between each Total JIT

sub-variables with total Lean operations is strong. Finally, the relationship between total JIT and total Lean Operations is strong. This indicates that the correlation between the total JIT and total Lean Operations dimensions is very strong and can affect each other.

- The result indicates that Total JIT sub-variables affected Lean Operations (overproduction waste, inventory waste, motion waste, transportation waste, over-processing waste, defects waste, waiting waste, and underutilization waste) significantly, the highest effect was for JIT Selling, followed by JIT Operation, finally, JIT Purchasing.

Recommendations:

In the light of the current study outcomes the following points can be recommended:

Recommendations for Jordanian Pharmaceutical Manufacturing Companies:

1- The current study recommends that Jordanian Pharmaceutical Manufacturing Companies should increase the awareness of the Just in Time concept, and its role in maintaining and improving operations.

2-The current study recommends that Jordanian Pharmaceutical Manufacturing Companies should integrate Total JIT practices as a tool and technique to eliminate waste and make the operation more effective and efficient in their strategic planning and practices.

3- The current study recommends that Jordanian Pharmaceutical Manufacturing Companies should apply all Total JIT practices because there is a relationship among the Total JIT sub-variables.

4 - The current study recommends that Jordanian Pharmaceutical Manufacturing Companies should conduct special training courses for managers and employees for the successful implementation of Total JIT practices.

5-The current study recommends that Jordanian Pharmaceuticals Manufacturing Companies should pay more attention to encouraging creativity through continuous training programs, employee’s involvement, participation, and empowerment. Finally, the adoption of a reliable incentive system, for more support.

6- The current study recommends that Jordanian pharmaceutical manufacturing companies should give more awareness to the ERP system, and statistical aspects to control the operations.

7- The current study recommends that Jordanian pharmaceutical manufacturing companies should study and analyze separately all kinds of waste that don't add value, and put suitable solutions, to improve and enhance operations.

8-The current study recommends that Jordanian pharmaceutical manufacturing companies should emphasize on long-term contracts implementation, for procurement and sourcing, and sharing demand forecasting with all partners in order to develop long-term demand plan.

9-The current study recommends that Jordanian pharmaceutical manufacturing companies should reevaluate the Inventory and Warehousing and their role in creating waste, and manage how to reduce such waste while studying the benefits and advantages that will be gained.

Recommendations for Academicians and Future Research:

1- The current study recommends carrying out a similar study in the same sector in other countries, especially in Arab Countries and the Middle East, to make the results generalized.

2 - The current study recommends sharing other levels of employees are working in Jordanian pharmaceutical manufacturing companies, as this study was limited to the manager level only.

3- The current study recommends applying the same variables on other manufacturing companies' sectors since this study was related to the pharmaceutical manufacturing sector.

4-The current study takes place within a special time (COVID-19 Pandemic) and a limited period, therefore, it's appropriate to repeat this study after some time to observe the development of the manufacturing more accurately.

5-Finally, extending the analyses to other industries and countries represent future research opportunities, which can be done by further testing with larger samples within the same industry, and including other industries will help mitigate the issue of generalizing conclusions on other organizations and industries.

References

Abdallah, K. M., & Al-Ali, A. M. (2016) Develop Conceptual Framework for Lean Organization to Achieve Continuous Process Improvement: A Case Study in Al-Hikma Pharmaceuticals Jordan Company. ***Journal of Business and Management****, 18, (4), 99-108.*

*Abu Zaid, M. K. S. A., Migdadi, M. M., Alhammad, F. A., & Al-Hyari, K. A. (2016). An empirical examination of total just-in-time impact on operational performance: insights from a developing country****. International Journal of Supply Chain and Inventory Management,*** *1(4), 286-305.*

Aksoy, A., & Öztürk, N. (2011). Supplier selection and performance evaluation in just-in-time production environments. ***Expert systems with applications, (Elsevier),****38(5), 6351-6359.*

Al Haraisa, Y. E. (2017). Just-In-Time system and its impact on operational excellence: An empirical study on Jordanian industrial companies. ***International Journal of Business and Management,*** *12(12), 158.*

Al Kunsol, W. H. (2015). The Effect of Lean Six Sigma on the Jordanian Pharmaceutical Manufacturing Organizations' Business Performance. ***Master Thesis, Middle East University****. Amman, Jordan.*

*Alcaraz, J. L. G., Maldonado, A. A., Iniesta, A. A., Robles, G. C., & Hernández, G. A. (2014). A systematic review/survey for JIT implementation: Mexican maquiladoras as case study****. Computers in Industry (ELSEVIER),*** *65(4), 761-773.*

Alkhalidi, A. B., & Abdallah, A. B. (2018). Lean bundles and performance outcomes in the pharmaceutical industry: benchmarking a Jordanian company and operational excellence international project. ***Modern Applied Science,*** *12(8), 90-102.*

Al-Kurdi, M. (2020). ***Fact International****. http://factjo.com/news.aspx?Id=85410.*

*Al-Maani, A. (2016). JIT in the Jordanian Industrial Companies. International Journal of Academic Research in Accounting, **Finance and Management Sciences**, 6(3), 31-36.*

*AL-Manei, M., Salonitis, K., & Xu, Y. (2017). Lean implementation frameworks: the challenges for SMEs**. Procedia Cirp,** 63, 750-755.*

*Al-Matarneh, G. F. (2012). Requirements and obstacles of using Just in Time (JIT) system: evidence from jordan**. International Management Review**, 8(1), 55.*

*Al-Shourah, A. A., Al-Tarawneh, R. T., & Alzu'bi, F. A. (2018). The integration of lean management and six sigma strategies to improve the performance of production in industrial pharmaceutical. **International Journal of Business and Management**, 13(8), 207-216.*

*Belekoukias, I., Garza-Reyes, J. A., & Kumar, V. (2014). The impact of lean methods and tools on the operational performance of manufacturing organisations**. International Journal of Production Research,** 52(18), 5346-5366.*

*Benton Jr, W. C. (2010). Just‐ in‐ time/lean production systems. **Wiley Encyclopedia of Operations Research and Management Science**, (on -line), available: https://onlinelibrary.wiley.com/doi/abs/10.1002/9780470400531.eorms0441*

*Camuffo, A., De Stefano, F., & Paolino, C. (2017). Safety reloaded: lean operations and high involvement work practices for sustainable workplaces. **Journal of Business Ethics,** 143(2), 245-259.*

*Chahal, V., & Narwal, M. (2017). Impact of lean strategies on different industrial lean wastes. **International Journal of Theoretical and Applied Mechanics,** 12(2), 275-286.*

*Chowdary, B. V., & George, D. (2012). improvement of manufacturing operations at a pharmaceutical company: A lean manufacturing approach. **Journal of Manufacturing Technology Management,** 23(1), 56-75.*

Danese, P., Romano, P., & Bortolotti, T. (2012). JIT production, JIT supply and performance: investigating the moderating effects. ***Industrial Management & Data Systems,*** *112 (3), 441-465.*

Darwish, A. H. (2018). Dr. Abdel-Aziz Ahmad Sharabati "The Effect of Total Just in Time on Competitive Advantage on International Fast Food Restaurants in Jordan. ***Master Thesis, Middle East University****. Amman, Jordan.*

Dreamer, S., & Niewiarowski, P. (2013). Lean in Novartis Pharma: sustainability through a five-step deployment methodology. In ***Leading Pharmaceutical Operational Excellence*** *(pp. 145-152).* ***Springer****, Berlin, Heidelberg.*

*Fercoq, A., Lamouri, S., & Carbone, V. (2016). Lean/Green integration focused on waste reduction techniques****. Journal of Cleaner production,*** *137, 567-578.*

Friedli, T., & Lembke, N. (2013). Structures of Operational Excellence Initiatives. ***In Leading Pharmaceutical Operational Excellence.*** *245-261 Springer, Berlin, Heidelberg.*

Friedli, T., Basu, P., Bellm, D., & Werani, J. (2013). Leading pharmaceutical operational excellence. ***Leading Pharmaceutical Operational Excellence Outstanding Practices and Cases,*** *411-418.*

Friedli, T., Goetzfried, M., & Basu, P. (2010). Analysis of the implementation of total productive maintenance, total quality management, and just-in-time in pharmaceutical manufacturing. ***Journal of Pharmaceutical Innovation****, 5(4), 181-192.*

Garza-Reyes, J. A., Betsis, I. E., & Kumar, V. (2018). Lean readiness–the case of the European pharmaceutical manufacturing industry. ***International Journal of Productivity and Performance Management,*** *67 (1), 20-44.*

Goetsch, D. L., & Davis, S. (2014). ***Quality management for organizational excellence: introduction to total quality*** *(7th Ed). Harlow, England: Pearson Education Limited.*

Green Jr, K. W., Inman, R. A., & Birou, L. M. (2011). Impact of JIT-selling strategy on organizational structure. ***Industrial Management & Data Systems****, 111(1), 63-83.*

Green Jr, K. W., Inman, R. A., Birou, L. M., & Whitten, D. (2014). Total JIT (T-JIT) and its impact on supply chain competency and organizational performance. ***International Journal of Production Economics****, 147, 125-135.*

Gupta, A. K. (2011). A conceptual JIT model of service quality. ***International Journal of Engineering Science and Technology****, 3(3), 2214-2227.*

Hair Jr, J., Sarstedt, M., Hopkins, L., and G. Kuppelwieser, V. (2014). Partial least squares structural equation modeling (PLS-SEM) An emerging tool in business research. ***European Business Review****, 26(2), 106-121.*

Heizer, J., Render, B., & Al-Zu'bi, Z. (2013). ***Operations management*** *(Arab world Ed.). Harlow, England: Pearson Education Limited.*

Inman, R. A., Sale, R. S., Green Jr, K. W., & Whitten, D. (2011). Agile manufacturing: relation to JIT, operational performance and firm performance. ***Journal of Operations Management,*** *29(4), 343-355.*

Islam, M. S., Samad, M. A., & Islam, T. (2018). Implement Kaizen Tool 5S to Improve Workplace Condition and Pave Way for Lean Management at a Selected Pharmaceutical Factory. ***International Conference on Engineering Research and Education School of Applied sciences & Technology, SUST, Sylhet****,298.*

Jadhav, J. R., Mantha, S. S., & Rane, S. B. (2015a). Analysis of interactions among the barriers to JIT production: an interpretive structural modeling approach. ***Journal of Industrial Engineering International****, 11(3), 331-352.*

Jadhav, J. R., Mantha, S. S., & Rane, S. B. (2015b). Roadmap for Lean implementation in Indian automotive component manufacturing industry: comparative study of UNIDO Model and ISM Model. ***Journal of Industrial Engineering International,*** *11(2), 179-198.*

Jaiganesh, V., & Sudhahar, J. C. (2013). Sketching out the hidden lean management principles in the pharmaceutical manufacturing. ***International Journal of Scientific and Research Publications,*** *3(2), 1-12.*

JAPM. (2017). The Jordanian Association of Pharmaceutical Manufacturers. Retrieved July 14, 2017, from ***http://www.japm.com/Public/English.aspx?Lang=2&Page_Id=385&Menu_Parent_ID=18&type=R***

Jones, G. R. (2013). ***Organizational theory, design, and change****. Upper Saddle River, NJ: Pearson.*

Kairu, K. (2015). Role of Strategic Inventory Management on Performance of Manufacturing Firms in Kenya: A Case of Diversey Eastern and Central Africa Limited. International ***Academic Journal of Procurement and Supply Chain Management****, 1(4), 22-44.*

Karam, A. A., Liviu, M., Cristina, V., & Radu, H. (2018). The contribution of lean manufacturing tools to changeover time decrease in the pharmaceutical industry. ***ELSEVIR. A SMED project. Procedia Manufacturing****, 22, 886-892.*

Khaireddin, M., Assab, M. I. A., & Nawafleh, S. A. (2015). Just-in-Time Manufacturing practices and Strategic Performance: An Empirical Study Applied on Jordanian Pharmaceutical Industries. ***International Journal of Statistics and Systems****, 10(2), 287-307.*

Kotler, P., & Keller, K. (2016). ***Marketing Management*** *(Fifteenth edition). Pearson education Limited. (Original work published 2016).*

Kulkarni, S., Patil, A., & Pingle, S. (2014). Supplier Evaluation and Purchasing In Jit Environment-A Survey of Indian Firms. ***International Journal of Mechanical and Production Engineering****, 2(1), 1-5.*

Kumar, A., Kumar, R. G., Narahari, N. S., & Mithilesh, K. M. (2015). Case study on identification and elimination of waste through lean implementation in an automotive part manufacturing industry. ***International Journal of Lean Enterprise Research,*** *1(3), 253-265.*

*Lamba, S. S. (2013). Winning the "Facility of the Year"-Award with an Indian Plant. **In Leading Pharmaceutical Operational Excellence** (pp. 209-226). Springer, Berlin, Heidelberg.*

*Lewis, M.A. (2000), "Lean production and sustainable competitive advantage", **International Journal of Operations & Production Management**, 20 (8), 959978.*

*Marhamati, A., Taheri, M., & Hesamzadeh, M. (2017). Effect of Supply Chain Management Strategy on Company Performance with mediating Role T-JIT. **Journal of Administrative Management, Education and Training**, 13(1), 10-21.*

*Milovanovic, B., Sisek, B., & Kolakovic, M. (2011). Just in time concept as a mean for achieving competitive advantage in the virtual economy**. In Annals of DAAAM for 2011 & Proceedings of the 22nd International DAAAM Symposium**, 22(1), 1105-1106.*

*Negrão, L. L. L., Godinho Filho, M., & Marodin, G. (2017). Lean practices and their effect on performance: a literature review. **Production Planning & Control,** 28(1), 33-56.*

*Nimeh, H. A., Abdallah, A. B., & Sweis, R. (2018). Lean supply chain management practices and performance: empirical evidence from manufacturing companies**. Int. J Sup. Chain. Mg**t, 7(1), 1.*

*Noe, R. A., Hollenbeck, J. R., Gerhart, B., & Wright, P. M. (2019). **Human Resource Management: gaining a competitive advantage** (eleventh edition). Toronto: Mcgraw-Hill Ryerson.*

*Othman, A. A., Sundram, V. K., Sayuti, N. M., & Bahrin, A. S. (2016). The relationship between supply chain integration, just-in-time and logistics performance: a supplier's perspective on the automotive industry in Malaysia. **International journal of supply chain management**, 5(1), 44-51.*

*Panwar, A., Jain, R., Rathore, A. P. S., Nepal, B., & Lyons, A. C. (2018). The impact of lean practices on operational performance–an empirical investigation of Indian process industries. **Production Planning & Control**, 29(2), 158-169.*

Pheng, L. S., & Meng, C. Y. (2018). Managing productivity in construction: JIT operations and measurements. Routledge. **books.google.com**

Pieńkowski, M. (2014). Waste measurement techniques for Lean companies. ***International journal of lean thinking****, 5(1), 11-24.*

Qureshi, M. I., Iftikhar, M., Bhatti, M. N., Shams, T., & Zaman, K. (2013). Critical elements in implementations of just-in-time management: empirical study of cement industry in Pakistan. ***SpringerPlus,*** *2(1), 645.*

Ramlawati, R. (2018). Just in time and competitive advantage: understanding their linkages and impact on operational performance. ***Archives of Business Research****, 6(8),189_204.*

Resta, B., Powell, D., Gaiardelli, P., & Dotti, S. (2015). Towards a framework for lean operations in product-oriented product service systems. ***CIRP Journal of Manufacturing Science and Technology****, 9, 12-22.*

Saleh, W., Ahmed, E., & Khashman, Y. (2018) Lean Implementation in Jordanian Pharmaceutical Industry: The Case of Hikma Company. ***European Journal of business and Management.*** *10,1-3.*

Sekaran, U. (2003). ***Research methods for business: A skill building approach, student edition****. John Wiley & Sons, Singapore.*

Sieckmann, F., Ngoc, H. N., Helm, R., & Kohl, H. (2018). Implementation of lean production systems in small and medium-sized pharmaceutical enterprises. ***Procedia Manufacturing****, 21, 814-821.*

Simanjuntak, M. R., & Yudy, R. S. (2017). Pilot Project Analysis Model Just In Time (Jit) To Improve The Performance Of Time Construction Process Of Gathering Station In Tarakan, ***Imperial Journal of Interdisciplinary Research (IJIR)****,3(5),* ***http://www.onlinejournal.***

Singh, C. D., Singh, R., Mand, J. S., & Singh, S. (2013). Application of lean and JIT principles in supply chain management. ***International Journal of Management Research and Business Strategy,*** *2(1), 85-98.*

Singh, G., & Singh Ahuja, I. (2014). An evaluation of just in time (JIT) implementation of manufacturing performance in the Indian industry. ***Journal of Asia Business Studies****, 8(3), 278-294.*

Singh, S., Gupta, S., & Ladhe, Y. P. (2017) Inbound Sequenced Fusion of Diverse Management theory like Lean, JIT, TPM, ERP to Eliminate Worthless Element for Superior Productivity in Exhaustive Plant. ***International Journal of Engineering Research and General Science,*** *5 (3), 181–192.*

*Sternberg, H., Stefansson, G., Westernberg, E., af Gennäs, R. B., Allenström, E., & Nauska, M. L. (2013). Applying a lean approach to identify waste in motor carrier operations****. International Journal of Productivity and Performance Management.*** *62 (1), 47-65.*

Thürer, M., Tomašević, I., & Stevenson, M. (2017). On the meaning of 'waste': review and definition. ***Production Planning & Control****, 28(3), 244-255.*

Troy, W. (2013). Structuring and Implementing an Operational Excellence Program from Scratch in the Biotech Industry. In ***Leading Pharmaceutical Operational Excellence*** *(pp. 169-187). Springer, Berlin, Heidelberg.*

Villa, D. (2010). Automation, lean, six sigmas: Synergies for improving laboratory efficiency. ***Journal of Medical Biochemistry****, 29(4), 339-348.*

Wright, C. (2017). Fundamentals of assurance for lean projects. IT Governance Ltd. ***books.google.com.***

*Wu, S. J., Melnyk, S. A., & Swink, M. (2012). An empirical investigation of the combinatorial nature of operational practices and operational capabilities****. International Journal of Operations & Production Management.*** *(2),121-155.*

Appendices

Appendix 1: Panel of Referees Committee.

No.	Name	Qualification	Organization
1.	Prof. Mohammad Khair Abu Zeid	Professor of Management	Al-Balqa'a University
2.	Prof. Riad .M. Awad	Professor of Pharmacy	University of Petra
3.	Prof. Murad Etiani	Professor of Management	Israa University
4.	Prof. Ahmed Ali Saleh	Professor of Management	Middle East University
5.	Dr. Fayez Al- Badri	Assistant Professor	Middle East University
6.	Dr. Mohammad Aldayleh	Associate Professor	Middle East University
7.	Dr. Abdullah Bataineh	Associate Professor of Marketing	Middle East University
8.	Dr Hussam Ali	Faculty Member	Middle East University
9.	Dr. Deema Al-Kawasmi	Assistant Professor	Middle East University
10.	Dr.Alsayed A.N.Sallam	Drug Research Center Director &Consultant	Al-Taqaddom Pharmaceutical Industries
11.	Dr Tareq Jallad	Business Development Director	Jordan pharmaceutical manufacturing company
12.	Dr. Zakiya Kurdi	Executive Director	Pharma International
13.	Dr. Sharif Al-Atrash	Director	Tabuk pharmaceuticals company
14.	Dr Abdulnasir Sijari	General Manager	Itqan Pharma

Appendix 2: Thesis Questionnaire

Dear Participant:

The purpose of this master thesis is to study **"The Effect of Total Just-in-Time perceived Practices on Lean Operations in Jordanian Pharmaceutical Manufacturing Companies."**

This questionnaire contains 61 questions, which may take 15 minutes to answer; therefore, we will be deeply thankful to you for devoting your valuable time to answer it.

Your answers will remain confidential and will be used for research purposes only.

Again, we appreciate your participation in this research. Please, if you have any questions or comments, please don't hesitate to call on this number (00962799008289).

Thank you for your fruitful cooperation.

Researcher: Riman Jbeiro

Supervisor: Dr. Abdel-Aziz Ahmad Sharabati

Questionnaire

Part One: Demographic information:

Company name (optional):

Date of establishment of the company:

Number of employees in the company:

Gender: ☐ Male ☐ Female

Age: ☐ Less than 30 ☐ Between 30-39 ☐ Between 40-50 ☐ Above 50

Experience (Years): ☐ Less than 10 ☐ Between10-20 ☐ Between 21-30 ☐ More than 30.

Education: ☐ Diploma ☐ Bachelor ☐ Master ☐ Ph.D.

Title/Position: ☐ Supervisor ☐ Manager ☐ Director ☐ G.M.

Department: ☐ Operations & Quality ☐ Supply Chain ☐Sales & Marketing ☐ Finance.

Part two: The following 61 questions tap into your perception about the actual implementation of total JIT variables and lean operation elements.

[**1** = strongly not implemented, **2** = not implemented, **3** = neutral, **4** = implemented, **5** = strongly implemented] based on your knowledge and experience about the statement.

Just-In-Time Purchasing

1.	The company signs long-term contracts with the right suppliers.	1	3	3	4	5
2.	The company places orders based on forecasting.	1	2	3	4	5
3.	The company receives materials on the right quality.	1	2	3	4	5
4.	The company receives materials on the right specifications.	1	2	3	4	5
5.	The company receives requested materials at the right quantity.	1	2	3	4	5
6.	The company receives materials at the right time.	1	2	3	4	5
7.	The company negotiates payment terms.	1	2	3	4	5

Just-In-Time Operations

8.	The company schedules production according to market demand priorities.	1	2	3	4	5
9.	The company organizes the equipment to facilitate operation.	1	2	3	4	5
10.	The company commits to continuous process improvement.	1	2	3	4	5
11.	The company controls production activities through ERP system.	1	2	3	4	5
12.	The company implements preventive maintenance.	1	2	3	4	5
13.	The company works to reduce set-up times of the equipment.	1	2	3	4	5
14.	The company trains staff to facilitate operations.	1	2	3	4	5

Just-in-Time Selling

15.	The company responds to customer complaints	1	2	3	4	5
16.	The company delivers on-time.	1	2	3	4	5
17.	The company delivers the right quantity.	1	2	3	4	5
18.	The company delivers the right quality.	1	2	3	4	5
19.	The company delivers the right specifications.	1	2	3	4	5
20.	The company accepts returning expired products.	1	2	3	4	5
21.	The company organizes inventory according to delivery times.	1	2	3	4	5

Lean Operation

Over-Production Waste

22	The company estimates the order quantity.	1	2	3	4	5
23	The company confirms the orders before starting production.	1	2	3	4	5
24	The company estimates the raw materials required for production.	1	2	3	4	5
25	The company operates its equipment efficiently.	1	2	3	4	5
26	The company operates its equipment effectively.	1	2	3	4	5

Inventory Waste

27	The company provides appropriate storage conditions.	1	2	3	4	5
28	The company conducts stocktaking to its various inventories.	1	2	3	4	5
29	The company stores the materials according to the consumption rate.	1	2	3	4	5
30	The company considers an efficient warehouses location.	1	2	3	4	5
31	The company tracks inventory activities through the ERP system.	1	2	3	4	5

Motion Waste

32.	The company standardizes work.	1	2	3	4	5
33.	The company reduces the movements of workers that are not connected with work.	1	2	3	4	5
34.	The company organizes the factory to reduce excess movement.	1	2	3	4	5
35.	The company uses appropriate internal means of transportation at different locations.	1	2	3	4	5
36.	The company hires the appropriate number of workers.	1	2	3	4	5

Transportation Waste

37.	The company provides alternatives for transport operations	1	2	3	4	5
38.	The company puts standard procedures during transportation.	1	2	3	4	5
39.	The company schedules shipments with partners.	1	2	3	4	5
40.	The company uses appropriate means of transportation.	1	2	3	4	5
41.	The company develops well-skilled workers for transportation.	1	2	3	4	5

Over-Processing Waste

42.	The company adjusts the time of the production process.	1	2	3	4	5
43.	The company emphasizes the flow of required procedures.	1	2	3	4	5
44.	The company commits to the production schedule.	1	2	3	4	5
45.	The company describes the working procedures for workers.	1	2	3	4	5
46.	The company uses appropriate statistical aspects.	1	2	3	4	5

Defects Waste

47.	The company uses criteria that are higher than the GMP guidelines.	1	2	3	4	5
48.	The company implements the Product Quality Review (PQR) system.	1	2	3	4	5
49.	The company uses quality control charts.	1	2	3	4	5
50.	The company adapts standard quality specifications with partners.	1	2	3	4	5
51.	The company conducts quality-training programs.	1	2	3	4	5

Waiting Waste

52.	The company provides raw materials on time.	1	2	3	4	5
53.	The company manages production processes effectively.	1	2	3	4	5
54.	The company performs maintenance of equipment periodically.	1	2	3	4	5
55.	The company sets priorities for manufacturing.	1	2	3	4	5
56.	The company takes appropriate decisions quickly when necessary.	1	2	3	4	5

Underutilization Waste

57.	The company discovers talent.	1	2	3	4	5
58.	The company encourages creativity thorough employees' participation.	1	2	3	4	5
59.	The company implements an incentive system to reward valuable ideas.	1	2	3	4	5
60.	The company conducts innovation training continuously.	1	2	3	4	5
61.	The company adopts new technologies within its processes.	1	2	3	4	5

Appendix 3: Thesis Questionnaire (Arabic Version)

جامعة الشرق الأوسط
MIDDLE EAST UNIVERSITY
Amman - Jordan

عزيزي المشارك:

الهدف من رسالة الماجستير هذه هو دراسة **"تأثير الممارسات المتداولة للأنتاج الكلي الآني على العمليات الرشيقة في شركات الصناعة الدوائية الأردنية".**

يحتوي هذا الاستبيان على 61 سؤالاً، والتي قد تستغرق 15 دقيقة للإجابة؛ لذلك نرجو التكرم بالإجابة حول التطبيق الفعلي على جميع الأسئلة، مع العلم أ نه سيتم التعامل مع الإ جابات بسرية تامة وسيتم استخدامها لأغراض البحث فقط، ولن يسمح لأحد بالاطلاع عليها.

مرة أخرى، نحن نقدر مشاركتك في هذا البحث. من فضلك، إذا كان لديك أي أسئلة أو تعليقات، فلا تتردد في الاتصال على هذا الرقم (00962799008289).

شكرا لتعاونكم ودعمكم لإنجاح هذه الرسالة.

الباحثة: ريمان أمين جبيرو

المشرف: د. عبد العزيز أحمد شرباتي

الاستبانة:

الجزء الأول: المعلومات الديموغرافية:

اسم الشركة (اختياري):

تاريخ تأسيس الشركة:

عدد العاملين في الشركة:

الجنس: □ ذكر □ أنثى

العمر: □ أقل من 30 □ بين 30-39 □ بين 40-50 □ فوق 50

الخبرة (سنين): □ أقل من 10 □ بين 10-20 □ بين 21-30 □ أكثر من 30.

التعليم: □ دبلوم □ بكالوريوس □ ماجستير □ دكتوراه.

اللقب / المنصب: □ مشرف □ رئيس قسم □ مدير □ مدير أعلى

□نائب الرئيس □مدير عام.

القسم: □ العمليات □ سلسلة التوريد □ المبيعات والتسويق □ المالية

□ الإدارة □ الجودة.

الجزء الثاني:

الرجاء التأكْد من إجابةُ كّل سؤال ووضع دائرة حول الجواب الصحيَح استِنَاًدا إلى معرفتك وخبرتك حول الواقع الموجود وليس بناء على الاعتقاد أو الوضع المثالي.

1 = غيرمطبق بشدة، 2 = غيرمطبق ، 3 = محايد ، 4 = مطبق ، 5 = مطبق بشدة .

<u>الإنتاج الآنى (بالموقت المناسب)</u>

الشراء في الوقت المناسب

.1	تقوم الشركة بتوقيع عقود طويلة الأمد مع الموردين المناسبين.	1	2	3	4	5
.2	تقوم الشركة بإرسال أوامرالشراء للموردين بناءً على التنبؤ.	1	2	3	4	5
.3	تستلم الشركة المواد بالجودة المطلوبة.	1	2	3	4	5
.4	تستلم الشركة المواد بالمواصفات الصحيحة.	1	2	3	4	5
.5	تستلم الشركة المواد المطلوبة بالكمية الصحيحة.	1	2	3	4	5
.6	تستلم الشركة المواد المطلوبة في الوقت المناسب.	1	2	3	4	5
.7	تفاوض الشركة شروط الدفع.	1	2	3	4	5

التشغيل في الوقت المناسب

.8	تقوم الشركة بجدولة الإنتاج وفقًا لأولويات طلب السوق.	1	2	3	4	5
.9	تنظم الشركة المعدات بطريقة تسهل التشغيل.	1	2	3	4	5
.10	تلتزم الشركة بالتحسين المستمر للعمليات.	1	2	3	4	5
.11	تتحكم الشركة في أنشطة الإنتاج من خلال نظام تخطيط موارد.	1	2	3	4	5
.12	تقوم الشركة بالصيانة الوقائية.	1	2	3	4	5
.13	تعمل الشركة على تقليل أوقات إعداد المعدات.	1	2	3	4	5
.14	تدرب الشركة الموظفين على تسهيل العمليات.	1	2	3	4	5

البيع في الوقت المناسب

.15	تستجيب الشركة لشكاوى العملاء.	1	2	3	4	5
.16	تخدم الشركة الزبائن في الوقت المحدد.	1	2	3	4	5
.17	تقدم الشركة الكمية المطلوبة .	1	2	3	4	5
.18	تقدم الشركة المنتج بالجودة المطلوبة.	1	2	3	4	5
.19	تقدم الشركة المواصفات الصحيحة.	1	2	3	4	5
.20	تقبل الشركة إرجاع المنتجات منتهية الصلاحية.	1	2	3	4	5
.21	ترتب الشركة المخزون حسب أوقات التسليم.	1	2	3	4	5

العملية الرشيقة

الإنتاج الزائد

.22	تقوم الشركة بتقدير كمية الطلب.	1	2	3	4	5
.23	تؤكد الشركة الطلبات قبل بدء الإنتاج.	1	2	3	4	5
.24	تقدر الشركة المواد الخام اللازمة للإنتاج.	1	2	3	4	5
.25	تقوم الشركة بتشغيل معداتها بكفاءة.	1	2	3	4	5
.26	تقوم الشركة بتشغيل معداتها بشكل فعال.	1	2	3	4	5

المخزون

.27	توفر الشركة شروط التخزين المناسبة.	1	2	3	4	5
.28	تقوم الشركة بجرد مخزوناتها المختلفة.	1	2	3	4	5
.29	تقوم الشركة بتخزين المواد حسب معدل الاستهلاك.	1	2	3	4	5
.30	تأخذ الشركة بعين الاعتبار موقع مناسب للمستودعات.	1	2	3	4	5
.31	تتعقب الشركة أنشطة المخزون من خلال نظام تخطيط موارد المؤسسات ERP.	1	2	3	4	5

الحركة الزائدة

.32	تقوم الشركة بتوحيد معايير العمل.	1	2	3	4	5
.33	تقلل الشركة من تحركات العمال غير المرتبطة بالعمل.	1	2	3	4	5
.34	تنظم الشركة المصنع لتقليل الحركة الزائدة.	1	2	3	4	5
.35	تستخدم الشركة وسائل النقل الداخلية المناسبة في مواقع مختلفة.	1	2	3	4	5
.36	توظف الشركة العدد المناسب من العمال.	1	2	3	4	5

عمليات النقل

.37	توفر الشركة خيارات لعمليات النقل .	1	2	3	4	5
.38	تضع الشركة إجراءات قياسية أثناء النقل.	1	2	3	4	5
.39	تقوم الشركة بجدولة الشحنات مع الشركاء.	1	2	3	4	5
.40	تستخدم الشركة وسائل النقل المناسبة.	1	2	3	4	5
.41	تقوم الشركة بتطوير مهارة العمال للنقل.	1	2	3	4	5

العمليات الزائدة

.42	تقوم الشركة بضبط وقت العملية الإنتاجية.	1	2	3	4	5
.43	تؤكد الشركة على سير الإجراءات المطلوبة.	1	2	3	4	5
.44	تلتزم الشركة بجدول الإنتاج.	1	2	3	4	5
.45	تصف الشركة إجراءات العمل للعمال.	1	2	3	4	5
.46	تستخدم الشركة الجوانب الإحصائية المناسبة.	1	2	3	4	5

الإنتاج المعيب

47.	تستخدم الشركة معايير أعلى من مبادئ GMP.	1	2	3	4	5
48.	تطبق الشركة نظام مراجعة جودة المنتج (PQR).	1	2	3	4	5
49.	تستخدم الشركة مخططات مراقبة الجودة.	1	2	3	4	5
50.	تعتمد الشركة مواصفات الجودة القياسية مع الشركاء.	1	2	3	4	5
51.	تنفذ الشركة برامج تدريب الجودة.	1	2	3	4	5

وقت الإنتظار

52.	توفر الشركة المواد الخام في الوقت المحدد.	1	2	3	4	5
53.	تدير الشركة عمليات الإنتاج بفعالية.	1	2	3	4	5
54.	تقوم الشركة بصيانة المعدات بشكل دوري.	1	2	3	4	5
55.	تحدد الشركة أولويات التصنيع.	1	2	3	4	5
56.	تتخذ الشركة القرارات المناسبة بسرعة عند الضرورة.	1	2	3	4	5

المواهب غير المستغلة

57.	تكتشف الشركة المواهب الفردية للعاملين.	1	2	3	4	5
58.	تشجع الشركة الإبداع من خلال مشاركة الموظفين.	1	2	3	4	5
59.	تطبق الشركة نظام حوافز لمكافأة الأفكار القيمة.	1	2	3	4	5
60.	تقوم الشركة بالتدريب على الابتكار باستمرار.	1	2	3	4	5
61.	تعتمد الشركة تقنيات جديدة في عملياتها.	1	2	3	4	5