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The Impact of Supply Chain Components on Lean Manufacturing Performance at Jordanian Paint Manufacturing Organizations

أثر مكونات سلسلة التوريد على أداء التصنيع الرشيق في منظمات تصنيع الدهانات الأردنية

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Authorization

I am Omar Abdelmahdi Taha Abu Taha. I authorize the Middle East University to provide copies of my thesis on paper and electronically to libraries, organizations, and institutions concerned with scientific study and studies upon request.

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Examination Committee's Decision

This Thesis, **"The Impact of Supply Chain Components on Lean Manufacturing Performance at Jordanian Paint Manufacturing Organizations"** was successfully defended and approved on 21-Jan-2024.

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Omar Abdelmahdi Taha Abu Taha

Dedication

*First of all, thanks to Allah and my parents, family, teachers, and friends; you supported me all the time to help me reach this position. I hope to be a responsible researcher as you all believe in me, **Mom**; you are the best, and your smile excites me; thank you for everything you did to make me the person I am right now. God bless you all the time; I love you. **Dad**, my idol who gave me strength, taught me how to struggle to obtain my dreams, and inspired me; I love you too—**my Twins, Wesam**. You shared many memorable moments in my life with me, and you inspired me by creating vibes of competitive study; I love you, too.*

To my countries, Palestine and Jordan, with love.

Omar Abdelmahdi Taha Abu Taha

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The Impact of Supply Chain Components on Lean Manufacturing Performance at Jordanian Paint Manufacturing Organizations

Prepared by: Omar Abdelmahdi Taha Abu Taha
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Abstract

Purpose: Supply Chain Components have emerged as a critical tool for supply chain management, which attempts to visualize and control supply chain activities to achieve Lean Manufacturing Performance. Therefore, this study aims to investigate the impact of Supply Chain Components on Lean Manufacturing Performance at Jordanian Paint Manufacturing Organizations.

Design/Methodology/Approach: The study is designed based on quantitative, descriptive, cause-effect, and cross-sectional methods. The researcher used a questionnaire to collect primary data by surveying 225 managers and leaders at Jordanian Paint Manufacturing Organizations. After confirming the tool's normality, validity, and reliability, the researcher performed a descriptive analysis and examined the correlation between variables. Finally, the researcher assessed multiple regressions of the impact by using the SPSS 20 program.

Findings: The result shows that the Jordanian Paint Manufacturing Organizations implement both Supply Chain Components sub-variables and Lean Manufacturing Elements. It also strongly impacts Supply Chain Components sub-variables on Lean Manufacturing. The study shows the significant and positive impact of the Supply Chain Components on Lean Manufacturing of Jordanian Paint Manufacturing Organizations. Inventory and Pricing have rated the highest effect on Lean Manufacturing, followed by Transportation, Facilities, and Sourcing. At the same time, Information does not significantly impact total Lean Manufacturing.

Practical and Managerial Implications: Implementing Supply Chain Components in Jordanian Paint Manufacturing Organizations is a must, not an option. As a result, including Supply Chain Components in vision, goals, and strategies will direct planning and daily actions toward Lean Manufacturing.

Social Implications: This study suggests that corporations consider corporate social responsibility while selecting suppliers, internal operations, and selling to customers.

Limitations/Recommendations: This study applied to Jordanian paint manufacturing companies. As a result, it suggests that future studies collect more data over a more extended period to test the validity of the current model and measuring device. It also means conducting comparable research on other businesses in Jordan and the same industry outside of Jordan to assess the generalizability of its findings.

Originality/Value: This research is one of the few studies examining the issue of Supply Chain Components and investigating its impact on Lean Manufacturing of Jordanian Paint Manufacturing Organizations.

Keywords: Supply Chain Management, Supply Chain Components, Lean Manufacturing Performance, Jordanian Paint Manufacturing Organizations.

أثر مكونات سلسلة التوريد على أداء التصنيع الرشيق في منظمات تصنيع الدهانات الأردنية

إعداد: عمر عبد المهدي طه أبو طه
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الملخّص

الهدف: برزت مكونات سلسلة التوريد كأداة رئيسية لإدارة سلسلة التوريد، والتي تحاول تصور أنشطة سلسلة التوريد والتحكم فيها لتحقيق أداء التصنيع الرشيق. لذلك، تهدف هذه الدراسة إلى التحقيق في تأثير مكونات سلسلة التوريد على أداء التصنيع الرشيق في شركات تصنيع الدهانات الأردنية.
التصميم / المنهجية / النهج : تم تصميم الدراسة بناء على الأساليب الكمية والوصفية والسبب والنتيجة والمقطع العرضي. استخدم الباحث استبانة لجمع البيانات الأولية وتم اختيار عينة تشكلت من 225 مديرا وقائدا في منظمات تصنيع الدهانات الأردنية. بعد التأكد من طبيعية الأداة وصلاحيتها وموثوقيتها ، تم إجراء تحليل وصفي ، وتم فحص العلاقة بين المتغيرات. وأخيرا، استخدمت الانحدار المتعددة لتقييم الأثر باستخدام برمجيه SPSS 20.
النتائج: أظهرت النتائج أن منظمات صناعة الدهانات الأردنية تطبق كلا من المتغيرات الفرعية لمكونات سلسلة التوريد وعناصر التصنيع الرشيق. كما يظهر أن هناك متغيرات فرعية قوية لمكونات سلسلة التوريد على التصنيع الرشيق. بعد ذلك، تظهر الدراسة أن هناك تأثيرا كبيرا وإيجابيا لمكونات سلسلة التوريد على التصنيع الرشيق لشركات تصنيع الدهانات الأردنية، حيث صنف المخزون والتسعير أعلى تأثير على التصنيع الرشيق ، ثم النقل، والتوريد، على التوالي. في حين أن المعلومات لا تظهر تأثيرا كبيرا على إجمالي التصنيع الرشيق .
الآثار العملية والإدارية: تطبيق مكونات سلسلة التوريد في منظمات تصنيع الدهانات الأردنية أمر لا بد منه وليس خيارا. نتيجة لذلك ، سيؤدي تضمين مكونات سلسلة التوريد في الرؤية والهدف والاستراتيجيات إلى توجيه التخطيط والإجراءات اليومية نحو التصنيع الرشيق.
الآثار الاجتماعية: تشير هذه الدراسة إلى أن الشركات تأخذ في الاعتبار المسؤولية الاجتماعية للشركات أثناء اختيار الموردين والعمليات الداخلية والبيع للعملاء.
القيود/التوصيات: تم إجراء البحث الحالي على شركات تصنيع الدهانات الأردنية. نتيجة لذلك ، يقترح أن الدراسات المستقبلية تجمع المزيد من البيانات على مدى فترة زمنية أطول لاختبار صحة

النموذج الحالي وجهاز القياس. كما يقترح إجراء أبحاث مماثلة على شركات أخرى في الأردن وكذلك نفس الصناعة خارج الأردن لتقييم قابلية تعميم نتائجها.

الأصالة/القيمة: يمكن اعتبار هذا البحث واحدا من الدراسات القليلة التي تدرس مسألة مكونات سلسلة التوريد، وتبحث في تأثيرها على التصنيع الرشيق لمنظمات تصنيع الدهانات الأردنية.

الكلمات المفتاحية: إدارة سلسلة التوريد، مكونات سلسلة التوريد، أداء التصنيع الرشيق ، شركات تصنيع الدهانات الأردنية.

Chapter One
Introduction

1.1 Background

As a result of the accelerating industrial and technological advancements, the intensifying fierce global competition among businesses, and the numerous crises that have impacted businesses across a wide range of industries, it has become essential for organizations to adopt modern management concepts to maintain their viability in the market and improve the efficiency and profitability then preserve the survival and adapt to a dynamic environment and to give their customers the appropriate product of the right quality, at the right place, at the right price, and on time, many businesses use lean manufacturing techniques that cut down on waste. Therefore, these techniques achieve by paying more attention to the concepts of Just in Time (JIT), the Toyota Production System (TPS), and the concepts of Lean operations, which are potent systems for improving productivity; this can achieve by relying on the use of supply chain components in the form and efficiency required in the organization because of their influential role. Therefore, this study came to determine the impact of supply chain components on lean manufacturing and to prove the importance of supply chain components in organizations.

The effect of globalization on free markets and the resulting rise in international and regional competition forced businesses to launch superior products and services at reasonable prices at the appropriate time and location. These businesses had to establish relationships with supply-dependent clients (Piotrowicz et al., 2023). Supply chain components are a coordinated effort between an organization's internal departments and its partners, suppliers, and consumers, and it depends on the efficient administration of incoming goods, services, information, and funds (Marhani et al., 2022). By providing consumers with a high-quality, cost-effective product on time, this procedure increases the value of the end product by balancing efficiency and responsiveness (Abu Nimeh et al., 2018).

Supply chain components are crucial for enhancing the performance of lean manufacturing processes and gaining a competitive edge. Organizations must combine their objectives and operations for the supply chain components to operate at peak procedure and to maintain a competitive edge (Moyano-Fuentes et al., 2021). The supply chain concentrates on several components, including facilities, transportation, inventory, information, pricing, and sourcing, to obtain optimum benefits that drive the chain to enhance the lean and agility of operations (Sharma et al., 2021). Integration and coordination are needed in the supply chain components process to decrease eight wastes (extra transport, excess inventory, unnecessary motion, waiting, overproduction, over-processing, defects, and underutilized resources) of lean manufacturing (Langley et al., 2020).

The importance of supply chain components and lean manufacturing results in rising customer awareness of quality, rapid technological advancement, globalization, and hyper-competition between competitors (Munteanu & Ştefãnigă, 2018). Many manufacturers seek different methods to obtain lean manufacturing practices to minimize eight wastes, which are considered a cost to the company, and these wastes do not add any value to customers or products. This study uses one strategic orientation to obtain that by managing supply chain components significantly (Pinto et al., 2018).

Due to the importance of lean manufacturing practices in organizations to enhance production efficiency and operation performance, this study aims to investigate the impact of Supply Chain Components on Lean Manufacturing Performance in Jordanian

Paint Manufacturing Companies and how supply chain components contribute to diminishing eight wastes significantly when managing chain's components effectively.

1.2 Study Purpose and Objectives

The primary purpose of this study is to investigate the impact of supply chain components (facilities, inventory, transportation, information, sourcing, and pricing) on lean manufacturing performance at Jordanian paint manufacturers. While the objectives are:

1- To examine the level of implementation of Supply Chain Components at Jordanian Paint Manufacturing Organizations.

2- To examine the level of implementation of Lean Manufacturing Performance at Jordanian Paint Manufacturing Organizations.

3- To determine the relationship between Supply Chain Components and Lean Manufacturing Performance at Jordanian Paint Manufacturing Organizations.

4- To examine the impact of Supply Chain Components on Lean Manufacturing Performance at Jordanian Paint Manufacturing Organizations.

To provide reasonable recommendations to Jordanian paint manufacturers and might be for other industries and decision-makers. In addition, this study contributes to the scientific field.

1.3 Study Significance and Importance

This study is critical because it is important to examine how supply chain components affect lean manufacturing performance in the Jordanian paint industry. This study aims to develop essential understanding guidelines regarding how supply chain components affect lean manufacturing in other sectors, institutions, and decision-makers. The information may also interest academic research on supply chain component reporting and decision-making.

Consequently, the following theoretical and empirical reasons support the study's value and importance:

1. Draw attention to the role of supply chain components in improving lean manufacturing in the Jordanian paint manufacturing industry.
2. Draw attention to the significance of observing and managing the sub-variables for components and their immediate impact on lean manufacturing performance in the Jordanian paint manufacturing sector.
3. Support additional investigations concerning Supply Chain Components and their significance for the paint manufacturing sector or other related industries.
4. Provide advice to decision-makers on applying supply chain components in the paint industry and other industries.

The present study is significant because it highlights the contribution of supply chain components to the development of lean manufacturing in the Jordanian paint industry. Moreover, it facilitates the adoption of Lean Manufacturing practices in other sectors. A realistic adoption roadmap for the Supply Chain Components system should also be outlined for decision-makers, taking into account its noteworthy influence.

Ultimately, the results of this study could support the use of libraries as secondary data sources and aid in the discussion among academics and industry professionals regarding the viability of implementing supply chain components.

1.4 Problem Statement

Based on unstructured interviews with a group of managers who work as an engineer in different companies in the paint manufacturing industries and they are indicated in Appendix (1), the researcher found many challenges and obstacles were confronted in high excess inventory, many defective products, extra transport, overproduction, high bottleneck in processes, neglect for resources and over-processing; these things do not add value to customers generally and there is a huge cost to reduce these wastes in this field when mangers try to diminish them, affecting the overall problems at these organizations. Those mangers need to solving for these problems smoothly and without high cost. The main reason for choosing this field in this study is that this is the first study that has selected this field.

In more specific detail, the following explains these issues related to lean manufacturing directly according to managers interviewed at these companies with scientific references and previous studies confirming the impact of supply chain components on Lean Manufacturing problems. This industry differs from others in that the number of handled raw materials, semi-finished materials, and finished goods is numerous compared to other sectors. Hence, places and inventories must store these materials without causing waste material defects (Brito et al., 2019a). The types of raw materials used in this field are exported from international suppliers to specialized chemical companies, and this requires proper management of the supply chain to transport these materials at the lowest costs and prices without any waste such as waiting times or inappropriate quantities or inappropriate or modes transportation, which forces to make a re-order also that creates over-processing, waiting and defects and this is not a lean manufacturing process due to these raw materials' expiration dates and sensitivity

(Kumar & Jha, 2019). The appropriate time in these stocks and supply chain components management is crucial to avoid wasting raw materials, under-processing materials, and finished goods, and re-manufacture products again due to their different specifications, and this is not an operation lean manufacturing (Tiwari et al., 2023). Making optimal use of suppliers' resources and relying on more than one supplier along the supply chain is one of the main reasons for wasting time and quality (Novais et al., 2020). Continuous modifications in rules and regulations imposed by the Jordanian government, customs, and other governments cause delays in selecting suppliers and preparing inputs for manufacturing organizations, sometimes causing underutilization of lean manufacturing.

Customer needs and requirements constantly change due to intense competition between organizations. That made it more challenging to integrate supply chain activities and processes, making it difficult to deliver goods and services to customers and customers at the right time and place, causing companies to lose control of lean manufacturing processes (Barnes, 2020). The problem of this research can be perceived by scientifically answering the following questions.

Study Questions:

Based on the problem statement, this study derived four main questions as the following:

1. What is the level of implementation of supply chain components in Jordanian Paint manufacturing organizations?
2. What is the level of implementation of lean manufacturing performance dimensions at Jordanian Paint manufacturing organizations?
3. To what extent is a relationship between supply chain components and lean manufacturing performance in Jordanian Paint manufacturing organizations?

4. To what extent do supply chain components impact lean manufacturing performance in Jordanian Paint manufacturing organizations?

Descriptive statistics answered the first and second questions, a correlation test answered the third, and the fourth was answered by testing all of the following hypotheses.

1.5 Study Hypotheses

Based on the study questions and problem statements, the following hypotheses are derived from measuring the impact of supply chain components and lean manufacturing performance at ($\alpha \leq 0.05$):

Hypothesis H_{01}: Supply chain components (facilities, inventory, transportation, information, sourcing, and pricing) do not impact lean manufacturing of Jordanian Paint organizations' performance at ($\alpha \leq 0.05$).

Based on the supply chain components, the following are sub-hypotheses:

Hypothesis $H_{01.1}$: The facility component does not impact lean manufacturing of Jordanian Paint organizations' performance at ($\alpha \leq 0.05$).

Hypothesis $H_{01.2}$: The inventory component does not impact lean manufacturing of Jordanian Paint organizations' performance at ($\alpha \leq 0.05$).

Hypothesis $H_{01.3}$: The transportation component does not impact lean manufacturing of Jordanian Paint organizations' performance at ($\alpha \leq 0.05$).

Hypothesis $H_{01.4}$: The information component does not impact lean manufacturing of Jordanian Paint organizations' performance at ($\alpha \leq 0.05$).

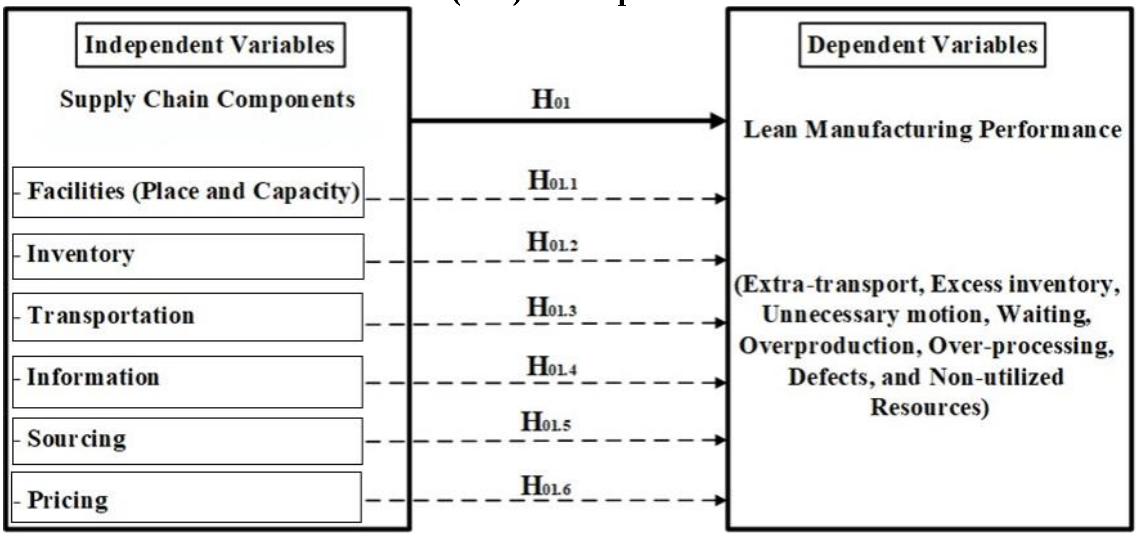
Hypothesis $H_{01.5}$: The sourcing component does not impact lean manufacturing of Jordanian Paint organizations' performance at ($\alpha \leq 0.05$).

Hypothesis $H_{01.6}$: The pricing component does not impact lean manufacturing of Jordanian Paint organizations' performance at ($\alpha \leq 0.05$).

1.6 Study Model

This study chooses to set the study model that illustrates the impact of supply chain components with all of its components (facilities, inventory, transportation, information, sourcing, and pricing) on lean manufacturing performance (extra transport, excess inventory, unnecessary motion, waiting, overproduction, over-processing, defects, and underutilized resources) at Jordanian Paint organizations, as shown in model (1), lean manufacturing was taken as one group to ensure the impact in this study. It may be taken as separated in future studies to ensure the impact individually.

Model (1.01): Conceptual Model.



Sources: study model developed by the researcher based on independent variables: Marodin et al. (2019), (Garcia-Buendia et al., 2021), (Borges et al., 2019), (Vanichchinchai, 2019), (Moyano-Fuentes et al., 2021), (Hadrawi, 2019), (Al-Tit, 2016), (Ruiz-Benítez et al., 2018), (Maqueira et al., 2021), (Grewal et al., 2010).

1.7 Operational Definitions

Supply Chain Components refer to components of the supply chain (Facilities, Inventory, Transport, Information, sourcing, and pricing) that enable a balance between responsiveness to the customer and efficiency in the supply chain to be competitive in its chosen strategy. The questionnaire measured the supply chain components with questions from 1 to 30, as shown in Appendix (2).

Facilities (Place and Capacity) refer to a specific stage or location where raw materials and products are handled or transformed while moving from the suppliers to the end consumer with a suitable quantity that meets customers' demands. The questionnaire measured the facilities by questions from 1 to 5.

Inventory consists of raw materials, Work-in-Process (WIP), and finished goods to ensure smooth operations, meet customer demand, and minimize supply chain disruptions as a buffer between supply and demand. The questionnaire measured the inventory by questions from 6 to 10.

Transportation refers to the transfer of raw materials and goods between locations, requiring several modes of transportation, and it is essential to guarantee that goods are delivered to the correct location at the appropriate time and in the proper condition. The questionnaire measured transportation by questions from 11 to 15.

Information refers to the flow of information within the supply chain as a technology, communication channel, software, or any other mechanism that enables the timely and accurate transmission of data, instructions, and feedback across various stages or entities of the supply chain network through two directions to achieve consistency of processes along the chain. The questionnaire measured the information by questions from 16 to 20.

Sourcing refers to selecting suppliers or vendors to obtain materials or services by identifying the most suitable suppliers who can meet the organization's and customer's needs, and this is achieved by evaluating candidate suppliers based on specific criteria and selecting the best one. The questionnaire measured the sourcing by questions from 21 to 25.

Pricing refers to strategically determining and implementing prices for goods or services sold throughout the supply chain, from the supplier to the end customer. It entails establishing price points that reflect the product or service's value. The questionnaire measured the pricing by questions from 26 to 30.

Lean Manufacturing Performance refers to reducing and eliminating wastes (Extra Transport, Excess Inventory, Unnecessary Motion, Unnecessary Motion, Waiting, Overproduction, Over-processing, Defects, Non-utilized Resources) to maximize customer value and increase efficiency and the processes' effectiveness by examining every waste of the production process. The questionnaire measured the lean manufacturing performance by questions from 31 to 62, as shown in Appendix (2).

Extra Transport refers to any needless movement or transit of goods or materials throughout production. It entails needlessly processing, storing, or transporting things that take time to improve the finished output. The questionnaire measured the extra transport by questions from 31 to 34.

Excess Inventory refers to the accumulation of raw materials, work-in-process materials, or goods within storage or supply chain that exceeds current or anticipated demand when the company produces more items than it can sell or use efficiently. The questionnaire measured the excess inventory by questions from 35 to 38.

Unnecessary Motion refers to any action or movement that does not improve the ultimate production process or customer needs and includes any physical actions that are not necessary and can be reduced or eliminated to increase effectiveness and output. The questionnaire measured the unnecessary motion by questions from 39 to 42.

Waiting is doing nothing or slowly working while waiting for a previous step to be complete and then continuing to the next within process guidelines to achieve the duty. The questionnaire measured the waiting by questions from 43 to 46.

Overproduction refers to components that are not required or goods manufactured before demand or produced as excess products more than the specific customer's demand that does not add value to the customer. The questionnaire measured the overproduction by questions from 47 to 50.

Over-processing refers to doing more work, adding more components, or including more steps in procedures or processes of production than the customer requires and does not add value to the product. The questionnaire measured the Over-processing by questions from 51 to 54.

Defects refer to products or sub-assemblies that deviate from the customer's or standard specification requirements and end up as waste or scrap. The questionnaire measured the defects by questions from 55 to 58.

Non-utilized Resources refer to any resources not being used to their full potential or not optimized during manufacturing, including machinery, supplies, zone, and human resources. The questionnaire measured the non-utilized resources by questions from 59 to 62.

1.8 Study Limitations and Delimitations

Human Limitation: The study was carried out only by managers, supervisors, heads of sections, and leaders who work at Jordanian paint manufacturing organizations.

Place Limitation: The study was conducted on twenty Jordanian paint manufacturing organizations in Jordan.

Time Limitation: The study was conducted during the second and first semesters of the academic year 2023/2024.

Study Delimitation: Applying something in one industry restricts its use in others. It may be challenging to extrapolate findings from one industry or the Jordanian environment to other industries, countries, or sectors because the study was conducted in Jordan. Further research opportunities are achieved by extending the analyses to other sectors and countries. That is achieved by working on additional testing with larger samples within the same industry. Including other sectors will also help mitigate the problem of extrapolating findings to other organizations and industries. More empirical research, including data collection from other countries—especially Arab ones—is also necessary.

Restrictions on data access pertain to the period during which data is gathered through questionnaires and annual reports, potentially limiting the quantity and quality of data collected. The lack of comparable research in Jordan and other Arab nations is another issue.

Chapter Two
Conceptual and Theoretical Framework and Previous Studies

2.1 Introduction

Definitions of supply chain components and lean manufacturing are provided in this chapter, along with information on how these concepts relate to other factors in lean manufacturing. Additionally, it incorporates earlier investigations and models. It concludes by summarizing the key differences between this study and earlier ones.

2.2 Definitions and Components of Variables

Lean manufacturing and supply chain components were defined in various ways by different authors, with each definition being specific to the study's field, industry, and goal. Supply chain elements either entirely or partially improve lean manufacturing performance.

2.2.1 Supply Chain Components

The Supply Chain Components can be classified as logistical components (facilities, inventory, and transportation) and cross-functional components (information, sourcing, and pricing) following definitions. Diabat and Govindan (2011) defined the Components of a Supply Chain in terms of responsiveness and efficiency based on the interaction of the logistical and cross-functional supply chain performance components: facilities, inventory, transportation, information, sourcing, and pricing, and the goal is to structure the components to achieve the desired level of responsiveness at the lowest possible cost, thus improving supply. Saeed and Kersten (2019) defined supply chain components as the variables that influence the supply chain's performance, efficiency, and responsiveness, and these include (facilities, inventory, transportation, information, sourcing, and pricing). Zimon et al. (2020) defined supply chain components as the key factors that influence the performance and success of a supply chain. These components are classified into two types: internal components are those that the company can control, such as production, inventory, location, transportation, and information, while external components are those that the company cannot control, such as sourcing, pricing, demand, and competition, and both must be aligned with the competitive strategy and the customer.

In summary, supply chain components (facilities, inventory, transportation, information, sourcing, and pricing) refer to components that enable a balance between responsiveness to the customer and efficiency in the supply chain to be competitive in its chosen strategy.

Facilities (Place and Capacity):

Facilities are defined as locations for factories or warehouses to reach products to the end user smoothly and have the capacity to cover customers’ demands and markets. Ge et al. (2022) defined facility components as factories, warehouses, stores, seaports, airports, or other locations where goods are produced, stored, used, or sold. Sirilertsuwan et al. (2020) defined a facility component as a structure or area that provides a service or is utilized for industry, the quality or ease of performing something, or possessing an ability or competence. Saeed and Kersten (2019) defined Facility components as where a product is stored, assembled, and produced; having warehouse facilities close to customers increases responsiveness to client needs.

In summary, facilities (place and capacity) refer to a specific stage or location where raw materials and products are handled or transformed while moving from the suppliers to the end consumer with a suitable quantity that meets customers' demands.

Inventory:

An inventory component is defined as a component that controls the relationship between supply and demand with a safety-level stock to avoid shortage. Yadav et al. (2017) described the Inventory Component as the accounting of things, parts, and raw materials a corporation utilizes in production or sells to keep supply and demand in balance. Ramadheena et al. (2020) defined Inventory Component as a systematic strategy for acquiring, storing, and inventory of sale—both raw materials (components) and finished goods (products)—with the correct stock, at the proper levels, in the right place, at the right time, and the correct cost and price. Yadav et al. (2017) defined Inventory Components as including raw materials utilized in production or finished goods for sale, and there are three sorts of inventory: raw materials, work-in-progress, and finished goods.

In summary, inventory consists of raw materials, Work-in-Process (WIP), and finished goods to ensure smooth operations, meet customer demand, and minimize supply chain disruptions as a buffer between supply and demand.

Transportation:

There is agreement that transportation is defined as transporting from one point to another by choosing a mode that achieves the company's strategy. Pei et al. (2015) described the transportation component as the movement of products from one point to another, which begins at the beginning of the supply chain with resources making their way to the warehouse and continues ser with the customer's order delivered at the customer's doorstep utilizing various modes. Sarkar et al. (2016) defined the transportation component as the methods of transporting products and materials along the supply chain. Ke et al. (2015) explained the transportation component as continuing to the final user, with the customer's order delivered at the door via several modalities.

In summary, transportation refers to the transfer of raw materials and goods between locations, requiring several modes of transportation, and it is essential to guarantee that goods are delivered to the correct location at the appropriate time and in the proper condition.

Information:

The standard definition for information sharing is continuously communicating the data between every two stages in the supply chain to obtain the primary function smoothly. Yang et al. (2021) clarified the information component businesses use to manage the movement of resources and goods from raw materials suppliers to end-user delivery as systems that gather, organize, analyze, and distribute data that organizations use to manage and optimize supply chain applications. Madenas et al. (2014) defined the information component as integrating information systems, decision systems, and business processes to execute information searches, manage business operations, monitor business details, and do other business tasks. Panahifar et al. (2018) defined the information component as the data and communication that enable the coordination and visibility of the supply chain activities.

In summary, information refers to the flow of information within the supply chain as a technology, communication channel, software, or any other mechanism that enables the timely and accurate transmission of data, instructions, and feedback across various stages or entities of the supply chain network through two directions to achieve consistency of processes along the chain.

Sourcing:

Sourcing is the set of commercial procedures needed to buy items and services. Yildiz Çankaya (2020) defined the sourcing component as selecting and managing supply chain suppliers and partners. Jermsittiparsert and Rungsrisawat (2019) described the sourcing component as identifying, setting, and acquiring the necessary commodities, services, and raw materials for a company's day-to-day operations. Guo et al. (2016) defined the sourcing component as discovering the most acceptable and cost-effective suppliers to match the organization's demands and contribute to an efficient and successful supply chain. Saeed and Kersten (2019) defined the sourcing component as locating and selecting suppliers or vendors to receive products or services by assessing possible suppliers based on quality, price, dependability, availability, and ethical behaviors.

In summary, sourcing refers to selecting suppliers or vendors to obtain materials or services by identifying the most suitable suppliers who can meet the organization's and customer's needs, and this is achieved by evaluating candidate suppliers based on specific criteria and selecting the best one.

Pricing:

Many researchers agree that pricing is a business's procedure to determine how much to charge clients for its goods and services. Xiao and Shi (2016) defined the pricing component as deciding how much to charge consumers for goods and services, which is influenced by product demand and availability and client groups and expectations. Song et al. (2023) defined the pricing component as established in a way that maximizes revenue while fulfilling consumer expectations and market conditions. Ziari et al. (2022) described the pricing component as a point that indicates a product's or service's worth, considering elements such as manufacturing costs, market demand, competition, and target profit margins.

In summary, pricing refers to strategically determining and implementing prices for goods or services sold throughout the supply chain, from the supplier to the end customer. It entails establishing price points that reflect the product or service's value.

2.2.2 Lean Manufacturing Performance

Researchers and academics have a consensus about the core of the production technique called lean manufacturing, which aims to increase value for consumers by reducing waste across the whole value stream. Rewers et al. (2016) Lean manufacturing is defined as a manufacturing method that focuses on increasing productivity while decreasing waste in a manufacturing operation; waste, according to the lean concept, is everything that does not offer value that consumers are willing to pay for. Qamar et al. (2018) defined lean manufacturing as a manufacturing system that focuses on eliminating waste, increasing customer value, and pursuing continuous process improvement by utilizing lean concepts, techniques, and tools to reduce waste from the manufacturing cycle. Pagliosa et al. (2021) defined lean manufacturing as emphasizing efficiency, adaptability, and improvement in all aspects of a manufacturing process. Furthermore, it is a manufacturing strategy geared primarily at lowering timeframes inside the production system and reaction times from suppliers and consumers.

In summary, lean manufacturing is a manufacturing process that refers to reducing and eliminating wastes (extra transport, excess inventory, unnecessary motion, waiting, overproduction, over-processing, defects, and non-utilized resources) to maximize customer value and increase efficiency and the processes' effectiveness by examining every waste of the production process.

Extra Transportation:

The definition of cost as an extra transport had a consensus by researchers and scholars. Villarreal et al. (2016) defined additional transport as any excessive movement or transit of materials, products, or people inside the manufacturing process, including the handling, storing, or transporting ofobjects that do not directly contribute value to the end product. Domingo (2015) defined extra transport as any unnecessary transport practices that result in increased expenses, longer lead times, and probable damage or loss of products. Villarreal et al. (2017) defined extra transport as the unnecessary movement of people, tools, inventories, equipment, or merchandise.

In summary, extra transport refers to any needless movement or transit of goods or materials throughout production. It entails needlessly processing, storing, or transporting things that take time to improve the finished output.

Excess Inventory:

There is an agreement in the definition of excess inventory, which indicates unused or unsold items. Thakur (2016) defined excess inventory as unsold or unused items or raw materials a business does not intend to use or sell but must pay to store. Cuatrecasas-Arbós et al. (2015) defined excess inventory as products that firms maintain for an extended period, fail to market on time, and become obsolete stock with no monetary worth. Marodin et al. (2017) defined Excess Inventory as excessive amounts of raw materials, works-in-process, and finished goods causing storage costs, higher defect rates, and higher inventory finance costs.

In summary, excess inventory refers to accumulating raw materials, work-in-process materials, or goods within the storage or supply chain that exceeds current or anticipated demand when the company produces more items than it can sell or use efficiently.

Unnecessary Motion:

After reviewing the papers and research, it was discovered that there is consensus among researchers on the concept of unnecessary motion. Kumar et al. (2022) defined excessive motion as employees' needless mobility or walking, which draws them away from processing jobs. Che Ani and Abdul Azid (2020) expressed extreme motion due to poor ergonomics, and workers may be forced to scour the manufacturing floor for a tool or make needless or stressful physical motions. Yusuff and Abdullah (2016) defined unnecessary motion as Poor ergonomics in manufacturing that compels workers to stretch, bend, and pick up items to complete tasks.

In summary, unnecessary motion refers to any action or movement that does not improve the ultimate production process or customer needs and includes any physical actions that are not necessary and can be reduced or eliminated to increase effectiveness and output.

Waiting:

Most researchers indicate that waiting is an inactive process or queuing to continue to the next step. Palaniswamy (2021) defined Waiting as when a product or procedure is not actively being worked on but is held in a queue or delayed owing to resource restrictions or bottlenecks in the production line. Ng et al. (2010) defined Waiting as Idle time caused by delays, bottlenecks, or a lack of cooperation in production operations. Sheikh-Sajadieh et al. (2013) described Waiting as idle time because machines cycle, equipment malfunctions, and critical components fail to arrive at the next step, resulting in spending or work that adds no value to the customer or the product.

In summary, waiting is doing nothing or working as a slow process while waiting for a previous step to complete and then continuing to the next within process guidelines to achieve the duty.

Overproduction:

Most researchers agree that overproduction produces more than the customer requires, which is unnecessary**.** Chen et al. (2019) defined overproduction as making more than is needed or before it is necessary, resulting in needless items that need to be updated. Palaniswamy (2021) defined overproduction as occurring when more than the customer demand or process demands are produced, resulting in excess inventory and all of the expenditures listed above under inventory. Mazumder (2015) defined overproduction, or creating ahead of what is required by the following process or client, as promoting obsolescence and raising the likelihood of manufacturing the wrong thing.

In summary, overproduction refers to components that are not required and goods manufactured before needed. It is classified as excess products that exceed the specific customer's demand and do not add value to the customer.

Over-processing:

There is a different definition for over-processing mentioned by researchers and scholars. Hosseini et al. (2015) defined over-processing as doing more than the consumer wants, requires, or is prepared to pay for, such as polishing or adding finishing to product portions the customer will not see. Marhani et al. (2022) defined over-processing as using redundant or inappropriate processing, usually resulting from poor tool or product design. Aka et al. (2020) defined over-processing as providing more labor or value to a service or product than the end-user desires or requires by employing more components or adding more stages in a product or service than the end-user needs.

In summary, over-processing refers to doing more work, adding more components, or including more steps in procedures or processes of production than the customer requires and does not add value to the product.

Defects:

There is a different definition for defects mentioned by researchers and scholars. Dixit et al. (2015) defined defects as mistakes, rework, or scrap that do not fulfill quality or customer satisfaction standards. Khan et al. (2020) represented defects as the creation of a defective product or the delivery of an inadequate service that will necessitate either reworking or scraping the product, and the client will not be charged for either. Dewi et al. (2021) defined defects as goods, semi-finished products, raw materials, and services that do not meet client expectations.

In summary, defects refer to products or sub-assemblies that deviate from the customer's or standard specification requirements and end up as waste or scrap.

Non-utilized Resources:

There is a different definition for non-utilized resources mentioned by researchers and scholars. Brito et al. (2019b) defined non-utilized resources as needing to be more utilized or neglecting the workforce's talents, ideas, skills, or potential. Makovkin et al. (2018) explained that non-used resources fail to guarantee that all potential employee talent is exploited. Rewers et al. (2016) defined non-utilized resources as a failure to employ the full potential of people in a team or organization. Still, it can also refer to a failure to use any resource efficiently, whether tangible or intangible, human or non-human.

In summary, non-utilized resources refer to any resources that are not being used to their full potential or need to be optimized during the manufacturing process, including machinery, supplies, zone, and human resources.

2.3 Relationship between Supply Chain Components and Lean Manufacturing Performance

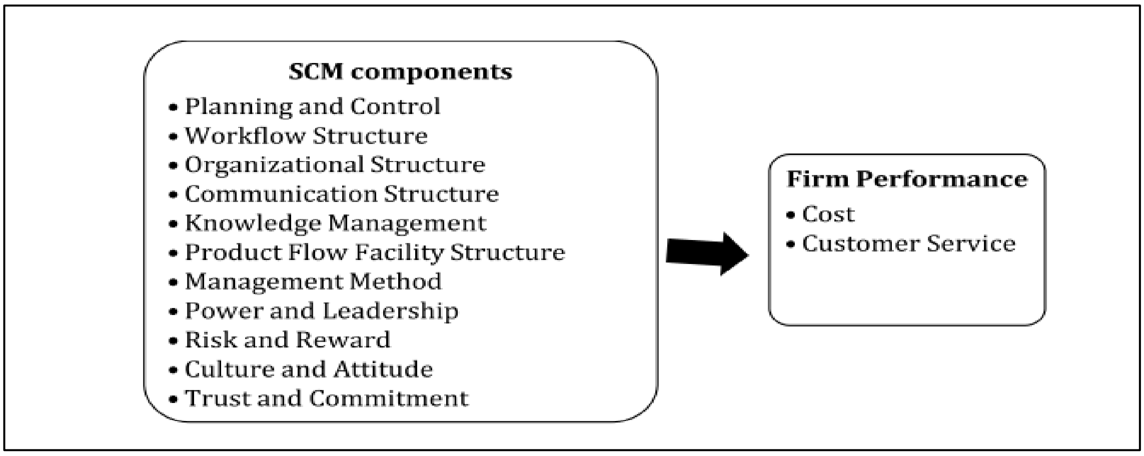
Many researchers studied the relationships between supply chain management practices, competitive advantages, organizational performance, and lean operation.

Boonjing et al. (2015) studied the impact of supply chain management components on firm performance. Awan et al. (2022) reviewed the mediating role of green supply chain management between lean manufacturing practices and sustainable performance. Hadrawi (2019) studied the impact of firm supply performance and lean processes on the relationship between supply chain management practices and competitive performance. Nimeh et al. (2018) explained the Lean Supply Chain management practices and performance using empirical evidence from manufacturing companies. Hani (2021) examined the moderating role of lean operations between supply chain integration and operational performance in Saudi manufacturing organizations. Vanichchinchai (2019) explained the effect of lean manufacturing on a supply chain relationship and performance. Novais et al. (2020) studied Lean Production implementation, cloud-supported logistics, and supply chain integration: interrelationships and effects on business performance.

In summary, limited literature investigated the supply chain components on any organizational performance or competitive advantages. Furthermore, most of the previous relationships were conducted for supply chain practices, supply chain collaboration, or supply chain integration with organizational performance or competitive advantages. This study conceptualizes the functional tasks of the values chain to examine the impact of supply chain components on lean manufacturing performance. This study extracted based on the summarization of previous relationships.

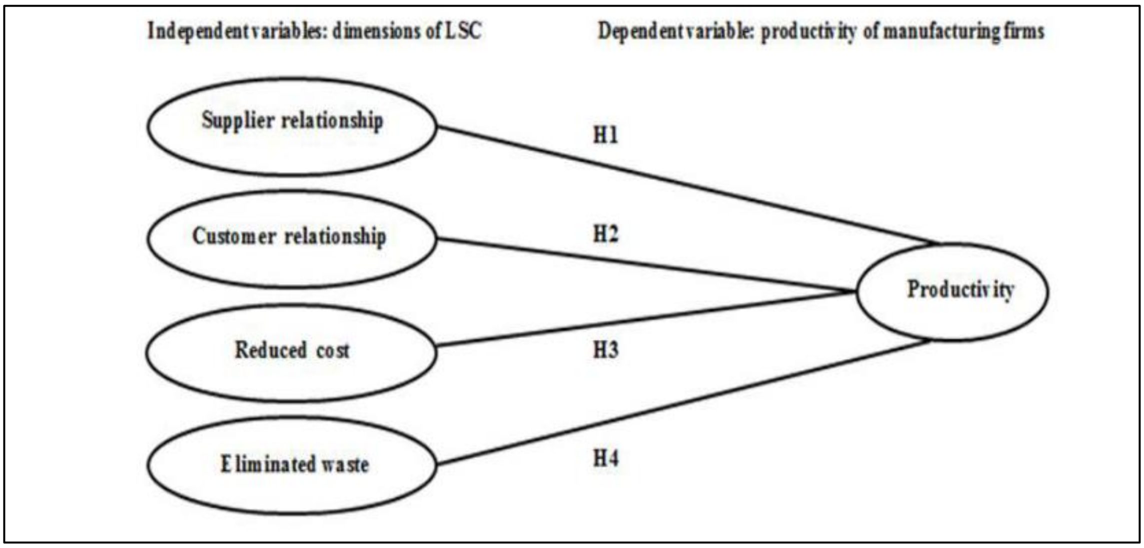
2.4 Previous Models

Boonjing et al. (2015) Model: Studied the impact of Supply Chain Management (SCM) components on firm performance as shown in model (2.1) below, the purpose of which is to investigate the relationship between eleven SCM management components and performance. Correlations and simple regression analysis were used to analyze the data. The results from this study support the positive relationship between components and performance. After the results were analyzed, the top five ranking of eleven SCM components were identified. These findings provide important insights for managers to understand the nature of their firms to leverage critical SCM components better.



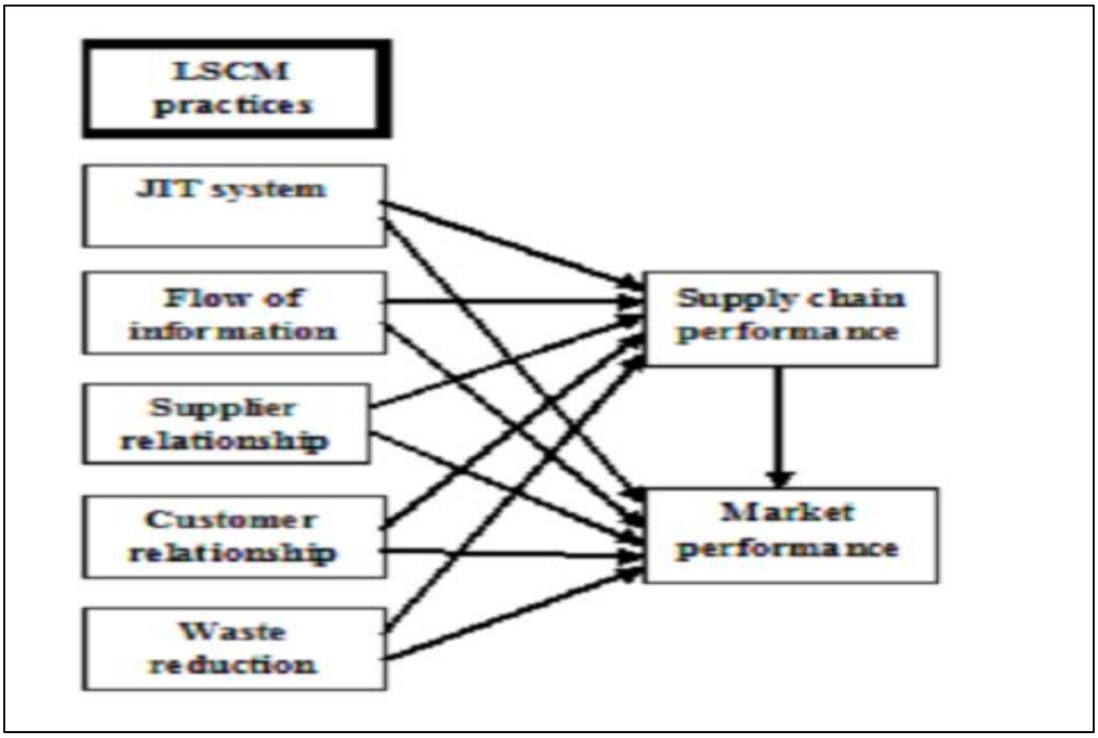
Model (2.1): Boonjing et al. (2015) Model.

Al-Tit (2016) Model: Examined the impact of the lean supply chain on the productivity of Saudi manufacturing firms in the Al-Qassim region as shown in model (2.2) below; the study contributes to the body of supply chain (SC) literature by providing evidence on the positive impact of LSC on productivity in an Arabian context, particularly in KSA. However, the study was conducted in one industrial region in the KSA; therefore, the generalization of the findings may only apply to some firms in the same country or other countries.



Model (2.2): Al-Tit (2016) Model.

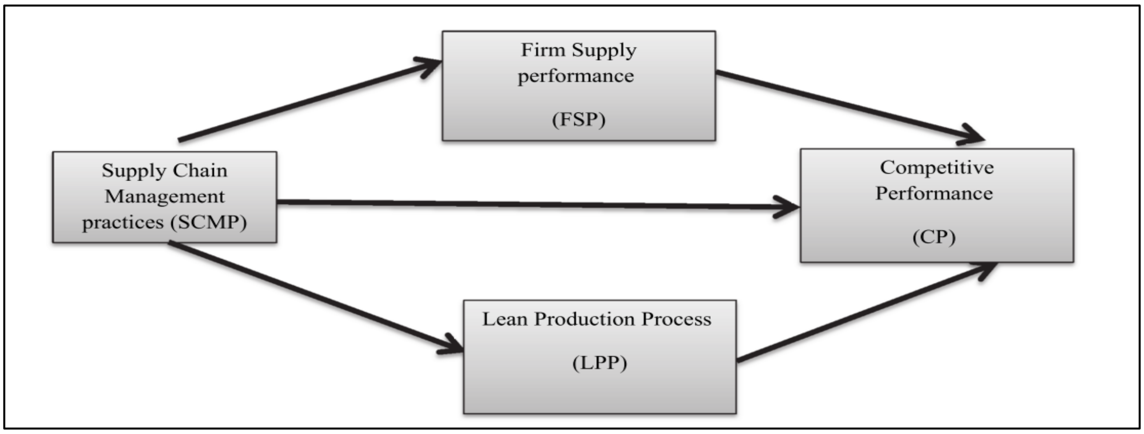
Nimeh et al. (2018) Model: Model (2.3) below provides empirical evidence from manufacturing companies to explain Lean Supply Chain Management (LSCM) practices and performance. The results show that three LSCM practices—just-in-time systems, information flow, and customer relationships—positively and significantly affect market performance. Furthermore, the performance of the supply chain was positively and significantly impacted by all LSCM practices. Moreover, a noteworthy and affirmative correlation existed between supply chain and market performance.



Model (2.3): Nimeh et al. (2018) Model.

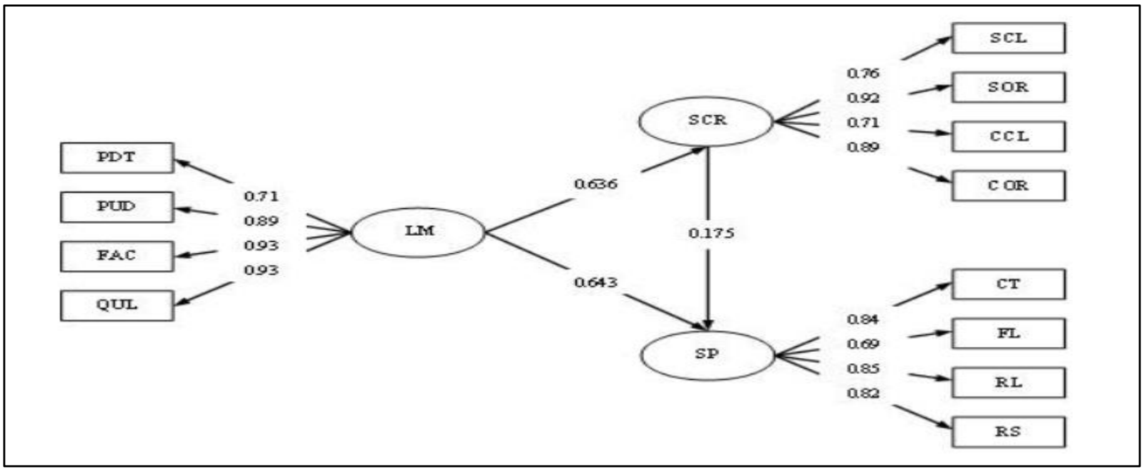
Hadrawi (2019) Model: Studied the impact of firm supply performance and lean processes on the relationship between supply chain management practices and competitive performance, as shown in model (2.4) below. The study's findings show a positive relationship between supply logistics and competitive performance (operational), and supply performance and lean processes partially mediated this relationship. The study also shows the importance of managing internal (production processes) and external (logistics and supply chain) processes of firms' operations in an integrated manner.

Supply chain management acts through critical internal processes to impact competitive performance.



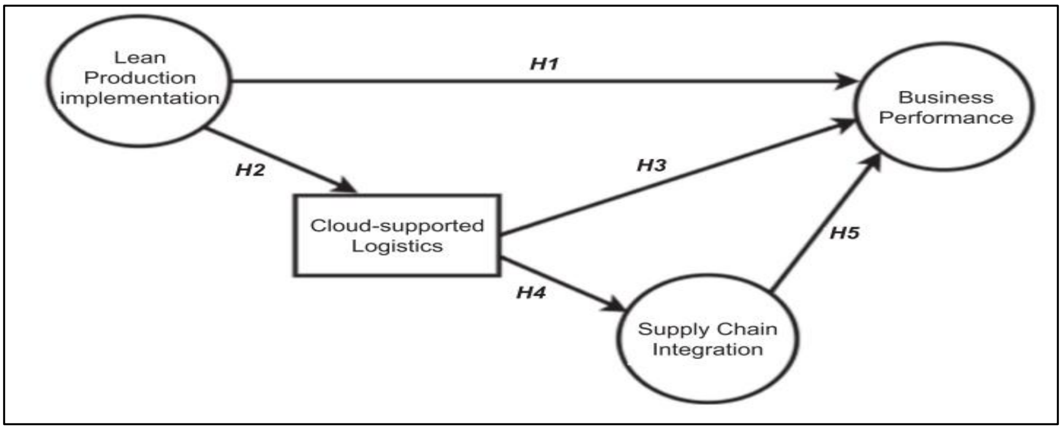
Model (2.4): Hadrawi*(2019)* **Model.**

Vanichchinchai (2019) Model: Discussed how the Supply Chain's Performance (SP) and Relationships (SCR) are affected by Lean Manufacturing (LM), as demonstrated by the model (2.5) used path analysis of structural equation modeling; the proposed model was tested as shown below. The LM, SCR, and SP frameworks were determined to be valid and dependable for the Thai manufacturing sectors. Not only did LM directly affect the SCR and SP, but it also indirectly affected the SP via the SCR. Also directly impacted by the SCR was the SP. Views on the controversy surrounding the effects of relationship-based SCM and SP versus transaction-based SCM are provided in this paper.



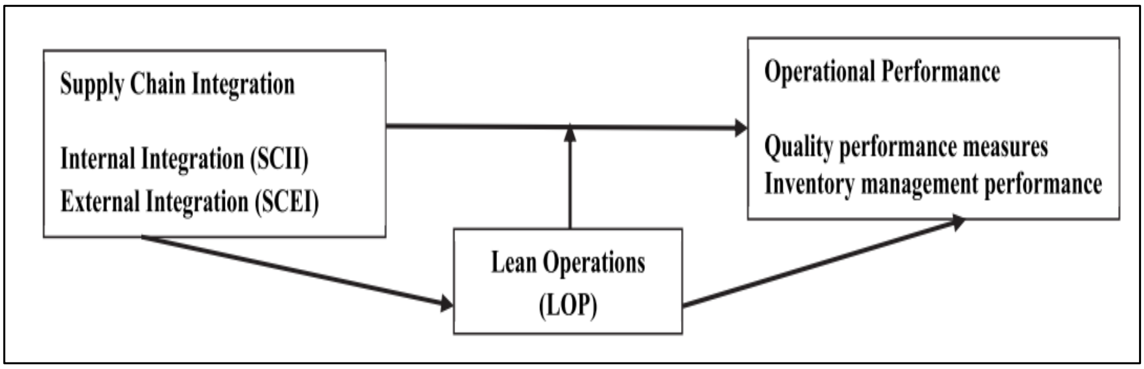
Model (2.5): Vanichchinchai*(2019)* **Model.**

Novais et al. (2020) Model: Studied lean production implementation, cloud-supported logistics, and supply chain integration: The findings suggest that using cloud-supported logistics is crucial to improving business outcomes in Lean Production environments, as demonstrated by the interrelationships and effects on business performance shown in model (2.6) below. Lean Production has been shown to impact performance directly and indirectly through the Cloud-Supported Logistics and Supply Chain Integration that these technologies generate. Supply chain integration also mediates the relationship between cloud-supported logistics and performance.



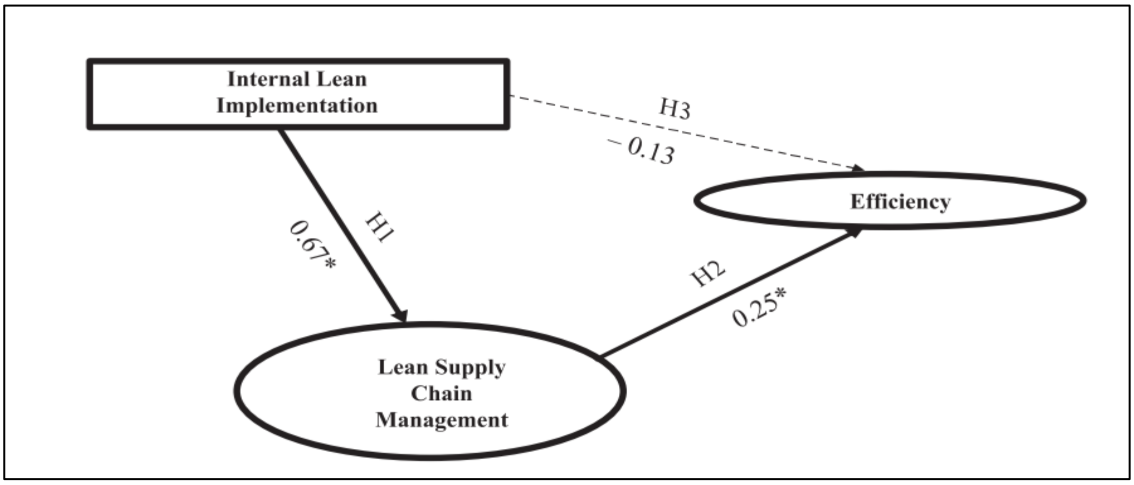
Model (2.6): Novais et al*(2020)* .**Model.**

Hani (2021) Model: Examining the relationship between supply chain integration and operational performance in Saudi manufacturing organizations, as illustrated by the model (2.7) below, the main findings indicate that manufacturing associations may be able to achieve operational performance by implementing lean practices when practicing supply chain integration cycles. Since there was a positive correlation between supply chain integration and operating performance and lean operations and operational performance, it is reasonable to assume that lean operations, when used as a directing variable, can positively influence the relationship between supply chain integration and operational performance. In particular, the relationship between quality performance metrics and supply chain integration.



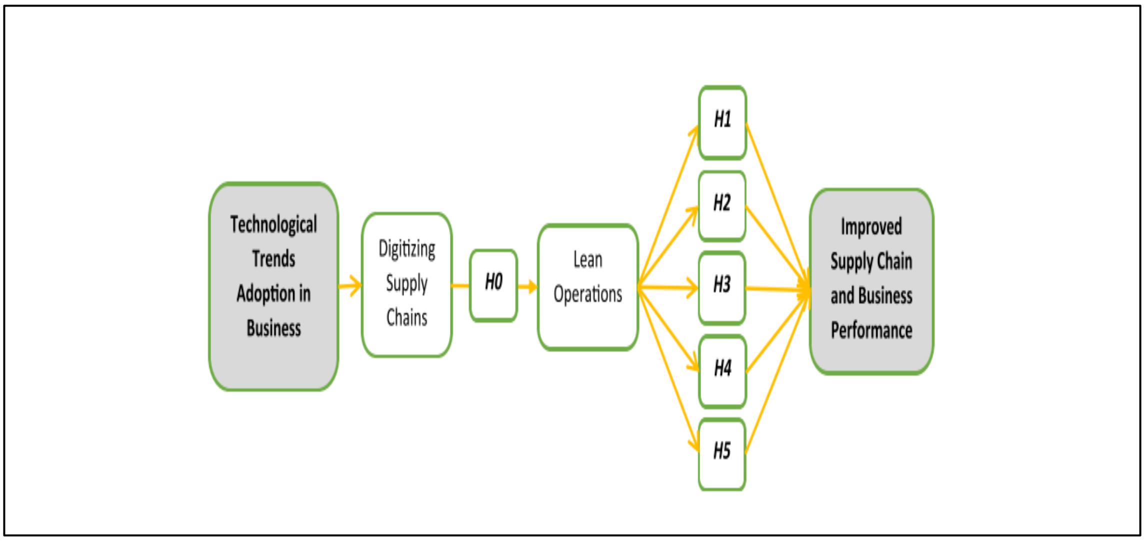
Model (2.7): Hani (2021) Model.

Moyano-Fuentes et al. (2021) Model: According to resource-based theory and integrated supply chain management, when lean management is extended throughout the supply chain, as demonstrated in model (2.8) below, the impact on efficiency is examined. The findings show that this improves the focal firm's efficiency. Furthermore, it has been found that internal lean management only positively affects the firm's efficiency when it helps to enhance the application of Lean Supply Chain Management.



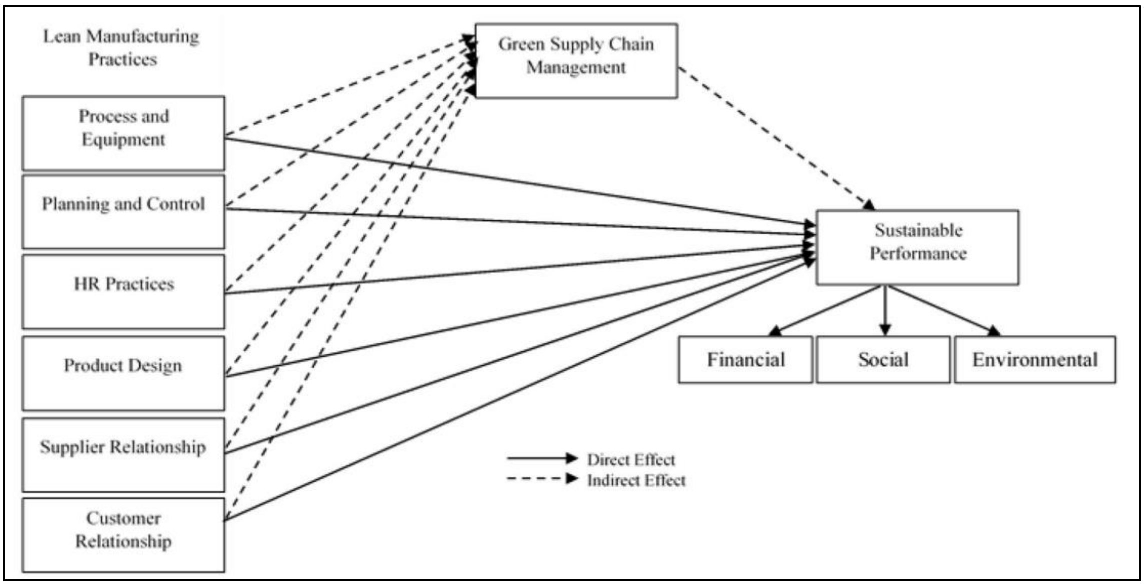
Model (2.8): Moyano-Fuentes et al*(2021)* .**Model.**

Garcia-Buendia et al. (2021) Model: Examined digitalizing supply chains' potential benefits and impact on lean operations as shown in model (2.9) below, the substantial influence of digitizing supply chains on the five Lean Operations practices under examination was confirmed by the authors. The majority of the potential effects that were looked at were found to have positive effects on some areas that directly enhance the supply chain's overall performance, as well as the five lean operations practices that were investigated. The degree to which the seven enabling technologies under investigation impact supply chain management and performance was also ascertained.



Model (2.9): Garcia-Buendia et al. (2021) Model.

Model Awan et al. (2022): Studied the mediating role of green supply chain management between lean manufacturing practices and sustainable performance as shown in model (2.10) below; the findings show that product design, supplier and customer relationships, process and equipment, and sustainable performance are all highly impacted. It is also acknowledged that Green Supply Chain Management is a mediator between environmental performance, supplier and customer relationships, product design, and HR procedures. The results empower managers and decision-makers in manufacturing organizations to apply lean manufacturing and GSCM to cut waste and boost sustainable efficiency.



Model (2.10): Awan et al. (2022) Model

2.5 Previous Studies

Boonjing et al. (2015) study titled: **"An Impact of Supply Chain Management Components on Firm Performance"** aims to determine how eleven supply chain management components and firm performance are related. Eleven supply chain management components were the foundation for the researcher's model and hypothesis. The data acquired came from primary data that was produced using surveys. Five industries were selected to select 241 logistics-related businesses: apparel, food and drink, healthcare, electronics, and automobiles. The results indicated a positive correlation between firm performance (cost and customer service) and all eleven components. Furthermore, the study discovered that knowledge management, workflow structure, product flow facility structure, planning and control, and management techniques should be the organization's top five supply chain management components, respectively; the managerial and behavioral components group of supply chain component factors has the most significant influence on the performance of the firm.

Al-Tit (2016) study titled: **"The Impact of Lean Supply Chain on Productivity of Saudi Manufacturing Firms in Al-Qassim Region"** the main goal is to determine how the Lean Supply Chain (LSC) benefits manufacturing companies in the Kingdom of Saudi Arabia (KSA). One hundred and fifty organizations were selected from the Al-Qassim region to represent the research community out of the total research population. As productivity predictors, four variables were created: waste elimination, cost reduction, manufacturer-supplier, and manufacturer-customer relationships. Seventy-five questionnaires were distributed throughout the neighborhood. For the statistical analysis, every questionnaire was valid. The study's results ensured that the hypotheses developed as predictors could forecast the output of the manufacturing companies in the Al-Qassim region. In other words, productivity benefited significantly from the lean supply chain's components.

Nimeh et al. (2018) study titled: **"Lean Supply Chain Management Practices and Performance: Empirical Evidence from Manufacturing Companies"** aimed to look into how Jordanian manufacturing companies' supply chains and markets would be affected by Lean Supply Chain Management (LSCM) activities. An extensive literature review identified five LSCM practices: just-in-time system, information flow, supplier relationship, customer relationship, and waste reduction. Managers and decision-makers from 400 manufacturing companies of various sizes and industries were given survey questionnaires to complete. About 308 questionnaires were ultimately usable, representing a 77% response rate. The just-in-time system, information flow, and customer relationship were found to have strong positive and significant effects on market performance. Additionally, the performance of the supply chain was positively and significantly impacted by all LSCM techniques. Additionally, the effectiveness of the supply chain had a positive and notable impact on market performance.

Qamar et al. (2018) study titled: **"Lean Versus Agile Production: Flexibility Trade-offs within The Automotive Supply Chain"** aimed to Differentiate between lean and agile firms based on their production processes and contrast the supply chain and External Flexibility (EF) of lean and agile firms. Data was collected through a survey sent via email to 140 automotive organizations in the Midlands (UK). Results showed that firms using agile production methods were more adaptable than those using lean production methods, which supported the theoretical idea of trade-offs. More significantly, Lean firms were primarily found to be operating at the top of the supply chain. In contrast, agile firms with high EF and Supply Chain Flexibility (SCF) levels were mainly positioned at the lower end of the automotive supply chain.

Ruiz-Benítez et al. (2018) study titled: **"The Lean and Resilient Management of The Supply Chain and its Impact on Performance"** aimed to look into the connections and relationships between resilient and lean Supply Chain (SC) practices and how this affects SC performance. Because both paradigms are crucial, the Aerospace Manufacturing Sectors (AMSs) were chosen as the research area, and to find connections between various lean and resilient practices, SC performance metrics, and a single systemic framework, Interpretive Structural Modeling (ISM) was used. ISM is a collaborative learning process built on graph theory, where knowledge from experts is extracted and transformed into a robust and well-organized model. A diverse group of experts from the AMS was assembled, giving them a complete understanding of all SC levels in the industry. The results also indicate that adopting lean SC practices rather than resilient SC practices results in a more remarkable improvement in performance. Unlike Lean SC practices, resilient SC practices do not impact all SC performance metrics.

Marodin et al. (2019) study titled: **"Lean Production and Operational Performance in The Brazilian Automotive Supply Chain"** The purpose is to comprehend the relationship between operational performance and Lean Production (LP) practices in the Brazilian automotive supply chain. A survey was conducted to determine the impact of 11 Lean Practices on five operational performance metrics. Sixty-four companies from the Brazilian automotive supply chain made up the sample. According to the findings, Brazilian companies are reducing lead times by implementing total productive maintenance practices and decreasing inventories by implementing just-in-time practices. However, there is a sizable gap in how these businesses put LP practices into practice, which could prevent them from achieving better operational performance results.

Saengchai and Jermsittiparsert (2019) study titled: **"The Mediating Role of Supplier Network, Moderating Role of Flexible Resource in The Relationship Between Lean Manufacturing Practices and The Organization Performance"** demonstrated the significance of businesses looking for international market opportunities for the capture and sustainability of competitive advantage. Emerging economies are switching from internal sector growth of import substitute industries to external sector growth through export industries as a result of the success of businesses from newly developed nations like the Far Eastern Asian nations of the Republic of Korea and the Republic of China, Taiwan, and South East Asian countries like Singapore. Thus, the study is interested in investigating the relationship between supply chain integration, export marketing strategies, and export performance of Indonesian manufacturing firms. The relationships between them are tested using the SEM-PLS technique. As a result, SEM-PLS has been used as a statistical technique to address the research questions and goals outlined in the current study. The study's findings have supported the study's theoretical framework and suggested hypothesis.

Hadrawi (2019) study titled: **"The Impact of Firm Supply Performance and Lean Processes on the Relationship Between Supply Chain Management Practices and Competitive Performance"** aimed to investigate the relationship between supply logistic integration, competitive performance, lean process, and supply performance. Based on a data set of 220 Iraqi manufacturing companies and the Amos software package. The dataset is analyzed using Structural Equation Modeling (SEM). The study's findings indicate that supply performance and lean processes partially mediate the relationship between supply logistics and competitive performance. The study also demonstrates the significance of managing internal and external processes (logistics and supply chain) of firms' operations in an integrated manner, with supply chain management acting through critical internal processes to influence competitive performance.

Borges et al. (2019) study titled: **"Lean Implementation in The Healthcare Supply Chain: A Scoping Review"** aims to illustrate the connection between Lean Production (LP) implementations used in the healthcare supply chain and the current implementation-related barriers. The findings indicate consensus regarding implementing lean production techniques in the healthcare supply chain. However, most studies still report that such an implementation is limited to particular departments or value streams within healthcare organizations. Healthcare organizations can cut costs and waste while enhancing patient safety and service quality. Additionally, its supply chain typically generates appropriate growth opportunities in terms of cost reduction and improvement in care quality. In this sense, healthcare has accepted the application of lean production principles.

Vanichchinchai (2019) study titled: **"The Effect of Lean Manufacturing on a Supply Chain Relationship and Performance"** aimed to investigate the effects of transaction-based Supply Chain Management (SCM) or Lean Manufacturing (LM) on

Supply Chain Relationships (SCR) and Supply Performance (SP) in Thailand's manufacturing sectors. The development of the LM, SCR, and SP measurement tools was based on thorough literature reviews, expert validation, and statistical methods to ensure reliability and validity. Model hypotheses were examined using structural equation modeling's path analysis. It was discovered that the frameworks for the set hypotheses were trustworthy and appropriate for Thai industrial manufacturers. LM directly impacted the SCR and SP, but the SP was also indirectly affected by the SCR. The SP was directly impacted by the SCR as well.

Ali et al. (2020) study titled: **"Barriers to Lean Six Sigma Implementation in The Supply Chain: An ISM Model"** Initially, the body of research on Lean Six Sigma **(**LSS) implementation in supply chain practiceswase reviewed, and ten expert consultation sessions were scheduled utilizing focused group techniques and brainstorming to avoid the most significant obstacles to LSS implementation. The experts were managers with more than five years of experience in various companies operating in the manufacturing sector. The experts were asked to rank the factors in order of preference and discuss how important each factor was among themselves. Based on the professionals' feedback, ten barriers were found by examining their responses. The interrelationships between the chosen LSS implementation barriers were analyzed using an interpretive structural modeling (ISM) methodology. Variables were grouped using a Matrices Impacts Crosiers Multiplication Appliquéd á un-Casements (MICMAC) analysis according to their driving and dependent powers. A literature review and feedback from industrial managers helped identify ten obstacles to LSS implementation by assisting them to concentrate their efforts on removing the most significant barriers.

Novais et al. (2020) study titled: **"Lean Production Implementation, Cloud-Supported Logistics, and Supply Chain Integration: Interrelationships and Effects**

on Business Performance" From a population of 1,717 Spanish companies, 260 companies in intermediate supply chain positions were chosen at random to test five hypotheses about the role of cloud computing technology in logistics (also known as cloud-supported logistics) and its impact on business outcomes in supply chain integration and lean manufacturing management contexts. An automated telephone surveying system was used to gather the data, with a 15.6% response rate (260 valid questionnaires). Five proposed hypotheses were tested. The results demonstrate that Cloud-Supported Logistics greatly enhances business outcomes in Lean Production environments. Because of the supply chain integration and cloud-supported logistics enabling these technologies, lean production has been found to impact performance and a more substantial indirect impact.

Fadaki et al. (2020) study titled: **"Leagile Supply Chain: Design Drivers and Business Performance Implications" studies** an innovative method for achieving supply chain leagility, along with an examination of the influence of uncertainty as the primary supply chain design factor on leagility. Partial Least Squares (PLS) analysis was used to examine information gathered by distributing a structured questionnaire to 299 Australian companies. The findings suggest optimizing deviations from a balanced supply chain with equal embedding of lean and agile elements can lead to increased performance. Furthermore, the degree of uncertainty positively impacts the Deviation from Leagility (DFL) index.

Singh et al. (2020) study titled: **"Impact of Lean Practices on Organizational Sustainability Through Green Supply Chain Management – An Empirical Investigation"** aimed at identifying the value of Green Supply Chain Management (GSCM) and researching how lean practices like Kaizen and innovation management have an impact on organizational sustainability and to determine the importance of

GSCM toward corporate sustainability, a set of questions, a questionnaire survey, and structured interviews have been conducted among industry professionals and academicians of the northern India region. The significance of lean practices toward sustaining organizations has been ensured by considering the mediating effect of GSCM through structural equation modeling, Cronbach's alpha, z-test, correlation, and t-test. The findings clarified the risks associated with fusing supply chain environmental thinking, innovation management, and Kaizen with government regulations. Although kaizen and innovation management techniques have a positive effect on the environmental supply chain, policies from the government should be created to increase this effect by lowering pollution. Kaizen and innovation management are implemented through GSCM, significantly improving competitive, environmental, and economic performance.

Sharma et al. (2021) study titled: **"A Systematic Literature Review to Integrate Lean, Agile, Resilient, Green and Sustainable Paradigms in The Supply Chain Management"** Lean, Agile, Resilient, Green, and Sustainable (LARGS) models focused on a systematic literature review to integrate into supply chain management. The following research questions: To properly situate LARGS research within the Supply Chain (SC) domain, it is crucial to comprehend the kinds of research articles that should be used. The geographical location of the studies and SCs' LARGS models, studying what industries or fields have been the subject of literary works, is crucial. Techniques and tools have also been employed. Third, the current developments in the interactions between LARGS models and SC performance metrics. Fourth, new issues and unexplored areas in this field have been identified, and future research directions have been suggested. One hundred sixty pertinent articles published between 1999 and 2019 were used for the analysis. The main research questions and potential future research directions in LARGS paradigms in SCs are highlighted, and results are summarized based on analysis.

Garcia-Buendia et al. (2021) study titled: **"Lean Supply Chain Management and Performance Relationships: What Has Been Done and What Is Left to Do"** explained a Systematic Literature Review (SLR) of the literature on the relationships between performance and Lean Supply Chain Management (LSCM). The main objective is to present the studied aspects, suggest a novel classification of the literature on the relationship between Lean supply chain management and performance, and discuss the conceptual and empirical evidence that links them. Two research areas can now be addressed thanks to the analysis: (a) the performance of LSCMs compared to earlier models and (b) the impact of LSCMs on performance. The researcher's guide should facilitate scholars' and practitioners' work. For researchers who want to delve deeper into this subject, the analysis helps examine and pinpoint the problems raised in the interactions between LSCM and performance.

Hani (2021) study titled: **"The Moderating Role of Lean Operations Between Supply Chain Integration and Operational Performance in Saudi Manufacturing Organizations"** aimed to investigate how the Lean Operations management component of Supply Chain Integration affects Operational Performance. Information was gathered from 288 supervisors working for Saudi industrial organizations in the Western region using a comprehensively planned survey. Hani (2021) study explores the interactions between operational performance, lean manufacturing, and supply chain integration. Lean operations (as a directing variable) may, therefore, be assumed to positively impact the relationship between supply chain integration and operational performance, given that both the connection between lean operations and operating performance and the connection between supply chain integration and operational performance were positive.

Maqueira et al. (2021) study titled: **" Total Eclipse on Business Performance and Mass Personalization: How Supply Chain Flexibility Eclipses Lean Production Direct Effect"** aimed to examine how Supply Chain Flexibility mediates the interactions between the adoption of Lean Production, mass personalization, and business performance. The proposed hypothetical framework has been tested using a sample of 260 companies chosen randomly from a population of 1,717 Spanish companies situated in an intermediate position in the supply chain. Data was collected via computerized telephone surveys, with a response rate of 15.6%. Structural equation models were created to test the six hypotheses that were put forth. Findings show businesses adopt lean production to enhance mass personalization processes and boost productivity.

Garcia-Buendia et al. (2021) study titled: **"Potential Benefits and Impact on Digitalizing Supply Chains Lean Operations"** aimed to identify critical areas and benefits under each of these practices to examine the potential effects of digitalizing supply chains on five chosen lean operations practices. Information was gathered from 74 participants, most of whom were university scholars and academic community members, through an online survey. The online poll has six main sections, but only three were used in this study. These sections were created to collect information about participants' demographics, the extent to which seven technological trends affect supply chain performance and management, and the potential effects of digitalizing supply chains on five lean operations practices. The results demonstrate that the five examined lean operations practices have been significantly impacted by the digitalization of supply chains.

Moyano-Fuentes et al. (2021) study titled: **"Extending Lean Management along The Supply Chain: Impact on Efficiency"** aimed to investigate how lean management at the internal and supply chain levels contributed to increasing the efficiency of the focus firm. 285 Spanish focal firms from various industrial sectors in the middle of the supply chain were the subject of an empirical study. Computer-assisted telephone interviewing and a telephone survey were used to collect the data. The hypotheses were put to the test with structural equations. The findings support the resource-based theory and integrated supply chain management by showing that the efficiency of the focal firm increases when lean management is applied throughout the entire supply chain. Additionally, it has been seen that internal Lean Management increases the focal firm's efficiency by improving the Lean Supply Chain.

Awan et al. (2022) study titled: **"Mediating Role of Green Supply Chain Management Between Lean Manufacturing Practices and Sustainable Performance"** Examined the impact of various lean manufacturing practices on organizations' sustainability performance, as well as the mediating factor of Green Supply Chain Management (GSCM), is the primary objective of this paper. Two hundred fifty manufacturers in Pakistan were surveyed, and the information was then analyzed using AMOS 25. Results show that sustainable performance is positively impacted by process and machine, product design, supplier relationships, and client relationships. Green supply chain management is a mediating factor in the interactions between human resource management procedures, product design, supplier relationships, customer relationships, and environmental performance.

Rahamneh et al. (2023) study titled: **"The Effect of Digital Supply Chain on Lean Manufacturing: A Structural Equation Modelling Approach"** this study aimed to evaluate how digital supply chains affected lean manufacturing. The digital supply chain was measured using seven dimensions: digital clients, digital suppliers, digital information technology and manufacturing, digital performance management, digital suppliers, digital logistics and inventory, and digital human resources. To represent the research population and gather the essential primary data, the companies in the electronic industries were the focus of the study. The data collection process used a convenient sampling method to address the research budget and time constraints. Using AMOS software, Structural Equation Modeling (SEM) was used to test the study hypotheses. The results showed that most digital supply chain dimensions positively impacted lean manufacturing except for digital suppliers and clients, which had no bearing on lean manufacturing. The results of this study assist organizational managers in making various decisions about resource allocation and investment to boost revenue and cut costs along digital supply chains.

Piotrowicz et al. (2023) study titled: **"Lean and Agile Metrics. Literature Review and Framework for Measuring Leagile Supply Chain"** aims to review metrics and create a framework for measuring agile supply chains. A framework known as the leagile supply strategy is created by combining metrics from the literature that apply to lean, agile, and agile strategy. This framework can represent both lean and agile strategies. A systematic literature review served as the foundation for this work. After gathering the literature, lean and agile metrics were extracted, examined, tallied, and organized into the framework. Results are contrasted with previous research on leagile supply chains. The results show that various metrics are specific to lean strategies, like process-focused, cost-effective, productivity, inventory, and delivery-based metrics, and metrics specific to agile strategies, like cooperation, collaboration, flexibility, and responsiveness. Standards for time, quality, and customer satisfaction metrics are also present for both strategies. Agile metrics target the outside world, whereas lean metrics are concrete and concentrated on internal operations and products.

Ali (2024) study titled: **"The Influence of Lean Manufacturing on Firm Performance Through Mediation of Supply Chain Practices"** Uses the mediating role of supply chain practices among various partner entities associated with achieving a shared goal to generate profit—mainly focusing on minimizing wastes and cutting costs so they can attain improved performance and competitive advantage—this research study seeks to investigate and validate the impact of lean manufacturing practices on specifically the Supply Performance and generally the Overall Firm Performance. The proposed and conjectured model was investigated and validated in this study through a deductive approach with a quantitative method. For use in Smart PLS 4 Path analysis, they were evaluated for validity, reliability, and structural equation modeling. The results obtained indicate that Lean Manufacturing (LM) practices have a positive and direct impact on Supply Chain Resilience (SCRs) and Supply Practice (SP). Additionally, the indirect effect of these practices validates the mediation of SCR between Lean practices and SP, improving overall firm performance in Pakistan's Small and Medium-sized Enterprises (SME) sector.

Turabi (2024) study titled: **"Supply Chain Integration and Agile Practices"** One critical element that has significantly impacted supply chain competitiveness is lead time. The recent COVID-19 pandemic negatively impacted lead time, and as a result, lead time increased unusually. A few factors, nevertheless, may positively impact the lead time. This study aimed to determine how supply chain integration and agile practices might affect lead times. A closed-ended questionnaire was used to gather research data from the respondents, who were managers and executives in the supply chain. The Statistical Package for Social Sciences was then used to analyze the data. The study's conclusions suggest that agile practices and supply chain integration help to shorten lead times. The results indicate that agile methods and supply chain integration can significantly cut lead times.

2.6 Expected Contribution of Current Study as Compared with Previous Studies

The current study may have the following contribution compared to previous studies:

Concept of Supply Chain Components: It appears that this study is one of the few that considers supply chain components. Consequently, its goal is to raise knowledge of how supply chain elements might enhance an organization's performance in lean manufacturing.

Purpose: The current study aims to investigate the effects of supply chain components on lean manufacturing performance. Most earlier research projects tested the impact of supply chain practices from a traditional viewpoint (suppliers, internal operations, and customer integrations) on an organization's competitive advantages or performance.

Environment: Most previous studies have been conducted outside of the Arab world. The current research is being carried out in Jordan, an Arab country.

Industry: This study examines the effect of supply chain components on lean manufacturing performance at Jordanian paint manufacturing organizations. It is the first of its kind.

Methodology: The earlier researches used yearly reports from various sectors and organizations. The perceptions of managers regarding actual execution form the basis of this study.

Population: This study chose a neglected sector in Jordan and has not surveyed or applied any study in this sector before, although there are a considerable number of companies that are classified as large, medium, and small Paint Companies.

Comparison: The current study's results are compared with previous studies' results to look for possible similarities or differences.

Chapter Three
Study Methodology (Methods and Procedure)

3.1 Introduction

The methodology of the study is described in this part of the research. The study's design, method, and processes for data analysis and reliability and validity tests are detailed in this chapter. In addition, the study's population and the procedures used to choose the sample and sampling unit are described in this chapter. Along with the guidelines for gathering primary and secondary data, the steps for developing and testing the research instrument, and an explanation of the statistical methods used for data analysis and result extraction.

3.2 Study Design

The study's design was based on the quantitative, descriptive, cause-effect, and cross-sectional methods. The problem was determined through an unstructured interview with a group of managers in the field and previous studies. The researcher collected the primary data using a questionnaire. The goal is to study the effect of Supply Chain Components on Lean Manufacturing Performance in the Jordanian Paint Sector. A literature review is the first step to creating a model for examining how Supply Chain Components affect lean manufacturing in the Jordanian Paint Industry. A panel of judges then enhanced the questionnaire. Data was collected by surveying the managers and team leaders working for Jordanian Paint Manufacturing companies. Following that, SPSS 20 was used to code the data. Following the validation and reliability of the variables, normalcy and correlation between them were checked, and descriptive analysis was performed. Lastly, multiple regressions are used to test the impact.

3.3 Study Population, Sample, and Unit of Analysis

This section explains how many samples were chosen from the population and the number of respondents from these samples.

3.3.1 Population and Sample

The paint manufacturing industry is registered in the Jordanian Association of Paint Manufacturers in 2023 in 65 Jordanian organizations. This study targeted 20 organizations as a sample, which means the study surveyed around 31% of Jordanian Paint Manufacturers.

3.3.2 Unit of Analysis

The researcher sent the survey to 250 males and females out of 600 persons in structured and unstructured meetings, and 225 people filled it out in the administration, operations, commercial, marketing, finance, and accounting divisions. The research sample included 225 randomly selected male and female workers from the study population, which means the response rate is 90%. All administrative staff members in Jordanian paint manufacturing organizations, categorized as managers, department heads, supervisors, and employees, make up the survey unit of analysis. As well as when and who will be accessible to fill out the surveys.

3.4 Data Collection Sources

To compile all of the necessary facts and information for this study, the researcher relied on two primary sources:

Secondary Data: Books, journals, and information from reliable internet sources relevant to this research.

Primary Data: Data was collected from first-hand accounts of the study's topic; a questionnaire was designed to collect this data from employees in the Jordanian Paint Organization.

3.4.1 Study Instrument (Tool)

The researcher first reviewed relevant theoretical literature and prior research to build the questionnaire. The researcher developed this survey to learn how different parts of the supply chain components affect lean manufacturing performance in factories. In its final form, the questionnaire comprised three parts: demographic data, independent variable dimensions, and dependent variable dimensions, as shown in Appendix (2), to meet the objectives of the current study.

The judges and referees on the panel were chosen from a pool of eminent academics from various universities and industry experts with extensive backgrounds in paint manufacturing. as displayed in Appendix (1) of the Referee Committee.

Demographic Data: The first section identifies the demographic characteristics of the sample members for the study, such as gender, age, experience, education, position, and division.

Independent Variable (Supply Chain Components): There are 30 items spread across six dimensions that were used to measure the level of implementation of supply chain components. These items are explicitly explained in Appendix (2) of the questionnaire. Measurements of the survey's supply chain components are shown in Table (3.1).

Table (3.1): Sub-variables of Supply Chain Components.

Dimensions	No. of Items	Number Sequence
Facilities (Place and Capacity)	5	1-5
Inventory	5	6-10
Transportation	5	11-15
Information	5	16-20
Sourcing	5	21-25
Pricing	5	26-30

Dependent Variable (Lean Manufacturing Performance): Thirty-two items comprising the Lean Manufacturing Performance level were spread out over eight dimensions. These items are explicitly explained in Appendix (2) of the questionnaire. Table (3.2) displays the dimensions of the lean manufacturing performance questionnaire.

Table (3.2): Sub-variables of Lean Manufacturing Performance.

Dimensions	No. of Items	Number Sequence
Extra Transport	4	31-34
Excess Inventory	4	35-38
Unnecessary Motion	4	39-42
Waiting	4	43-46
Overproduction	4	47-50
Over-processing	4	51-54
Defects	4	55-58
Non-utilized Resources	4	59-62

Five-point Likert has been used to define the level of each item of the sub-variables. The questions were scored an answer with a score of one (1) is strongly unimplemented to a score of five (5) is vigorously implemented.

3.4.2 Data Collection and Analysis

There were 255 completed surveys out of 250 given to managers and supervisors. Data was gathered between October and December 2023 from 20 of the 65 businesses registered with Jordanian Paint Manufacturers. Every questionnaire was collected and coded using SPSS 20, and these data must be tested to verify whether they are suitable for the hypothesis test; then, the validity and reliability tests are used for this purpose.

3.4.2.1 Validity Test

Three techniques were employed to verify the validity. Firstly, content validity was ensured by utilizing multiple data sources, such as prior studies and expert interviews. Secondly, a face validity assessment was conducted by a panel of judges, as shown in Appendix (1), to make necessary modifications to the final version of the questionnaire

(Sekaran & Bougie, 2016). Finally, construct validity was confirmed using Principal Component Factor Analysis with Kaiser Meyer Olkin (KMO).

Construct Validity (Factor Analysis):

The construct validity was verified using Kaiser Meyer Olkin (KMO) principal component factor analysis. Principal factor analysis was used to look at the data conformance and explanation. When a factor loading surpasses 0.40, it is considered acceptable and better than 0.50; there is a reference accept at 0.40 and another at 0.50 (Hair Jr et al., 2019).

On the other hand, sampling adequacy, harmony, and intercorrelations are measured using Kaiser Meyer Olkin (KMO); a high sampling is considered adequate if it exceeds 0.6 and has a KMO value between 0.8 and 1 (Kaiser & Cerny, 1979). Bartlett's Sphericity (BTS) is another correlation and data suitability indicator. Proper factor analysis is indicated if the significant value of the data is less than 0.05 at a 95% confidence level. The variance percentage displays the factors' capacity for explanation (Sekaran & Bougie, 2016).

Table (3.3) shows that the loading factor of facilities (place and capacity) items scored between 0.708 and 0.874. Therefore, the construct validity is assumed. KMO is rated 85.3%, indicating good adequacy, and the Chi^2 is 1024.728, which suggests the model's fitness. Moreover, the variance percentage is 78.773, which can explain 78.773% of the variation. Finally, the significance of Bartlett's Sphericity is less than 0.05, indicating the proper factor analysis.

Table (3.3): Principal Component Analysis Facilities (Place and Capacity).

No.	**Items**	**F1**	**KMO**	**Chi^2**	**BTS**	**Var %**	**Sig.**
1	The company chooses an expandable place based on demand.	0.708	0.853	1024.728	10.000	78.773	0.000
2	The company chooses the nearest suppliers.	0.790					
3	The company chooses warehouses nearest to customers.	0.831					
4	The company designs the capacity based on demand.	0.737					
5	The company chooses warehouses near the ports.	0.874					

Principal Component Analysis.

Table (3.4) shows that the loading factor of inventory items scored between 0.673 and 0.836. Therefore, the construct validity is assumed. KMO has a rating of 75.3%, indicating good adequacy, and the Chi^2 is 1061.506, which suggests the model's fitness. Moreover, the variance percentage is 75.210, which can explain 75.210% of the variation. Finally, the significance of Bartlett's Sphericity is less than 0.05, indicating the proper factor analysis.

Table (3.4): Principal Component Analysis Inventory.

No.	Items	F1	KMO	Chi^2	BTS	Var %	Sig.
1	The company maximizes turnover of inventory.	0.836	0.753	1061.506	10.000	75.210	0.000
2	The company holds the lowest limit of safety stock to avoid shortage.	0.828					
3	The company holds a suitable level of inventory for seasonal demand.	0.740					
4	The company provides suitable conditions for inventory.	0.684					
5	The company orders economic order quantity.	0.673					

Principal Component Analysis.

Table (3.5) shows that the loading factor of transportation items scored between 0.570 and 0.847. Therefore, the construct validity is assumed. KMO has rated 85.9%, which indicates good adequacy, and the Chi^2 is 948.269, which means the model's fitness. Moreover, the variance percentage is 77.740, which explains 77.74% of the variation. Finally, the significance of Bartlett's Sphericity is less than 0.05, indicating the proper factor analysis.

Table (3.5): Principal Component Analysis Transportation.

No.	Items	F1	KMO	Chi^2	BTS	Var %	Sig.
1	The company selects suitable transport modes.	0.832	0.859	948.269	10.000	77.740	0.000
2	The company uses suitable methods to unload containers to save time.	0.823					
3	The company minimizes lead time.	0.815					
4	The company uses a tracking transportation system to define arrival time.	0.847					
5	The company reships frequently according to forecast demand.	0.570					

Principal Component Analysis.

Table (3.6) shows that the loading factor of information items scored between 0.586 and 0.815. Therefore, the construct validity is assumed. KMO has rated 88.4%, indicating good adequacy, and the Chi^2 is 805.911, which means the model's fitness. Moreover, the variance percentage is 75.156, which can explain 75.156% of the variation. Finally, the significance of Bartlett's Sphericity is less than 0.05, indicating the proper factor analysis.

Table (3.6): Principal Component Analysis Information.

No.	Items	F1	KMO	Chi^2	BTS	Var %	Sig.
1	The company uses an Enterprise Resource Planning (ERP) system.	0.745	0.884	805.911	10.000	75.156	0.000
2	The company gathers data about its competitors.	0.815					
3	The company gathers data about the customers.	0.799					
4	The company gathers data about the suppliers.	0.814					
5	The company gets information about suppliers of suppliers.	0.586					

Principal Component Analysis.

Table (3.7) shows that the loading factor of sourcing items scored between 0.564 and 0.910. Therefore, the construct validity is assumed. KMO is rated 87.4%, indicating good adequacy, and the Chi^2 is 1008.302, which suggests the model's fitness. Moreover, the variance percentage is 77.864, which can explain 77.864% of the variation. Finally, the significance of Bartlett's Sphericity is less than 0.05, indicating the proper factor analysis.

Table (3.7): Principal Component Analysis Sourcing.

No.	Items	F1	KMO	Chi^2	BTS	Var %	Sig.
1	The company selects relevant suppliers for its core business.	0.564	0.874	1008.302	10.000	77.864	0.000
2	The company selects more than one supplier for one item.	0.910					
3	The company sets criteria to select suppliers.	0.880					
4	The company negotiates with suppliers to set details.	0.780					
5	The company decides to make\buy to select outsourcing.	0.759					

Principal Component Analysis.

Table (3.8) shows that the loading factor of pricing items scored between 0.503 and 0.827. Therefore, the construct validity is assumed. KMO is rated 76.0%, indicating good adequacy, and the Chi^2 is 1290.540, which suggests the model's fitness. Moreover, the variance percentage is 75.199, which can explain 75.199% of the variation. Finally, the significance of Bartlett's Sphericity is less than 0.05, indicating the proper factor analysis.

Table (3.8): Principal Component Analysis Pricing.

No.	Items	F1	KMO	Chi^2	BTS	Var %	Sig.
1	The company sets prices to compete with competitor's prices.	0.503	0.760	1290.540	10.000	75.199	0.000
2	The company divides pricing according to customer segments.	0.827					
3	The company changes prices based on the level of demand.	0.805					
4	The company maximizes the customer value to optimize price.	0.798					
5	The company sets prices based on the seasons.	0.827					

Principal Component Analysis.

Table (3.9) shows that the loading factor of extra transport items scored between 0.686 and 0.996. Therefore, the construct validity is assumed. KMO has a rating of 67.2%, indicating good adequacy, and the Chi^2 is 509.688, which means the model's fitness. Moreover, the variance percentage is 61.655, which can explain 61.655% of the variation. Finally, the significance of Bartlett's Sphericity is less than 0.05, indicating the proper factor analysis.

Table (3.9): Principal Component Analysis Extra Transport.

No.	Items	F1	KMO	Chi^2	BTS	Var %	Sig.
1	The company commits to on-time product delivery for customers.	0.885	0.672	509.688	6.000	61.655	0.000
2	The company maximizes cargo quantity per shipment.	0.903					
3	The company chooses the best route for transportation.	0.686					
4	The company monitors shipping to avoid damage during transport.	0.996					

Principal Component Analysis.

Table (3.10) shows that the loading factor of excess inventory items scored between 0.682 and 0.946. Therefore, the construct validity is assumed. KMO has rated 81.8%, indicating good adequacy, and the Chi^2 is 1147.293, which suggests the model's fitness. Moreover, the variance percentage is 86.078, which can explain 86.078% of the variation. Finally, the significance of Bartlett's Sphericity is less than 0.05, indicating the proper factor analysis.

Table (3.10): Principal Component Analysis Excess Inventory.

No.	Items	F1	KMO	Chi^2	BTS	Var %	Sig.
1	The company applies a Re-Order Point (ROP) for items.	0.682	0.818	1147.29	6.000	86.078	0.000
2	The company applies a Just in Time (JIT) inventory process.	0.920					
3	The company confirms that physical inventory counts match inventory records.	0.946					
4	The company works according to first in, first out.	0.895					

Principal Component Analysis.

Table (3.11) shows that the loading factor of unnecessary motion items scored between 0.627 and 0.755. Therefore, the construct validity is assumed. KMO has rated 61.7%, indicating good adequacy, and the Chi^2 is 963.780, which means the model's fitness. Moreover, the variance percentage is 70.564, which can explain 70.564% of the variation. Finally, the significance of Bartlett's Sphericity is less than 0.05, indicating the proper factor analysis.

Table (3.11): Principal Component Analysis Unnecessary Motion.

No.	Items	F1	KMO	Chi^2	BTS	Var %	Sig.
1	The company reduces recurrent internal auditing.	0.665	0.617	963.780	6.000	70.564	0.000
2	The company sorts fast-moving goods close to the loading area.	0.627					
3	The company reduces unnecessary working hours.	0.756					
4	The company uses a digital system for transactions.	0.775					

Principal Component Analysis.

Table (3.12) shows that the loading factor of waiting items scored between 0.795 and 0.925. Therefore, the construct validity is assumed. KMO is rated 49.8%, indicating good adequacy, and the Chi^2 is 378.983, which means the model's fitness. Moreover, the variance percentage is 46.423, which can explain 46.432% of the variation. Finally, the significance of Bartlett's Sphericity is less than 0.05, indicating the proper factor analysis.

Table (3.12): Principal Component Analysis Waiting.

No.	Items	F1	KMO	Chi^2	BTS	Var %	Sig.
1	The company minimizes set-up time.	0.795	0.498	378.983	6.000	46.432	0.000
2	The company reduces customer order cycle time.	0.796					
3	The company minimizes downtime.	0.925					
4	The company avoids production line bottlenecks.	0.924					

Principal Component Analysis.

Table (3.13) shows that the loading factor of overproduction items scored between 0.865 and 0.879. Therefore, the construct validity is assumed. KMO is rated 53.8%, indicating good adequacy, and the Chi^2 is 371.119, which means the model's fitness. Moreover, the variance percentage is 53.342, which can explain 53.342% of the variation.

Finally, the significance of Bartlett's Sphericity is less than 0.05, indicating the proper factor analysis.

Table (3.13): Principal Component Analysis Overproduction.

No.	Items	F1	KMO	Chi^2	BTS	Var %	Sig.
1	The company produces the number of units per batch based on demand.	0.879	0.538	371.119	6.000	53.342	0.000
2	The company produces according to forecast.	0.871					
3	The company prepares raw materials according to orders.	0.874					
4	The company produces sub-assemblies based on demand.	0.865					

Principal Component Analysis.

Table (3.14) shows that the loading factor of over-processing items scored between 0.700 and 0.904. Therefore, the construct validity is assumed. KMO is rated 79.7%, indicating good adequacy, and the Chi^2 is 645.039, which means the model's fitness. Moreover, the variance percentage is 78.285, so it can explain 78.285% of the variation. Finally, the significance of Bartlett's Sphericity is less than 0.05, indicating the proper factor analysis.

Table (3.14): Principal Component Analysis Over-processing.

No.	Items	F1	KMO	Chi^2	BTS	Var %	Sig.
1	The company produces right from the first time.	0.700	0.797	645.039	6.000	78.285	0.000
2	The company avoids repeating faults by setting preventive procedures.	0.760					
3	The company uses standard operating procedures.	0.904					
4	The company avoids monitoring production through more than one system.	0.767					

Principal Component Analysis.

Table (3.15) shows that the loading factor of defective items scored between 0.721 and 0.849. Therefore, construct validity is assumed. KMO is rated 82.6%, indicating good adequacy, and the Chi^2 is 675.858, which means the model's fitness. Moreover, the variance percentage is 80.297, which can explain 80.297% of the variation. Finally, the significance of Bartlett's Sphericity is less than 0.05, indicating the proper factor analysis.

Table (3.15): Principal Component Analysis Defects.

No.	Items	F1	KMO	Chi^2	BTS	Var %	Sig.
1	The company commits to the designed specifications to reduce variation.	0.835	0.826	675.858	6.000	80.297	0.000
2	The company commits to quality procedures to minimize the scrap.	0.849					
3	The company responds to customer complaints to reduce defects.	0.806					
4	The company controls the supplier's items quality to reduce defects.	0.721					

Principal Component Analysis.

Table (3.16) shows that the loading factor of non-utilized resource items scored between 0.633 and 0.873. Therefore, the construct validity is assumed. KMO has a rating of 67.7%, indicating good adequacy, and the Chi^2 is 320.792, which means the model's fitness. Moreover, the variance percentage is 59.593, which can explain 59.593% of the variation. Finally, the significance of Bartlett's Sphericity is less than 0.05, indicating the proper factor analysis.

Table (3.16): Principal Component Analysis Non-Utilized Resources.

No.	**Items**	**F1**	**KMO**	**Chi^2**	**BTS**	**Var %**	**Sig.**
1	The company empowers talented employees.	0.633	0.676	320.792	6.000	59.593	0.000
2	The company maximizes the utilization of dead areas.	0.873					
3	The company increases utilization of the machines at total capacity.	0.871					
4	The company utilizes the total available warehouses.	0.681					

Principal Component Analysis.

Table (3.17) shows that the loading factor of Supply Chain Components items scored between 0.533 and 0.881. Therefore, the construct validity is assumed. KMO has rated 83.9%, indicating good adequacy, and the Chi^2 is 1514.916, which suggests the model's fitness. Moreover, the variance percentage is 77.125, which explains 77.125% of the variation. Finally, the significance of Bartlett's Sphericity is less than 0.05, indicating the proper factor analysis.

Table (3.17): Principal Component Analysis Supply Chain Components.

No.	Items	F1	KMO	Chi^2	BTS	Var %	Sig.
1	Facilities (Place and Capacity)	0.768	0.839	1514.916	15.000	77.125	0.000
2	Inventory	0.855					
3	Transportation	0.881					
4	Information	0.855					
5	Sourcing	0.736					
6	Pricing	0.533					

Principal Component Analysis.

Table (3.18) shows that the loading factor of Lean Manufacturing Performance items scored between 0.402 and 0.910. Therefore, the construct validity is assumed. KMO is rated 83.2%, indicating good adequacy, and the Chi^2 is 1514.494, which suggests the model's fitness. Moreover, the variance percentage is 60.612, which can explain 60.612% of the variation. Finally, the significance of Bartlett's Sphericity is less than 0.05, indicating the proper factor analysis.

Table (3.18): Principal Component Analysis Lean Manufacturing Performance.

No.	Items	F1	KMO	Chi^2	BTS	Var %	Sig.
1	Extra Transport	0.572	0.832	1514.494	28.000	60.612	0.000
2	Excess Inventory	0.910					
3	Unnecessary Motion	0.402					
4	Waiting	0.811					
5	Overproduction	0.831					
6	Over-processing	0.813					
7	Defects	0.837					
8	Non-utilized Resources	0.759					

Principal Component Analysis.

3.4.2.2 Reliability Test (Cronbach's Alpha):

This test guarantees the tool's stability and measures the internal consistency of a set of survey items. The Cronbach's Alpha equation assessed all items inside the research dimensions (Sileyew, 2019). Table (3.19) presents the information.

Table (3.19): Reliability Coefficients (Cronbach's Alpha) for Dimensions of The Study Tool.

Main Variables	Variables	No. Of Items	Cronbach's alpha
Supply Chain Components	Facilities (Place and Capacity)	5	0.932
	Inventory	5	0.916
	Transportation	5	0.924
	Information	5	0.915
	Sourcing	5	0.925
	Pricing	5	0.913
	Supply Chain Components	**30**	**0.975**
Lean Manufacturing Performance	Extra Transport	4	0.873
	Excess Inventory	4	0.945
	Unnecessary Motion	4	0.859
	Waiting	4	0.881
	Overproduction	4	0.808
	Over-processing	4	0.907
	Defects	4	0.918
	Non-utilized Resources	4	0.866
	Lean Manufacturing Performance	**32**	**0.937**

Table (3.19) demonstrates that the reliability coefficients, calculated using Cronbach's Alpha technique, were all within an acceptable range for practical use. The reliability coefficient for Supply Chain Components sub-variables ranges between 0.913 and 0.932, and for Lean Manufacturing dimensions is between 0.808 and 0.945.

Research has demonstrated that dependability coefficients are widely accepted and suitable for practical use. Most investigations reported an approved reliability coefficient of 0.70, which is taken if it exceeded 0.60 (Hair et al., 2007; Hult et al., 2018).

3.4.2.3 Demographic Analysis

The demographic analysis presented in the below sections is based on the characteristics of the valid respondents, i.e., frequency and percentage of participants, such as gender, age, experience, education, position, and division.

Gender: Table (3.20) shows that the majority of respondents are males, whereas respondents are 141 persons with percent are (62.7%) and 84 (37.3%) females.

Table (3.20): Respondents' Gender.

Dimension	Classification	Frequency	Percent
Gender	Male	141	62.7
	Female	84	37.3
	Total	225	100.0

Age: Table (3.21) shows that the majority of respondents ages are between (41 and 50 years) 109 (48.4%) out of the total sample, and this matches with the study scope, which is the managerial level following those ages between (30-40 years of) 55 (24.4%), the following respondents who are younger than 30 years 37 (16.4%), finally those older than 50 years 24 (10.7%).

Table (3.21): Respondents' Age.

Dimension	Classification	Frequency	Percent
Age (years)	Less than 30	37	16.4
	30-40	55	24.4
	41-50	109	48.4
	More than 50	24	10.7
	Total	225	100.0

Experience: Table (3.22) shows that the majority of respondents have experience between (20-29 years) 101 persons (44.9%), which matches with the study sample that targets the managerial level. The following respondents had experience between (10-19 years) 77 (34.2%), followed by those with experience less than ten years 29 (12.9%). Finally, respondents have more than 30 years' experience 18 (8%).

Table (3.22): Respondents' Experience.

Dimension	Classification	Frequency	Percent
Experience (years)	Nine or less	29	12.9
	10-19	77	34.2
	20-29	101	44.9
	30 and more	18	8.0
	Total	225	100.0

Education: Table (3.23) shows that the majority of respondents 162 (72%) have a bachelor's degree, and there are 37(16.4%) have a master's degree, 21 persons (9.3%) have a diploma degree, five persons (2.2%) have a Ph.D. degree.

Table (3.23): Respondents' Education.

Dimension	Classification	Frequency	Percent
Education	Diploma	21	9.3
	Bachelor	162	72.0
	Master	37	16.4
	Ph.D.	5	2.2
	Total	225	100.0

Position: Table (3.24) shows that the majority of respondents are managers 136 (72.4%) out of the total respondents, 28 (12.4%) are heads of department, the third category is supervisors 24 (10.7%), the Employees 10 (4.4%) out of total respondents.

Table (3.24): Respondents' Position.

Dimension	Classification	Frequency	Percent
Position	Manager	163	72.4
	Head of Department	28	12.4
	Supervisor	24	10.7
	Employee	10	4.4
	Total	225	100.0

Division: Table (3.25) shows that the majority of respondents are working in the commercial/marketing division 83 (36.9%), then those working in finance/accounting 82 (36.4), the following operations division, there are 35 respondents (15.6%), finally administration was 25 (11.1%).

Table (3.25): Respondents' Division.

Dimension	Classification	Frequency	Percent
Division	Administration	25	11.1
	Operations	35	15.6
	Commercial/Marketing	83	36.9
	Finance/Accounting	82	36.4
	Total	225	100.0

Chapter Four
Analysis and Results

4.1 Introduction

This chapter will present the findings and corresponding analysis conducted by the researcher. Furthermore, this chapter will prioritize the noteworthy results and their statistical implications. The study variables will be examined and elucidated from a statistical perspective utilizing measures such as means, standard deviations, t-values, significance, importance, and ranking, and these results answer the first and second questions, which are built in Chapter (1) as a descriptive analysis. Next, illustrate the correlation between independent variables and examine their correlation with dependent variables. These results answer the third question, designed in chapter (1) as correlation analysis. Ultimately, the study hypothesis will be analyzed using multiple regressions to answer question fourth, which is designed in chapter (1) as a cause-effect analysis:

4.2 Descriptive Statistical Analysis

The mean, standard deviation, t-value, ranking, and implementation level describe the respondents' perception and the degree of implementation of each variable, dimension, and item. The implementation levels are divided into three categories based on the following formula equation period length (4.1):

$$\textbf{Period lenth} = \frac{\textbf{Upper level} - \textbf{Lower level}}{\textbf{Test value}} = \frac{\textbf{5}-\textbf{1}}{\textbf{3}} = \mathbf{1.33} \qquad \textbf{Equation}\,(\mathbf{4.1})$$

Therefore, the implementation is considered high if it is within the range of 3.67-5.00, medium between 2.34 and 3.66, and low implementation between 1.00 and 2.33. The mean in descriptive statistical analysis indicates the level of implementation for the variables, sub-variables, and items, and there are three levels: low, medium, and high. Standard deviation indicates the level of consensus for these variables, sub-variables, and items and how far these dimensions deviate from the mean. At the same time, the t-value indicates the significance level for these variables, sub-variables, and items at ($\alpha \leq 0.05$). In addition, there is a positive relationship between means and t-value and a negative relationship between standard deviation with means and standard deviation.

Independent Variable (Supply Chain Components)

Independent variables assess the extent of supply chain components in paint manufacturing institutions in Jordan; the study extracted the mean and standard deviation of the estimates provided by the sample members regarding the dimensions of the supply chain components, namely Facilities (Place and Capacity), Inventory, Transportation, Information, Sourcing, and Pricing. The data presented in Table (4.1) indicates that the mean values of the independent variables range from 3.23 to 3.99, with corresponding standard deviations ranging from 0.70 to 0.96. These findings suggest a consensus among Jordanian Paint Manufacturing Organizations on the medium level of implementation of the independent variables. The variables have a mean of 3.45 and a standard deviation of 0.73. These numbers indicate a consensus among Jordanian Paint Manufacturing Organizations at the medium level. All variables are significant for Jordanian Paint Manufacturing Organizations since the test statistic (t=9.16) is above the critical value (1.96). The above findings suggest that Jordanian Paint Manufacturing Organizations know the significance of supply chain components .

Table (4.1): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Supply Chain Components Variables.

No.	Item	M.	S.D.	t	Sig.	Imp.	Rank
1	Facilities (Place and Capacity)	3.23	0.96	3.59	0.00	Medium	6
2	Inventory	3.27	0.86	4.70	0.00	Medium	4
3	Transportation	3.25	0.88	4.30	0.00	Medium	5
4	Information	3.36	0.82	6.55	0.00	Medium	3
5	Sourcing	3.58	0.76	11.39	0.00	Medium	2
6	Pricing	3.99	0.70	21.31	0.00	High	1
	Supply Chain Components	**3.45**	**0.73**	**9.16**	**0.00**	**Medium**	

T-tabulated=1.96

Facilities (Place and Capacity):

Table (4.2) displays the mean values of Facilities (Place and Capacity) items, ranging from 3.05 to 3.35, with a standard deviation between 1.01 and 1.15. That indicates a semi-consensus among Jordanian Paint Manufacturing Organizations regarding the moderate implementation of Facilities (Place and Capacity) Items. The mean value of the Facilities (Place and Capacity) items is 3.23, with a standard deviation of 0.96. That indicates a semi-consensus among Jordanian Paint Manufacturing Organizations on the moderate level of implementation of the Facilities variable. Additionally, all facilities-related items hold moderate importance for Jordanian Paint Manufacturing Organizations, as indicated by a statistical test where the value of (t=3.59> 1.96).

Item (The company chooses warehouses near the ports.) in Table (4.2) indicates that it has t= 0.87 < 1.96 and a high standard deviation equals 1.15. There is a consensus unimplemented for this item at Jordanian Paint Manufacturing Organizations. The main reason for these results is that there is one port in Jordan for export and import cargoes; it is located in Aqaba, and most of these organizations cannot set their warehouses and inventories far away from their business.

Table (4.2): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Facilities Items.

No.	Item	M.	S.D.	t	Sig.	Imp.	Rank
1	The company chooses an expandable place based on demand.	3.34	1.01	5.00	0.00	Medium	2
2	The company chooses the nearest suppliers.	3.22	1.13	2.89	0.00	Medium	4
3	The company chooses warehouses nearest to customers.	3.35	1.04	4.99	0.00	Medium	1
4	The company designs the capacity based on demand.	3.25	1.08	3.45	0.00	Medium	3
5	The company chooses warehouses near the ports.	3.05	1.15	**0.87**	**0.31**	Medium	5
	Facilities (Place and Capacity)	**3.23**	**0.96**	**3.59**	**0.00**	**Medium**	

T-tabulated=1.96

Inventory:

Table (4.3) displays the average value of Inventory items falling within the range of 3.13 and 3.40, with a standard deviation ranging from 0.94 to 1.05. These numbers indicate a semi-consensus among Jordanian Paint Manufacturing Organizations regarding moderately adopting Inventory Items. The average value of the Inventory items is 3.27, with a standard deviation of 0.86. That indicates that Jordanian Paint Manufacturing Organizations generally agree on the moderate application of the inventory variable.

The calculated value (t=4.70) is above the critical value (1.96). That suggests a consensus on the significance of inventory among Jordanian Paint Manufacturing Organizations.

Table (4.3): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Inventory Items.

No.	Item	M.	S.D.	t	Sig.	Imp.	Rank
1	The company maximizes turnover of inventory.	3.20	1.00	3.04	0.00	Medium	4
2	The company holds the lowest limit of safety stock to avoid shortage.	3.30	0.97	4.67	0.00	Medium	3
3	The company holds a suitable level of inventory for seasonal demand.	3.37	0.95	5.92	0.00	Medium	2
4	The company provides suitable conditions for inventory.	3.40	0.94	6.30	0.00	Medium	1
5	The company orders economic order quantity.	3.13	1.05	1.98	0.00	Medium	5
	Inventory	**3.27**	**0.86**	**4.70**	**0.00**	**Medium**	

T-tabulated=1.96

Transportation:

Table (4.4) displays that the average value of Transportation items falls within the range of 3.18 to 3.43, with a standard deviation ranging from 0.90 to 1.03. These numbers indicate a semi-consensus among Jordanian Paint Manufacturing Organizations regarding the moderate adoption of Transportation Items. The mean value for the Transportation elements is 3.25, with a standard deviation of 0.88. That indicates a semi-consensus among

Jordanian Paint Manufacturing Organizations on the moderate implementation of the Transportation variable.

Transportation factors hold moderate importance for Jordanian Paint Manufacturing Organizations, as noted in a statistical test (t=4.30>1.96). There is a consensus about the significance of transportation in the Jordanian Paint Manufacturing Organization.

Table (4.4): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Transportation Items.

No.	Item	M.	S.D.	t	Sig.	Imp.	Rank
1	The company selects suitable transport modes.	3.18	1.03	2.72	0.00	Medium	5
2	The company uses suitable methods to unload containers to save time.	3.19	0.99	2.77	0.00	Medium	4
3	The company minimizes lead time.	3.22	0.97	3.44	0.00	Medium	3
4	The company uses a tracking transportation system to define arrival time.	3.24	0.94	3.80	0.00	Medium	2
5	The company reships frequently according to forecast demand.	3.43	0.90	7.13	0.00	Medium	1
	Transportation	**3.25**	**0.88**	**4.30**	**0.00**	**Medium**	

T-tabulated=1.96

Information:

Table (4.5) displays the mean value of information items ranging from 3.24 to 3.42, with a standard deviation between 0.88 and 0.99. These numbers indicate a semi-consensus among Jordanian Paint Manufacturing Organizations regarding the moderate implementation of information items.

The mean value of the Information items is 3.36, with a standard deviation of 0.82. That indicates a semi-consensus among Jordanian paint manufacturing Organizations on the moderate implementation of the Information variable.

All information elements are of moderate importance for Jordanian Paint Manufacturing Organizations, as indicated by the statistical test result (t=6.55>1.96).

There is a consensus regarding the significance of information in Jordanian Paint Manufacturing Organizations.

Table (4.5): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Information Items.

No.	Item	M.	S.D.	t	Sig.	Imp.	Rank
1	The company uses an Enterprise Resource Planning (ERP) system.	3.40	0.90	6.63	0.00	Medium	2
2	The company gathers data about its competitors.	3.42	0.88	6.66	0.00	Medium	1
3	The company gathers data about the customers.	3.24	0.99	3.69	0.00	Medium	5
4	The company gathers data about the suppliers.	3.34	0.92	5.56	0.00	Medium	4
5	The company gets information about suppliers of suppliers.	3.38	0.91	6.23	0.00	Medium	3
	Information	**3.36**	**0.82**	**6.55**	**0.00**	**Medium**	

T-tabulated=1.96

Sourcing:

Table (4.6) displays the average value of Sourcing items falling within the range of 3.44 and 3.95, accompanied by a standard deviation ranging from 0.80 to 0.94. These numbers indicate a semi-consensus among Jordanian Paint Manufacturing Organizations regarding the moderate use of Sourcing Items.

The average value of the Sourcing elements is 3.58, with a standard variation of 0.76. That indicates that Jordanian Paint Manufacturing Organizations generally agree on a moderate level of implementation for the Sourcing variable.

All sourcing items are of medium importance for Jordanian paint manufacturing organizations, as the value of t (t=11.39) is above the critical value of 1.96. That suggests a consensus on the significance of sourcing in Jordanian paint organizations.

Table (4.6): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Sourcing Items.

No.	Item	M.	S.D.	t	Sig.	Imp.	Rank
1	The company selects relevant suppliers for its core business.	3.44	0.94	7.10	0.00	Medium	5
2	The company selects more than one supplier for one item.	3.60	0.85	10.50	0.00	Medium	2
3	The company sets criteria to select suppliers.	3.46	0.88	7.79	0.00	Medium	3
4	The company negotiates with suppliers to set details.	3.46	0.88	7.79	0.00	Medium	4
5	The company decides to make\buy to select outsourcing.	3.95	0.80	17.75	0.00	High	1
	Sourcing	**3.58**	**0.76**	**11.39**	**0.00**	**Medium**	

T-tabulated=1.96

Pricing:

Table (4.7) displays the average pricing items falling within the range of 3.75 and 4.16, with a standard deviation ranging from 0.73 to 0.90. These numbers indicate a consensus among Jordanian Paint Manufacturing Organizations regarding the medium adoption of pricing items.

The mean value of the Pricing items is 3.99, with a standard deviation of 0.70. That indicates that Jordanian Paint Manufacturing Organizations generally agree on a high level of implementation for the Pricing variable.

Additionally, pricing items hold great significance for Jordanian Paint Manufacturing Organizations, as indicated by a statistically significant t-value of 21.31, which exceeds the critical value of 1.96. There is a consensus regarding the significance of pricing in Jordanian Paint Manufacturing Organizations.

Table (4.7): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Pricing Items.

No.	Item	M.	S.D.	t	Sig.	Imp.	Rank
1	The company sets prices to compete with competitor’s prices.	3.94	0.82	17.49	0.00	High	4
2	The company divides pricing according to customer segments.	3.98	0.81	18.13	0.00	High	3
3	The company changes prices based on the level of demand.	3.75	0.90	12.50	0.00	High	5
4	The company maximizes the customer value to optimize price.	4.12	0.78	20.58	0.00	High	2
5	The company sets prices based on the seasons.	4.16	0.73	22.31	0.00	High	1
	Pricing	**3.99**	**0.70**	**21.31**	**0.00**	**High**	

T-tabulated=1.96

To assess the level of Lean Manufacturing Performance in paint manufacturing institutions in Jordan, the following tables show the mean and standard deviation of the estimates provided by the study sample members for various dimensions of Lean Manufacturing Performance, including Extra Transport, Excess Inventory, Unnecessary Motion, Waiting, Overproduction, Over-processing, Defects, and Non-utilized Resources.

Dependent Variables (Lean Manufacturing Performance)

The data presented in Table (4.8) reveals that the mean values of the dependent variables range from 3.43 to 4.06, with corresponding standard deviations ranging from 0.60 to 0.78. These findings suggest a consensus among Jordanian Paint Manufacturing Organizations on the high level of implementation of the dependent variables. The variables have an overall mean of 3.75 and a standard deviation of 0.51. These numbers indicate a good level of agreement among Jordanian Paint Manufacturing Organizations. All factors are significant for Jordanian Paint Manufacturing Organizations, as noted in the statistical test (t=22.88>1.96).

The above findings suggest that Jordanian Paint Manufacturing Organizations know the significance of Lean Manufacturing Performance.

Table (4.8): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Lean Manufacturing Variables.

No.	Item	M.	S.D.	t	Sig.	Imp.	Rank
1	Extra Transport	4.06	0.60	25.41	0.00	High	1
2	Excess Inventory	3.96	0.70	19.38	0.00	High	2
3	Unnecessary Motion	3.87	0.73	16.59	0.00	High	3
4	Waiting	3.80	0.76	15.25	0.00	High	4
5	Overproduction	3.79	0.76	15.09	0.00	High	5
6	Over-processing	3.43	0.78	8.01	0.00	Medium	8
7	Defects	3.61	0.77	11.29	0.00	Medium	6
8	Non-utilized Resources	3.50	0.78	9.63	0.00	Medium	7
	Lean Manufacturing Performance	**3.75**	**0.51**	**22.88**	**0.00**	**High**	

T-tabulated=1.96

To assess the level of Lean Manufacturing Performance in Jordanian paint manufacturing facilities, the following tables show the mean and standard deviation of the study sample members' ratings for each dimension of Lean Manufacturing Performance. The following are the results:

Extra Transport:

Table (4.9) displays the average value of Extra Transport items falling within the range of 3.78 to 4.28, with a standard deviation ranging from 0.74 to 0.99. That indicates a semi-consensus among Jordanian Paint Manufacturing Organizations regarding the moderate adoption of Extra Transport Items. The average value of the Extra Transport items is 4.06, with a standard deviation of 0.60. These numbers indicate a consensus among Jordanian Paint Manufacturing Organizations regarding the high level of implementation of the Extra Transport variable.

Additionally, all additional transportation items are significant for Jordanian Paint Manufacturing Organizations, as indicated by the statistical test (t=25.41>1.96). That suggests a consensus on the significance of more transportation in Jordanian paint manufacturing companies.

Table (4.9): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Extra Transport Items.

No.	Item	M.	S.D.	t	Sig.	Imp.	Rank
1	The company commits to on-time product delivery for customers.	4.28	0.74	25.83	0.00	High	1
2	The company maximizes cargo quantity per shipment.	4.17	0.78	22.57	0.00	High	2
3	The company chooses the best route for transportation.	3.78	0.99	11.80	0.00	High	4
4	The company monitors shipping to avoid damage during transport.	4.02	0.80	19.07	0.00	High	3
	Extra Transport	**4.06**	**0.60**	**25.41**	**0.00**	**High**	

T-tabulated=1.96

Excess Inventory:

Table (4.10) shows that the mean of Excess Inventory items is between 3.75 and 4.29, with a standard deviation between 0.73 and 1.01, which means there is a semi-agreement among Jordanian Paint Manufacturing Organizations on Medium implementation of Excess Inventory Items. The overall mean of the Excess Inventory items is 3.96 with a standard deviation of 0.70, which means there is an agreement among Jordanian Paint Manufacturing Organizations on the High implementation of the Excess Inventory variable. Also, all Excess Inventory items are Essential for Jordanian Paint Manufacturing Organizations since (t=19.38>1.96). That indicates an agreement on the importance of Excess Inventory at Jordanian Paint Manufacturing Organizations.

Table (4.10): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Excess Inventory Items.

No.	Item	M.	S.D.	t	Sig.	Imp.	Rank
1	The company applies a Re-Order Point (ROP) for items.	4.29	0.73	26.61	0.00	High	1
2	The company applies a Just in Time (JIT) inventory process.	3.91	0.87	14.38	0.00	High	2
3	The company confirms that physical inventory counts match inventory records.	3.90	0.95	13.36	0.00	High	3
4	The company works according to First In, First Out (FIFO).	3.75	1.01	12.84	0.00	High	4
	Excess Inventory	**3.96**	**0.70**	**19.38**	**0.00**	**High**	

T-tabulated=1.96

Unnecessary Motion:

Table (4.11) indicates that the mean value of Unnecessary Motion items falls within the range of 3.52 to 4.08, with a standard deviation ranging from 0.78 to 0.91. These numbers suggest that there is consensus across Jordanian Paint Manufacturing Organizations about the moderate adoption of Unnecessary Motion Items. The average score for the Unnecessary Motion items is 3.87, with a standard deviation of 0.73. That indicates that Jordanian Paint Manufacturing Organizations generally agree on a high level of implementation of the Unnecessary Motion variable. Additionally, all factors related to Unnecessary Motion hold significant importance for Jordanian Paint Manufacturing Organizations, as indicated by the statistical test (t=16.59>1.96). That suggests a consensus on minimizing unnecessary motion among Jordanian Paint Manufacturing Organizations.

Table (4.11): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Unnecessary Motion Items.

No.	Item	M.	S.D.	t	Sig.	Imp.	Rank
1	The company reduces recurrent internal auditing.	3.52	0.91	8.60	0.00	Medium	4
2	The company sorts fast-moving goods close to the loading area.	4.08	0.78	20.73	0.00	High	1
3	The company reduces unnecessary working hours.	3.92	0.82	17.19	0.00	High	3
4	The company uses a digital system for transactions.	3.96	0.80	17.80	0.00	High	2
	Unnecessary Motion	**3.87**	**0.73**	**16.59**	**0.00**	**High**	

T-tabulated=1.96

Waiting:

Table (4.12) displays the average value of waiting items falling within the range of 3.76 and 3.86, along with a standard deviation ranging from 0.82 to 0.93. These numbers indicate a consensus among Jordanian Paint Manufacturing Organizations on moderately adopting Waiting Items. The mean value of the Waiting items is 3.80, with a standard deviation of 0.76. That indicates a consensus among Jordanian Paint Manufacturing

Organizations on the high level of implementation of the waiting variable. All Waiting elements are essential for Jordanian Paint Manufacturing Organizations, as the value of t (t=15.25) exceeds the critical value of 1.96. That reflects a consensus on the significance of Waiting at Jordanian Paint Manufacturing Organizations.

Table (4.12): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Waiting Items.

No.	Item	M.	S.D.	t	Sig.	Imp.	Rank
1	The company minimizes set-up time.	3.86	0.82	14.43	0.00	High	1
2	The company reduces customer order cycle time.	3.79	0.90	13.94	0.00	High	2
3	The company minimizes downtime.	3.78	0.91	13.01	0.00	High	3
4	The company avoids production line bottlenecks.	3.76	0.93	12.45	0.00	High	4
	Waiting	**3.80**	**0.76**	**15.25**	**0.00**	**High**	

T-tabulated=1.96

Overproduction:

Table (4.13) displays the average value of overproduction items falling within the range of 3.72 to 3.93, accompanied by a standard deviation ranging from 0.84 to 0.92. These numbers indicate a consensus among Jordanian Paint Manufacturing Organizations on the moderate adoption of Overproduction Items.

The mean value of the Overproduction items is 3.79, with a standard deviation of 0.76. That indicates a consensus among Jordanian Paint Manufacturing Organizations on the high implementation of the Overproduction variable.

Additionally, overproduced items are essential for Jordanian Paint Manufacturing Organizations, as the statistical test indicates (t=15.09>1.96). That implies a consensus on the significance of overproduction in Jordanian paint manufacturing organizations.

Table (4.13): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Overproduction Items.

No.	Item	M.	S.D.	t	Sig.	Imp.	Rank
1	The company produces the number of units per batch based on demand.	3.93	0.84	16.65	0.00	High	1
2	The company produces according to forecast.	3.74	0.90	12.18	0.00	High	3
3	The company prepares raw materials according to orders.	3.79	0.88	13.48	0.00	High	2
4	The company produces sub-assemblies based on demand.	3.72	0.92	11.79	0.00	High	4
	Overproduction	**3.79**	**0.76**	**15.09**	**0.00**	**High**	

T-tabulated=1.96

Over-processing:

Table (4.14) shows that the mean of over-processing items is between 3.14 and 3.66 with a standard deviation between 0.87 and 1.05, which means there is a semi-agreement among Jordanian Paint Manufacturing Organizations on Medium implementation of Over-processing Items. The overall mean of the over-processing items is 3.43 with a standard deviation of 0.78, which means there is an agreement among Jordanian Paint Manufacturing Organizations on the Medium implementation of the Over-processing variable. Also, all over-processing items are Essential for Jordanian Paint Manufacturing Organizations since (t=8.01>1.96). That indicates an agreement on the importance of Over-processing at Jordanian Paint Manufacturing Organizations.

Table (4.14): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Over-processing Items.

No.	Item	M.	S.D.	t	Sig.	Imp.	Rank
1	The company produces right from the first time.	3.62	0.89	10.54	0.00	Medium	2
2	The company avoids repeating faults by setting preventive procedures.	3.14	1.05	1.99	0.00	Medium	4
3	The company uses standard operating procedures.	3.31	0.90	5.20	0.00	Medium	3
4	The company avoids monitoring production through more than one system.	3.66	0.87	11.33	0.00	Medium	1
	Over-processing	**3.43**	**0.78**	**8.01**	**0.00**	**Medium**	

T-tabulated=1.96

Defects:

Table (4.15) shows the mean of Defects questions is between 3.52 and 3.65 with a standard deviation between 0.88 and 0.94, which means that there is an agreement among Jordanian Paint Manufacturing Organizations on Medium implementation of Defects Items. The overall mean of the Defects items is 3.61 with a standard deviation of 0.77, which means there is an agreement among Jordanian Paint Manufacturing Organizations on the Medium implementation of the Defects variable. Also, all Defects questions are essential for Jordanian Paint Manufacturing Organizations since (t=11.29>1.96). That indicates an agreement on the importance of Defects at Jordanian Paint Manufacturing Organizations.

Table (4.15): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Defects Items.

No.	Item	M.	S.D.	t	Sig.	Imp.	Rank
1	The company commits to the designed specifications to reduce variation.	3.64	0.90	10.68	0.00	Medium	2
2	The company commits to quality procedures to minimize the scrap.	3.63	0.91	10.11	0.00	Medium	3
3	The company responds to customer complaints to reduce defects.	3.65	0.88	11.09	0.00	Medium	1
4	The company controls the supplier's items quality to reduce defects.	3.52	0.94	8.60	0.00	Medium	4
	Defects	**3.61**	**0.77**	**11.29**	**0.00**	**Medium**	

T-tabulated=1.96

Non-utilized Resources:

Table (4.16) displays the average values of Non-utilized Resources items, ranging from 3.35 to 3.62, with a standard deviation between 0.84 and 1.04. These numbers indicate a semi-consensus among Jordanian Paint Manufacturing Organizations regarding the moderate implementation of Non-utilized Resources Items. The average value of the Non-utilized Resources items is 3.50, with a standard deviation of 0.78. That indicates that Jordanian Paint Manufacturing Organizations generally agree on a moderate level of implementation of the Non-utilized Resources variable. All unused resources are precious for Jordanian Paint Manufacturing Organizations, as indicated by the statistical significance (t=9.63>1.96). That suggests a consensus on the importance of Non-utilized Resources in Jordanian Paint Manufacturing Organizations.

Table (4.16): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Non-utilized Resources Items.

No.	Item	M.	S.D.	t	Sig.	Imp.	Rank
1	The company empowers talented employees.	3.62	0.84	11.06	0.00	Medium	1
2	The company maximizes the utilization of dead areas.	3.44	0.98	6.86	0.00	Medium	3
3	The company increases utilization of the machines at total capacity.	3.60	0.94	9.38	0.00	Medium	2
4	The company utilizes the total available warehouses.	3.35	1.04	5.05	0.00	Medium	4
	Non-utilized Resources	**3.50**	**0.78**	**9.63**	**0.00**	**Medium**	

T-tabulated=1.96

4.3 Correlation Matrix between Independent and Dependent Variables

Does the performance of Lean Manufacturing at Jordanian Paint Manufacturing Organizations correlate with the Supply Chain Components? The researcher employed Bivariate Pearson's Correlation (r) to examine the relationships among the independent, dependent, and associations between the independent and dependent variables.

The bivariate Pearson correlation table (r) (4.17) indicates that the correlations between the supply chain component variables are highly robust since all the (r) values between these variables were statistically significant. The table also demonstrates the correlations among most lean manufacturing performance factors. These results suggest satisfactory correlations among the parameters of Lean Manufacturing success. Table (4.17) shows that the degree of correlation between independent variables with each other is moderate, as it is less than 0.75. Where r ranges from 0.694 to 0.721, this confirms that the variables correlate, but the degree of this relationship is moderate. There are not very strong correlations between them, which indicates the possibility of applying multiple regression analysis. In addition, the degree of correlation between dependent variables and each other is moderate, where r ranges from 0.118 to 0.743. In comparison, the relationship between independent and dependent variables is solid, where r equals 0.937.

Table (4.17): Bivariate Pearson's Correlation (r) Among Independent Variables, Dependent variables, and between Independent and Dependent Variables.

Variables	Facilities	Inventory	Transportation	Information	Sourcing	Pricing	Supply Chain Components	Extra Transport	Excess Inventory	Unnecessary Motion	Waiting	Overproduction	Over-processing	Defects	Non-utilized Resources	Lean Manufacturing Performance
No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1																
2	.705**															
3	.799**	.668**														
4	.736**	.821**	.721**													
5	.602**	.667**	.753**	.694**												
6	.540**	.570**	.553**	.554**	.720**											
7	.886**	.929**	.937**	.920**	.851**	.728**										
8	.622**	.649**	.600**	.618**	.592**	.500**	.682**									
9	0.093	0.114	0.091	0.081	0.041	0.032	0.089	.254**								
10	.733**	.746**	.765**	.767**	.711**	.566**	.817**	.651**	0.118							
11	.669**	.710**	.664**	.618**	.567**	.518**	.716**	.438**	0.050	.545**						
12	.646**	.700**	.716**	.687**	.595**	.506**	.735**	.361**	0.029	.521**	.703**					
13	.734**	.769**	.802**	.764**	.710**	.633**	.839**	.410**	.141*	.595**	.578**	.669**				
14	.707**	.774**	.793**	.757**	.662**	.618**	.821**	.347**	0.100	.558**	.580**	.656**	.684**			
15	.712**	.783**	.769**	.753**	.689**	.608**	.821**	.523**	0.042	.655**	.575**	.608**	.718**	.743**		
16	.833**	.889**	.885**	.857**	.774**	.676**	**.937****	.662**	.323**	.784**	.759**	.780**	.865**	.845**	.830**	

****Statistically significant at the significance level ($\alpha \leq 0.01$).**

4.4 Hypothesis Testing

This section explains hypothesis testing for main and sub-hypothesis using normality, linearity, multi-collinearity, and multi-regression.

The Main Hypothesis:

Multiple regression analysis examines the relationship between the Supply Chain Components and Lean Manufacturing Performance variables to test the hypotheses. Normality, validity, reliability, multi-collinearity, independence of errors, and correlation are the presumptions that must be met to employ multiple regressions.

Normality Distribution (Histogram):

Figure (4.1) demonstrates the normal distribution of the data because the residuals do not affect it.

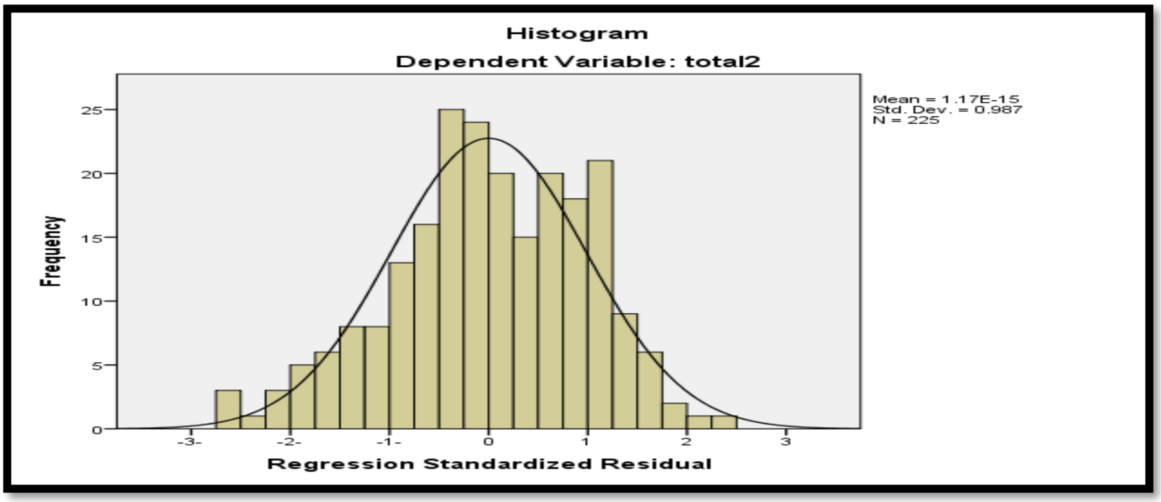


Figure (4.1): Normality Histogram.

Linearity:

Figure (4.2) demonstrates the linear relationships between the independent and dependent variables.

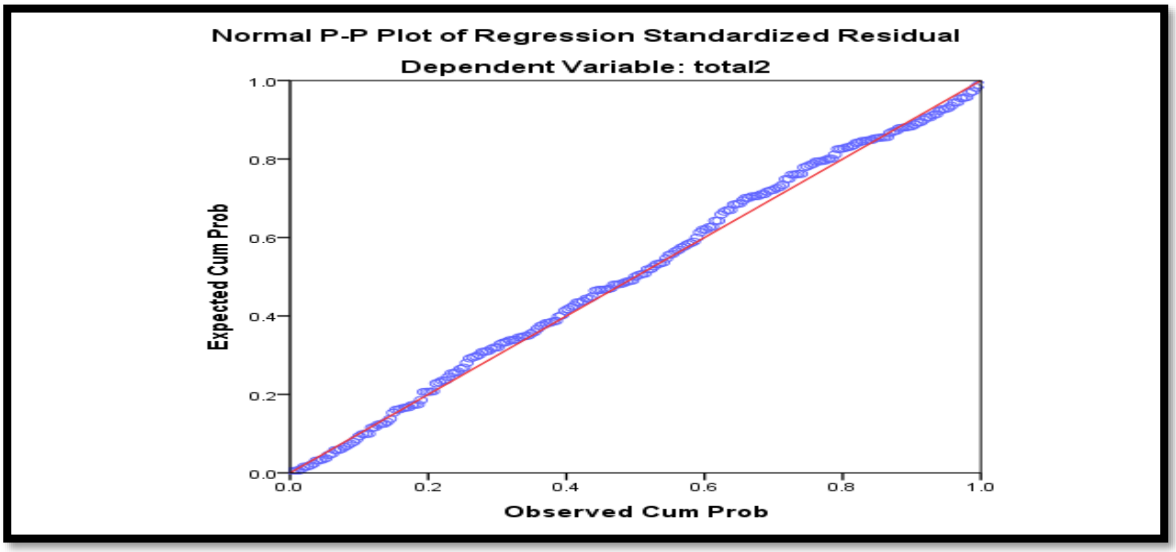


Figure (4.2): Linearity Test.

Equal variance (homoscedasticity): Figure (4.3) illustrates how the errors are dispersed around the mean, indicating no correlation between the errors and the predicted values. In this scenario, the model does not go against the assumption.

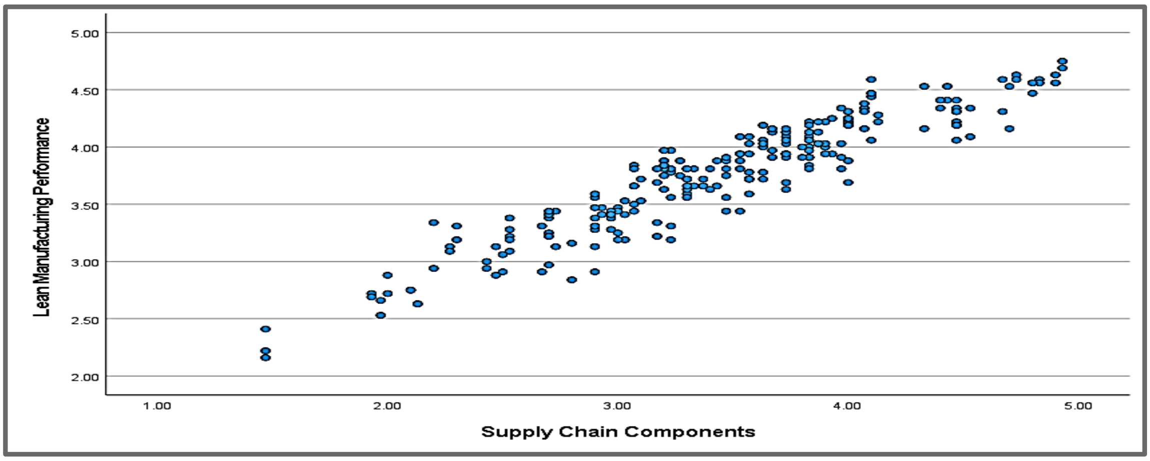


Figure: **(4.3) Linearity Test.**

Multicollinearity Test

Given normality, validity, and reliability assumptions, regression analysis can be applied in the current situation. That is particularly true after meeting the following underlying assumptions: Variance Inflation Factor (VIF) and tolerance are utilized for assessing multicollinearity. The multicollinearity assumption is not violated if the Variance Inflation Factor (VIF) is less than ten and the tolerance is more than 0.20.

Table (4.18) indicates that the VIF values are below ten and the tolerance values are over 0.10. That suggests that there is no presence of multicollinearity among the independent variables in the study.

Table (4.18): Multi-Collinearity Tests for Main Hypothesis.

Components	Tolerance	VIF
Facilities (Place and Capacity)	0.18	5.70
Inventory	0.12	8.46
Transportation	0.11	9.08
Information	0.12	8.15
Sourcing	0.25	3.99
Pricing	0.44	2.26

Multiple linear Regression:

Hypothesis H_{01}: Supply chain components (facilities, inventory, transportation, information, sourcing, and pricing) do not impact lean manufacturing of Jordanian Paint organizations' performance at ($\alpha \leq 0.05$). Table (4.19) shows that when regressing the independent variables of supply chain components, integration together against dependent impact lean manufacturing. R^2 indicates the model's fitness for multiple regressions and explains the variance of the independent variable on the dependent variable.

Table (4.19): Multiple Regressions Supply Chain Components Sub-variables on Lean Manufacturing Performance.

Model	R	R^2	Adjusted R^2	F	Sig.
1	0.937[a]	0.877	0.878	270.447	0.000[b]

a. Predictors (Constant): Facility, Inventory, Transportation, Information, Sourcing, and Pricing.
b. Dependent Variable: Lean Manufacturing.

Since R^2 is 87.7%, the independent variable can explain 87.7% of the variance on the dependent variable (R^2=87.7%, F=270.447, Sig.=0.000). Consequently, the null hypothesis is rejected, and the alternative hypothesis is accepted: supply chain components (facilities, inventory, transportation, information, sourcing, and pricing) impact lean manufacturing of Jordanian Paint organizations' performance at ($\alpha \leq 0.05$). Table (4.20) shows the significant effect of each independent variable on the dependent variable.

Table (4.20): Results of Multiple Regressions Analysis (Coefficients [a]): Regressing Supply Chain Components Variables against Total Lean Manufacturing Dimensions.

	Model	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.501	0.072	-	20.887	0.000
	Facilities (Place and Capacity)	0.062	0.030	0.112	2.094	0.037
	Inventory	0.192	0.041	0.310	4.711	0.000
	Transportation	0.138	0.041	0.230	3.376	0.001
	Information	0.079	0.042	0.125	1.875	0.062
	Sourcing	0.065	0.031	0.092	2.080	0.039
	Pricing	0.119	0.026	0.161	4.603	0.000

a. Dependent Variable: Lean Manufacturing Performance.
T-tabulated=1.960

Sub-Hypothesis:

Hypothesis $H_{01.1}$: The performance of Jordanian Paint organizations' lean manufacturing is not impacted by facilities management, with a significance at ($\alpha \leq 0.05$).

The data presented in Table (4.20) demonstrates that the facility variable (Place and capacity) significantly impacts lean manufacturing performance in Jordanian Paint Manufacturing Organizations. The values of Beta and t-value are 0.112 and 2.094, respectively, and these figures are statistically significant at ($\alpha \leq 0.05$). Thus, the null hypothesis is disproven, and the alternative hypothesis is supported.

Hypothesis $H_{01.2}$: The performance of Jordanian Paint organizations' lean manufacturing is not impacted by inventory management, with a significance at ($\alpha \leq 0.05$).

The data presented in Table (4.20) demonstrates a significant relationship between the Inventory variable and Lean Manufacturing Performance in Jordanian Paint Manufacturing Organizations. The values of Beta and t-value are 0.310 and 4.711, respectively, and these figures are statistically significant at ($\alpha \leq 0.05$). Thus, the null hypothesis is refuted, and the alternative hypothesis is affirmed.

Hypothesis $H_{01.3}$: The performance of Jordanian Paint organizations' lean manufacturing is not impacted by transportation management, with a significance at ($\alpha \leq 0.05$).

The data presented in Table (4.20) demonstrates that the Transportation variable significantly impacts Lean Manufacturing Performance in Jordanian Paint Manufacturing Organizations. The values of Beta and t-value are 0.230 and 3.376, respectively, and these figures are statistically significant at ($\alpha \leq 0.05$). Thus, the null hypothesis is refuted, and the alternative hypothesis is affirmed.

Hypothesis $H_{01.4}$: The performance of Jordanian Paint organizations' lean manufacturing is not affected by information management, with a significance at ($\alpha \leq 0.05$).

The data presented in Table (4.20) indicates that the Information variable does not significantly impact Lean Manufacturing Performance in Jordanian Paint Manufacturing Organizations. The values of Beta and t, which are 0.125 and 1.875, respectively, do not reach statistical significance at ($\alpha \leq 0.05$). Therefore, the null hypothesis is accepted, whereas the alternative hypothesis is rejected.

Hypothesis $H_{01.5}$: The performance of Jordanian Paint organizations' lean manufacturing is not impacted by sourcing management, with a significance at ($\alpha \leq 0.05$).

The data in Table (4.20) demonstrates that the Sourcing variable significantly impacts Lean Manufacturing Performance in Jordanian Paint Manufacturing Organizations. The values of Beta and t-value are 0.092 and 2.080, respectively, and these figures are statistically significant at ($\alpha \leq 0.05$). Thus, the null hypothesis is refuted, and the alternative hypothesis is affirmed.

Hypothesis $H_{01.6}$: The pricing management does not significantly impact the success of lean manufacturing in Jordanian Paint organizations, with a significance at ($\alpha \leq 0.05$).

The data presented in Table (4.20) demonstrates a significant impact of the Pricing variable on Lean Manufacturing Performance at Jordanian Paint Manufacturing Organizations. The values of Beta and t-value are 0.161 and 4.603, respectively, and these figures are statistically significant at ($\alpha \leq 0.05$). Thus, the null hypothesis is refuted, and the alternative hypothesis is affirmed.

In summary, the most robust dimension in Supply Chain Components implemented at Jordanian Paint Organization is pricing, the strongest dominion in Lean Manufacturing Performance implemented at Jordanian Paint Organization is Extra Transportation, the most robust dimension in Supply Chain Components implemented at Jordanian Paint Organization affected on Lean Manufacturing Performance at Jordanian Paint Organization. Finally, the relationship between Supply Chain Components and Lean Manufacturing Performance at Jordanian Paint Organization is linear.

Stepwise Multiple Regression:

Table (4.21) Summarizes stepwise multiple regression where Model (1) explains the impact of Facilities on lean manufacturing performance, Model (2) explains the impact of Facilities and Inventory on lean manufacturing performance, Model (3) explains the impact of Facilities, Inventory, and Transportation on lean manufacturing performance, Model (4) explains the impact of Facilities, Inventory, Transportation, and Information on lean manufacturing performance, Model (5) explains the impact of Facilities, Inventory, Transportation, Information, and Sourcing on lean manufacturing performance, Model (6) explains the impact of Facilities, Inventory, Transportation, Sourcing, Pricing on lean manufacturing performance, Model (7) explains the impact of Facilities, Inventory, Transportation, and Sourcing on lean manufacturing performance.

Table (4.21): Stepwise Multiple Regressions Supply Chain Components Sub-variables on Lean Manufacturing Performance.

Model	R	R^2	Adjusted R^2	F	Sig.
1	0.832[a]	0.693	0.691	502.983	0.000[h]
2	0.892[b]	0.795	0.793	430.971	0.000[h]
3	0.919[c]	0.845	0.843	401.089	0.000[h]
4	0.923[d]	0.853	0.850	318.415	0.000[h]
5	0.933[e]	0.870	0.867	293.269	0.000[h]
6	0.932[f]	0.869	0.867	365.244	0.000[h]
7	0.939[g]	0.880	0.877	320.157	0.000[h]

a. **Predictors: (Constant), Facilities.**
b. **Predictors: (Constant), Facilities, Inventory.**
c. **Predictors: (Constant), Facilities, Inventory, Transportation.**
d. **Predictors: (Constant), Facilities, Inventory, Transportation, Information.**
e. **Predictors: (Constant), Facilities, Inventory, Transportation, Information, Sourcing.**
f. **Predictors: (Constant), Facilities, Inventory, Transportation, Sourcing.**
g. **Predictors: (Constant), Facilities, Inventory, Transportation, Sourcing, Pricing.**
h. **Dependent Variable: Lean Manufacturing.**

Table (4.22) Summarizes stepwise multiple regression where Model (1) explains that there is significantly impact of Facilities with effect size (Beta) equal 0.832 on lean manufacturing performance at ($\alpha \leq 0.05$) where all null hypotheses are rejected and alternative hypotheses are accepted where t-value>1.96 in this model, Model (2) explains that there is significantly impact of Facilities and Inventory with effect size (Beta) equal 0.150, and 0.754 respectively on lean manufacturing performance at ($\alpha \leq 0.05$) where all null hypotheses are rejected and alternative hypotheses are accepted where t-value >1.96 in this model, Model (3) explains that there is significantly impact of Inventory and Transportation with effect size (Beta) equal 5.236 and 0.449 respectively on lean manufacturing performance at ($\alpha \leq 0.05$) where all null hypotheses are rejected and alternative hypotheses are accepted where t-value >1.96 in this model except null facilities' hypothesis is accepted since (t-value= 1.842 <1.96) in this model, Model (4) explains that there is significantly impact of Facilities, Inventory, Transportation, and Information with effect size (Beta) equal 0.140, 0.354, 0.251, and 0.232 respectively on lean manufacturing performance at ($\alpha \leq 0.05$) where all null hypotheses are rejected and alternative hypotheses are accepted where t-value >1.96 in this model, Model (5) explains that there is significantly impact of Facilities, Inventory, Transportation, and Sourcing with effect size (Beta) equal 0.139, 0.355, 0.222, and 0.218 respectively on lean manufacturing performance at ($\alpha \leq 0.05$) where all null hypotheses are rejected and alternative hypotheses are accepted where t-value >1.96 in this model except null information's hypothesis is accepted since (t-value= 1.254 <1.96), Model (6) explains that there is significantly impact of Facilities, Inventory, Transportation, Sourcing, Pricing with effect size (Beta) equal 0.131, 0.369, 0.282, and 0.237 respectively on lean manufacturing performance at ($\alpha \leq 0.05$) where all null hypotheses are rejected and alternative hypotheses are accepted where t-value >1.96 in this model, Model (7) explains that there is significantly impact of Inventory, Transportation, and Sourcing with effect size (Beta) equal 0.340, 0.321, 0.131, and 0.153 respectively on lean manufacturing performance at ($\alpha \leq 0.05$) where all null hypotheses are rejected and alternative hypotheses are accepted where t-value >1.96 in this model except null facilities' hypothesis is accepted since (t-value= 1.909 <1.96).

In summary, the best-case scenario is model (6) where all components' t- values greater than t- tabulated and has the largest effect size.

Table (4.22): Results of Stepwise Multiple Regressions Analysis (Coefficients [a]): Regressing Supply Chain Components Variables against Total Lean Manufacturing Dimensions.

	Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.310	0.067	-	34.466	0.000
	Facilities (Place and Capacity)	0.446	0.020	0.832	22.427	0.000
2	(Constant)	2.015	0.062	-	32.685	0.000
	Facilities (Place and Capacity)	0.080	0.038	0.150	2.095	0.037
	Inventory	0.452	0.043	0.754	10.533	0.000
3	(Constant)	1.925	0.055	-	35.119	0.000
	Facilities (Place and Capacity)	0.062	0.034	0.115	**1.842**	0.067
	Inventory	0.237	0.045	0.396	5.236	0.000
	Transportation	0.262	0.031	0.449	8.408	0.000
4	(Constant)	1.848	0.058	-	31.819	0.000
	Facilities (Place and Capacity)	0.075	0.033	0.140	2.277	0.024
	Inventory	0.213	0.045	0.354	4.740	0.000
	Transportation	0.147	0.045	0.251	3.238	0.001
	Information	0.146	0.043	0.232	3.430	0.001
5	(Constant)	1.686	0.062	-	27.073	0.000
	Facilities (Place and Capacity)	0.074	0.031	0.139	2.394	0.017
	Inventory	0.213	0.042	0.355	5.049	0.000
	Transportation	0.129	0.043	0.222	3.024	0.003
	Information	0.054	0.043	0.086	**1.254**	0.211
	Sourcing	0.147	0.027	0.218	5.407	0.000
6	(Constant)	1.696	0.062	-	27.420	0.000
	Facilities (Place and Capacity)	0.070	0.031	0.131	2.267	0.024
	Inventory	0.221	0.042	0.369	5.288	0.000
	Transportation	0.164	0.032	0.282	5.058	0.000
	Sourcing	0.160	0.025	0.237	6.390	0.000
7	(Constant)	1.525	0.071	-	21.422	0.000
	Facilities (Place and Capacity)	0.057	0.030	0.106	**1.909**	0.058
	Inventory	0.204	0.040	0.340	5.052	0.000
	Transportation	0.187	0.032	0.321	5.921	0.000
	Sourcing	0.088	0.029	0.131	3.033	0.003
	Pricing	0.113	0.026	0.153	4.378	0.000

a. Dependent Variable: Lean Manufacturing Performance.
T-tabulated=1.960

Chapter Five
Results' Discussion, Conclusion, and Recommendations

5.1 Results' Discussion

The study reveals a significant prevalence of utilizing different sub-variables of Supply Chain Components in Jordanian Paint Manufacturing Organizations. Inventory is the most widely used out of these sub-variables, with Transportation and Pricing being implemented to a lesser extent. The application of sourcing and facilities is notable.

Further investigation is warranted due to the limited influence of Information on lean manufacturing performance in Jordanian paint businesses, even when considering confidence, at ($\alpha \leq 0.05$). The little impact might be ascribed to the efficacy of the current information management systems employed by these companies, such as not using an Enterprise Resource Planning (ERP) system professionally and a lack of gathering data about the competitors, customers, suppliers, and suppliers of suppliers dynamically according to updates. The origin of this might also be attributed to the level of development of lean manufacturing processes inside these organizations, suggesting that the existing systems sufficiently facilitate lean practices without substantial reliance on information-related elements. Furthermore, the evaluation methods used to estimate the impact of information management may be inappropriate or not fully capture the subtleties of its effect. Moreover, the outcomes could be impacted by market and industry-specific characteristics commonly seen in the Jordanian setting. The absence of influence does not inherently reduce the significance of information management. Still, it highlights the complex nature of the several elements that affect lean manufacturing efficiency in this specific context.

The study indicates that Information is not the main factor affecting lean manufacturing performance in Jordanian paint companies.

However, inventory, transportation, and pricing are crucial in determining efficiency. Thorough investigation and sophisticated comprehension of the contextual dynamics are essential for revealing the complexities of lean manufacturing in this particular industry inside the Jordanian Manufacturers.

The results of this study indicate that there are medium to high implementations for supply chain components, pricing, sourcing, information, inventory, transportation, and facilities, respectively, at Jordanian Paint Organizations. There are medium to high implementations for lean manufacturing performance, extra transport, excess inventory, unnecessary motion, waiting, overproduction, defects, non-utilized resources, and over-processing, respectively, at Jordanian Paint Organizations. There are the relationships between sub-variables for supply chain components, between sub-variables for lean manufacturing, and between sub-variables for supply chain components and lean manufacturing at Jordanian Paint Organizations. The inventory strongly affects lean manufacturing, followed by pricing, transportation, facilities, and sourcing. The information does not affect lean manufacturing; supply chain components generally impact lean manufacturing, so all null hypotheses are rejected except the information's hypothesis is accepted.

These organizations deliberately choose to prioritize inventory management strategically. By prioritizing this sub-variable, organizations may ensure that their resources and efforts are directed toward the most influential aspects of their supply chain. This strategic alignment is likely a result of a strong understanding of certain operational obstacles and market demands. It demonstrates a focused strategy to meet the specific needs of the paint manufacturing industry in Jordan, highlighting a dedication to improving processes that align with industry trends and overall corporate goals.

The prevalence of effective inventory management in Jordanian paint manufacturing institutions, with inventory management being the most widely adopted sub-variable, can be attributed to many variables. Efficient inventory management is vital in the coating industry because it maintains a delicate equilibrium between raw materials and final products, frequently susceptible to storage conditions and shelf-life limitations. Furthermore, efficient inventory management is crucial in minimizing expenses, maximizing storage capacity, and guaranteeing prompt product availability in a fiercely competitive market like Jordan. These factors are essential for maintaining customer satisfaction and ensuring the firm's long-term viability. The emphasis on inventory indicates a deliberate decision by these organizations to allocate resources and efforts toward the most influential aspects of their supply chain to unique operational difficulties and market demands.

The study findings indicate a typical application of supply chain components in paint manufacturing organizations in Jordan. The transportation and pricing components demonstrate a moderate level of implementation, while the supply and facilities components follow suit. The heightened attention on transportation and pricing may stem from escalating transportation expenses or challenges in ascertaining product prices. These factors have a direct impact on production costs and earnings. However, the execution of facility components can be subpar due to insufficient focus on these issues or an inability to make substantial enhancements. That may be attributed to difficulties in sourcing procedures, such as ensuring the sustainable source of raw materials or minimizing inventory expenses.

Furthermore, updating facilities to align with contemporary manufacturing requirements can take time and effort. To summarize, these findings provide guidance to paint manufacturing organizations in Jordan on enhancing supply chain components with a more straightforward implementation process than others. That will improve lean manufacturing performance directly.

Table (5.1) provides a detailed overview of the impact matrix obtained from ANOVA analysis, illustrating the connections between the sub-variables of Supply Chain Components (facilities, inventory, transportation, information, sourcing, and pricing) and their effect on Lean Manufacturing Performance metrics. The Lean Manufacturing Performance measures include Extra Transport, Excess Inventory, Unnecessary Motion, Waiting, Overproduction, Over-processing, Defects, and Non-utilized Resources.

The analytical results offer valuable insights into the statistical importance of these correlations, enhancing the comprehension of the interactions between supply chain components and lean manufacturing effectiveness.

Table (5.1): Summary of Multiple Regressions of Supply Chain Components Sub-Variables on Lean Manufacturing Performance (ANOVA).

No.	Dimensions (Independent Variables)	Lean Manufacturing Performance (Dependent Variables)
1	Supply Chain Components	+
2	Facilities (Capacity and Place)	+
3	Inventory	+
4	Transportation	+
5	Information	
6	Sourcing	+
7	Pricing	+

+: Significant Impact.

1- These findings confirm and strengthen the crucial role different components play in the supply chain in defining and improving the efficiency of Lean Manufacturing Performance. Boonjing et al. (2015) support the results of this study on the significant impact of various Supply Chain components, such as facilities, inventory, transportation, information, sourcing, and pricing, on Lean Manufacturing Performance.

2- Facilities may arise from challenges faced in the procurement procedures, such as guaranteeing the environmentally responsible acquisition of raw materials, efficiently minimizing inventory expenses, choosing the nearest suppliers, designing the capacity based on demand, and selecting warehouses closest to customers. Furthermore, there may be difficulties in sufficiently upgrading facilities to meet the requirements of current manufacturing methods. Hadrawi (2019) study supports that the significant impact of sub-variables in facilities management on Lean Manufacturing Performance is likely due to a need for more emphasis or difficulties in attaining substantial enhancements in these areas.

3- The significant impact of inventory management on the efficiency of lean manufacturing in Jordanian Paint organizations is remarkable. The influence can be ascribed to the crucial significance of efficient inventory management in the coating sector. Ensuring the equilibrium of raw materials and final items is vital due to their susceptibility to storage conditions and limited shelf life. The effective control and organization of inventory are essential in enhancing the overall efficiency of lean manufacturing processes in this particular setting. Hani (2021) study supports the results in this study.

4- This influence of transportation can be explained by transportation costs or difficulties in determining precise product pricing, selecting suitable transport modes, minimizing lead time, and frequently reshipping according to forecast demand. These factors directly impact lean production. The importance of transportation management resides in its capacity to either enhance cost efficiency or present obstacles that directly hinder lean manufacturing performance, highlighting the complex connection between efficient logistics and overall operational success in this industry. Novais et al. (2020) study supports that the influence of transportation management on the efficiency of lean manufacturing is significant.

5- The lack of significant influence of information management on the performance of lean manufacturing in Jordanian Paint organizations can be attributed to the effectiveness of current information management systems and the high level of maturity of lean manufacturing processes in these firms. Furthermore, restricted methods to assess this effect and the impact of market and industry-specific factors in Jordan add to this conclusion. These facts indicate that, in this particular setting, other factors may have a more significant influence on improving lean manufacturing efficiency at ($\alpha \leq 0.10$). Garcia-Buendia et al. (2021) study supports the survey's results by impacting information on five lean operations.

6- The efficacy of sourcing methods substantially affects the overall efficiency of lean manufacturing processes in the specific context of paint manufacture in Jordan. Awan et al. (2022); (Nimeh et al., 2018) studies support the results of this study, which demonstrates that sourcing management significantly impacts lean manufacturing performance in Jordanian paint firms.

7- The efficacy of lean manufacturing in Jordanian Paint organizations is notably impacted by pricing management. The results highlight the importance of well-designed pricing strategies in influencing and improving the overall effectiveness of lean manufacturing processes in the Jordanian paint sector. Al-Tit (2016) study supports the results of this study.

5.2 Conclusion

This research aims to investigate the impact of the sub-variables of the Supply Chain components (facilities, inventory, transportation, information, sourcing, and pricing) on Lean Manufacturing Performance. The data for this inquiry was collected using a well-tested and dependable questionnaire. The study used correlation and multiple regression analysis to examine the formulated hypotheses rigorously. The study demonstrates a significant focus on inventory management in Jordanian paint manufacturing institutes, with inventory management being the most widely adopted sub-variable. The emphasis on effective inventory management in the coating business is justified by the urgent necessity to maintain a delicate equilibrium of raw materials and finished items and balance them between supply and demand. These resources and goods are susceptible to storage conditions and shelf life, making proper management important.

Moreover, the study reveals the typical incorporation of supply chain elements in paint manufacturing companies in Jordan. The transportation and pricing components are implemented modestly, while the sourcing and facilities components follow suit. The increased attention given to transportation and pricing factors can be attributable to rising transportation expenses or difficulties in effectively establishing product prices. These findings provide significant insights for paint manufacturing organizations in Jordan, helping them enhance supply chain components with reduced implementation. Organizations can strengthen local and global competitiveness by improving operational efficiency in these domains.

5.3 Recommendations

5.3.1 Recommendations for Jordanian Paint Manufacturing Organizations

- The study proposes that Jordanian Paint Manufacturing Organizations should include tools for the Supply Chain component in their strategic objectives and operational processes, which would be advantageous.
- The study suggests that Jordanian Paint Manufacturing Organizations should adopt a collaborative approach in implementing the various components of the Supply Chain, acknowledging their interconnectedness and reciprocal influence on one another.
- The study recommends Jordanian Paint Manufacturing Organizations focus on logistical components (facility, inventory, and transportation) more than cross-logistical components (information, sourcing, and pricing); logistic components are controllable; in addition, these dimensions have a substantial impact on lean manufacturing as a bulk rather than cross-logistic components.
- The paper recommends Jordanian Paint Manufacturing Organizations focus on components of the supply chain, especially the inventory component, which has a direct impact on lean manufacturing by employing inventory metrics by establishing minimum safety stock, monitoring turnover, and applying First-In-First Out (FIFO) for all kinds of stock.
- The paper proposes that Jordanian Paint Manufacturing Organizations should implement strategies, utilize resources, and employ Key Performance Indicators (KPIs) to evaluate the progress of supply chain enhancement. That entails the assessment, standardization, and juxtaposition of its constituents with other entities within the paint production industry.

- The study proposes that Jordanian Paint Manufacturing Organizations establish a specialized office that conducts regular audits and supervises supply chain management.
- This study recommends that Jordanian Paint Manufacturing Organizations recruit a third partner to manage logistics or cross-logistics efficiently. That may be cost-effective but guaranteed to reduce eight wastes according to the cost-benefits strategy.
- This study recommends that Jordanian Paint Manufacturing Organizations prioritize the adoption of long-term contracts with suppliers and vendors. Furthermore, it proposes jointly sharing demand forecasting with partners to create a comprehensive long-term demand plan.
- This study proposes that Jordanian Paint Manufacturing Organizations should prioritize fostering employee creativity using ongoing training, active participation, and empowerment. The implementation of a dependable incentive system supports this recommendation.

5.3.2 Recommendations for Academics and Future Research

- Considering that this study focuses on managers and leaders in Jordanian Paint Manufacturing Organizations, it is advisable to include personnel from other hierarchical levels in future research.
- It is advisable to reproduce it in other countries within the same industry, considering that the study focuses on Jordanian Paint Manufacturing Organizations in Jordan. It is essential to prioritize performing research in other Arab countries due to their shared social and cultural lifestyles. That will increase

the relevance of the study's findings in a broader regional context and enhance the generalizability of this study.

- Given the exclusive focus on a single Jordanian Paint Manufacturing Organization in this study, it is recommended that the same variables be applied to other manufacturing industries to achieve a more thorough and diverse knowledge.
- Due to the study's restricted timeline, conducting a follow-up study at a suitable interval is advisable to evaluate industry advancements over time.
- Many studies could be derived from this study by taking some parts of independent or dependent sub-variables and running a new study.

Examining the analyses across many industries and nations offers prospects for further research. That can be accomplished by more comprehensive testing using larger samples within the same industry. Incorporating diverse industries can effectively tackle the issue of making broad conclusions that apply to different organizations and sectors.

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Appendices

Appendix (1): Panel of Referees Committee:

No.	Name	Qualification	Organization
1	Prof. Azzam Abou Moghli	Ph. D. Management	Middle East University
2-	Prof. Ahmad Ali Salih	Ph. D. Management	Middle East University
3-	Prof. Ali Elidable	Ph. D. Management	Middle East University
4-	Prof. Ahmad Ghandour	Ph. D. Management	Middle East University
5-	Prof. Loay Salheih	Ph. D. Management	Israa University
6-	Dr. Husam Yaseen	Ph. D. Management	Middle East University
7-	Dr. Gufran Saeed Hajjawy	Ph. D. Management	The World Islamic Sciences and Education University
8-	Dr. Nidal Amin Al-salhi	Ph. D. Management	Petra University
9-	Dr. Mohammad Meziad Al-junidi	Ph.D. Management	Petra University
10-	Dr. Murad Salim Attiany	Ph. D. Management	Israa University
11-	Eng. Jameel Al-Qudah	Operation Manager	National Paint Industry
12-	Eng. Nawras Al Remawi	Supply chain Manager	Al-Jazeera Paint Industry
13-	Eng. Lawzat Abu Shehadeh	Factory Manager	Golden Paint Industry
14-	Eng. Hesham Atteih	Logistic Manager	National Paint Industry
15-	Eng. Mohammed Mahameed	Logistic Manager	Jotun Paint Industry

Appendix (2): Letter and Questionnaire of Respondents

جـــامـعـــة الـــشـرق الأوسـط
MIDDLE EAST UNIVERSITY
Amman - Jordan

Questionnaire

Dear Participant:

The purpose of this master thesis is to study **"The Impact of Supply Chain Components on Lean Manufacturing Performance at Jordanian Paint Manufacturing Organizations."**

This research contains 62 questions, which may take 20 minutes to answer; therefore, the researcher thanks you for the valuable time you spent answering them. Your answers will be highly confidential and used for research purposes only. Again, the researcher appreciates your participation in this research; if you have any questions or comments, call (00962786887564).

Thank you for your fruitful cooperation.

Researcher: Omar Abedelmahdi Taha Abu Taha
Supervisor: Prof. Dr. Abdel Aziz Ahmad Sharabati

Part (1): Demographic Information.

Gender: □ Male □ Female

Age (years): □ Less than 30 □ 30-40 □ 41-50 □ More than 50

Experience (years): □ 9 or less □ 10-19 □ 20-29 □ 30 and more

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

Position: □ Director □ Head of Department □ Supervisor □ Employee

Division: □Administration □Operations □Commercial/Marketing □Finance/Accounting

Part (2):

The following 62 questions test Jordanian Paint Manufacturing Companies employees' perception of the implementation. Please rate each question according to actual implementation and not based on your beliefs.

Hint: 1 = Never Implemented, 2 = Slightly Implemented, 3 = Sometimes, 4 = Almost Implemented, 5 = Frequently Implemented.

NO.	Question	strongly unimplemented	unimplemented	normal	implemented	strongly implemented
1	**Facilities (Place and Capacity)**					
1	The company chooses an expandable place based on demand.	1	2	3	4	5
2	The company chooses the nearest suppliers.	1	2	3	4	5
3	The company chooses warehouses nearest to customers.	1	2	3	4	5
4	The company designs the capacity based on demand.	1	2	3	4	5
5	The company chooses warehouses near the ports.	1	2	3	4	5
2	**Inventory**					
6	The company maximizes turnover of inventory.	1	2	3	4	5
7	The company holds the lowest limit of safety stock to avoid shortage.	1	2	3	4	5
8	The company holds a suitable level of inventory for seasonal demand.	1	2	3	4	5
9	The company provides suitable conditions for inventory.	1	2	3	4	5
10	The company orders economic order quantity.	1	2	3	4	5
3	**Transportation**					
11	The company selects suitable transport modes.	1	2	3	4	5

12	The company uses suitable methods to unload containers to save time.	1	2	3	4	5
13	The company minimizes lead time.	1	2	3	4	5
14	The company uses a tracking transportation system to define arrival time.	1	2	3	4	5
15	The company reships frequently according to forecast demand.	1	2	3	4	5
4	**Information**					
16	The company uses an Enterprise Resource Planning (ERP) system.	1	2	3	4	5
17	The company gathers data about its competitors.	1	2	3	4	5
18	The company gathers data about the customers.	1	2	3	4	5
19	The company gathers data about the suppliers.	1	2	3	4	5
20	The company gets information about suppliers of suppliers.	1	2	3	4	5
5	**Sourcing**					
21	The company selects relevant suppliers for its core business.	1	2	3	4	5
22	The company selects more than one supplier for one item.	1	2	3	4	5
23	The company sets criteria to select suppliers.	1	2	3	4	5
24	The company negotiates with suppliers to set details.	1	2	3	4	5
25	The company decides to make\buy to select outsourcing.	1	2	3	4	5
6	**Pricing**					
26	The company sets prices to compete with competitor’s prices.	1	2	3	4	5
27	The company divides pricing according to customer segments.	1	2	3	4	5
28	The company changes prices based on the level of demand.	1	2	3	4	5
29	The company maximizes the customer value to optimize price.	1	2	3	4	5
30	The company sets prices based on the seasons.	1	2	3	4	5
7	**Extra Transport**					
31	The company commits to on-time product delivery for customers.	1	2	3	4	5
32	The company maximizes cargo quantity per shipment.	1	2	3	4	5
33	The company chooses the best route for transportation.	1	2	3	4	5
34	The company monitors shipping to avoid damage during transport.	1	2	3	4	5
8	**Excess Inventory**					
35	The company applies a Re-Order Point (ROP) for items.	1	2	3	4	5
36	The company applies a Just in Time (JIT) inventory process.	1	2	3	4	5
37	The company confirms that physical inventory counts match inventory records.	1	2	3	4	5
38	The company works according to First In, First Out (FIFO).	1	2	3	4	5
9	**Unnecessary Motion**					
39	The company reduces recurrent internal auditing.	1	2	3	4	5
40	The company sorts fast-moving goods close to the loading area.	1	2	3	4	5
41	The company reduces unnecessary working hours.	1	2	3	4	5
42	The company uses a digital system for transactions.	1	2	3	4	5
10	**Waiting**					
43	The company minimizes set-up time.	1	2	3	4	5
44	The company reduces customer order cycle time.	1	2	3	4	5
45	The company minimizes downtime.	1	2	3	4	5
46	The company avoids production line bottlenecks.	1	2	3	4	5
11	**Overproduction**					

47	The company produces the number of units per batch based on demand.	1	2	3	4	5
48	The company produces according to forecast.	1	2	3	4	5
49	The company prepares raw materials according to orders.	1	2	3	4	5
50	The company produces sub-assemblies based on demand.	1	2	3	4	5
12	**Over-processing**					
51	The company produces right from the first time.	1	2	3	4	5
52	The company avoids repeating faults by setting preventive procedures.	1	2	3	4	5
53	The company uses standard operating procedures.	1	2	3	4	5
54	The company avoids monitoring production through more than one system.	1	2	3	4	5
13	**Defects**					
55	The company commits to the designed specifications to reduce variation.	1	2	3	4	5
56	The company commits to quality procedures to minimize the scrap.	1	2	3	4	5
57	The company responds to customer complaints to reduce defects.	1	2	3	4	5
58	The company controls the supplier's items quality to reduce defects.	1	2	3	4	5
14	**Non-utilized Resources**					
59	The company empowers talented employees.	1	2	3	4	5
60	The company maximizes the utilization of dead areas.	1	2	3	4	5
61	The company increases utilization of the machines at total capacity.	1	2	3	4	5
62	The company utilizes the total available warehouses.	1	2	3	4	5

Appendix (3): Letter and Questionnaire of Respondents (Arabic version):

جامعة الشرق الأوسط
MIDDLE EAST UNIVERSITY
Amman - Jordan

الاستبانة

حضرة المشارك:

ان الغرض من رسالة الماجستير هذه هو معرفة **" أثر مكونات سلسلة التوريد على أداء التصنيع الرشيق في منظمات تصنيع الدهانات الأردنية".**

يحتوي هذا البحث على 62 سؤالاً قد تستغرق الإجابة عليها 20 دقيقة؛ ولذلك فإننا سنكون شاكرين لك على تخصيص وقتك الثمين للإجابة عليها. ستكون إجاباتك سرية للغاية وسيتم استخدامها لأغراض البحث فقط. مرة أخرى، نحن نقدر مشاركتك في هذا البحث. من فضلك، إذا كان لديك أي أسئلة أو تعليقات، الاتصال على (00962786887564).

أشكركم على تعاونكم المثمر.

الباحث: **عمر عبد المهدي طه أبو طه**

المشرف: **الأستاذ الدكتور عبد العزيز أحمد الشرباتي**

الجزء الاول : المعلومات الديموغرافية

الجنس: □ ذكر □ أنثى

العمر : □ أقل من 30 عامًا □ 30-40 عامًا □ 41-50 عامًا □ أكثر من 50 عامًا

الخبرة: □ 9 سنوات أو أقل □ 10-19 سنة □ 20-29 سنة □ 30 سنة فأكثر

التعليم: □ دبلوم □ بكالوريوس □ ماجستير □ دكتوراه.

المنصب: □ مدير □ رئيس القسم □ مشرف □ الموظفين

القسم: □ الإدارة □ العمليات □ التجارية/التسويق □ المالية/المحاسبة

الجزء الثاني:

يحتوي الجزء التاني على 62 سؤالًا تختبر تصورات موظفي شركات التصنيع الدهانات من فضلك، قم بتقييم كل سؤال وفقا للتنفيذ الفعلي وليس استنا ًدا إلى اعتقادك.

حيث ان : [1 = غير مطبق بقوة، 2 = غير مطبق، 3 = عادي، 4 = مطبق، 5 = مطبق بقوة].

الرقم	السؤال	غير مطبق بشدة	غير مطبق	محايد	مطبق	مطبق بشدة
		1	2	3	4	5
.1	**المرافق (المكان والسعة)**					
.1	تختار الشركه المكان القابل للتوسع حسب الطلب.	1	2	3	4	5
.2	تختار الشركه الموردين الاقرب.	1	2	3	4	5
.3	تختار الشركه المستودعات الاقرب للزبائن.	1	2	3	4	5
.4	تصمم الشركة السعة بناءا على الطلب.	1	2	3	4	5
.5	تختار الشركة المستودعات بقرب الموانئ.	1	2	3	4	5
.2	**المخزون**					
.6	تزيد الشركة من حركة دوران المخزون.	1	2	3	4	5
.7	تحتفظ الشركة بالحد الأدنى من المخزون لتتجنب الانقطاع.	1	2	3	4	5
.8	تمتلك الشركة مستوى مناسبا من المخزون للطلب الموسمي.	1	2	3	4	5
.9	توفر الشركة الظروف المناسبة للمخزون.	1	2	3	4	5
.10	تقوم الشركة بطلب كميات تلبي الحاجة مع أقل الكلف الممكنة.	1	2	3	4	5
.3	**النقل**					
.11	تختار الشركة وسائط النقل المناسبة.	1	2	3	4	5
.12	تستخدم الشركة طرقا مناسبة لتفريغ الحاويات لتوفير الوقت.	1	2	3	4	5
.13	تقلل الشركة من الوقت ما بين الطلب الى الاستلام.	1	2	3	4	5
.14	تستخدم الشركة نظام تتبع النقل لتحديد وقت الوصول.	1	2	3	4	5
.15	تقوم الشركة بإعادة الشحن بشكل متكرر وفقا للطلب المتوقع.	1	2	3	4	5
.4	**المعلومات**					

.16	تستخدم الشركة نظام تخطيط موارد المؤسسات.	1	2	3	4	5
.17	تجمع الشركة بيانات حول المنافسين.	1	2	3	4	5
.18	تجمع الشركة بيانات حول الزبائن.	1	2	3	4	5
.19	تجمع الشركة بيانات حول الموردين.	1	2	3	4	5
.20	تحصل الشركة على معلومات حول موردي الموردين.	1	2	3	4	5
.5	**المورد**					
.21	تختار الشركة الموردين ذوي الصلة لأعمالها الأساسية.	1	2	3	4	5
.22	تختار الشركة أكثر من مورد لكل مادة.	1	2	3	4	5
.23	تضع الشركة معايير لاختيار الموردين.	1	2	3	4	5
.24	تتفاوض الشركة مع الموردين لتحديد التفاصيل.	1	2	3	4	5
.25	تقرر الشركة الحاجة للتصنيع/الشراء للاستعانة بمورد خارجي.	1	2	3	4	5
.6	**التسعير**					
.26	تحدد الشركة الأسعار لتنافس أسعار المنافسين.	1	2	3	4	5
.27	تقسم الشركة الأسعار وفقا لشرائح العملاء.	1	2	3	4	5
.28	تقوم الشركة بتغيير الأسعار بناء على مستوى الطلب.	1	2	3	4	5
.29	تزيد الشركة من خواص المنتج لزيادة السعر.	1	2	3	4	5
.30	تحدد الشركة الأسعار حسب مواسم البيع.	1	2	3	4	5
.7	**النقل الإضافي**					
.31	تلتزم الشركة بتسليم المنتج في الوقت المحدد للعملاء.	1	2	3	4	5
.32	تزيد الشركة كمية البضائع لكل شحنة.	1	2	3	4	5
.33	تختار الشركة أفضل طريق للنقل.	1	2	3	4	5
.34	تراقب الشركة الشحن لتجنب التلف أثناء النقل.	1	2	3	4	5
.8	**المخزون الزائد**					
.35	تقوم الشركة بإعادة طلب المادة من المورد قبل نفاذها.	1	2	3	4	5
.36	تطبق الشركة نظام الانتاج عند الطلب في عمليات التخزين.	1	2	3	4	5
.37	تؤكد الشركة المخزون الفعلي يتطابق مع سجلات المخزون.	1	2	3	4	5
.38	تعمل الشركة بنظام بيع القديم اولا ثم الجديد.	1	2	3	4	5
.9	**الحركة الغير لازمة**					
.39	تقلل الشركة من التدقيق الداخلي المتكرر.	1	2	3	4	5
.40	تفرز الشركة البضائع سريعة الحركة بجانب منطقة التحميل.	1	2	3	4	5
.41	تقلل الشركة من ساعات العمل غير الضرورية.	1	2	3	4	5
.42	تستخدم الشركة نظاما رقميا للمعاملات.	1	2	3	4	5
10	**الانتظار**					
.43	تقلل الشركة من اوقات التجهيز لبدأ العمل.	1	2	3	4	5
.44	تقلل الشركة من الوقت ما بين الطلب الى استلام المنتج.	1	2	3	4	5
.45	تقلل الشركة من وقت التوقف عن العمل.	1	2	3	4	5
.46	تتجنب الشركة اوقات التوقف على خط الانتاج.	1	2	3	4	5
.11	**الانتاج الزائد**					
.47	تنتج الشركة عدد الوحدات لكل باتش حسب الطلب.	1	2	3	4	5
.48	تنتج الشركة وفقا لتوقعات الطلب.	1	2	3	4	5

.49	تقوم الشركة بإعداد المواد الخام وفقا لطلب العملاء.	1	2	3	4	5
.50	تقوم الشركة بانتاج المواد الوسيطة حسب الطلب.	1	2	3	4	5
.12	**العمليات الزائدة**					
.51	تنتج الشركة المنتج بالطريقة الصحيحة من المرة الأولى.	1	2	3	4	5
.52	تتجنب الشركة تكرار الاخطاء من خلال تثبيت اجراءات وقائية.	1	2	3	4	5
.53	تستخدم الشركة إجراءات تشغيل قياسية.	1	2	3	4	5
.54	تتجنب الشركة مراقبة الإنتاج من خلال أكثر من نظام.	1	2	3	4	5
.13	**العيوب**					
.55	تلتزم الشركة بالمواصفات المصممة لتقليل التباين.	1	2	3	4	5
.56	تلتزم الشركة بإجراءات الجودة لتقليل التالف.	1	2	3	4	5
.57	تستجيب الشركة لشكاوى العملاء لتقليل العيوب.	1	2	3	4	5
.58	تضبط الشركة جودة سلع المورد لتقليل العيوب.	1	2	3	4	5
.14	**الموارد غير مستخدمة**					
.59	تعمل الشركة على تمكين الموظفين الموهوبين.	1	2	3	4	5
.60	تزيد الشركة من استخدام المناطق الغير مستغلة.	1	2	3	4	5
.61	تزيد الشركة من استخدام الآلات بكامل طاقتها.	1	2	3	4	5
.62	تستخدم الشركة إجمالي المستودعات المتاحة.	1	2	3	4	5