The Effect of Supplier Collaboration on Company Performance through Lean Manufacture and Inventory Control

by Dherma Riofiandi

Submission date: 05-Jul-2022 08:12PM (UTC+0700)
Submission ID: 1866892792
File name: 213-Manuscript-1097-1-10-20220629.pdf (291.74K)
Word count: 8237
Character count: 47249

IJBS VOL. 5, NO. 1, JUNE 2022: 74–86 DOI: 10.9744/ijbs.5.1.74–86
E-ISSN 2621-6426

The Effect of Supplier Collaboration on Company Performance through Lean Manufacture and Inventory Control

Derma Riofiandi[1], Zeplin Jiwa Husada Tarigan[2*]
[1,2]Faculty of Business and Economics, Petra Christian University, Indonesia
Jl. Siwalankerto 121-131, Surabaya, Indonesia
Email: zeplin@petra.ac.id
*Corresponding author

Abstract

This study examined how supplier collaboration practices can affect company performance through the mediation of lean manufacturing and inventory control in the context of Java, Indonesia. The mediating effect of lean manufacturing and inventory control on the relationship between supplier collaboration practices and company performance was investigated. This survey was collected among 88 manufacturing companies on the island of Java, which are engaged in the chemical and chemical goods sector and the non-metallic minerals industry. Validity and reliability analysis and structural equation modeling to test hypotheses using smartPLS software. This study reveals that supplier collaboration practices positively and significantly affect company performance. In addition, it also found that inventory control positively and significantly mediates the relationship between supplier collaboration practices and company performance. In contrast, lean manufacturing does not significantly mediate the relationship between supplier collaboration practices and company performance. This study contributes to the knowledge of the mediation effect in the practice of inventory control and lean manufacturing on the company performance-supplier collaboration relationship. Company leaders also gain insight on how to collaborate with suppliers to help companies implement more efficient business practices by making continuous improvements and always maintaining inventory levels so that companies can improve their performance.

Keywords: Supplier Collaboration; Lean Manufacturing; Inventory Control; Company Performance.

1. Introduction

Globalization impacts trade between one region, nationally and even regionally, without clear boundaries. Trade, often called business transactions, is vital for a region's economy, both large and small-scale, domestic and inter-country trade. The more significant work impacts the number of suppliers of similar goods and substitute goods, resulting in increasingly complex business competition. Increased competition will impact companies to emphasize efficient and effective processes by producing competitive products (Tarigan et al., 2020). The process innovation carried out by the company internally cannot provide greater efficiency and effectiveness, so the company involves supplier partners and customer partners (Zhang et al., 2015).

Companies can also involve customers to contribute to determining product development in detail and product requirements accurately so that data from customers can be integrated directly with company systems (Uvet et al., 2020). The company's efforts to overcome supply shocks are building partnerships with suppliers (Tarigan & Siagian, 2021). Companies with suppliers build a collaboration system to understand each other between one business and another. The relationship between the two parties is established by regulating the working mechanism and providing a sense of security for both parties (Ni & Sun, 2018). Supplier collaboration, a widely accepted idea, requires the direct involvement of companies with supplier partners to jointly invest in processes or products for sustainable purposes (Tarigan & Siagian, 2021; Tanuwijaya et al., 2021).

The company's ability to build good cooperation with suppliers and provide a strategic role for suppliers in the company's operations to jointly improve the production process of manufacturing companies, participate in sustainable material procurement, provide access rights to share knowledge in improving company performance on an ongoing basis (Cheng et al., 2012; Tarigan, 2019). The company's collaboration with its suppliers can improve the innovation performance of manufacturing companies in China (Zhang et al., 2015). Companies are trying to build good collaborations with their suppliers to improve company performance in manufacturing companies in the USA (Cao & Zhang, 2011). The collaboration that the company builds is essential in increasing the company's competitiveness and performance. This collaboration provides better results than

companies that move individually, so collaboration can build together by providing improvements in creating efficient and productive operations (Uvet et al., 2020). Companies in China show that collaboration with suppliers can improve operational performance and financial performance. Improved performance and competitive advantage can be achieved with suppliers' relationship that includes trust, supporting suppliers to improve their processes, sharing information, involvement of suppliers in new product development, and long-term relationships (Al-Abdallah et al., 2014).

Manufacturing companies always try to maintain a balance between the supply of goods and services needed by the company so that they are always available, so a collaboration system between suppliers and companies is needed to run well. Companies need to build good partnerships with suppliers in delivering raw materials according to company need and the quantity and quality of materials needed by the company on an ongoing basis (Huang et al., 2020). In addition, lean manufacturing requires collaboration with suppliers to support manufacturing programs (Vanichchinchai, 2019).

In manufacturing companies, inventory (raw material, goods in-process, and finish goods) should be managed so that inventory is sufficient, not too much but not too little, so that raw material costs become economical. The company does not lose the opportunity to serve sales due to a lack of raw material inventory (Abdul, 2018). Controlling the company's inventory with a certain level as needed will provide efficiency and effectiveness because it can estimate the appropriate material needs, timely delivery, and adequate inventory levels (Hilmola, 2020). Effective inventory control management is recognized as one of the areas that the management of any organization must possess. Companies must be able to develop an effective inventory control system or program so that the organization can feel the benefits in the future. The application of lean value stream mapping industry manufacturing can increase the rate of converting raw materials into finished products on the operational side by reducing waste (Garza-Reyes et al., 2018; Siagian and Tarigan, 2021). Demeter and Matyusz (2011) conclude that the application of Lean nufacturing is positively related to reducing inventories of raw materials, work in process, and finished goods.

Ogbo & Ukpere (2014) explained in their research that organizations would benefit from an effective inventory control management system. Waste reduction, optimal use of resources, high inventory utilization, cost reduction, increased profitability, transparency, accountability, increased sales effectiveness, and stock holding and taking, which are accessible, are some benefits the organization will feel. Lean manufacturing in the manufacturing industry with lean production can impact financial performance and market performance (Abreu-Ledón et al., 2018). The implementation of lean manufacturing contributes significantly to the improvement of company performance. However, to achieve the desired performance, all lean manufacturing must be implemented holistically because of their mutually supportive nature (Nawanir et al., 2016). Iranmanesh et al. (2019) argue that lean manufacturing contributes to financial performance by lowering managerial costs, providing information about the importance and value of pollution reduction, or lowering the costs of implementing environmental improvements.

Based on the results of previous studies, no one has conducted simultaneous research on the four constructs of lean manufacturing, inventory control, and supplier collaboration on company performance. In addition, previous research has not shown research on manufacturing companies engaged in chemicals or basic chemical raw materials.

2. Literature Review

Supply chain management (SCM) is a whole system approach carried out to manage the entire flow of information, materials, and services from raw material suppliers through factories and warehouses to the final customer (Siagian et al., 2021). SCM is one of the most effective ways for organizations to increase the company's competitive advantage (Jiputra et al., 2020). SCM includes a set of practices and approaches taken to effectively integrate all parties involved in the supply chain (suppliers, manufacturers, distributors, and customers). The goal is to improve the long-term performance of each organization and the supply chain in a sustainable and high-performance business model (Kristianto & Tarigan, 2019). In addition, SCM has been widely regarded as an effective management tool for organizations to maintain business stability, growth, and company profitability (Gorane & Kant, 2017).

SCM as a set of approaches utilized to integrate suppliers, manufacturing, warehousing, and storage effectively so that merchandise is produced and distributed in the right quantity, at

the right location, and at the right time to minimize the costs of the entire supply chain network and achieve the targeted level of satisfaction. SCM is also the strategic and efficient coordination of conventional business functions and strategies across these business functions within a given company and across businesses in the supply chain to develop the company's long-term performance and the supply chain as a single unit (Tarigan, & Siagian, 2021).

2.1. Supplier Collaboration

Collaboration built by the company with suppliers is a form of partnership as a strategic relationship that aims between the company and suppliers to share compatible goals strive for mutual benefit, and recognize a high level of interdependence (Tanuwijaya et al., 2021). The partnership process involves the company and suppliers working together to plan and carry out supply chain operations regarding the procurement of raw materials, quality of raw materials, and well-coordinated time to achieve common goals and mutual benefits (Zhang et al., 2015; Tarigan & Siagian, 2021). Collaboration describes cooperation between independent but related companies to share resources and capabilities to meet the most extraordinary or dynamically changing customer needs. The company's collaboration with suppliers in the supply chain flow is an ability to work across organizational boundaries to build and manage value-added processes for both parties to meet customer needs (Cao & Zhang, 2011).

Supply chain collaboration is increasingly being used as a form of mutually supportive business-to-business relationships such as partnerships, alliances, supplier-manufacturer relationships, integration with suppliers, and networking (Tarigan & Siagian, 2021; Kristianto & Tarigan, 2019). Companies that work with suppliers can create some benefits that self-employment cannot achieve (Huang et al., 2020). The indicators used in measuring collaboration with suppliers adopting indicators in research are information sharing, joint knowledge, collaboration, and communication for problem-solving, resource sharing, and decision synchronization.

2.2. Lean Manufacturing

Lean manufacturing is a best practice in production that considers using existing resources to obtain economic value for customers by reducing waste or eliminating activities that do not provide added value (Anosike et al., 2021). Lean manufacturing in production identifies those that cannot be assessed in any production and tries to reduce or eliminate them to increase productivity or profits (Siagian and Tarigan, 2021). Lean manufacturing concerns internal manufacturing processes and the operation of the entire supply chain (So & Sun, 2010). The business environment is changing rapidly, and organizations are forced to face challenges and complexities that continue to grow. The lean manufacturing concept was developed to maximize resource utilization by minimizing waste. Lean is formulated to respond to a fluctuating and competitive business environment (Sundar et al., 2014).

Lean manufacturing, which is applied to manufacturing companies with lean production using measurement items of process control & improvements, flow, workforce development, maintenance management, just-in-time, customer focus, and supplier relationship, was proposed by Abreu-Ledón et al. (2018). Lean manufacturing, also known as lean production in manufacturing companies, uses a complete system, flow system, setup times, and total productive maintenance (Hardcopf et al., 2021). The indicators used to measure lean manufacturing focused on lean production are process control & improvements, just-in-time, flow systems, and product maintenance.

2.3. Inventory Control

Inventory control is a company inventory management activity that aims to maximize the use of a company's inventory to minimize losses and gain profits from these activities (Yaqoub, 2012). The company's inventories include raw materials, work-in-process, and finished goods. Inventory control is essential for companies because it can determine the effectiveness and efficiency of inventory to reduce the amount of inventory without damaging internal efficiency, the accuracy of delivery to customers, and the right inventory level (Hilmola et al., 2020).

Inventory Control is the available materials for companies as needed by providing adequate quantities and types of inventories (Ogbo & Ukpere, 2014). Managers must be able to meet the budget that has been set and decide what to order, how to process, and when to order so that stock is available on time and at the most optimal cost. Therefore, inventory management involves organizing, planning, and controlling the flow of materials from their initial purchasing units through internal operations to points of service

through distribution (Tarigan et al., 2020; Ogbo & Ukpere, 2014). The indicators used in this study adopted the research of Fernando et al. (2020): Controlling the level of comparison of sales to average inventory levels inventory and inventory data information systems.

2.4. Company Performance

Company performance is part of the company's effectiveness, including operational and financial results (Jiputra et al., 2020). Company performance, described differently by (Siagian and Tarigan, 2021), is the actual result or output produced by a company which is then measured and compared with the expected results or output. Company performance is considered a multidimensional construct and a measure of a company's success and achievement (Kristianto & Tarigan, 2019). Operational performance and business performance are two measures of company performance. In their research, Liu et al. (2013) describes the business performance as referring to the company's financial performance related to net income, profitability, and return on investment, while operational performance refers to an increase in the company's response to a changing environment relative to its competitors. Hani (2021) states that operational performance in implementing lean operations manufacturing companies is the collaboration of all units in the company to support the production system as a business center in producing adaptability, transportation time, demand capability, and organizational stock turnover. The indicators used in this study follow Hardcopf et al. (2021) and Siagian et al., (2021): cost reduction, product quality, delivery on time, and flexibility.

2.5. Hypothesis Development

According to So & Sun (2010), supplier collaboration is a key capability of a successful SCI which adopts manufacturing best practices such as lean manufacturing, helping manufacturers and their suppliers set common goals/strategies to better support various operational processes. Lean manufacturing if there is no common interest and collaboration at the production level without a standard system with all suppliers (Martono, 2018). Lean manufacturing is a production system that uses resources with little sacrifice to meet consumer expectations and desires. Collaboration with suppliers is needed to support lean manufacturing programs (Vanichchinchai, 2019). Lean manufacturing aims to eliminate costs that are considered unnecessary or activities that are not value-added from one process so that activities along the process flow (value stream) can produce value (Sartal et al., 2017). Then it can be formulated:

H_1: Supplier collaboration affects lean manufacturing.

Control of the movement of raw materials from suppliers to customers is a crucial problem. Strategies in this area have now become the focus of top management. Raw materials influence the total investment in inventory control capital, work-in-process, and finished materials making this a potential for improvement (Tarigan et al., 2020; Han et al., 2012). Holmstrőm et al. (2016) describe some severe obstacles to increasing flexibility in scheduling production capacity and allocating scarce supplies. Suppliers can benefit significantly by incorporating customer demand, inventory, and distribution requirements in their processes. Research conducted by Costantino et al. (2014) presents interactions that arise from sharing information between suppliers' parameters inventory control effect bullwhip, which reveals how inventory variance and average service levels increase. The most influential impact occurs when collaboration begins at the downstream level because, once demand distortion begins, it is more difficult to limit and recover. Then it can be formulated:

H_2: Supplier collaboration affects inventory control.

Supplier Collaboration provides a mechanism for companies to reduce risks associated with supply uncertainty or gain access to resources, enabling them to achieve production and service goals, and ultimately improve firm performance (Cheng et al., 2012). Construction collaboration between companies and suppliers has a positive impact on company performance, with collaboration can improve company performance as seen by increased productivity and better response to customers (Tarigan, 2019). The partnership that the company built with its suppliers at manufacturing companies and found that the supply collaboration impacts company performance (Cao & Zhang, 2011; Yaqoub, 2012). The company's collaboration with suppliers in the Yangtze River Delta cities of China, with 133 respondents as senior managers and directors, found that the collaboration built the company with suppliers could provide the company's innovation performance (Zhang et al., 2015).

Research conducted by (Uvet et al., 2020) explains that supplier collaboration results can directly improve supplier communication and will affect the company's logistics performance and achieve the highest operational performance improvement.

H_3: Supplier collaboration influences company performance.

Capkun et al. (2009) support that the implementation of inventory control improves company performance through lower inventory levels, lower quality costs, and more excellent customer responsiveness with higher profits. The company's ability to control inventory can increase company performance because it can increase efficiency and effectiveness (Hilmola, 2020). Ogbo & Ukpere's (2014) research shows that organizations will benefit from an effective inventory control management system. The company's ability to control inventory properly provides operational excellence with inventory cycle times and process efficiency for the company (Fernando et al., 2020).

H_4: Inventory control affects company performance.

Practices Lean manufacturing must be implemented holistically because of its mutually supportive nature, where lean manufacturing contributes significantly to increasing performance (Nawanir et al., 2016). Lean production in manufacturing companies shows that lean production impacts the financial and market (Abreu-Ledón et al., 2018). One of the ways to achieve financial performance is with lean manufacturing by reducing managerial costs to reduce pollution, providing information about the importance of reducing pollution, or lowering the cost of implementing environmental improvements (Iranmanesh et al., 2019). The company's ability to implement lean operations, which are part of lean manufacturing, can improve the operational performance of manufacturing companies by increasing product quality and inventory efficiency (Hani, 2021; Sundar et al., 2014).

H_5: Lean manufacturing affects company performance.

The application of lean value stream mapping industry manufacturing can increase the rate of converting raw materials into finished products on the operational side by reducing waste (Garza-Reyes et al., 2018). Demeter and Matyusz (2011) concluded that implementing lean manufacturing is positively related to reducing inventories of raw materials, work in process, and finished goods. The company's ability to implement lean in manufacturing companies will be able to reduce inventory at the right size and amount of production (Deif & ElMaraghy, 2014). Lean production is part of lean manufacturing, which makes the manufacturing system focus on producing products on time at the lowest cost. Lean manufacturing in the production area reduces waste in each production process to produce products (Hani, 2021).

H_6: Lean manufacturing affects inventory control.

Based on the explanation above, a research model can be determined, as shown in Figure 1.

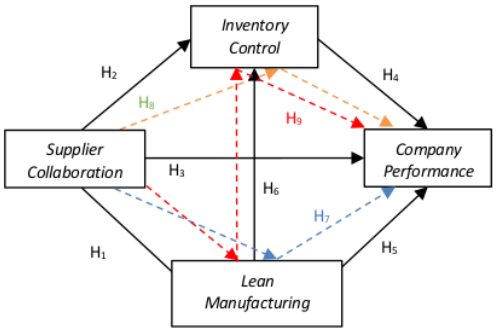

Figure 1. Research Model

Based on the research model in Figure 1, it is found that there are three indirect hypotheses that the writer wants to test the relationship between the hypotheses. The hypotheses are:

H_7: Supplier collaboration affects company performance through lean manufacturing.

H_8: Supplier collaboration influences increase company performance through inventory control.

H_9: Supplier collaboration affects company performance through lean manufacturing and inventory control.

3. Methods

An essential element in research is the type of research because it determines the overall research results obtained by the researcher. For example, quantitative research aims at sampling techniques that are generally carried out randomly, and data collection uses research instruments. In addition, data analysis is quantitative/statistical to test established hypotheses (Ferdinan, 2014). Finally, the population is a combination of all

elements that determine events, things, or people that form specific characteristics in the center of researchers' attention because it is seen as a research universe (Ferdinan, 2014).

The population in this study were companies engaged in manufacturing in the chemical industry and chemical goods as many as 273 (two hundred seventy-three) companies and in the non-metallic minerals industry, as many as 296 (two hundred ninety-six), a total of 569 (five hundred sixty-nine) companies located in East Java. The samples for this study were 85 manufacturing companies in the chemical industry and goods from chemical companies and the non-metallic mineral industry in East Java. This research's sampling technique is nonprobability, with judgmental sampling. The criteria for selecting the sample in this study were companies operating in the chemical sector. Data analysis techniques in quantitative research use statistics. Data analysis was carried out by grouping data based on variables and respondents, grouping data based on variables from all respondents, presenting data for each variable studied, performing calculations to answer the problem formulation, and performing calculations to test the proposed hypothesis. This study uses a relationship model to test existing hypotheses and SEM (structural equation model). In the SmartPLS software calculations, there is a tiered relationship structure between variables (Hair et al., 2019).

4. Results

The object of the research is a manufacturing company in Java related to the processing of the chemical industry and chemical goods as well as the non-metallic mineral industry in Java. The characteristics of the respondents were reviewed based on the number of company employees. The most significant number of employees with more than 99 employees is categorized as large companies by 59 respondents (67%). In comparison, with 20 to 99 employees with a total of 20 respondents (23%) categorized as medium-scale industry, and the number of workers is less than 20 employees, a total of 9 respondents (10%) are small-scale industry. The company's location in the study consists of the provinces of East Java, Central Java, West Java, Jakarta, and Banten. The largest percentage is in East Java province at 56% with 49 respondents, the two West Java provinces at 19% with 17 respondents, the third Jakarta at 18% with 16 respondents, the four Central Java provinces at 5% with four respondents, and lastly, Banten province was 2% with two respondents.

Characteristics of respondents are reviewed based on the position or position in the department. The two positions with the highest scores were supervisor and manager, with 59 respondents (67%). This illustrates that the respondent is in the middle manager position as coordination and operational responsibility and can be said to have known the company's condition so that he could represent the company in filling out this research questionnaire. The lowest position is in the senior staff with as many as eight respondents and the owner with one respondent. The measurement of the reflexive model was assessed using reliability and validity for validity with convergent validity and discriminant validity, and composite reliability for indicator blocks. Indicators with a loading factor value greater than 0.5 can be said to have met convergent validity and can be accepted (Hair et al., 2019).

Variable supplier collaboration, the lowest value is obtained on the indicator that the company shares resources with suppliers (SC5) of 0.564, and the value is above 0.5. Therefore, all measurement items on the supplier collaboration have met the convergent validity requirements and can be accepted. In the second variable, namely lean manufacturing, the lowest value was obtained on the indicator that the company implemented process control well (LM1) of 0.8055, and the value was above 0.5; so it can be said that all measurement items on the lean manufacturing have met and are acceptable. Variable inventories control the lowest value on the indicator of the company controlling the inventory cycle periodically in the warehouse (IC2) is 0.745, and the value is above 0.5. Therefore, measurement items on the inventory control have met and are acceptable, and finally, on the fourth variable, firm performance, the lowest value is obtained on the indicator. Therefore, the company provides adequate flexibility for customer orders (CP4) and has met convergent validity.

The reliability test was conducted to prove the instrument's accuracy, consistency, and accuracy in proving the construct. The reliability test uses the composite reliability method. The use of composite reliability to test construct reliability the composite reliability value is said to be reliable if it has a composite reliability value of more than 0.7. The results shown in Table 2 have met the requirements.

Table 1. Convergent Validity Test

Indicator	Supplier Collaboration	Lean Manufacturing	Inventory Control	Company Performance
Company sharing knowledge with suppliers (SC1)	0.700			
Companies sharing information with suppliers (SC2)	0.739			
Companies communicating in solving problems with suppliers (SC3)	0.613			
Companies involving suppliers in solving problems (SC4)	0.597			
The company shares resources with suppliers (SC5)	**0.564**			
The company synchronizes decisions together with suppliers (SC6)	0.644			
The company implements process control well (LM1)		**0.805**		
The company makes continuous improvements (LM2)		0.864		
The company can complete the right product time (just in time) (LM3)		0.868		
The company's production process flow is running well (LM4)		0.852		
company's production productivity is running well (LM5)		0.849		
The company controls the level of finished products by considering sales (IC1)			0.782	
The company controls the inventory cycle periodically in the warehouse (IC2)			**0.745**	
The company controls the order process well (IC3)			0.848	
The company controls the inventory level of raw materials adequately in the warehouse (IC4)			0.826	
The company controls the information system in the warehouse adequately (IC5)			0.855	
The company can reduce production costs (CP1)				0.740
The company can produce products according to customer requirements criteria (CP2)				0.813
The company delivers products to customers according to the specified time (CP3)				0.780
The company provides adequate flexibility for customer orders (CP4)				**0.636**

Table 2. Reliability Test of Research

Variables Research Variables	Cronbach's Alpha	rho_A	Composite Reliability
Supplier Collaboration	0.738	0.732	0.810
Lean manufacturing	0.902	0.904	0.927
Inventory Control	0.870	0.873	0.906
Company Performance	0.737	0.763	0.832

Testing the research hypothesis is shown in the t-statistical value. In that case, if the statistic is above or equal to 1.96, or the significance value (p-value) is below or equal to 0.05 (5%), it is stated that the alternative hypothesis is accepted. The hypothesis is rejected if the t-statistic value is below or equal to 1.96 or the p-value is above or equal to 0.05 (5%).

Table 3 shows the test of the first hypothesis with a path coefficient value of the influence of

supplier collaboration on lean manufacturing of 0.412, which has a t-statistic of 4.411, exceeding the t-statistic of 1.96 and has a P-value of 0.000 under 0.05. It can be concluded that there is a significant positive effect between supplier collaboration on lean manufacturing in the manufacturing industry. This means that supplier collaboration significantly increased lean manufacturing in the manufacturing industry in this study with a significant level of 0.05. The second hypothesis with a path coefficient value of the influence of supplier collaboration on inventory control is 0.162, which has a t-statistic of 2.759, exceeding the t-statistic of 1.96 and has a P-value of 0.006, which is below 0.05. It can be concluded that there is a positive and significant influence between supplier collaboration on inventory control in the manufacturing industry.

Table 3. Direct Effect Hypothesis Test Results

Direct Effect	Path Coefficient	T Statistics	P-Values
Supplier Collaboration → Lean Manufacturing	0.412	4.411	0.000
Supplier Collaboration → Inventory Control	0.162	2.759	0.006
Supplier Collaboration → Company Performance	0.245	2.529	0.012
Inventory Control → Company Performance	0.638	6.387	0.000
Lean manufacturing → Company Performance	0.007	0.056	0.955
Lean manufacturing → Inventory Control	0.759	11.822	0.000

The third hypothesis with the path coefficient value of the influence of supplier collaboration on company performance is 0.245, which has a t-statistic of 2.529, exceeding the t-statistical 1.96 and has a P-value of 0.012, which is below 0.05. Therefore, it can be concluded that there is a significant influence between supplier collaboration on company performance in the manufacturing industry. This means that in this study, supplier collaboration was able to significantly increase company performance in the manufacturing industry with a significant level of 0.05. The fourth hypothesis is the path coefficient value of the influence of inventory control on company performance of 0.284, which has a t-statistic of 1.969, exceeding the t-statistic of 1.96, and has a P-value of 0.005, equal to a significance value of 0.05. It can be concluded that there is a significant influence between inventory control on company performance in the manufacturing industry. This means that in this study, inventory control was able to significantly increase company performance in the manufacturing industry with a significant level of 0.05. Based on Table 3, it was obtained that the fifth hypothesis was tested with a path coefficient value of the influence of lean manufacturing on company performance of 0.007, which has a t-statistic of 0.056 less than a t-statistic of 1.96 and has a P-value of 0.995 greater of a significance value of 0.05. Therefore, it can be concluded that lean manufacturing has no significant effect on company performance in the manufacturing industry. It is found in this study that lean manufacturing is not able to directly have an impact on company performance in the manufacturing industry, with a significant level of 0.05.

The sixth hypothesis with a path coefficient value of the influence of lean manufacturing on inventory control is 0.759, which has a t-statistic of 11.822, exceeding the t-statistic value of 1.96 and has a P-value of 0.000, which is smaller than a significance value of 0.05. It can be concluded that there is a significant influence between lean manufacturing on inventory control in the manufacturing industry. It is found in this study that lean manufacturing can directly increase optimal inventory control in company performance with a significant level of 0.05. Indirectly can be shown in Table 4.

Table 4. Hypothesis Test Results Indirect Effect

Indirect Path	Path Coeficient	T Statistics	P Values
Supplier Collaboration → Inventory Control → Lean manufacturing → Company Performance	0.484	6.028	0.000
Supplier Collaboration → Inventory Control → Company Performance	0.305	4.491	0.000
Supplier Collaboration → Lean manufacturing → Company Performance	0.112	1.713	0.079

Based on Table 4, it was obtained that two indirect hypotheses are supported while the other is rejected. Indirectly obtained, the value of the

path coefficient of the influence of supplier collaboration on company performance through inventory control and lean manufacturing is 0.484, which is has a t-statistic of 6.028 exceeding a t-statistic of 1.96 and has a P-value of 0.000, which is less than a significance value of 0.05. It can be concluded that there is a significant influence between supplier collaboration on company performance through inventory control and lean manufacturing in the manufacturing industry. This means in this study that supplier collaboration can improve company performance through inventory control and lean manufacturing with a significant level of 0.05. Testing on the hypothesis indirectly obtained the path coefficient value of supplier collaboration on company performance through inventory control of 0.305, which has a t-statistic of 4.491 exceeding the t-statistic of 1.96 and has a P-value of 0.000, which is smaller than a significance value of 0.05. It can be concluded that there is a significant influence between supplier collaboration on company performance through inventory control in the manufacturing industry. This means in this study that supplier collaboration can improve company performance through inventory control in the manufacturing industry with a significant level of 0.05. The indirect hypothesis is obtained that the path coefficient value of the influence of supplier collaboration on company performance through lean manufacturing is 0.012, which has a t-statistic of 1.713 less than a t-statistic of 1.96 and has a P-value of 0.079 greater than a significance value of 0.05. It can be concluded that there is no significant effect between supplier collaboration on company performance through lean manufacturing in the manufacturing industry. This means in this study that supplier collaboration cannot improve company performance through lean manufacturing in the manufacturing industry with a significant level of 0.05. It can be concluded that there is a significant influence between supplier collaboration on company performance through inventory control and lean manufacturing in the manufacturing industry. The company's ability to share knowledge with suppliers (SC1) and information sharing with suppliers (SC2) can improve company performance by increasing the company's ability to produce products according to customer requirements by optimizing inventory control. Inventory control is carried out by controlling the order process properly and the ability to control the information system in the warehouse adequately.

5. Discussion

Supplier collaboration significantly increased lean manufacturing implementation in the manufacturing industry with a significant level of 0.05. Supplier collaboration shown by the company being able to share knowledge to suppliers (SC1) of 0.700 and sharing information to suppliers (SC2) of 0.739 was able to increase lean manufacturing with company activities through continuous improvement (LM2) of 0.864. Companies that collaborate with suppliers can make lean manufacturing implementation run well and improve the production process on time. This study supports the results of research by So & Sun (2010), Martono (2018), and Sartal et al. (2017), which states that supplier collaboration is a way for companies to be able to adopt manufacturing best practices by implementing lean manufacturing. The company's ability to share knowledge with suppliers (SC1) is 0.700 and to share information with suppliers (SC2) is 0.739 to have an impact on the optimization of inventory control in the company on an ongoing basis. The company's ability to control information systems and process orders in a controlled manner can maintain inventory levels. The results of the study support the results of research conducted by Han et al. (2012), Holmstrm et al. (2016), and Costantino et al. (2014), which states that supplier collaboration can maintain the company's inventory control on an ongoing basis.

Supplier collaboration significantly increased company performance in the manufacturing industry with a significant level of 0.05. Furthermore, the company's ability to share knowledge with suppliers (SC1) of 0.700 and share information with suppliers (SC2) of 0.739 has an impact on increasing company performance, which is shown that the company can produce products according to the criteria of customer needs and deliver products to customers according to the specified time. This research is in line with research that states that supplier collaboration can significantly improve the implementation of company performance (Cheng et al., 2012; Tarigan, 2019; Cao & Zhang, 2011; Zhang et al., 2015; Uvet et al., 2020; Al-Abdallah et al., 2014). Inventory control significantly increased company performance in the manufacturing industry with a significant level of 0.05. This means that in this study, inventory control was able to significantly increase company performance in the manufacturing

industry with a significant level of (0.05. Inventory control, indicated by the largest loading factor value on the company's item controlling the order process well (IC3), is 0.848, and the company is controlling the information system in the warehouse adequately (IC5) of 0.855, which has an impact on increasing company performance. Optimization of inventory level control in the company can impact the company's ability to produce products according to the criteria of customer needs, and the company send products to customers at a predetermined time. This study supports the result of research that state that inventory control has an impact on increasing company performance (Capkun et al., 2009; Hilmola, 2020; Ogbo & Ukpere, 2014; Fernando et al., 2020).

Lean manufacturing cannot directly impact company performance in the manufacturing industry, with a significant level of 0.05. The company in implementing lean manufacturing with the company's efforts to make continuous improvements (LM2) 0.864 has not been able to directly impact the company's company to produce products according to customer needs criteria. This study supports the results of different studies from the results research by Nawanir et al. (2016), Abreu-Ledon et al. (2018), Iranmanesh et al. (2019), Deif & ElMaraghy (2015), and Hardcopf et al. (2021) which states that lean manufacturing has a direct impact on increasing company performance. However, it supports the research results of Hani (2021), which states that lean manufacturing does not have a direct impact on improving company performance. It must be through the mediation of operational activities, such as product quality control.

This shows that the company has made continuous improvements (LM2) of 0.864, and the company's ability to complete products on time (just in time) (LM3) of 0.868 is able to have an impact on optimizing inventory control. Inventory optimization enables the company to properly control the order process (IC3) 0.848 and adequate information systems in the warehouse (IC5) 0.855. This condition supports the results of research, which states that lean manufacturing can optimize the company's inventory control (Abdul, 2018; Garza-Reyes et al., 2018; Demeter & Matyusz, 2011; Deif & ElMaraghy, 2014; Hani, 2021).

The results of the study provide a theoretical contribution to developing supply chain management, especially in building good relationships between buyer suppliers on an ongoing basis to build a more agile company and increase company competitiveness. Practical contribution to the industry, especially operational and procurement managers, to build good partnerships with suppliers and involve active suppliers in company operations. Operational managers in manufacturing companies establish appropriate procedures for partners to be more involved in the company to produce more efficient and effective products to increase competitiveness on an ongoing basis.

6. Conclusions

Several conclusions can be drawn based on the discussion on supplier collaboration research on company performance through lean manufacturing and inventory control. First, collaboration with suppliers affects the company's lean manufacturing by developing the company's ability to share knowledge with suppliers. Second, collaboration with suppliers affects the optimization of inventory control with the company's ability to share information with suppliers, impacting the company's ability to complete products on time. Third, collaboration with suppliers impacts company performance by producing product delivery to customers according to a predetermined time. Fourth, Lean manufacturing, which is implemented by continuous improvements, has an impact on optimizing inventory control by adequately controlling the order process. Fifth, Lean manufacturing that is implemented by making continuous improvements does not directly impact company performance because it needs to be mediated by optimizing inventory level control. Optimal inventory control through inventory level control can improve company performance with the ability to produce products according to customer requirements criteria and deliver products to customers within the specified time. Supplier collaboration impacts company performance through inventory control and lean manufacturing. Supplier collaboration affects company performance through optimal inventory control in maintaining inventory levels. Supplier collaboration has no significant effect on company performance through lean manufacturing.

References

Abdul, F. W. (2018). Lean Manufacturing Implementation in Inventory Control as A Repair Process. *Jurnal Logistik Indonesia*, *2*(1), 31-36. https://doi.org/10.31334/jli.v2i1.216

Abreu-Ledón, R., Luján-García, D. E., Garrido-Vega, P., & Escobar-Pérez, B. (2018). A Meta-

Analytic Study of the Impact of Lean Production on Business Performance. *International Journal of Production Economics*, *200*, 83–102. doi:10.1016/j.ijpe.2018.03.015

Al-Abdallah, G. M., Abdallah, A. B., & Bany Hamdan, K. (2014). The Impact of Supplier Relationship Management on Competitive Performance of Manufacturing Firms. *International Journal of Business and Management*, 9(2). doi:10.5539/ijbm.v9n2p192

Ogbo, A. I., & Ukpere, W. I. (2014). The Impact of Effective Inventory Control Management on Organisational Performance: A Study of 7up Bottling Company Nile Mile Enugu, Nigeria. *Mediterranean Journal of Social Sciences*, *5*(10), 109. doi:10.5901/mjss.2014.v5n10p109

Anosike, A., Alafropatis, K., Garza-Reyes, J., Kumar, A., Luthra, S., & Rocha-Lona, L. (2021). Lean Manufacturing and Internet of Things – A Synergetic or Antagonist Relationship. *Computers in Industry*, *129*, 103464, https://doi.org/10.1016/j.compind.2021.103464.

Cao, M. & Zhang, Q. (2011). Supply Chain Collaboration: Impact on Collaborative Advantage and Firm Performance. *Journal of Operations Management*, *29*(3), 163–180. https://doi.org/10.1016/j.jom.2010.12.008

Capkun, V., Hameri, A., & Weiss, L. A. (2009). On the Relationship between Inventory and Financial Performance in Manufacturing Companies. *International Journal of Operations & Production Management*, 29(8), 789–806. doi:10.1108/01443570910977698.

Uvet, H., Celik, H., Cevikparmak, S., & Adana, S. (2020). Supply Chain Collaboration in Performance-Based Contracting: An Empirical Study. *International Journal of Productivity and Performance Management*, *70*(4), 769-788. https://doi.org/10.1108/IJPPM-01-2019-0008.

Cheng, T., Yip, F. & Yeung, A. (2012). Supply Risk Management via Guanxi in the Chinese Business Context: The Buyer's Perspective. *International Journal of Production Economics*, *139*(1), 3-13. https://doi.org/10.1016/j.ijpe.2011.03.017

Costantino, F., Gravio, G. D., Shaban, A., & Tronci, M. (2014). Replenishment Policy Based on Information Sharing to Mitigate the Severity of Supply Chain Disruption. *International Journal of Logistics Systems and Management*, *18*(1), 3-23. doi:10.1504/ijlsm.2014.062119

Deif, A. M., & ElMaraghy, H. (2014). Cost Performance Dynamics in Lean Production Leveling. *Journal of Manufacturing Systems*, 33(4), 613-623, doi.org/10.1016/j.jmsy.2014.05.010

Demeter, K., & Matyusz, Z. (2011). The Impact of Lean Practices on Inventory Turnover. *International Journal of Production Economics*, *133*(1), 154–163. doi:10.1016/j.ijpe.2009.10.031.

Ferdinand, A. (2014). *Metode Penelitian Manajemen: Pedoman Penelitian untuk Skripsi, Tesis dan Disertai Ilmu Manajemen [Management Research Methods: Research Guidelines for Theses, Theses and Accompanied by Management Science]*. Semarang: Universitas Dipenogoro.

Fernando, Y., Zainul Abideen, A. & Shaharudin, M.S. (2020). The Nexus of Information Sharing, Technology Capability and Inventory Efficiency. *Journal of Global Operations and Strategic Sourcing*, *33*(4), 327-351. https://doi.org/10.1108/JGOSS-02-2020-0011.

Garza-Reyes, J. A., Kumar, V., Chaikittisilp, S., & Tan, K. H. (2018). The Effect of Lean Methods and Tools on The Environmental Performance of Manufacturing Organisations. *International Journal of Production Economics*, 200, 170–180. doi:10.1016/j.ijpe.2018.03.030

Garza-Reyes, J. A., Kumar, V., Chaikittisilp, S., & Tan, K. H. (2018). The Effect of Lean Methods and Tools on the Environmental Performance of Manufacturing Organisations. *International Journal of Production Economics*, 200, 170–180. doi:10.1016/j.ijpe.2018.03.030.

Gorane, S. & Kant, R. (2017). Supply Chain Practices and Organizational Performance: An Empirical Investigation of Indian Manufacturing Organizations. *The International Journal of Logistics Management*, *28*(1), 75-101. https://doi.org/10.1108/IJLM-06-2015-0090

Hair, J. F., Risher, J. J., Sarstedt, M. & Ringle, C. M. (2019). When to Use and How to Report The Results of PLS-SEM. *European Business Review*, *31*(1), 2-24. https://doi.org/10.1108/EBR-11-2018-0203

Han, C., Dong, Y., & Dresner, M. (2012). Emerging Market Penetration, Inventory Supply, and Financial Performance. *Production and Operations Management*, 22(2), 335–347. doi:10.1111/j.1937-5956.2011.01311.x

Han, Z., Huo, B. & Zhao, X. (2019). Backward Supply Chain Information Sharing: Who does it Benefit? *Supply Chain Management*, https://doi.org/10.1108/SCM-03-2019-0098

Hani, J. S. B. (2021). The Moderating Role of Lean Operations between Supply Chain Integration

and Operational Performance in Saudi Manufacturing Organizations. *Uncertain Supply Chain Management*, *9*(2) 169–178, doi: 10.5267/j.uscm.2020.10.004

Hardcopf, R., Liu, G., & Shah, R. (2021). Lean Production and Operational Performance: The Influence of Organizational Culture. *International Journal of Production Economics*, *235*, 108060, doi.org/10.1016/j.ijpe.2021.108060

Hilmola, O.-P. (2020). Role of Inventory and Assets in Shareholder Value Creation. *Expert Systems with Applications*: *X*, 5, 100027, doi.org/10.1016/j.eswax.2020.100027

Holmstrőm, J., Småros, J., Disney, S. M., & Towill, D. R. (2016). Collaborative Supply Chain Configurations: The Implications for Supplier Performance in Production and Inventory Control. *Developments in Logistics and Supply Chain Management*, 27–37. doi:10.1057/9781137541253_3

Huang, Y., Han, W. & Macbeth, D.K. (2020). The Complexity of Collaboration in Supply Chain Networks. *Supply Chain Management*, 25(3), 393-410. https://doi.org/10.1108/SCM-11-2018-0382

Iranmanesh, M., Zailani, S., Hyun, S., Ali, M., & Kim, K. (2019). Impact of Lean Manufacturing Practices on Firms' Sustainable Performance: Lean Culture as a Moderator. *Sustainability*, *11*(4), 1112. doi:10.3390/su11041112.

Jiputra, J. A., Tarigan, Z. J. H., & Siagian, H. (2020). The Effect of Information Technology on Retailer Satisfaction through Supply Chain Management Practices and Retailer-Distributor Relationship in Modern Retailer Surabaya. *Petra International Journal of Business Studies*, *3*(2), 126-134. https://doi.org/10.9744/ijbs.3.2.126-134

Kristianto, I., & Tarigan, Z. J. H. (2019). The Impact TQM System on Supply Chain Performance through Supply Chain Integration and Employee Satisfaction. *Petra International Journal of Business Studies*, *2*(1), 8-17. https://doi.org/10.9744/ijbs.2.1.8-17

Liu, H., Ke, W., Kee Wei, K., & Hua, Z. (2013). Effects of Supply Chain Integration and Market Orientation on Firm Performance. *International Journal of Operations & Production Management*, *33*(3), 322–346. doi:10.1108/01443571311300809.

Martono, R. V. (2018). *Manajemen Logistik [Logistics Management]*. Jakarta. Kompas Gramedia.

Ni, W., & Sun, H. (2018). A Contingent Perspective on the Synergistic Effect of Governance Mechanisms on Sustainable Supply Chain. *Supply Chain Management: An International Journal*, *23*(3), 153–170. doi:10.1108/SCM-08-2017-0260

Sartal, A., Llach, J., Vázquez, X. H., & de Castro, R. (2017). How Much does Lean Manufacturing Need Environmental and Information Technologies? *Journal of Manufacturing Systems*, *45*, 260–272. doi:10.1016/j.jmsy.2017.10.005

Siagian, H., & Tarigan, Z. J. H. (2021). The Central Role of IT Capability to Improve Firm Performance through Lean Production and Supply Chain Practices in the COVID-19 Era. *Uncertain Supply Chain Management*, *9*(4), 1005-1016, doi: 10.5267/j.uscm.2021.6.012

Siagian, H., Tarigan, Z. J. H., & Jie, F. (2021). Supply Chain Integration Enables Resilience, Flexibility, and Innovation to Improve Business Performance In Covid-19 Era. *Sustainability*, *13*(9), 1-19. https://doi.org/10.3390/su13094669

So, S., & Sun, H. (2010). Supplier Integration Strategy for Lean Manufacturing Adoption in Electronic-Enabled Supply Chains. *Supply Chain Management: An International Journal*, *15*(6), 474–487. doi:10.1108/13598541011080455.

Sundar, R., Balaji, A. N., & Kumar, R. M. S. (2014). A Review on Lean Manufacturing Implementation Techniques. *Procedia Engineering*, *97*, 1875–1885. doi:10.1016/j.proeng.2014.12.341.

Tanuwijaya, N. C., Tarigan, Z. J. H., & Siagian, H. (2021). The Effect of Top Management Commitment on Firm Performance through the Green Purchasing and Supplier Relationship Management in 3-Star Hotel Industry in Surabaya. *Petra International Journal of Business Studies*, *4*(2), 169-181. https://doi.org/10.9744/ijbs.4.2.169-181

Tarigan, Z. J. H. (2019). The Impact of Organization Commitment to Process and Product Innovation in Improving Operational Performance. *International Journal of Business and Society*, *19*(2), 335-346.

Tarigan, Z. J. H. & Siagian, H. (2021). The Effects of Strategic Planning, Purchasing Strategy and Strategic Partnership on Operational Performance. *Uncertain Supply Chain Management*, *9*(2), 363-372, doi: 10.5267/j.uscm.2021.2.006

Tarigan, Z. J. H., Siagian, H., & Jie, F. (2020). The Role of Top Management Commitment to Enhancing the Competitive Advantage through ERP Integration and Purchasing Strategy. *International Journal of Enterprise Information Systems*, 16 (1), 1-16, doi: 10.4018/IJEIS.2020010103

Vanichchinchai, A. (2019). The Effect of Lean Manufacturing on A Supply Chain Relationship and Performance. *Journal of Manufacturing Technology Management, 31*(2), 236-259. doi:10.3390/su11205751

Yaqoub, A. M. (2012). Pengaruh Mediasi Kepercayaan pada Hubungan Antara Kolaborasi Supply Chain, dan Kinerja Operasi [Mediation Effect of Trust on the Relationship Between Supply Chain Collaboration, and Operational Performance]. *Jurnal Manajemen dan Kewirausahaan*, *14*(2), 138-146.

Zhang, H., Wang, H.-C., & Zhou, M.-F. (2015). Partnership Management, Supply Chain Collaboration, and Firm Innovation Performance: An Empirical Examination. *International Journal of Innovation Science*, 7(2), 127-138.

Zhang, X., Deng, Y., Chan, F. T. S., & Mahadevan, S. (2015). A fuzzy extended analytic network process-based approach for global Supplier selection. *Appl Intell, 43*, 760–772. https://doi.org/10.1007/s10489-015-0664-z.

The Effect of Supplier Collaboration on Company Performance through Lean Manufacture and Inventory Control

ORIGINALITY REPORT

12%	13%	14%	9%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	repository.petra.ac.id Internet Source	3%
2	pdfs.semanticscholar.org Internet Source	2%
3	www.m.growingscience.com Internet Source	1%
4	www.growingscience.com Internet Source	1%
5	www.scribd.com Internet Source	1%
6	www.emerald.com Internet Source	1%
7	Submitted to University of Portsmouth Student Paper	1%
8	ijisrt.com Internet Source	1%
9	Submitted to Embry Riddle Aeronautical University	1%

Student Paper

10	core.ac.uk Internet Source	1 %
11	media.neliti.com Internet Source	1 %
12	Submitted to Central Washington UNiversity Student Paper	1 %
13	Submitted to Florida Institute of Technology Student Paper	1 %
14	d.researchbib.com Internet Source	1 %

Exclude quotes	On	Exclude matches	< 1%
Exclude bibliography	Off		