



LEAN MANUFACTURING AND SUPPLY CHAIN PERFORMANCE THROUGH SUPPLIER RELATIONSHIP AND PERFORMANCE

**Dr. Mohamad Ghozali Hassan Al-Haj
Universiti Utara Malaysia**

Abstract

Purpose: The purpose of the study is evaluate the factors comprising of lean manufacturing, supply chain relationship and supplier performance and their impact the supply chain performance in the supply chain firms in Jordan.

Methodology: 293 responses were collected from the supply chain professionals of Jordan using nonprobability purposive sampling technique. The PLS-SEM also known as the partial least square structural equation modeling is a type of data analysis used that enables the evaluation of difficult relationship among the variables of study. The PLS-SEM was used in the research. SmartPLS software version 3.2.8 was used.

Findings: Lean manufacturing has significant effect on supply chain relationship and supplier performance; whereas SC relationship has significant effect on supplier performance while statistically insignificant effect on SC performance. Finally, supplier performance has significant effect on SC performance.

Implications: It has been also suggested to see the resource allocation that must be done over time, because delaying in this process can stop the further work that is being connected with the past stage. As all the work are interconnected here. Managers are further recommended in the following study to keenly focus on the nationalities of the supplier or customer before purchasing because it can cost higher if you are purchasing it from other countries rather than focusing the goods of own country.

Keywords: Lean Manufacturing, Supply Chain Relationship, Supply Chain Performance, Jordan, PLS-SEM

Introduction

The following study has the main objective to see the effect of the Lean manufacturing ground along with the ground of transaction-based supply chain management group on the platform of supply chain relation along with supply performance and supply chain performance in the manufacturing industry that are being located in the region of Thailand. However, in the following study, the measurement tools have been discussed for the ground of lean manufacturing, supply chain relationships, supplier performance and supply chain performance that were further made by the detailed literature review, experts of this field along with all the techniques or statistics that help to make the reliability along with validity. Furthermore, the model has been hypothesized that was tested with the ground of path analysis of structural equation modeling. It has been seen that the frameworks are being considered as important, reliable along with the valid point of view for the Thai manufacturing companies or industries that are the grounds named Lean

manufacturing, supply chain relationship, supplier performance, and supply chain performance. However, it has been observed that there is no direct relationship between the two variables named Lean manufacturing and supply chain performance, whereas along with this relationship lean manufacturing has a direct relationship with supply chain relationship and supplier performance. In addition to this supply chain have a direct relationship with the supplier performance and supply chain performance. Furthermore, in a matter of lean manufacturing and supply chain performance, supply chain relationship, and supplier performance are behaving as mediating variables. Moreover, supplier performance has a direct relationship with supply chain performance.

Furthermore, lean manufacturing has a trust bind or platform with the stakeholders that are grounded further with the suppliers and customers. Whereas, in practice, in supply chain ground it has been observed that people face the conflict among interests between partners. The relationship that has been seen positive here is all about being collaborative. The recommendation has been given by the author named Slone, Dittmann, and Mentzer (2010) that the collaboration can be said real when it has been done between the trade partners, further another author stated that research has been done in the Lean manufacturing ground have some sort of implementation in the platform of smaller firms that are being scarce just because of having the lower bargaining power stated by the two authors named (Beaumont, Wilson, & Roy, 2009; Hu, Mason, Williams, & Found, 2015). Moreover, the author explains the ground of supply chain management relationship that has been focused on by the transaction that is being in the level of operation to decrease the cost and it can affect the relationships negatively among partners of the same ground stated by the authors named (Crum, Poist, & Daugherty, 2011). Whereas the author has found that Supply chain management in the region of Thailand still has an objective on decreasing the cost of transactions rather than focusing on the partnership of the firms. When the partnership of the firm will be strong everything will go smoothly, but when the firm focuses on the cost only and ignore the ground of partnership, they can face a lot of issues regarding the supply chain ground or suppliers ground stated by the author named (Vanichchinchai, 2014).

The benefits that can be taken from this study are that practitioners can get the lessons for the raising output by managing the target of the week where the productivity level can increase. In the following study, the relationship is showing the influence on the ground of production directly so here they can get the lesson of enhancing the supply chain network of their organization. Many of the things can be discussed wider when the supply chain network has been discussed like boost cooperation. Practitioners are required to see the ground of partnership where the connection can be made strong. Furthermore, academicians get the benefits of getting the ground of improved margins along with the ground of decreasing waste and likely add the flexibility of the ground. It helps to grow faster in this study and helps in manufacturing along with the ground of data centralizations. Moreover, the benefits have been seen regarding procurement towards the planning towards the logistics firm where scheduling along with the delivery is considered as the important factor and sometimes logistics has been considered as the separate thing that has linked with the purchasing thing.

The purpose of the study is evaluate the factors comprising of lean manufacturing, supply chain relationship and supplier performance and their impact the supply chain performance in the supply chain firms in Jordan.

Following is the structure of the paper: Chapter 2 comprises of theoretical background and empirical studies, chapter 3 comprises of research methodology used in the paper, chapter 4 comprises of data analysis and interpretation and chapter 5 comprises of conclusion of the research.

Literature Reviews

The area of supply chain management used to with the ground of logistics along with the platform of physical transaction in the level of operation. However, the focus has been seen in the partnership ground where the external business partners are included in the level of strategic. According to the author named Talib, Rahman, and Qureshi (2011), after reviewing the literature of supply chain management ground it has been observed that there are a total of six major practices of supply chain management among 40 practices. All of them are re-engineering material that leads towards lean practices, employing information, and do communication technologies along with all the relationships with customers, the strategic partnership with suppliers, close partnership with suppliers, and the culture that is changing the corporate.

However, two practices are being related to the information along with the material transaction whereas the next three are related to the relationship with all the factors that are being gathered from the sixth corporate cultures. In addition to this, supply chain management however includes the ground of transaction-based

along with relationship-based factors. Moreover, the intangible relation-based ground of SCM usually focuses on the platform of the partnership between the business stakeholders that are on the strategic level to get the synergy from the ground of collaboration during the transaction based that usually focused and highlighted the tangible material flows to get the decreasing cost and get the delivery performance to the operational level stated by the two authors (Vanichchinchai, 2019; Vanichchinchai & Igel, 2009). Whereas the practices have been done from both sides as mentioned by the author named Flynn, Huo, and Zhao (2010), further the same author highlights the supply chain management focuses on the supplier along with customer integration, but the research of that platform completely denies the ground of internal operational integration. However, in the ground of a lean production system that was purely introduced by the author Krafcik et al. (1998), that further being famous by Womack 1990 in the book named “The Machine that Changed the World”.

Furthermore, the five principles of the foundation named lean thinking have been highlighted that are for the platform of implementation in enterprises that are 1) specify the value, 2) ground of identifying the value stream 3) avoid the interruptions in the platform of value flow, 4) customer pull value and the last one is 5) start pursuing the perfection ground, stated by the author named (Womack & Jones, 1996). Whereas, the increasing competition in business has been seen where the times are shorter lead loan with the lower cost and lean manufacturing here must be expanded towards the external partners where it has been identified and help to decrease the waste not only in the ground of internal but as well as external ground as well stated by the author named (Cudney & Elrod, 2010; Taylor, 2006). Moreover, according to the author named Shah 2007 highlights the ground of recommendation where the authors suggested that the ground of Lean manufacturing must be in the integrated socio-technical system that has an object to cut the waste by decreasing the internal along with external variability with the ground of supply network.

Whereas, according to the author named (Mollenkopf, Stolze, Tate, & Ueltschy, 2010; Tortorella, Miorando, & Marodin, 2017) Lean supply chain management has taken as the less adopted rather than the ground of lean manufacturing because of few difficulties during the time of implementation. Likewise, the author named (Perez, de Castro, Simons, & Gimenez, 2010), the report has been highlighted regarding the main issues in the following study where the current trading strategies are based in the ground of senior management commitment along with the support that has the difficulty in the value stream that from the team along with help to fluctuating auction prices and existing adversarial ground that has much power in the relationships among suppliers and customer. Moreover, according to the authors named Gueimonde-Canto, González-Benito, and García-Vázquez (2011); Rajamma, Zolfagharian, and Pelton (2011); Vanichchinchai and Igel (2011) stated that the relationship between the suppliers and customer can be very weird by the ground of business, nationality of organizations, the nationality of customer likewise the nationality of suppliers, position in the form of supply chain and firm size. In supply chain relation it has been advised to all the suppliers and customers to be in the exchanges of the collaborative and transactional just because it is sort of the need of developing the relationship to discrete the transaction that further collaborates the exchange behavior. Furthermore, the magnitude of these practices that explain the impact and type of relationship, stated by the authors named (Chen & Fung, 2013; Dwyer, Schurr, & Oh, 1987). However, the author suggested that the ground of platform required the certain practices at the level of the operation like the platform of rules along with the role specification, information sharing and some selective matching along with exit processions stated by the author named (Bowersox, Daugherty, & Dröge, 1992).

Moreover, the author has explained the ground of partnerships in the industry of garment where it has been found that most of the retailers of garments are considered as intermediate merchandisers that re being in a relationship as well like a retailer and intermediate merchandiser that further collaborate, whereas, these intermediate merchandisers along with the ground of small garments are considered as adversarial stated by the author named (Masson, Iosif, MacKerron, & Fernie, 2007). It has been seen that when the ground of supply chain management has been clear the relationship among the supplier performance and supply chain performance effect so well. Supply chain performance is the ground where the overall performance has been seen that includes the effect of supply chain relationship among the supplier and customer and supplier performance in that exchange of goods. Everything has its importance and role. If lean manufacture effects the supplier performance so somehow it affects overall supply chain performance because they relate to each other. In the outcome, the author suggested that future researchers but see the relationship practices on the customer ground and supplier side for the relational exchanges stated by the author named (Chen & Fung, 2013). Therefore, the following hypothesis has been made that re being established to observe in the following study:

H1: Lean manufacturing has a significant effect on supply chain relationship.

H2: Lean manufacturing has a significant effect on supplier performance.

H3: Supply chain relationship has a significant effect on supplier performance.

H4: Lean manufacturing has a significant effect on supply chain performance through supply chain relationship.

H5: Lean manufacturing has a significant effect on supply chain performance through supplier performance.

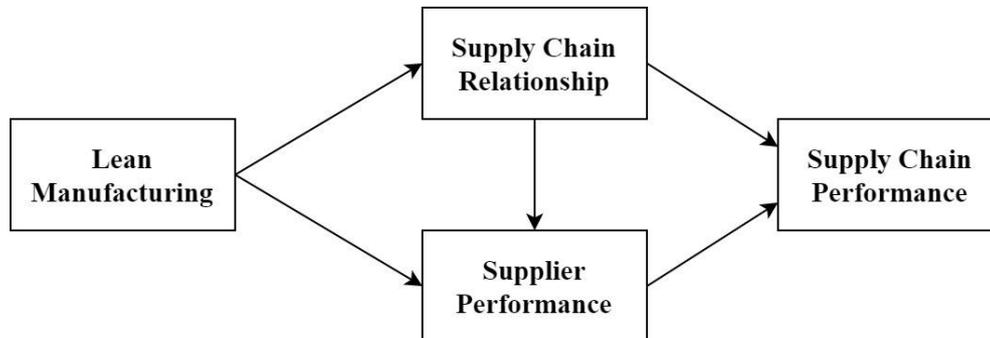


Figure 1: Research Model

Research Methods

There are two different types of approach used in a study called as the quantitative approach and the qualitative approach. The quantitative approach is a systematic examination of phenomenon with the help of data that is in numbers and is analyzed using the mathematical or statistical techniques (Bryman, 2017). The quantitative approach was adopted in this research.

There are two purposes that are used in the researches called as the exploratory purpose and the explanatory purpose. The explanatory purpose is used to study a problem not studied properly before. The explanatory purpose helps in understanding why and how a specific phenomenon occurs by evaluating the relationship among them (Peffer, Tuunanen, Rothenberger, & Chatterjee, 2007). The explanatory purpose was adopted in this research.

There are two types of design used in researches called as the causal design and the correlational design. The causal design is a design where the observer manipulates a variable and examines changes in other variable for the cause and effect relationship between them. It is a type of non-experimental research design (Leedy & Ormrod, 2010). The causal research design was adopted for the study.

The non-probability sampling is a type of sampling where the researcher collects the data from specific target population rather than collecting the data randomly. The non-probability sampling technique consists of many different types including the purposive sampling, convenience sampling, snowball sampling etc. (Etikan, Musa, & Alkassim, 2016). The purposive sampling is a type of sampling where the researcher collects data from people based on their judgement as to who can provide the relevant information (Tongco, 2007). The purposive sampling technique was adopted for the study.

The PLS-SEM also known as the partial least square structural equation modeling is a type of data analysis used that enables the evaluation of difficult relationship among the variables of study (Becker, Klein, & Wetzels, 2012). The PLS-SEM was used in the research. SmartPLS software version 3.2.8 was used.

DATA ANALYSIS

Following table 1 shows the profile of respondents.

Table 1: Profile of the Respondents (n = 293)

		Frequency	Percent
Designation	Assistant Manager	14	4.8
	Deputy Manager	167	57.0
	Manager	105	35.8
	Senior Manager	7	2.4
Years of Experience	Less than 1 Year	14	4.8
	1 to 5 years	91	31.1
	5 to 10 years	20	6.8
	More than 10 years	168	57.3
Firm Size	Less than 250 employees	84	28.7
	250-500 employees	69	23.5
	500-1000 employees	63	21.5
	More than 1000 employees	77	26.3

Table 2 shows results of measurement model.

Measurement Model					
	Loadings	Prob.	Alpha	CR	AVE
LM1 <- Lean	0.743	0.000			
LM2 <- Lean	0.810	0.000	0.856	0.899	0.692
LM3 <- Lean	0.899	0.000			
LM4 <- Lean	0.867	0.000			
SCP1 <- SC Performance	0.946	0.000			
SCP2 <- SC Performance	0.938	0.000	0.934	0.949	0.825
SCP3 <- SC Performance	0.784	0.000			
SCP4 <- SC Performance	0.954	0.000			
SCR1 <- SC Relationship	0.808	0.000			
SCR2 <- SC Relationship	0.948	0.000	0.853	0.893	0.673
SCR3 <- SC Relationship	0.772	0.000			

				0			
SCR4 <- SC Relationship		0.753		0.00			
				0			
SLP1 <- Supplier Performance		0.837		0.00			
				0			
SLP3 <- Supplier Performance		0.738		0.00	0.77	0.86	0.67
				0	8	2	7
SLP4 <- Supplier Performance		0.887		0.00			
				0			

The above mentioned table has a recommended threshold for factor loadings that factor loadings with value less than 0.40 cannot be acceptable but values in range 0.40 to 0.70 is good. However, values higher than 0.70 is very highly retained (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014). Similarly, the table shows composite reliability and AVE. The CR can be accepted higher than 0.70 and AVE can be acceptable with value higher than 0.50 (Hair, Ringle, & Sarstedt, 2011). Thus, this table has been successful and achieved measurement model.

Table 3 shows results of Fornell and Larcker (1981) criterion.

Table 3: Fornell and Larcker (1981) Criterion

	Lean	SCP	SCR	SP
Lean	0.832			
SC Performance	0.011	0.908		
SC Relationship	0.391	0.142	0.823	
Supplier Performance	0.413	0.357	0.391	0.823

The above table has some recommendations given by Fornell and Larcker (1981) that values both horizontal and vertical must be higher in their constructs as compared to values in other constructs. Thus, the values are in line with the recommendation and it has achieved discriminant validity using Fornell and Larcker (1981) criterion.

Table 4 shows results of crossloadings.

Table 4: Crossloadings

	Lean	SCP	SCR	SP
LM1	0.743	-0.025	0.232	0.157
LM2	0.810	-0.076	0.296	0.550
LM3	0.899	0.044	0.333	0.257
LM4	0.867	0.038	0.416	0.272
SCP1	0.140	0.946	0.316	0.438
SCP2	0.031	0.938	0.007	0.315
SCP3	-0.327	0.784	-0.085	0.110
SCP4	-0.175	0.954	0.065	0.268
SCR1	0.221	0.045	0.808	0.280
SCR2	0.459	0.179	0.948	0.415

SCR3	0.280	0.094	0.772	0.325
SCR4	0.118	0.140	0.753	-0.058
SLP1	0.335	0.623	0.195	0.837
SLP3	0.255	0.006	0.395	0.738
SLP4	0.417	0.036	0.459	0.887

The above table has been given a recommendation that values in their own constructs (horizontally) must be higher in the comparison to the values in other constructs (Hair et al., 2014). Hence, this table has in relation with the threshold and has accepted discriminant validity using cross loadings.

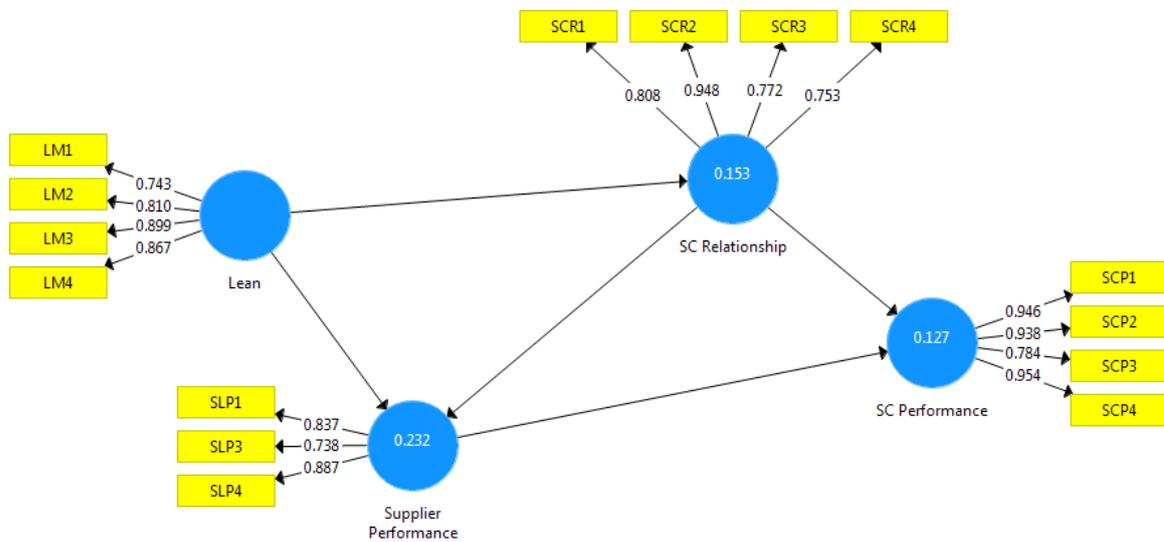


Figure 2: PLS Algorithm

Table 5 shows results of Heterotrait-Monotrait (HTMT) ratio.

	Lean	SCP	SCR	SP
Lean				
SC Performance	0.216			
SC Relationship	0.391	0.164		
Supplier Performance	0.433	0.342	0.428	

The above table has to show values with less than 0.90 so that HTMT can be reported (Henseler, Hubona, & Ray, 2016). The table has values in relation to the recommendation and has achieved discriminant validity using HTMT ratio.

Table 6 shows the results of path analysis for hypothesis-testing.

Table 6: Path Analysis using PLS-SEM

	Estimate	S.D.	T-Stats	Prob.
Lean -> SC Relationship	0.391	0.031	12.783	0.000
Lean -> Supplier Performance	0.307	0.037	8.295	0.000
SC Relationship -> SC Performance	0.003	0.074	0.043	0.965
SC Relationship -> Supplier Performance	0.270	0.054	5.016	0.000
Supplier Performance -> SC Performance	0.356	0.071	4.996	0.000

Lean manufacturing has significant effect on supply chain relationship (0.391, $p < 0.001$) and supplier performance (0.307, $p < 0.001$); whereas SC relationship has significant effect on supplier performance (0.270, $p < 0.001$) while statistically insignificant effect on SC performance (0.003, $p > 0.05$). Finally, supplier performance (0.356, $p < 0.001$) has significant effect on SC performance.

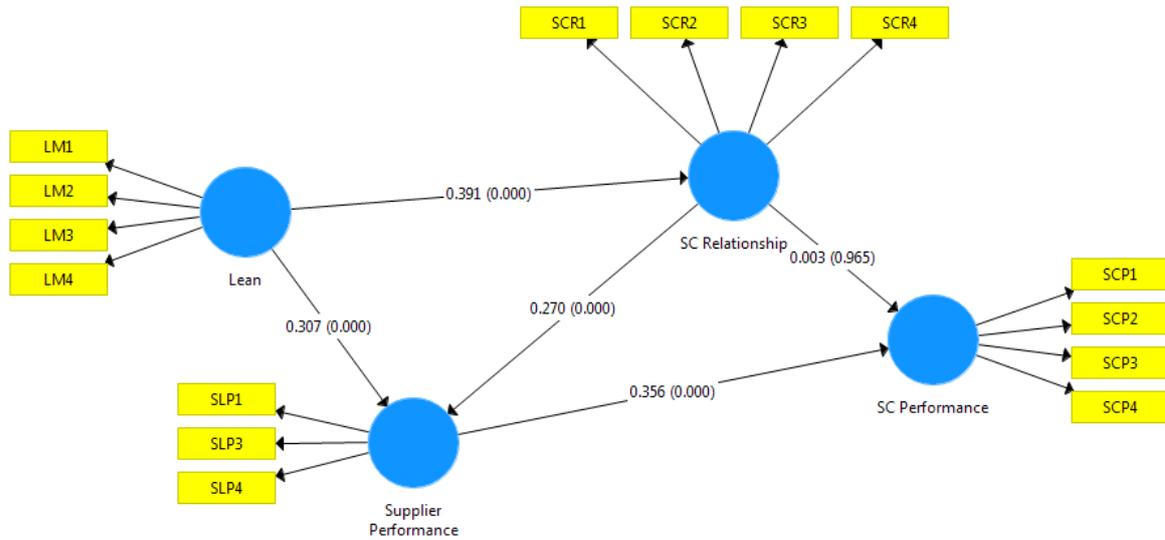


Figure 3: PLS Bootstrapping

Conclusion

The findings of the following study have highlighted the relationship between the four variables named Lean manufacturing, supplier performance, supply chain performance, and supply chain relationship. It has been discussed that the relationship between the supplier and customer must be transactional at the operational level that helps to keep the relationship positive exchange (O'Connor, Lowry, & Treiblmaier, 2020). However, the collaboration between the members of the supply chain is considered as the fundamental part of this following study just because to achieve the full goals that are being aimed in the study. As all the relationships are interconnected with each other and supplier or customer relationship has been the priority that must be managed (Mani, Gunasekaran, & Delgado, 2018).

However, the researchers of this ground are recommended to invest the time in the ground of supplier performance along with the supply chain performance and supply chain relationship as they are all connected with the lean manufacturing and has an effect on the overall firm performance. Moreover, it has been also suggested to see the resource allocation that must be done over time, because delaying in this process can stop the further work that is being connected with the past stage. As all the work are interconnected here. Managers are further recommended in the following study to keenly focus on the nationalities of the supplier or customer before purchasing because it can cost higher if you are purchasing it from other countries rather than focusing the goods of own country. In addition to this, managers can accept the potential risk that gave opportunities for developing the relationships among the customer and supplier as to when the two grounds named supplier performance and supply chain performance will be strong so automatically it will affect positively the results of the supply chain performance.

Furthermore, in the future, researchers are suggested to work on the ground of lean supply chain management along with the ground of supply chain performance, supplier performance, and supplier relationship. It has been further suggested to focus on other industries like the shoe market, bags market, or jewelry market rather than just focusing on one industry. The study must be generalized that can be further applied by the international authors or researchers as well that will help to give the recognition. Supply chain management has been considered as the vast ground where the procurement process has its value. When it comes to productivity, future researchers are suggested to work on the weekly productivity while maintaining the supplier performance, as the relationship among customers and suppliers is the important thing that kind of effect by the productivity level as well. The supplier performance has been seen by the quality of his or her work along with the delivery timeline. Customers have many options where they can switch easily. Future researchers are suggested to keenly work on the ground by generalizing the study, do the statistical information with explanation, consider a vast industry, add up new variables like productivity effects on supplier performance, and the ground of lean supply chain management.

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