

Lean Manufacturing Practices And Their Effect On Sustainability Performance: Insight From Selangor Manufacturing Industry

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Abstract

Lean manufacturing practices benefited to firm performance, however the research regarding the implementation of lean manufacturing on firm sustainability performance is limited. Therefore, the aims of the study are to examine the effect of lean manufacturing practices towards firm sustainability performance using Triple-Bottom Line (TBL) approach. The same lean manufacturing practices was adopted from Norani and Wahab (2011) as indicator in the study. Data were gathered by using questionnaire and was sent to 308 manufacturing industry located in Selangor and 25 industry experts by email. By the way, there were only 51 responses returned. Statistical Package for Social Sciences (SPSS) 22.0 system is applied to answer the research objectives and to test the hypotheses. The findings show process and equipment, and customer relationship has significant influence on TBL sustainability performance whereas manufacturing planning and control, human resources and supplier relationship show the opposite. The present study contributes to practitioner in research perspective and beneficial to manufacturer the extent level of lean manufacturing practices and its effect on TBL sustainability performance in order to help their firm achieve sustainable improvement in economic, environmental and social aspects.

Keywords

Lean Manufacturing Practices, Sustainability Performance, Triple-Bottom Line, Manufacturing Sector

1. Introduction

Manufacturing sector in Malaysia have been set as a core sector for Malaysia economic growth. The report showed contribution of manufacturing sector to Gross Domestic Product (GDP) in Tenth Malaysia Plan have achieved RM 1,111 billion (Department of Statistic Malaysia, 2020). Moreover, 2.8 million of new job opportunities have created by manufacturing sector to new employment. Also, the sales value of Malaysia manufacturing has growth up to RM 76.1 billion in December 2019 which increased 22.1 per cent as compare to RM 72.3 billion in 2018 at same period (Department of Statistic Malaysia, 2020). Nonetheless, the contribution of manufacturing sector in national account (GDP) at current prices showed ranked at second place after services sector as compare to 2015 prices which ranked at first places. This due to rapid changes and highly competitive between manufacturing industries and others sector, therefore sustainability performance become significant important nowadays for a firm to survive in marketplace and lead to purpose of conducted this study by implemented Lean Manufacturing Practices (LMPs) as indicator.

LMPs being adopted in this study due to empirical result done by several researchers prove the implemented of lean manufacturing practices significant effect on business overall performance and sustainability. Previous study by Zahraee (2016) states applied lean manufacturing in industry able to improve competitiveness in the domestic and international market. Finding from Burawat (2019) studies also shown successful lean implementation apply in Thailand SMEs manufacturing industry generate a better economic performance and lead to all sustainable competitive including operational, economic, environmental and social performance. According to Hussain, Al-Aomar, and Melhem (2019), finding shows adoption of lean practices generate high impact towards economic sustainability by improve efficiency and service quality.

In addition, the used of LMPs as indicator in the study due to lean practices and lean thinking view as new development or growth of Toyota's practices or generic version based on Toyota Production System (TPS) and the Toyota Way of Management system with an objective to eliminating waste at the same time to improve production efficiency consistency (Rosing et al., 2015). However, under the lean philosophy and principles, there are consists wide variety of practices and tools in which different approach consists it function specifically to address different issue following to achieve the objective (Evangelos Psomas, 2019). Nonetheless, among wide variety of LMPs, researcher select only five dimension as independent variables which adopted from Norani and Wahab (2011) studies to test its impact on TBL sustainability performance. The same independent variable was adopted from Norani and Wahab (2011) studies into the study because internal and external threat were taken into account for the hypotheses test which able to provide more reliable and accurate information reflect on three aspect of sustainability performance including economic, environmental and social aspects.

Besides, previous literature by various authors showed the implementation of LMPs measure on sustainability performance is limited. A studies by Henaio, Sarache and Gómez (2019) showed that most previous work linking between Lean Manufacturing (LM) and firm performance only in specific particular without taken sustainability performance using TBL approach. For instance, implement of LM only measure on operational performance or economic performance. Same goes to study by Banihashemi, Fei, and Chen (2019), huge amount of previous work mainly focusing on performance by only taken factor of economic and environmental performance into account. Martínez León and Calvo-Amodio (2017) studies concluded that majority of previous studies limited their scope with expressed only in one direction without consider the economic, environmental, and social aspect. Hence, due to the limitation of previous studies, thus it generates the aims for researcher to conduct this study by implement LMPs on TBL sustainability performance to fulfil the gaps.

1.1 Research Aim

The research objectives of the study as follow:

- To analyze level of lean manufacturing practices.
- To examine the impact of lean manufacturing practices on TBL sustainability performance.

2. Literature Review

There were five (5) lean manufacturing practices being select as indicator and three (3) outcome included economic, environmental, and social sustainability performance to be investigate in this study. The same independent variable was adopted from Norani and Wahab (2011). Next, the literature review of all variable in this study will be discuss in next section.

2.1 Lean manufacturing practices

(a) Process and equipment

Extra-processing recognized as one of the waste under the seven wastes (Earley, 2016a). In Sundin et al. (2011), over processing or excess production impact on economic and environmental performance due to storage issues for additional semi-finished products and increase of storage cost and capital cost. Equip employees with the right skills enable to increase their understanding on the work process to avoid make any mistake that could lead to injury, which also contribute to enhance social sustainability performance by concerned on the society well-being in all operation (Earley, 2016b). In fact, sustainability performance in aspect of economic and environmental can improved by using process and equipment practices removing those extra-processing and unnecessary usage included energy and materials. The reduction impacts of environmental performance is expected contribute to enhance social performance which establish employees healthy work life without over work due to extra motion or extra-processing.

(b) Manufacturing planning and control

An appropriate planning and control can improved transparency by concern on correction rather than on prevention, thus it could lead to more accurate on time communication, material usage and avoid delays (Brady et al., 2018; Yusup, Mahmood and Salleh, 2015). Production scheduling, quality control and selective maintenance has integrated as cost model in Tambe and Kulkarni (2016) studies and results shown planning and control practices can help to improve economic performance by reduce time, reduce wastage of material in work process, rework and improve the work conditions (environmental performance). The used of Gemba-Kaizen also highlighted in Cherrafi et al. (2019) studied as a basic of indicator that influences on sustainability result. For an example, Gemba enhance environmental sustainability results by reduce water consumption, toxic air emission and pollution whereas Kaizen improve economic and social sustainability performance through efficient on the continuous flow of production and well-being in all operation. As such, the previous study proves the manufacturing planning and control practices have direct effect toward economic, environmental, and social sustainability performance, thus this practice has been adopted in this study.

(c) Human Resources Practices

According to Bombiak and Marciniuk-Kluska, 2018; Hao, Liu, and Goh, 2020, human resources practices contribute to enhancing a firm environmental sustainability goals by educated the important tacit knowledge to employees such as eco-friendliness to employees and the idea of create environmental friendly product. In studies by Cristiani and Peiró (2019), economic performance of an organization affected by human resources practices through control of employee turnover rates, productivity, quality and rate of innovation. Using cross-functional workforce and provide training to employees lead to enhance social performance in which market demand from customer can truly understand by a firm follow with propose an effective solution to accomplish customer requirements (Qi et al., 2020). Therefore, human resources practices are adopted in this study in order to examine its effect on economic, environmental and social sustainability performance.

(d) Supplier Relationship

Supplier relationship views as crucial practices for companies to stablish long-term business relationship due to the changes of environmental issue and variety of customer behavior in marketplace (Tang & Hsu, 2015). According to Wilson (2015), to improve environmental and social performance associated with the engagement of supplier together with the closer scrutiny by the retailer in order to achieve environmental regulations and standards and enhance firm's green image. Monitoring of supplier sustainability practices can help to develop a better firm sustainability performance in aspect of environment and social (Shafiq et al., 2017). Strategy for improving responsibility and flexibility of manufacturing industry through effective supplier relationship such as Just-in-time delivery by supplier, establish long-term relationship, close contact with supplier and feedback on their performance (Qadri, 2015).

(e) Customer Relationship

According to Tang and Hsu (2015), customer relationship is a important element to be concerned in order to stablish long-term cooperation between producer and customers in transaction, also the degree of sincere willingness to communicate. The used of Corporate Social Responsibility (CSR) as approach for business aims build up a good relationship with customer and stakeholder to enhance business operation efficiency, corporate reputation and significant improvements to the firm's social sustainability performance by involvement and engagement of customers and stakeholders along with the activities (Camilleri, 2016). According to Fung et al., 2016; Koetz, 2019, customer delight and engagement become a importance element to be focus by marketing because customer and customer experience are more empowered than ever. For instance, brand loyalty and fulfils customer expectation with various deals is good to improve customer experience to drive beyond transactional activities, thus it led to enhance social sustainability performance. In summary, customer relationship can enhance the social sustainability performance by constantly improve the overall customer retention, loyalty and response from society. This following effect to improvement of economic performance through growth in sales while fulfils customer expectation and expected to be enhanced environmental performance by minimized the emission of hazardous substance.

2.2 Sustainability Performance

(a) Economic Sustainability Performance

In economic line typically related to financial or monetary aspects (Sanchez, Galbreath, & Nicholson, 2017). The economic line basically associated with the growth of the economy of an organization and explained how well its

contributions to support it. A study done by previous researcher stated the return, growth, profitability and equity as an indicator economic success (Nadae, Carvalho, & Vieira, 2019). At the same time, cost view as a core element for economic performance to measures profitability (Ribas & Cachim, 2019).

(b) Environmental Sustainability Performance

Environmental sustainability refers to the capability of business to fulfil their current demand or targets of the business by using natural resources, without harm ecological balance or even society in general. According to Elkington (1998), environmental sustainability performance view as increasing crucial being as a competitive strategic approach in the world of business because they believe eco-efficiency product concept offer higher quality and value to consumer also enable them to reduce waste, risk and costs. In the Brundtland Report written by Keeble (1988) also mention future patterns of primary sector, secondary sector and human settlements can be made far less material-intensive in order to achieve economically and environmentally efficient. Back to mid-1990s, environmental agenda being much promoted as sustainability development agenda and opening out into a much broader for NGOs to investigate more in deep regarding issues of environmental and sustainability follow with alternative solution.

(c) Social Sustainability Performance

The third area of sustainability under TBL approach which take people, planet and profit as a consideration in the book Cannibals with Forks: The Triple Bottom Line of 21st Century Business (Elkington, 1997). Social sustainability focused on how an individual organization get going their long-their responsibility for current and future potential stakeholders.

3. Research Methodology

Quantitative methodology was applied in this study and questionnaire has been developed for the data collection. The results following generate by using Statistical Package for Social Sciences 22.0 (SPSS) system. Next, several analyses included descriptive statistics of analysis, reliability test, normality test and regression analysis has been used in the study to test the hypotheses of the study,

3.1 Questionnaire Design and Survey Instrument

A structured of survey questionnaire was developed by researcher aims to collect data regarding lean manufacturing practices and TBL sustainability performance. The information obtain is crucial for researcher to test the hypotheses of the study and achieve the research objectives. The questionnaire was adapted from Iranmanesh et.al, (2019) as survey instrument in this study. After that, a set of questionnaires had designed and consists of three major sections which the first section asks regarding respondent firm general information. Next, following second section asks regarding measurement item for each indicator of lean manufacturing practices and third section was asks regarding sustainability performance by using TBL approach. The first section was multiple choice option while second and third section was using five-point Liker scale to measure the best opinion by respondent firm. Table 1 precise all the questionnaire format which used for survey and data collection in this study.

Table 1: The concept of questionnaire format

Section	Description
Section 1: General information	<ul style="list-style-type: none"> This section consists of general information about the respondent firm. The general information includes gender, types of manufacturing and others.
Section 2: Lean manufacturing practices (i) Process and equipment (ii) Manufacturing planning and control (iii) Human resources practices (iv) Supplier relationship (v) Customer relationship	<ul style="list-style-type: none"> This section will be listed down related indicator for each dimension as measurement item to be answer by respondent firm. A total number of 5 dimension included and 26 statements will be asked to evaluate in this section.
Section 3: Sustainability performance	<ul style="list-style-type: none"> This section will be listed down related

(i) Economic sustainability performance (ii) Environmental sustainability performance (iii) Social sustainability performance	indicator for each dimension as measurement item to be answer by respondent firm. A total number of 3 dimension included and 17 statements will be asked to evaluate in this section.
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3.2 Data Analysis Technique

The data collected was analyze by using SPSS 22.0 system to test the hypotheses. The findings obtained through various of process analysis included data screening, descriptive statistical analysis, reliability test, normality test and regression analysis. Data screening was performed in the measurement model aims to prevent any missing of data before proceeding to descriptive statistical analysis. The used of descriptive statistical analysis is to present the results of general information by respondent firm who involve in this survey and answer the first research objective. Next step is reliability test which aims to determine the internal consistency of the study follow by normality test. Last analysis applied was regression analysis in which used to test the hypotheses to achieve the second research objectives of the study.

3.3 Research Framework

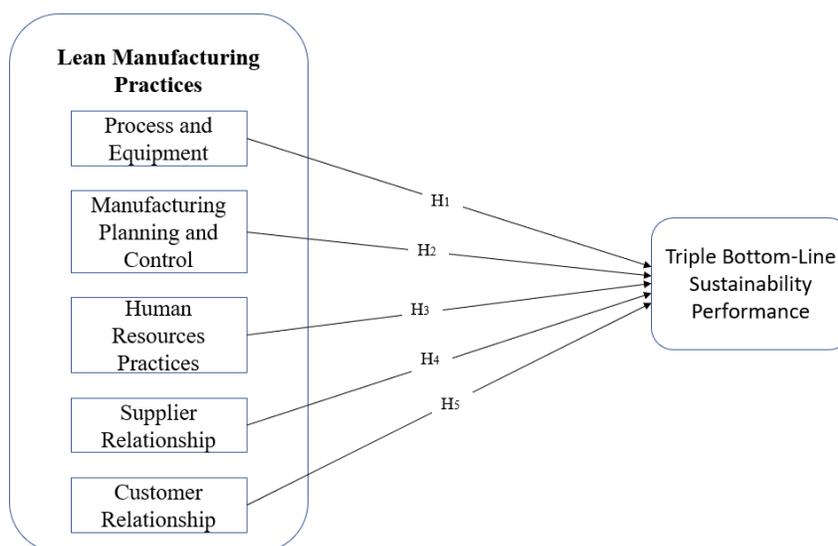


Figure 1: Research framework

Figure 1 showed the research framework of the study and indicate all independent and dependent variables being adopt in this study. In short, there are total of five (5) hypotheses has developed in this study as follow:

- H1: The effect of process and equipment practices towards TBL sustainability performance.
- H2: The effect of manufacturing planning and control practices towards TBL sustainability performance.
- H3: The effect of human resources practices towards TBL sustainability performance.
- H4: The effect of supplier relationship practices towards TBL sustainability performance.
- H5: The effect of customer relationship practices towards TBL sustainability performance.

4. Analysis of Results

4.1 Response Rate

A total number of 51 responses or equal to 15.32% response rate were received by researcher in 2 months duration after the survey questionnaire sent to 308 manufacturing industry located only in Selangor including Small and Medium Enterprises (SMEs) and large-scale organization and 25 industry experts through LinkedIn indeed website.

4.2 Descriptive Statistic of Frequency

This section shows the general information about respondent firm background and Table 2 shown the summary of general information by frequency and percentage.

Table 2: Summary of general information

	Description	Frequency	Percentage
Size of organization	Small and Medium Enterprise	32	62.7
	Large scale organization	19	37.3
	Total	51	100.0
Length of duration operated until today	Less than 5 years	2	3.9
	6 to 10 years	7	13.7
	11 to 15 years	4	7.8
	16 to 20 years	9	17.6
	21 years or onwards	29	56.9
	Total	51	100.0
The status of ownership	100% Local	35	68.6
	Joint venture	13	25.5
	Fully foreign	3	5.9
	Total	51	100.0
Number of employees	Less than 50 employees	11	21.6
	51 - 100 employees	16	31.4
	101 - 150 employees	1	2.0
	151 - 200 employees	2	3.9
	201 employees and above	21	41.2
	Total	51	100.0
Category of company	Automotive	1	2.0
	Chemical & petrochemical products	2	3.9
	Electrical & electronic products	4	7.8
	Machinery & engineering	11	21.6
	Medical, pharmaceutical & optical instruments	3	5.9
	Palm oil-based products	1	2.0
	Paper & printing	5	9.8
	Plastic & plastic products	7	13.7
	Rubber products	1	2.0
	Steel & metal products	2	3.9
	Textile, wearing apparel & leather	3	5.9
	Transport equipment	3	5.9
	Wood, wood products & furniture	3	5.9
	Other	5	9.8
Total	51	100.0	
Position	CEO/ COO/ Managing Director	11	21.6
	Manager	19	37.3
	Assistance Manager	8	15.7
	Executive	12	23.5
	Supervisor (Production/ Quality Control)	1	2.0
	Total	51	100.0
Aware of lean practices	Yes	45	88.2
	No	6	11.8
	Total	51	100.0
Benefited to firm performance	Yes	45	88.2
	No	6	11.8
	Total	51	100.0
Duration of	Less than 1 year	14	27.5

implemented lean manufacturing practice	2 - 3 years	6	11.8
	3 - 4 years	3	5.9
	More than 4 years	28	54.9
	Total	51	100.0
ISO certification holding by company	ISO 9001	47	92.2
	ISO 14001	25	49.0
	ISO/TS 16949	6	11.8
	OHSAS 18001	8	15.7
	Other	4	6.0

4.3 Descriptive Statistic of Variable

This section answered the first research objective of the study. To analyze the level of lean manufacturing practices, descriptive statistic of variable has using in the study to obtain the mean value and standard deviation following to examine the influences effect level. Based on Table 3, the finding shows the five (5) lean manufacturing practices have high moderate level with the results between 3.73 to 4.03 mean values.

Table 3: Summary of descriptive statistic of variables

Variable	N	Mean	Std. Deviation
avgPE	51	3.74	.49
avgMPC	51	3.73	.52
avgHR	51	3.81	.54
avgSR	51	3.75	.54
avgCR	51	4.03	.50

4.4 Reliability Test

Reliability analysis was applied to determine the internal consistency of the study. Cronbach's alpha coefficient was the items employed in reliability analysis to measure the internal consistency. According to Taber (2017), alpha value is acceptable when the value ranging from 0.45 to 0.98. In studies by Hair et al, 2010, the acceptance agreed value for Cronbach's alpha is between 0.6 and 0.7. Table 4 showed all variable were valid with the Cronbach's Alpha value ranging from 0.508 to 0.888.

Table 4: Summary of reliability test

Variable	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Process and Equipment	0.726	0.735	6
Manufacturing planning and control	0.508	0.493	5
Human resources practices	0.774	0.78	6
Supplier relationship	0.608	0.605	5
Customer relationship	0.612	0.647	5
Economic sustainability performance	0.598	0.61	6
Environmental sustainability performance	0.888	0.888	6
Social sustainability performance	0.846	0.844	5

4.5 Normality Test

Kolmogorov-Smirnov normality test was used in this study due to sample size is more than 50. An analyst essential used for this study is to determine the distribution of the data is normal or not normal, which following to validate the assumption of tests based on regression. (Yap & Sim, 2011). Table 5 showed the normality test of TBL sustainability performance and results showed it was normal distribution in which the p-value equal to 0.092 ($p > 0.05$).

Table 5: Kolmogorov-Smirnov Normality Test

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
avgTBLSP	.115	51	.092	.971	51	.246

a. Lilliefors Significance Correction

4.6 Regression Analysis

This section answered the second research objective of the study. The findings show the regression coefficient of process and equipment practices have significant relationship effect towards TBL sustainability performance with the result of p-value equal to 0.003 ($p < 0.05$). Hence, the hypothesis 1 was supported. Next, the regression coefficient of manufacturing planning and control practices shows have insignificant relationship effect towards TBL sustainability performance with the result of p-value equal to 0.155 ($p > 0.05$). Hence, the hypothesis 2 was not supported. Same goes to the hypothesis 3 was not supported in which the regression coefficient of human resources practices shows insignificant relationship effect towards TBL sustainability performance with the result, p-value equal to 0.632 ($p > 0.05$). The hypothesis 4 also not supported in the study in which the regression coefficient of supplier relationship practices has insignificant relationship effect towards TBL sustainability performance with the result of p-value equal to 0.069 ($p > 0.05$). Interestingly, the regression coefficient of customer relationship practices has significant relationship effect towards TBL sustainability performance with the result of p-value equal to 0.010 ($p < 0.05$). Hence, the hypothesis 5 is supported. Table 6 showed the summary results of regression analysis by hypothesis.

Table 6: Summary results of regression analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.477	.458		1.041	.303		
	avgPE	.321	.102	.332	3.148	.003	.775	1.291
	avgMPC	.142	.098	.156	1.446	.155	.739	1.353
	avgHR	-.046	.095	-.052	-.483	.632	.737	1.356
	avgSR	.192	.103	.218	1.861	.069	.627	1.594
	avgCR	.337	.126	.351	2.674	.010	.500	2.000

a. Dependent Variable: avgTBLSP

As shown in Table 7, the findings showed there were two (2) hypotheses were supported whereas three (3) hypotheses were not supported in the study.

Table 7: Summary results of hypotheses test

Hypotheses	Hypotheses Statement	Result
H1	Process and equipment practices have positive effect towards TBL sustainability performance	Supported
H2	Manufacturing planning and control practices have insignificant relationship effect towards TBL sustainability performance.	Not supported
H3	Human resources practices have insignificant relationship effect towards TBL sustainability performance.	Not supported
H4	Supplier relationship practices have insignificant relationship effect towards TBL sustainability performance.	Not supported
H5	Customer relationship practices have positive relationship effect towards TBL sustainability performance.	Supported

5. Discussion

According to the result, findings showed process and equipment practices were significant effect on Triple-Bottom Line (TBL) sustainability performance included economic sustainability performance, environmental sustainability performance and social sustainability performance. In fact, it shows that hypothesis 1 (H1) was supported in this study. The finding of this study similar with Bergmiller (2006) which environmental sustainability performance effected by over-processing following lead to emission and hazardous waste due to exceed usage of energy and resources. Hence, value stream mapping, error proofing technique, cycle time reduction, continuous flow of production, order and cleanliness and set up reduction were applied to reduce the issue of over-processing follow with improving in TBL sustainability performance. In Azevedo and Sholiha (2015) studies, value stream mapping and value stream costing are two crucial elements measure on economic performance through gathered of comprehensive costing information.

The result confirmed the insignificant effect of manufacturing planning and control practices on TBL sustainability performance. In fact, it represents the hypothesis 2 (H2) was not supported in the study. The result obtained inconsistent with Chen et al. (2015) studies which indicate that manufacturing planning and control lead to better environmental sustainability performance through internal process improvement and adopt better environmental technologies in processing. Same goes to studies by Ng, Low and Song (2015); Sajan et al. (2017) supported the important of manufacturing planning and control lead to enhance sustainability of environmental performance by using pull system to ensure the quantity of materials and production at right volume without exceed market requirement to avoid excess consumption and waste. Moreover, Kanban system also suggested by Yusup, Mahmood and Salleh (2015) studies for planning and organizing on production volume in order to match up with customer demands and lead to reduce in operating cost to sustainable improve on economic performance. Similarly with studies by Verrier, Rose and Caillaud (2015), the used of Kanban system and lot size reduction for inventory management able to contribute high level of economic and environmental performance through reducing of power usage. According to Chiarini (2014), proactive maintenance of equipment reduce the risk of potential for injury on employee and avoids processed failure in order to accomplish social sustainability performances. As such, previous studies shown a positive effect of manufacturing planning and control on sustainability performance whereas contrast with the results of the study.

The findings showed the human resource practices insignificant effect on TBL sustainability performance. In fact, it showed that hypothesis 3 (H3) was not supported in the study. The findings in line with Resta et al. (2016) studies, which environmental and social aspect does not affect by the human resources practices. One of the reasons for this insignificant effect relationship due to lack of focuses on the lean implementation process and the sustainability strategy. Reversely, the studies by Hao, Liu and Goh (2020) shown the environmental sustainability performance affected by human resources practices due to employee tacit knowledge on create idea of environmental friendly products. Cross-functional workforce also highlighted in Qi et al. (2020) studies as important strategy under human resources practices to gain better understanding of customer and market demand in order to enhance social performance by concerned customer retention and improve on economic performance by prevent expenses on producing unfamiliar product.

The findings showed supplier relationship insignificant effect on TBL sustainability performance. In short, it represents the hypotheses 4 (H4) was not supported in the study. The result inconsistent with Piercy and Rich (2015) studies, which his studies obtained supplier relationship positive effects on improvement of economic, environmental and social aspect though information sharing. For an example, manage wisely on supplier relationship benefited on reducing the bullwhip effect that leads to higher cost due to excess production and also benefited to environmental due to lower the stock holding. According to Wilson (2015), engage suppliers relationship is essential to consider in process of sustainability performance in which enhancing working environment and well-being of supplier by implemented right practices. Furthermore, effective supplier relationship can shorten the response time and ensure material or services deliver by supplier on time basis which indicate to achieve high level of efficiency and effectiveness in sustainability performance (Bhamu & Sangwan, 2014). As such, some previous studies prove that supplier relationship positive effect on TBL sustainability performance and consequently the results findings showed insignificant relationship effect between supplier relationship on TBL sustainability performance.

According to the results, customer relationship confirmed the positive relationship effect on TBL sustainability performance included economic sustainability performance, environmental sustainability performance and social

sustainability performance. In fact, it showed that hypothesis 5 (H5) was supported in the study. The finding of this study in line with Sajan et al. (2017) who claimed the customer relationship were particular element in LMPs and have direct effect towards the social benefits in addition to economic and environmental. According to Bhamu and Sangwan (2014), external issues like customer and environmental slightly effect on economic performance in which opening up new customer will generate better economic performance. As such, focuses on customer relationship by understanding what customer's demand will enhance customer satisfaction and consequently will lead to improve TBL sustainability performance.

6. Conclusion

The purpose of this study is attempted to analyze the level of lean manufacturing practices and examine the impact of lean manufacturing practices on TBL sustainability performance in Selangor manufacturing industry. Throughout the process of analysis, the findings show process and equipment, and customer relationship has significant influence on TBL sustainability performance whereas manufacturing planning and control, human resources and supplier relationship show the opposite. The present study contributes to practitioner in research perspective in which the implication of lean manufacturing practices enhancing on firm TBL sustainability performance and beneficial to manufacturer the knowledge regards the extent level of lean manufacturing practices and its impact on TBL sustainability performance to help their firm achieve sustainable improvement in economic, environmental and social aspects.

6.1 Limitations of the study

There is certain barrier faced by researcher during conducted this research and lead to limitations of the study. First, Covid-19 pandemic is the major limitation and lead to low response rate or returned in the study. E-mailing and phone call is the only method used by researcher for data collection along 2 months survey period. Also, the respondent who asked for answer the survey assumed that was a scam and certain respondent refuse to answer the survey due to them tight by their company rules.

6.2 Recommendation for Future Research

Future research is recommended to open the study area by involving others state within Malaysia as well as others sector instead of specified only Selangor manufacturing industries. Also, future research is recommended to adopt different model or practices such as supply chain management practices, synergy between soft lean and hard lean, moderator or integration of strategies to investigate its effect on TBL sustainability performance. The outcome of the study might vary as compare to the findings of the study.

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