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The Mediating Effect of Sustaining Lean Improvement on the Relationship between Sustainable Manufacturing Practices and Sustaining Performance

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Abstract:

Sustainable Development Goals are setting a new global target on sustainability whereby oil and gas (O&G) corporate are expected to play an important role through sustainable manufacturing practices (SMP) and sustaining lean improvement (SLI). Accordingly, both parties are crucial to achieve sustainable performance (SP) with triple-bottom line concept of these organisations. However, research on the relationship of SMP, SLI and SP is relatively rare particularly in Malaysian O&G sector. Therefore, this study is aimed to provide empirical evidence showing that SMP and SLI significantly improve SP in order to encourage organisations to implement these practices. The study population will be Malaysian O&G organizations listed in Malaysia Oil and Gas Services and Equipment (OGSE) Catalogue 2018 where data were collected using a questionnaire-based survey through Linkedin and Google form. This research involved 53 O&G organisations in Malaysia. This paper provides evidence of the positive and significant relationship between SMP, SLI and SP as well as the partial mediating effect of SLI implementation on the relationship between SMP and SP.

Keywords: *Malaysia, Oil and Gas Sector, Sustainable Manufacturing Practices, Sustaining Lean Improvement, Sustainable Performance.*

I. INTRODUCTION

The concept of sustainable development emerged from global pressure in the 1980s and ultimately forced itself onto the agenda of governments and international institutions. It is now as the global standard for measuring development objectives and performance in both developed and developing countries. The United Nations' Brundtland Commission defined sustainable development as the development with ability to meet human needs without compromising the life of future generations as in [1]. Besides that, sustainability often referred as the triple-bottom-line (TBL) as it can create organisation and community value by integrating environmental and social responsibilities with economic goals [2]. Therefore, Beekaroo, Callychurn and Hurreeram [3] suggested to design and implement sustainable manufacturing practices (SMP) in order to develop products and services that contribute to sustainable performance.

Malaysia holds the fourth-highest oil reserves and the third-highest natural gas reserve in the Asia-Pacific region where the oil, gas and energy sector contributes to about 20 percent of Malaysia's GDP [4]. Even so, the petrochemical products including petrochemicals industry is facing pressure to step up and diversify production into a more knowledge-based chemical portfolio in the derivative and specialty markets, given the ever-changing demand from consumers due to better lifestyle choices [5]. Therefore, there is a need for O&G organisations to take on a greater role in balancing economic, environmental and social needs.

However, extant literature from year 2010 to 2019

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indicates most past studies [6]–[10] have predominantly address the adoption of SMP in an industry and less concentration was given on exploring the impact on the combination of all three dimensions of SP which are economic, environmental and social. In addition, the literatures [6], [7], [9], [11]–[13] have been mainly addressing various SMP and dimensions from the manufacturing and automotive sectors. To fill up this gap, the current study provides a composite SMP and SP framework combining all three sustainability dimensions in the O&G sector of Malaysia. Apart from that, this study also contributes to sustaining lean improvement (SLI) activities that potentially improve the SMP and SP in the context.

II. Literature Review

A. Oil and Gas Sector in Malaysia

There are over 3,500 O&G businesses in Malaysia that comprise international oil companies, independents, services and manufacturing companies which support the needs of the O&G value chain both domestically and regionally [5]. The industry is expected to have grown moderately in 2018, as companies responded to stabilising oil prices and continuing access to low cost of feedstock. It is also an industry that has attracted the greatest level of Domestic Direct Investment (DDI) in 2017, amounting to RM25.6 billion out of RM26 billion in approved investments across 10 projects that created 1,949 job opportunities. Thus, in spite of the global trends in the O&G industry, it continues to play a significant role in the economic development of Malaysia [14].

B. Sustainable Manufacturing Practices

SMP is the responsibilities and activities of the manufacturing industry in achieving sustainability [15]. Subsequently, previous studies have identified a common set of SMP elements although the findings and results of the previous studies are differently generated. The list of previous case studies on sustainable manufacturing in various industry and country from year 2011 to year 2019 have been reviewed [6], [7], [18]–[27], [8], [28]–[30], [9]–[13], [16], [17] and the SMPs have been classified into four categories which are organization management, environment management, employee management and social responsibility. A list of constructs SMP with corresponding authors in previous studies is analysed by using matrix method in order to generate clear construct variables. One SMP is then selected from each category based on their popularity followed by the suitability of the SMP to be applied on O&G industry.

Accordingly, the SMP of leadership, reduces wastes and control pollution, employee environmental training and community relation from the categories of organizational management, environment management, employee management and social responsibilities respectively were chosen as the factors for this research due to their high popularity among the past researchers from 2011 to 2019.

C. Sustaining Lean Improvement

The conceptual of sustaining lean improvement (SLI) that depends on three elements which are standard work, employee involvement and continuous improvement which have adopted from [31]. Besides that, Habidin et al. [19] have developed a research model by using SLI as the mediator to study the relationship between SMP and SP in Malaysian automotive industry. This shows that researchers initiate SLI elements in achieving sustainability.

D. Sustainable Performance

This study focuses on one of the key approaches which is the triple bottom line (TBL). Svensson et al. [32] reviewed that the TBL strategy is strongly associate with business sustainability effort by harmonising social, environmental and economic elements. The concept of TBL was initially formed by Elkington as cited in [33] which he pointed out that economic and social needs are highly correlated with the environmental dimension. Since then, the exploration of TBL and sustainability concepts has been started in a breadth of application. Many studies started to investigate the TBL concepts with diversified theories, outlooks, frameworks and models resulting in sustainable manufacturing (SM) has become one of the most debated subjects among the researchers and practitioners.

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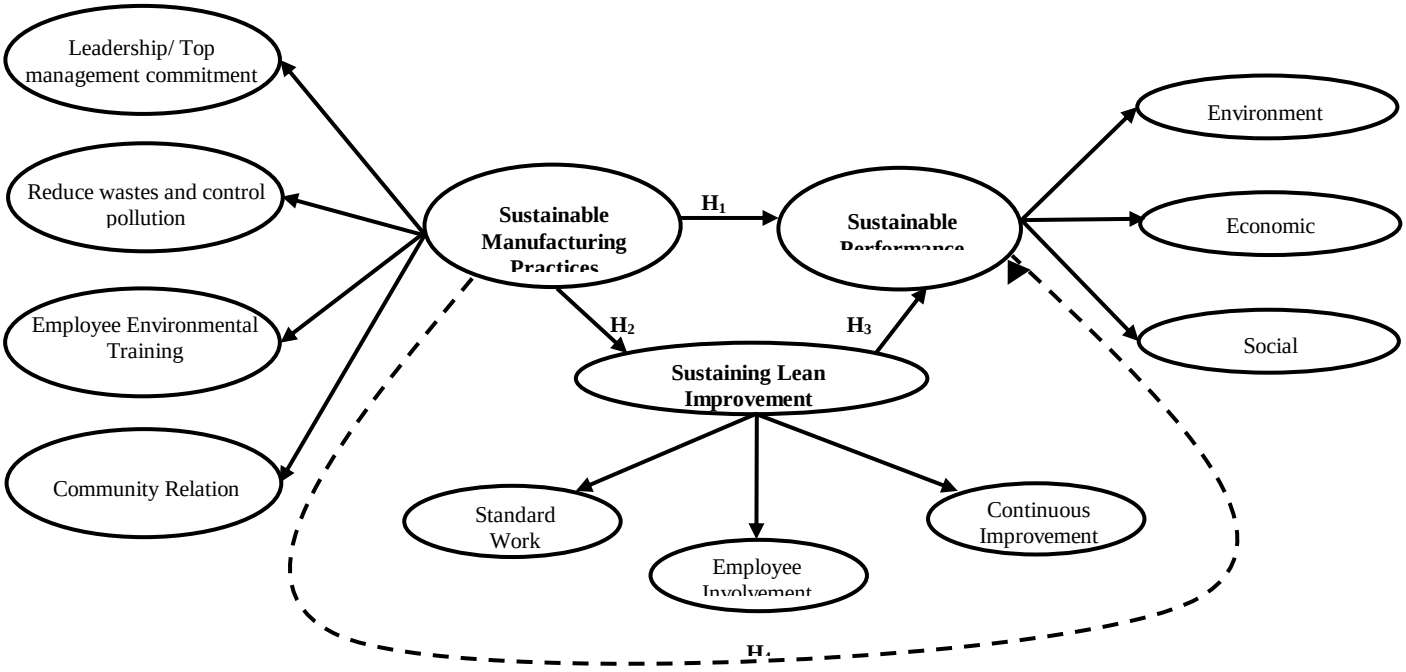
E. Research Framework

The proposed conceptual research framework of this study is shown in Figure 1 below after reviewing the literature and journals in details from past researchers on SMP, SLI and SP. Four hypotheses were then developed from the proposed research framework as illustrated in Fig. 1.



F. Research Hypotheses

H_1: There is a positive and direct significant relationship between SMP and SP in Malaysian O&G sector.

H_2: There is a positive and direct significant relationship between SMP and SLI in Malaysian O&G sector.

H_3: There is a positive and direct significant relationship between SLI implementation and SP in Malaysian O&G sector.

H_4: The implementation of SLI has an indirect effect to mediate the relationship between SMP and SP in Malaysian O&G sector.

III. RESEARCH METHODOLOGY

This study adopted a quantitative approach and conducted a survey via Linkedin and Google Form using a structured questionnaire set as the research instrument. This is because quantitative research entails primarily a deductive approach. When using this approach, the research tends to test theories rather than creating new theories [34].

Besides that, the sampling frame for this study is a list of companies listed in the Malaysia Oil and Gas Services and Equipment (OGSE) Catalogue 2018. The list could be compiled from Malaysia Petroleum Resources Corporation (MPRC) website. The target population for this study will be Malaysian O&G organizations and the unit of analysis in this study is the O&G firm as a whole. A respondent will be randomly chosen from each Malaysian O&G organization. According to Malaysia OGSE Catalogue 2018, there are 242 Malaysian OGSE all over Malaysia where the sample size of respondents for this study will be randomly selected among all the O&G organizations in Malaysia. Supposingly, the sample size of the respondents will be 152 respondents that were selected randomly by referring to [35] method of sample size determination. However, this study will only select a minimum of 50 respondents randomly due to time and cost constraints.

The questionnaires were designed based on the literature review on SMP, SLI and SP given in literature review. Five points of Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree,

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5 = strongly agree) will be used in the questionnaire to examine the respondents' answers in SMP that have been constructed by past researches. To develop the measures, the author included totally 46 items in the structured questionnaire set where 18 items pertaining to SMP [6], [7], [24], [36], [37], 13 items to the SLI [24], [38], [39] and 15 items to the SP [7], [24], [25], [40].

This study utilised the IBM SPSS statistics software (version 24.0) to perform descriptive analysis and correlation analysis on the preliminary data. This study also performed the partial least square-structural equation modelling (PLS-SEM) using SmartPLS (version 3) to test the previously developed hypotheses. The PLS-SEM was selected due to small sample size and the exploratory nature of this study [41]. This study also performed two-step approach recommended by Choi et al. [42] to analyse and interpret the PLS results with respect to the hypotheses: (1) assessment of the reliability and validity of the measurement (outer) model and (2) testing of the structural (inner) model. For this study, the reliability analysis included both composite reliability and Cronbach's alpha coefficients, while the validity analysis included convergent validity and discriminant validity. The mediating analysis was evaluated using the bootstrapping (53 cases and 5000 samples) to obtain the direct and indirect path coefficients.

IV. Results

A. Demographic Information of Respondents

From 96 of questionnaire being distributed, only 65 responses collected completely thru google form where 12 responses are unusable due to same responses for all items, respondents with less than 3 years of servicing the organization. Therefore, this study uses 53 set of questionnaires (55.21%) as responded to the five research objectives. Table 1 presents the demographics of the respondents. Male represented 77.4% of the respondents, which is not surprising as male participation in O&G workforces is higher [43]. The employment position that was most represented in the survey was engineer (64.2%). 77.4% of the respondents were permanent employee in their respective O&G organisation. Approximately 37.7% of the respondents indicated that they have served their current organisation for 3 to 5 years.

Table 1: Descriptive Analysis for Demographic Background

Demographic Characteristics	Item	Frequency	Percentage (%)
Gender	Male	41	77.4
	Female	12	22.6
Employment Position	Engineer	34	64.2
	Executive	6	11.3
	Manager/ Assistant Manager	7	13.2
	Others	6	11.3
Employment Status	Contract	12	22.6
	Permanent	41	77.4
Length of Services	Less than 3 years	0	0.0
	3 to 5 years	20	37.7
	5 to 7 years	14	26.4
	More than 7 years	19	35.8

B. Assessment of Measurement Model

Prior to evaluating the measurement model, this study assessed the indicator reliability and internal consistency for construct reliability as well as convergent validity and discriminant validity for the validity of individual measures as shown in Table 2 and Table 3. According to Hair et al. [44], the outer loadings should be greater than 0.70, however loadings between 0.40 and 0.70 should be remove only if the deletion helps to increase the composite reliability to its minimum threshold value of 0.7. Seven outer loadings (B1, B3, C2, E4, E5, H3 and I2) ranged from 0.4897 to 0.6828 where all other outer loadings were above 0.70. The indicators were retained for this study as for both composite reliability and convergent validity exceeded the recommended threshold value [45]. In short, the indicator reliability was established and statistically significant.

The assessment of the composite reliability and Cronbach's Alpha values reflected that all the constructs had a value higher than 0.70 where high internal consistency reliability was established as well as the convergent validity is verified where the average variance extracted (AVE) of all constructs

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were greater than the minimum threshold value of 0.50 [44].

In addition, this study assessed the discriminant validity based on the HTMT analysis. The discriminant validity has been established between all the constructs according to the $HTMT_{0.90}$ criterions [46]. This indicates that none of the items of the constructs are measuring the similar thing. In the other words, it does not contain the overlapping items from the respondents' perception in the constructs.

In summary, the assessment of the measurement models shows that the validity and reliability of all reflective constructs are achieved in this study by using indicator reliability, internal consistency, convergent validity and discriminant validity.

Table 2: Results of Reliability Analysis and Convergent Analysis

Construct	Item	Outer Loading	p-value	Cronbach's Alpha	Composite Reliability	AVE
Sustainable Manufacturing Practices				**0.9528**	**0.9578**	**0.5608**
A. Leadership/ Top Management Commitment	A1	0.7244	**	0.9046	0.9296	0.7259
	A2	0.7749	**			
	A3	0.7981	**			
	A4	0.7781	**			
	A5	0.7353	**			
B. Wastes Reduction and Control Pollution	B1	0.6828	**	0.8705	0.9065	0.6619
	B2	0.7285	**			
	B3	0.4897	**			
	B4	0.8329	**			
	B5	0.7714	**			
C. Employee Environmental Training	C1	0.7865	**	0.9363	0.9544	0.8396
	C2	0.6265	**			
	C3	0.8124	**			
	C4	0.7585	**			
D. Community Relation	D1	0.7150	**	0.9044	0.9336	0.7790
	D2	0.8101	**			
	D3	0.7679	**			
	D4	0.8105	**			
Sustaining Lean Improvement				**0.9441**	**0.9515**	**0.6041**
E.Standard Work	E1	0.7896	**	0.9155	0.9372	0.7503
	E2	0.7988	**			
	E3	0.7899	**			
	E4	0.6342	**			
	E5	0.5590	**			
F. Employee Involvement	F1	0.7973	**	0.9324	0.9521	0.8396
	F2	0.8264	**			
	F3	0.7965	**			
	F4	0.8138	**			
G. Continuous Improvement	G1	0.7783	**	0.9046	0.9333	0.7779
	G2	0.7401	**			
	G3	0.8582	**			
	G4	0.8655	**			
Sustainable Performance				**0.9468**	**0.9530**	**0.5763**
H. Environmental Performance	H1	0.7129	**	0.8940	0.9222	0.7041
	H2	0.7915	**			
	H3	0.6207	**			
	H4	0.7090	**			
	H5	0.7597	**			
I. Economic Performance	I1	0.8311	**	0.9227	0.9419	0.7644
	I2	0.6757	**			
	I3	0.8457	**			
	I4	0.7998	**			

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	I5	0.7845	**			
J. Social Performance	J1	0.7418	**	0.9143	0.9359	0.7452
	J2	0.7746	**			
	J3	0.7632	**			
	J4	0.7778	**			
	J5	0.7681	**			

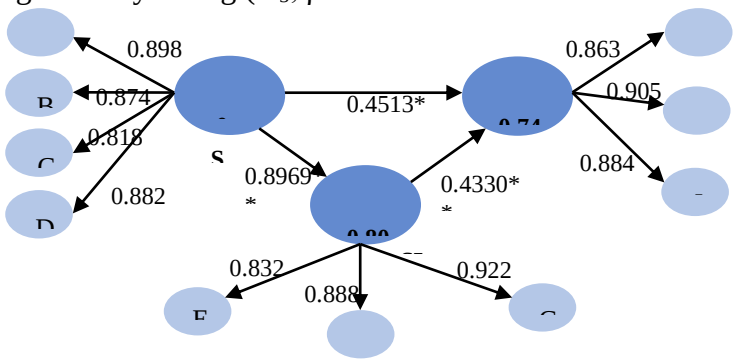
A. Assessment of Structural Model

The structural model is then examined by using PLS Algorithm to study the direct effects, explained variance (R_2), statistical significance and path coefficients. The results were shown in Fig. 2. Apart from that, there were no issues on collinearity among the predictors in the structural model as the VIF value is examined and they are clearly between the threshold values of 1<VIF<5 [41]. The R_2 values for endogenous variables indicate that the theoretical model proposed explains 80.44% or 0.8044 of the total variance in SLI and 74.17% or 0.7417 of the total variance in SP. In overall, the structural models in the present study has good predictive relevance as indicated by positive values of Q_2.

It was ascertained that SMP had a positive and significant relationship with both SP (H_1; β = 0.4513; p < 0.05, t = 2.4962) and SLI (H_2 = β = 0.8969; p < 0.05, t = 18.9985). Besides that, the relationship between SLI and SP was significantly strong (H_3; β = 0.4330; p < 0.05; t = 2.6887). Thus, H_1, H_2 and H_3 were supported.

Subsequently, this study examined the mediating effect by computing the Variance Accounted For (VAF) as the ratio between direct and indirect effects. Principally, the VAF complements the assessment of mediation through the bootstrapping procedure where VAF of above 80% indicates full mediation, VAF of between 20% and 80% shows partial mediation and VAF below 20% demonstrated no mediation [44]. The VAF can be calculated as below:

$$\text{VAF} = \frac{Indirect\ Effect}{Total\ Effect}$$



Note: ** indicates p < 0.05, t-value in parentheses.

Figure 2: PLS results for direct effects.

Table 3 shows the direct effects, indirect effect and total effect when SLI acts as a mediator into the relationship between SMP and SP. The value of VAF is also calculated and shown in the table below.

Table 3: Summary Test of Mediation by Bootstrapping Method

Relationships	Path Coefficients	T-statistics	P-values
SMP -> SP	0.4513*	2.4962	0.0126
SMP -> SLI	0.8969**	18.9985	0.0000
SLI -> SP	0.4330**	2.6887	0.0072

Indirect Effect (a)	0.3883*
Direct Effect (b)	0.4513*
Total Effect (a+b = c)	0.3883 + 0.4513 = 0.8396
VAF	$\frac{0.3883}{0.8396} = 0.4625$ 0.4625 × 100% = 46.25%
Note: * represents 1% level of significance. * represents 5% level of significance.	

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Consequently, 46.25% of SMP on SP is explained by the SLI mediator. Since VAF is larger than 20% but smaller than 80%, it can be recognised as partial mediation. Overall, all the hypotheses of this study were accepted.

I. Discussion

To address research objective 1, the items used in questionnaires for this study are adapted from various studies from different sectors and have been applied to O&G sector as well as establishing their reliability and validity in Malaysia context, thus making a methodological contribution. Likewise, all the items from the factors of SMP, SP and SLI in this study fulfilled the criteria for measurement models which are indicator reliability, internal consistency, convergent validity and discriminant validity. Therefore, none of the items were removed from further analysis and the overall instrument were valid and reliable in the given context.

Subsequently, this research revealed a positive and direct significant relationship between SMP and SP in Malaysian O&G sector. It is consistent with the previous studies [7], [8], [47], suggesting that sustainable manufacturing practices have significant positive impact on improving sustainable performance of an organization. Tiwari and Khan [48] also suggested that the management is committed to sustainability by defining the most relevant triple bottom line objectives and integrating them to business objectives for ensuring long-term sustainability of the business and the environment would be achieved as the business is operating. Pham and Kim [33] reported that if construction firms focus more on the implementation of SMP, their sustainability performance will increasingly be improved. On contrary, research done by [49] reflected that there is insufficient evidence to support external SMP such as community relation and economic sustainability due to lack of adequate strategic planning and implementation. This demonstrates that there is a trade-off between sustainable performance where external SMP may place an economic burden on firms. Therefore, it was suggested that an organisation needs to implement SMP in a holistic approach in order to balance environmental, social and economic outcomes. Thus, the researcher concludes that sustainable manufacturing practices support the sustainable performance in an organization in Malaysian O&G sector.

Furthermore, it is aligned with the previous studies [50]–[52] where SMP initiated a sustainable continuous improvement environment. In addition, SMP such as leadership support was found to be critical to sustaining lean efforts [53]. According to Loh et al. [54], leadership needs to distribute across all three management levels, namely, top management, middle management and lower management as lean sustainability happens due to motivation that gain mutual trust and respect among employees which promote employee involvement. Therefore, it was proven that to sustain a success lean improvement in long term, Malaysian O&G sector should implement SMP across the organization.

Apart from that, the findings validate the previous studies where [53] recognized that active multi-disciplinary staff involvement in leading lean efforts was critical to sustainability. Vo, Kongar and Suárez Barraza [55] reflected that continuous improvement efforts in a packaging industry able to thrives corporate culture, improve employee empowerment, reduce operational costs, improve product quality, yield customer and employee satisfaction where eventually sustainable performance achieved. In contrast to [56], there is evidence that the relationship between lean-green integration that include continuous improvement and sustainable performance is not always linear. Perhaps, the impact varies depending on the type of sustainable performance dimension being measured in the study. However, the results in this study provided with the dimensions used reflected and can be concluded that lean sustainability is critical for Malaysian O&G sector to remain competitive in facing the challenging market and lead to sustainable performance.

Lastly, this paper presented that the implementation of SLI has an indirect effect to mediate the relationship between SMP and SP in Malaysian O&G sector. These findings were also confirmed by the other existing studies [57] reported that the development of learning organization when implementing total quality management practices namely employee involvement and continuous improvement may significantly improve their operational performance. Given that all the direct and indirect relationships between SMP and SP were statistically significant, the mediating relationship of SLI and SP was ascertained, which implies that the

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increase in SMP potentially results in higher SLI and eventually boost the SP.

The emerging sustainability issues prompt the O&G organizations to implement SMP followed by SLI in a way to enhance their economic, environmental and social performance. This study has made various contributions and implications of both theoretical and practical aspects. First, it proposed a model based on the relationship of SMP, SLI and SP, which serves for the future studies on sustainability management, specifically those that will address the importance of SMP and SLI in the O&G sector. Perhaps, there is a new contribution for knowledge development of scholarly researchers due to scarce studies of SLI a mediator on the relationship between SMP and SP. Generally, this paper provides empirical evidence for the effects of SMP, SLI on improving organizational sustainable performance and the findings are expected to provide essential insights for the practitioners to boost their sustainable performance particularly in Malaysian O&G sector. In fact, an effective implementation of SMP will promote SLI which results a better SP.

There are some expected potential limitations found when interpreting the results presented and conclusions draw from this study. Firstly, this study applied cross-sectional data that gathered at one particular time and background. Therefore, it was suggested that a study in long term is required to offer greater definitive summarization. Secondly, the sample size of this study is relatively small due to time and cost constraint and may not be corresponding with the Malaysian O&G sector precisely. Thus, a larger sample size is recommended for future research. Finally, this study examined the relationship between SMP, SLI and SP generally in O&G sector. This study may be replicated specifically for certain industry such as automotive industry to determine specific industry effect as very limited studies on sustainability of automotive industry in Malaysia.

II. CONCLUSION

This study was designed to address a knowledge gap in the relationship between SMP, SLI and SP in Malaysian O&G sector. Additionally, mediation analysis was performed to examine whether SLI mediates the relationship between SMP and SP. The findings of this study suggested that an efficient and effective implementation of SMP will have a significant and positive relationship towards SP. This study also shows that SLI improve firm's SP. Besides that, implementation of SLI would also mediate the relationship between SMP and SP. Hence, the factors in SMP and SLI should be given more accentuation in future progression of Malaysia O&G sector for sustainability. Finally, it was believed that this study would benefit and generate knowledge for future reference by Malaysian O&G organizations and other related parties.

REFERENCES

[1] A. Y. Chang and Y. T. Cheng, "Analysis model of the sustainability development of manufacturing small and medium- sized enterprises in Taiwan," *J. Clean. Prod.*, vol. 207, pp. 458–473, 2019.

[2] I. J. Orji, "Examining barriers to organizational change for sustainability and drivers of sustainable performance in the metal manufacturing industry," *Resour. Conserv. Recycl.*, vol. 140, no. September 2017, pp. 102–114, 2019.

[3] D. Beekaroo, D. S. Callychurn, and D. K. Hurreeram, "Developing a sustainability index for Mauritian manufacturing companies," *Ecol. Indic.*, vol. 96, no. August 2018, pp. 250–257, 2019.

[4] MIDA, "Oil and Gas." [Online]. Available: https://www.mida.gov.my/home/oil-and-gas/posts. [Accessed: 09-Dec-2019].

[5] MIDA, "Malaysia: Investment Performance," 2018. [Online]. Available: https://www.mida.gov.my/home/malaysia:-investment-performance/posts/. [Accessed: 09-Dec-2019].

[6] D. Adebanjo, P. L. Teh, and P. K. Ahmed, "The impact of external pressure and sustainable management practices on manufacturing performance and environmental outcomes," *Int. J. Oper. Prod. Manag.*, vol. 36, no. 9, pp. 995–1013, Sep. 2016.

[7] S. H. Abdul-Rashid, N. Sakundarini, R. A. Raja Ghazilla, and R. Thurasamy, "The impact of sustainable manufacturing practices on sustainability performance: Empirical evidence from Malaysia," *Int. J. Oper. Prod. Manag.*, vol. 37, no. 2, pp. 182–204, 2017.

[8] K. M. Shankar, D. Kannan, and P. U. Kumar, "Analyzing sustainable manufacturing practices e A case study in Indian context," *J. Clean. Prod.*, vol. 164, pp. 1332–1343, 2017.

[9] S. Gupta, G. S. Dangayach, A. K. Singh, M. L. Meena, and P. N. Rao, "Implementation of sustainable manufacturing practices in Indian manufacturing companies," *Benchmarking*, vol. 25, no. 7, pp. 2441–2459, 2018.

[10] N. Chowdhury and J. Yasmin, "A Study On

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Sustainable Manufacturing Practices In RMG Industries Of Bangladesh," May 2018.

[11] N. F. Habidin, A. F. M. Zubir, N. M. Fuzi, N. A. M. Latip, and M. N. A. Azman, "Sustainable manufacturing practices in Malaysian automotive industry: confirmatory factor analysis," *J. Glob. Entrep. Res.*, vol. 5, no. 1, 2015.

[12] T. A. Chin, H. H. Tat, and Z. Sulaiman, "Green supply chain management, environmental collaboration and sustainability performance," *Procedia CIRP*, vol. 26, no. December, pp. 695–699, 2015.

[13] M. J. Asha'ari and S. Daud, "The Effects of Cleaner Production and Resource Efficiency on Corporate Sustainability Performance," *Indian J. Sci. Technol.*, vol. 11, no. 4, pp. 1–6, 2018.

[14] Z. Zakariah, "Oil and gas set to be next star in 2019," *New Straits Times*, Kuala Lumpur, 12-Feb-2019.

[15] M. A. Moktadir, T. Rahman, M. H. Rahman, S. M. Ali, and S. K. Paul, "Drivers to sustainable manufacturing practices and circular economy: A perspective of leather industries in Bangladesh," *J. Clean. Prod.*, vol. 174, pp. 1366–1380, Jan. 2018.

[16] S. S. Kuik, S. V. Nagalingam, and Y. Amer, "Sustainable supply chain for collaborative manufacturing," *J. Manuf. Technol. Manag.*, vol. 22, no. 8, pp. 984–1001, 2011.

[17] P. Hong, J. J. Roh, and G. Rawski, "Benchmarking sustainability practices: Evidence from manufacturing firms," *Benchmarking*, vol. 19, no. 4, pp. 634–648, 2012.

[18] M. A. Rosen and H. A. Kishawy, "Sustainable manufacturing and design: Concepts, practices and needs," *Sustainability*, vol. 4, no. 2, pp. 154–174, 2012.

[19] N. F. Habidin, A. F. M. Zubir, J. Conding, N. A. S. L. Jaya, and S. Hashim, "Sustainable manufacturing practices, sustaining lean improvements and sustainable performance in Malaysian automotive industry," *World Rev. Entrep. Manag. Sustain. Dev.*, vol. 9, no. 4, pp. 444–459, 2013.

[20] R. Bogue, "Sustainable manufacturing: a critical discipline for the twenty-first century," *Assem. Autom.*, vol. 34, no. 2, pp. 117–122, 2014.

[21] N. Hami, M. R. Muhamad, and Z. Ebrahim, "Exploring Sustainable Practices and Sustainability Performance Among Malaysian Manufacturing Firms," *Sci. Int.*, vol. 26, no. 5, 2014.

[22] N. Nordin, H. Ashari, and M. F. Rajemi, "A Case Study of Sustainable Manufacturing Practices," *J. Adv. Manag. Sci.*, vol. 2, no. 1, pp. 12–16, 2014.

[23] S. N. Russell and H. H. Millar, "Exploring the Relationships among Sustainable Manufacturing Practices, Business Performance and Competitive Advantage: Perspectives from a Developing Economy," *J. Manag. Sustain.*, vol. 4, no. 3, pp. 37–53, 2014.

[24] R. Dubey, A. Gunasekaran, and A. Chakrabarty, "World-class sustainable manufacturing: Framework and a performance measurement system," *Int. J. Prod. Res.*, vol. 53, no. 17, pp. 5207–5223, Sep. 2015.

[25] N. Hami, M. R. Muhamad, and Z. Ebrahim, "The impact of sustainable manufacturing practices and innovation performance on economic sustainability," *Procedia CIRP*, vol. 26, pp. 190–195, 2015.

[26] Z. Wang, N. Subramanian, A. Gunasekaran, M. D. Abdulrahman, and C. Liu, "Composite sustainable manufacturing practice and performance framework: Chinese auto-parts suppliers' perspective," *Int. J. Prod. Econ.*, vol. 170, pp. 219–233, 2015.

[27] I. Abdullah, W. Hasrulnizzam Wan Mahmood, H. Fazli Md Fauadi, M. Nizam Ab Rahman, K. Malaysia, and S. Bahri Mohamed, "Sustainable manufacturing practices in Malaysian palm oil mills Priority and current performance," *J. Manuf. Technol. Manag.*, vol. 28, no. 3, pp. 278–298, 2017.

[28] K. Emamisaleh, K. Rahmani, and S. Iranzadeh, "Sustainable Supply Chain Management Practices and Sustainability Performance in the Food Industry," *South East Asian J. Manag.*, vol. 12, no. 1, pp. 1–19, 2018.

[29] A. K. Kähkönen, K. Lintukangas, and J. Hallikas, "Sustainable supply management practices: making a difference in a firm's sustainability performance," *Supply Chain Manag.*, vol. 23, no. 6, pp. 518–530, Sep. 2018.

[30] D. Ramanujan, W. Z. Bernstein, M. A. Totorikaguena, C. F. Ilvig, and K. B. Ørskov, "Generating Contextual Design for Environment Principles in Sustainable Manufacturing Using Visual Analytics," *J. Manuf. Sci. Eng. Trans. ASME*, vol. 141, no. 2, pp. 1–12, 2019.

[31] C. C. Schlichting, "Sustaining Lean Improvements," Worcester Polytechnic Institute, 2009.

[32] G. Svensson *et al.*, "Framing the triple bottom line approach: Direct and mediation effects between economic, social and environmental elements," *J. Clean. Prod.*, vol. 197, pp. 972–991, 2018.

[33] H. Pham and S. Y. Kim, "The effects of sustainable practices and managers' leadership competences on sustainability performance of construction firms," *Sustain. Prod. Consum.*, vol. 20, pp. 1–14, 2019.

[34] A. Bryman and E. Bell, *Business Research Methods*, Third Edit. 2018.

[35] R. V. Krejcie and D. fv. Morgan, "DETERMINING SAMPLE SIZE FOR RESEARCH ACTIVITIES,"

May – June 2020
ISSN: 0193-4120 Page No. 574 - 585

1970.

[36] M. K. Zahari, "The development of total quality management (TQM), work culture and employee performance relationship in Malaysia manufacturing industry," Universiti Teknologi Malaysia, 2015.

[37] M. Mapar, M. J. Jafari, N. Mansouri, R. Arjmandi, R. Azizinejad, and T. B. Ramos, "Original Articles Sustainability indicators for municipalities of megacities: Integrating health, safety and environmental performance," *Ecol. Indic.*, vol. 83, pp. 271–291, 2017.

[38] S. Y. Tan, "Lean six sigma sustainability factors," Universiti Teknologi Malaysia, 2016.

[39] N. A. Abu Seman *et al.*, "The mediating effect of green innovation on the relationship between green supply chain management and environmental performance," *J. Clean. Prod.*, vol. 229, pp. 115–127, Aug. 2019.

[40] R. M. Elhuni and M. M. Ahmad, "Key Performance Indicators for Sustainable Production Evaluation in Oil and Gas Sector," *Procedia Manuf.*, vol. 11, pp. 718–724, 2017.

[41] J. F. Hair Jr, J. J. Risher, M. Sarstedt, and C. M. Ringle, "When to use and how to report the results of PLS-SEM," *Eur. Bus. Rev.*, vol. 31, no. 1, pp. 2–24, Jan. 2019.

[42] S. L. Choi, C. F. Goh, M. B. H. Adam, and O. K. Tan, "Transformational leadership, empowerment, and job satisfaction: The mediating role of employee empowerment," *Hum. Resour. Health*, vol. 14, no. 1, pp. 1–15, 2016.

[43] R. Ponton, "Shattering the 'glass ceiling' in oil and gas companies," *New Straits Times*, 08-Oct-2019.

[44] J. F. Hair Jr., G. T. M. Hult, C. Ringle, and M. Sarstedt, *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, Second Edi. Los Angeles, London, New Delhi, Singapore, Washington DC, Melbourne: SAGE Publications, 2017.

[45] J. F. Hair Jr, M. Sarstedt, L. Hopkins, and V. G. Kuppelwieser, "Partial least squares structural equation modeling (PLS-SEM) An emerging tool in business research," *Eur. Bus. Rev.*, vol. 26, no. 2, pp. 106–121, 2014.

[46] J. Henseler, C. M. Ringle, and M. Sarstedt, "A new criterion for assessing discriminant validity in variance-based structural equation modeling," *J. Acad. Mark. Sci.*, vol. 43, no. 1, pp. 115–135, 2015.

[47] A. Moldavska and T. Welo, "A Holistic approach to corporate sustainability assessment: Incorporating sustainable development goals into sustainable manufacturing performance evaluation," *J. Manuf. Syst.*, vol. 50, pp. 53–68, 2018.

[48] K. Tiwari and M. Shadab Khan, "An action research approach for measurement of sustainability in a multi-echelon supply chain: Evidences from Indian sea food supply chains," *J. Clean. Prod.*, 2019.

[49] N. Hami, M. R. Muhamad, and Z. Ebrahim, "The impact manufacturing sustainability of sustainable practices on sustainability," *J. Teknol.*, vol. 78, no. 1, pp. 139–152, 2016.

[50] J. S. Randhawa and I. S. Ahuja, "5S – a quality improvement tool for sustainable performance: literature review and directions," *International Journal of Quality and Reliability Management*, vol. 34, no. 3. Emerald Group Publishing Ltd., pp. 334–361, 2017.

[51] F. Costa, L. Lispi, A. P. Staudacher, M. Rossini, K. Kundu, and F. D. Cifone, "How to foster Sustainable Continuous Improvement: A cause-effect relations map of Lean soft practices," *Oper. Res. Perspect.*, vol. 6, Jan. 2019.

[52] M. L. Gracía-Pérez and M. Gil-Lacruz, "The impact of a continuing training program on the perceived improvement in quality of health care delivered by health care professionals," *Eval. Program Plann.*, vol. 66, pp. 33–38, 2017.

[53] R. Flynn *et al.*, "The sustainability of Lean in pediatric healthcare: a realist review," *Syst. Rev.*, vol. 7, no. 1, p. 137, Dec. 2018.

[54] K. L. Loh, S. Mohd Yusof, and D. H. C. Lau, "Blue ocean leadership in lean sustainability," *International Journal of Lean Six Sigma*, vol. 10, no. 1. Emerald Group Publishing Ltd., pp. 275–294, 04-Mar-2019.

[55] B. Vo, E. Kongar, and M. F. Suárez Barraza, "Kaizen event approach: a case study in the packaging industry," *Int. J. Product. Perform. Manag.*, 2019.

[56] A. Bhattacharya, A. Nand, and P. Castka, "Lean-green integration and its impact on sustainability performance: A critical review," *Journal of Cleaner Production*. 2019.

[57] G. Tortorella, R. Giglio, F. S. Fogliatto, and R. Sawhney, "Mediating role of learning organization on the relationship between total quality management and operational performance in Brazilian manufacturers," *J. Manuf. Technol. Manag.*, 2019.