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Ethical Climates as a moderator on the Relationship between Lean Manufacturing Practices and Manufacturing Performance using PLS-SEM

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Abstract – *Lean manufacturing practices (LMP) is considered as a manufacturing philosophy that can lead to global manufacturing and gives the manufacturers a competitive advantage. In line with that, this study was aimed to examine the relationship between LMP and manufacturing performance among Malaysia's manufacturing organizations. Specifically, it aimed at investigating the moderating role of ethical climate on the relationship between LMP on manufacturing performance. This research is conducted through the collection of data from 335 manufacturing organizations in Malaysia. The data collected were analyzed by performing the PLS-SEM technique. Results indicate the positive relation between job Lean Manufacturing Practices and Manufacturing Performance. It is also demonstrating positive relationship between ethical climate and manufacturing performance. However, ethical climate did not perform as a moderator between lean manufacturing practices with manufacturing performance. Yet, the interaction plot diagram shows that the intersection between lean manufacturing practices and ethical climate curves will eventually appear at some point. This study has contributed to literature a few novelties such as: (i) to test all these constructs relations in manufacturing organizations in Malaysia and; (ii) to investigating the possible moderating role of ethical climate on these constructs more different than previous studies have already done. Additionally, the findings also have contributed theoretically, practically and methodologically with imperative implications to academicians, policy-makers and manufacturing organizations specifically.*

Key Words: Ethical Climate, Lean Manufacturing Practices, Manufacturing Performance

1.INTRODUCTION

In the swift development of technology, it might be able to help the organization to perform well. However, the influence of ethical value must be to take into consideration. As stated by [1], ethical climate was significant in competitive advantage that led to the organizations performance. Likewise, study [2]; [3]; [4] revealed that the organizations need to fully adopt and implement the company's code of ethics in order to succeed in lean implementation and at once can impact the manufacturing performance. In addition, lean and ethics need to integrate and walk "side by side" to gain the best results and involve co-workers who can acknowledge the ethical codes in their task to reflect to the outcome.

In subsequent, the finding research performed by [5] point out that an ethical climate possible to upsurge the organizational performance. Consequently, relating to the positive effect of an ethical climate, previous studies have highlighted on the interrelation between an ethical climate and organizational performance, and up till now lack of study on the mechanisms by which an ethical climate rallies performance [6].

Meanwhile, performance usually discussed in multi facet base on particular research. Organization performance, operational performance and manufacturing performance is basically using the same metrics in order to monitor and measure the performance and efficiency in the particular organization [7];[8]. In line with that, this study is using Manufacturing performance as dependent variable in order to measure the performance in the manufacturing organizations.

On the other hand, [9] stated that most of the manufacturing company implemented lean manufacturing in order to boost the manufacturing performance. Hence, alluding to [10], a set of lean tools used to improve manufacturing performance in that way it is respond to market demands in various dimensions for instance enhanced product quality, faster delivery and lower cost. Additionally, the key tools and techniques within the lean system for example Kanban, 5S, Poka-Yoke, Single-Minute Exchange of Dies (SMED), visual control and many more that lead to improve the manufacturing performance [10]. Meanwhile, lean production was one of the oldest improvement methodologies, providing high value to the customer via the use of best practices such as 5S, mistake proofing and Kanban [11]. Notwithstanding, a study by [12] identified Kanban, Taguchi, Kaizen, pinch technology, just in time (JIT), statistical process control (SPC), business process reengineering (BPR), failure mode and effect analysis, total productive maintenance (TPM), SMED, Poka-Yoke, agile manufacturing and flexible automation and intelligent manufacturing as the most appropriate tools for the improvement of manufacturing performance.

Consequently, lean manufacturing practices will be a compatible and relevant tool and practice in order to help the manufacturing organizations to survive in the market [13];[14]. Likewise, [15] revealed that lean manufacturing is a philosophy that refer to the Toyota Production System and other Japanese management practices that attempt to eliminate waste and needless activities in the firms.

In conjunction with that, this study is intending to examine the relationship between variables: Lean Manufacturing Practices; Manufacturing Performance and to test the moderating effect of ethical climate towards manufacturing performance.

2. LITERATURE REVIEW

2.1 Manufacturing performance

[16] defines and assesses the manufacturing performance indicators based on production quality, processing time and cost that were able to measure performance in the organizations. Besides, [17] asserted that the capabilities of manufacturing performance can be enriched by decreasing manufacturing outputs such as the cost, quality, delivery time and delivery time reliability, flexibility and innovativeness.

The previous scholars have been use the word of manufacturing performance in the manufacturing company interminably. Though, the term operational performances also been used in the previous research, yet still remain the same definition [18];[19]. Therefore, operational performance and manufacturing performance using the same metrics in order to evaluate the performance as stated by [7]; [8]. Similarly, a study by [20] also using the term manufacturing performance in order to measure the operational performance. Three dimensions comprises of quality, productivity and cycle time has been discussed as manufacturing performance.

Notwithstanding, probably the prior studies revealed that manufacturing performance usually deliberated from the aspect of main concern pertaining quality, delivery, flexibility, time and cost. Nonetheless, there were also a few studies using another metrics such as inventory, productivity, customer satisfaction, diversity, weighted performance and flow to measure manufacturing performance and operational performance. Meanwhile, [9] indicated that there were forty studies relating to manufacturing performance measures were reviewed to identify the most commonly used in the manufacturing sector. As a result, this study had measure manufacturing performance through five dimensions namely quality, delivery, flexibility, time and cost. Table 2.1 show the commonly used manufacturing performance measure in the previous studies.

Table -1: Manufacturing Performance matrix

Manufacturing Performance	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Quality	x	x	x		x	x	x	x	x	x	x	x		x				x	x	x	x	x
Delivery		x	x	x	x	x	x		x	x	x	x	x	x	x	x	x				x	x
Flexibility		x	x		x	x		x	x	x	x	x		x		x	x	x		x	x	x
Time				x	x	x	x	x		x	x	x		x					x	x	x	
Cost		x	x		x	x	x		x	x	x	x	x	x	x	x	x		x	x	x	
Inventory	x		x	x											x							
Productivity	x							x					x									
Customer satisfaction								x			x		x								x	
Diversity								x														
Flow																		x				
Dependability (Product specification)																x	x			x		

2.2 Lean Manufacturing Practices

Lean is a term invented by [21] who a chief researcher in the International Motor Vehicle Program (IMVP) executed at the Massachusetts Institute of Technology (MIT). In his landmark paper Krafcik introduced the term "Lean" in order to portray a production system that uses fewer resources of the whole thing compared to mass production. Nonetheless, many researchers define lean differently. Consequently, [22] has reviewed on the lean studies and summarized the term that had been used to define lean. The result from the review shows that lean had been define as a way; a process; a set of principles; a set of tools and techniques; an approach; a concept; a philosophy; a practice; a system; a program; a manufacturing paradigm; a model.

Yet, even though there are many definition of lean but there were one aim which is to eliminate waste [23]. Indeed, the frequent cited list of lean principles found in the literature was recommended by [24] .Nevertheless, [24] extended the principles that created by [24] by emphasize on the 'matters of people' in his principles. [25] stated that a particular business will consider as a lean organization when it cultivates and organize lean principles appropriately.

There are many dissimilar definitions concerning the nature of lean manufacturing practices. Although the implementation of lean varies from one organization to another, the basic core elements of lean always remain the same. Some companies choose to implement the full array of lean tools while others choose a piecemeal approach in which several tools deemed appropriate to their operation are chosen [26]. Nonetheless, the principles of lean still remain constant, which are the elimination of waste through specifying value, identifying value stream, flow, pull, and perfection [24] . For the purpose of this study, conceptualization is done based on the previous work by [27]; [23] . Literature review stressed that the nature of lean definition is both too broad and prove to be difficult in discriminating the underlying component of lean [23]. This approach takes lean manufacturing as an integral social and technical system that manufacturers incorporate as part of their operation. In fact, [28] asserted that lean manufacturing practices has come out to be an incorporated system that comprises highly related features and wide management practices such as just-in-time, quality systems, cellular manufacturing. Based on this perspective, six elements will be used to measure lean manufacturing practices because of commonly used of practices. Base on this conceptualization, the six parameters used to define lean manufacturing practices are cellular layout, pull system/Kanban, Quick changeover technique, total quality management, total preventive maintenance and small lot production. The breakdown of these six elements is as follows:

Table -2: Lean Manufacturing Practices matrix

Lean Manufacturing Practices	(Alaskari et al., 2016)	(Zahraee, 2014)	(Nawanir et al., 2015)	(Rosman Iteng et al., 2015)	(Belekoukias, Garza-2014)	Krishnan & Parveen (2013)	(Nawanir et al., 2013a)	(Chauhan & Singh, 2012)	(Taj & Morosan, 2011a)	(Tang et al., 2011)	(Furlan, Vinelli, et al., 2011a)	(Furlan, Dal, et al., 2011)b	(Chen & Tan, 2011)	(C. L. Steinlicht, 2010)	(Rahman et al., 2010)	(Mackelprang & Nair, 2010)
Cellular manufacturing/group technology		X	X				X		X		X	X		X		X
Pull system/Kanban	X	X	X			X	X	X	X		X	X			X	X
Quick changeover techniques	X	X	X				X		X		X	X	X	X	X	X
Total quality management		X				X				X					X	
Total productive maintenance		X	X	X	X	X	X						X	X		X
Small lot production			X				X		X		X	X	X		X	

Therefore, the hypothesis 1 was developed as below:
H_2: There is a relationship between lean manufacturing practices and manufacturing performance?

2.3 Ethical Climate

The existence of unethical behaviours within organizations has been extensively discussed. Consequently, it is the main concern of all bodies neither professionals nor disciplines to discover all potential ways organizations [29]. Ethical climate is define as a perceptions of ethical either doing correct or wrong that should be handle in all organizations in order to ensure the productivity of organizations can be maintain in the good performance whereby it can be also seen as policies in the organizations, procedures, and ethical conduct that guides an individual to behave with maximum level of ethics that leads to organizational success [30]. Moreover, ethical climate can affects both decision making and performances in the organizations [31]. Meanwhile, [32] stated that ethical climate is on behalf of the organization's policies, procedures and practices on ethical issues.

Accordingly, it can be as a reference for employee behaviour as it can influence employees' attitudes and behaviour. Furthermore, alluding to [33]; [34], ethical climate is a part of the larger organization culture. Contrariwise, [31] conceptually classified ethical climate as a type of organizational work climate.

[35] was examine the connection between ethical climate and features of job satisfaction and organizational buyers in their study. The results also show that work satisfaction can be reached at dissimilar levels based on particular components related to the work atmosphere. Meanwhile, study by [34] was accomplished a literature review of the current body of empirically-based studies connecting to the causes and consequences of in what way the ethical climate of a company eventually affects the occurrence of workplace abnormality. Consequently, obviously, unethical and unexpected behaviour problems are of great anxiety to organizations, which must take steps to resolve them, at the same time as development strong positive ethical cultures. Therefore, further studies related to ethical climate are needed using more definitive and qualitative measurements to learn more about these behaviours.

In subsequent, [36] has conducted a research in order study how an organization's ethical climate positively connects to its financial performance by considering an organization's innovation, a support for innovation and performance evaluation. Surprisingly, the results indicate that an organization's ethical climate is positively related to financial performance, and its positive relationship is mediated by an organization's innovation. The result also shows that a support for innovation has the moderating effect, such that the positive influence of an organization's ethical climate on its innovation increases when a support for innovation is high.

In conjunction to that, ethical climate has been vital issues in the organizations that donate to the company's performance. Aforementioned, earlier scholars had found ethical climate as a good predictor on organizational performance [37]. Additionally, based on past study, Resource Based View (RBV) asserted that human capital asset makes competitive advantage and develop performance through employee's behaviour. Up till now, [31] considered ethical climate as related to recognized normative system of an organization. The preceding studies conclude that inconsistency of ethical matter need the for the further investigation pertaining ethical climate which may have a critical impact on organization performance and its reputation. Therefore, the hypothesis 2 and 3 was developed as below:

H_2: There is a significant relationship between Ethical climate and Manufacturing Performance.
H_3: Ethical climate is moderate influencing lean practices on manufacturing performance

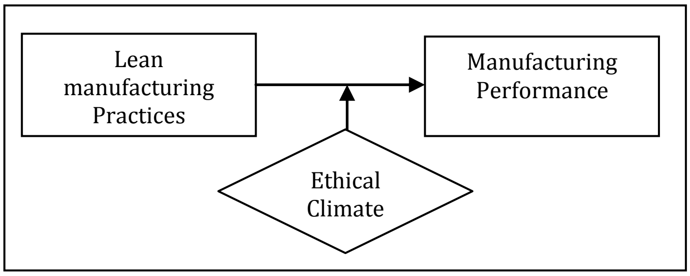

Fig -1: Conceptual Framework

Conceptual framework has been proposed as to explicate the relationship between variables in this study [38]. This framework was developed based on the literature review and it has been identified, one independent variable, one moderating variable, and one dependent variable. Figure 1, illustrates the theoretical relationship of the manufacturing performance, ethical climate and lean manufacturing practices for this study. The independent variable is lean manufacturing practices, ethical climate quantified as moderating, while manufacturing performance as the dependent variable.

3. METHODOLOGY

This research was conducted in quantitative study by employing descriptive study and to examine the relationship between lean manufacturing practices and manufacturing performance whereby ethical climate as a moderator. The targeted population of this study is the manufacturing organizations in Malaysia. According to Federation of Malaysian Manufacturer (FMM), there was approximately 2600 manufacturing organizations in Malaysia. Thereby, based on [39], sample size for this study was 335 organizations. The targeted respondents will include top management and middle management.

The simple random technique has been used as representative of the target population. The design of the questionnaire has been prepared, and validated by the Subject Matter Experts (SMEs) through content validity using This is to ensure the item of each section is reliable and can be accepted. Additionally, to make respondents understand the questions without any confusion. Due to the fact that the response rate for unit analysis of an organization is low, which has demonstrated in the past [40]; [41], the researcher decided to use PLS-SEM with the recommendations of sample size ranging from 30 to 100, compared to CB-SEM generally range from 200 to 800 [42]. Hence, the data collection will be analyzed using SPSS version 23 and SmartPLS 3.0 for the purpose of descriptive statistics and inferential statistics respectively.

3.1 Data Collection and Responses

A sample of 335 manufacturing organization is Malaysia was identified using [39] in determining the sample size. Hence, the manufacturing organizations were randomly selected using randomizer software. Questionnaires has been distributed through online survey through email. The formal address of the office, contact number and email addressed were attained through the directory of Federation of Malaysian Manufactures (FMM) 2017. All the particulars are very essential to make sure the process of collecting the data are running smoothly.

Intentionally, the questionnaire has been addressed to the top managerial level and Middle level from General Manager, until executive/engineers since they are expected to have a vast knowledge about lean manufacturing practices, manufacturing performance, and ethical climate in the organization. Consequently, within the six months of data collection process, a total of 102 questionnaires were received after follow-up mailings and telephone calls producing a primary response rate of 30.4 percent.

4. RESULT AND ANLYSIS

4.1 Measurement Model

The evaluation of the measurement model or also called outer model is the first step of PLS analysis and it reveals to fulfill the certain criteria of reliability and validity, it must be linked with reflective and formative outer models as stated by [43]. Therefore, it is important to differentiate between reflective and formative model. [44] mentioned that a reflective measurement model has relationships from the latent variable to its indicators. On the other hand, formative measurement models have relationships from the indicators to the latent variable.

Since the researcher had found all the indicators reflected to the constructs in the research framework, it is important to meet the criteria of evaluation reflective measurement models. As described by [44] the evaluation involves determining internal consistency (composite reliability), indicator reliability, convergent validity (average variance extracted, AVE), and discriminant validity (cross-loadings, Fornell-Larcker criterion and HTMT).

This study applies second order measurement model since construct under studies (i.e. Lean Manufacturing Practices, Ethical climate, Manufacturing Performance) are regarded as multi-dimensional variables, consistent with previous studies [45]; [46]. Conventionally, second order measurement model assessment in PLS-SEM is conducted through "repeated indicator" approach [47]. However, the correct AVE will not appear in the result output, hence researchers need to do the appropriate calculation in MS Excel template. Due to this limitation, this study employs another technique called "two-stage approach" as suggested by [48]. This technique is called "two-stage approach" because i) Stage One: Researchers need to apply repeated indicator approach [47] to obtain latent variable scores of the first order constructs and ii) Stage Two: Previously obtained latent variable scores are used as the manifest variables in the second order measurement model analysis.

For the first stage of measurement model assessment, whereby there are 21 latent variables (i.e. 17 first order constructs; CELL, PULL, QUCIK, SLP, TPM, TQM, BVL, EGO, PCP, COST, DELI, FLEX, QUAL, TIME with three second order constructs; LMP, EC, MP). First order constructs represent the dimensions of second order constructs. Meanwhile, the second stage of measurement model assessment portrayed only three latent variables (i.e. LMP, EC, MP). In this stage, the dimensions of LMP, EC and MP have been transformed into manifest variables (indicators). In both figures, numbers noted on the arrows represent the outer loading (factor loading) values while numbers appear inside the constructs indicate the AVE values. Table 4.8 presents these values in detailed.

Table -2: Measurement model result

Constructs 1st Order	Constructs 2nd Order	Loadings	Items	CA	CR	AVE
Cellular Layout (CELL)	Lean Manufacturing Practices (LMP)	.753	B1	.803	.858	.505
		.594	B2			
		.816	B3			
		.664	B4			
		.699	B5			
		.716	B6			
Pull System (PULL)		.787	B7	.845	.885	.563
		.797	B8			
		.798	B9			
		.645	B10			
		.734	B11			
		.731	B12			
Quick Setup (QUICK)		.770	B13	.820	.874	.582
		.785	B14			
		.688	B15			
		.788	B16			
		.778	B17			
Total Quality Management (TQM)		.830	B18	.885	.913	.637
		.821	B19			
		.784	B20			
		.684	B21			
		.897	B22			
		.757	B23			
Total Productive Maintenance (TPM)	Lean Manufacturing Practices (LMP)	.741	B26	.785	.856	.548
		.842	B27			
		.835	B28			
		.577	B29			
		.672	B30			
Small Lot Production (SLP)		.708	B31	.833	.902	.757
		.933	B32			
		.949	B34			
CELL		.841		.952	.960	.801
PULL		.937				
QUICK		.938				
TQM		.934				
TPM		.829				
SLP		.882				
Egoism (EGO)	Ethical climate (EC)	.787	E1	.849	.886	.528
		.718	E2			
		.682	E3			
		.818	E4			
		.721	E5			
		.721	E6			
Benevolence (BVL)		.594	E10	.775	.849	.533
		.655	E11			
		.817	E12			
		.796	E13			
		.763	E14			
Principle (PCP)		.767	E16	.879	.903	.509
		.718	E17			
		.725	E19			
		.704	E20			
		.697	E21			
		.697	E22			
		.672	E24			
		.747	E25			
		.696	E26			
EGO		.839		.894	.934	.826
BVL		.839				
PCP		.954				
Quality (QUAL)	Manufacturing Performance (MP)	.822	D1	.875	.904	.574
		.766	D2			
		.711	D3			
		.826	D4			
		.711	D5			
		.781	D6			
		.675	D7			
Delivery (DELI)		.815	D8	.723	.844	.644
		.762	D9			
		.829	D10			
Flexibility (FLEX)		.809	D11	.810	.876	.639
		.740	D12			
		.796	D13			
		.848	D14			
Time (TIME)		.730	D15	.901	.928	.724
		.935	D16			
		.759	D17			
		.924	D19			
		.884	D20			

Table -2: Measurement model result (continue)

Constructs		Loadings	Items	CA	CR	AVE
1st	2nd Order					
Cost (COST)	Manufacturing Performance (MP)	.842	D21	.803	.858	.505
		.801	D22			
		.673	D23			
		.637	D24			
QUAL DEL FLEX TIME COST		.887		.845	.885	.563
		.811				
		.920				
		.866				
		.716				

In this measurement model, several items/indicators (i.e. B24, B25, B33, B35, D18, D24, D25, E7, E8, E9, E15, E18 and E23) have been dropped from the model to achieve convergent and discriminant validity requirements. According to [49] , researchers are allowed to drop not more than 20% items for any particular construct from total items in the model in order to achieve convergent and discriminant validity requirements. Hence, it is acceptable to drop 18 out of 110 items (i.e. ≈16%) from this model.

Ultimately, the results in Table 2 shows that all constructs have passed the internal consistency reliability (i.e. CR more than .708) and convergent validity (i.e. AVE more than .50) tests [50]; [44]. Although outer loadings of some items are below than the benchmarking value (i.e. .708 according to [44]) the values are still acceptable in regards to other relevant sources. In addition, researchers are allowed to retain any item with outer loading .40 and above if the AVE value for its construct already achieve .50, which is the minimum indication for convergent validity [51].

Then, measurement model is further assessed by verifying the discriminant validity. Three (3) types of test are involved in assessing the discriminant validity namely; i) cross-loadings comparison, ii) [52] criterion (see Table 3), and iii) HTMT ratio (see Table 4). Cross-loadings refer to an indicator's (i.e. item's) correlations with other constructs in the model. In order to establish the discriminant validity, indicator's (i.e. item's) outer loading on the associated construct must be greater that any of its cross-loadings on other construct [44]; [49]. As the result for this findings, the outer loading values are always exceeding the cross-loading values, thus indicates discriminant validity between all constructs in the model have been established.

Next, the second approach to specify discriminant validity is the Fornell-Larcker criterion [52]. Fornell-Larcker criterion is a measure of discriminant validity that compares the square root of each construct's AVE with its correlations with all other constructs in the model. In particular, the square root of each construct's AVE must be greater than its highest correlation with any other construct. It means a construct must share more variance with its associated indicators (i.e. items) than with any other construct[52]; [44].

Table -3: Results of Fornell & Larcker (1981) criterion

Constructs	LMP	EC	MP
LMP	**.895**		
EC	.474	**.909**	
MP	.611	.705	**.839**

In Table 3, values with the bold fonts inside the diagonal columns represent the square root of each construct's AVE. Values in the diagonal columns should be higher than all other values in the row and column of the table. As can be seen, all diagonal values are higher than other values, hence it can be concluded that measurements have established discriminant validity.

Recent criticism on the cross-loadings approach and Fornell-Larcker criterion to examine a lack of discriminant validity under several circumstances have led to the suggestion of using HTMT ratio to assess discriminant[49]; [53]. HTMT is the ratio of the between-trait correlations to the within-trait correlations. HTMT is the mean of all correlations of indicators across constructs measuring different constructs relative to the mean of the average correlations of indicators measuring the same construct [53]. As such, this study also tests discriminant validity using this newly proposed method and the results are shown in Table 4.

Table -4: Results of HTMT ratio

Constructs	LMP	EC	MP
LMP			
EC	.502		
MP	.658	.777	

HTMT value that is greater than .85 [54] or .90 [55], indicates a problem of discriminant validity. Table 4 shows that majority of the values are below .85. Hence, it is confirmed that there is no discriminant validity problem between all constructs in the model. Since all conditions of convergent validity and discriminant validity have been fulfilled, this study proceeds to structural model assessment in the next section.

4.1 Structural Model

Structural model analysis or also known as the significance testing is the process of testing whether a certain result likely has occurred by chance. It involves testing whether a path coefficient is truly different from zero in the population. Assuming a specified significance level, the null hypothesis of no effect (i.e., the path coefficient is zero in the population) is rejected if the empirical t-value (as provided by the data) is larger than the critical t-value. Empirical t value is the test statistic value obtained from the data set at hand, while critical t-value is the cut-off or criterion on which the significance of a coefficient is determined [49].

In this study, structural model analysis is performed to answer the main research objectives. Using bootstrapping procedures with 5000 resamples [44];[49] in SmartPLS 3.2.8 software [48], the empirical t-values (t-statistics) are computed to indicate the significance of the hypothesized relationships.

Analyzing the structural model involves assessing basic measures such as coefficient of determination (R2), path coefficient (β) and the empirical t-values (t-statistics) [44];[49]. Nevertheless, several additional measures such as confidence interval [56], effect sizes (f2) and predictive relevance (Q2) [57], are also recommended for a more comprehensive reporting. As recommended, Table 5 and Table 6 include all those measures as part of the reporting.

Table -5: Results of hypotheses testing

Hypotheses	β	Std. Dev	T Stats	Confidence Interval 2.5%	Confidence Interval 97.5%	Decisions
H1: LMP->MP	.392	.095	4.104***	.200	.571	Accepted
H2: EC->MP	.393	.106	3.719***	.188	.603	Accepted
H3: LMP x EC->MP	-.217	.175	1.243	-.433	.367	Not accepted

Note. Two-tailed test. Significant at $p < .05$*, $p < .01$**, $p < .001$***

Table -6:
Results of multi-collinearity, variance explained and effect sizes

Hypotheses	VIF	Effect Size (f^2)	Coefficient of determination (R^2)	Predictive Relevance (Q^2)
H1: LMP->MP	1.290	.234		
H2: EC->MP	1.290	.236	.491	.353
H3: LMP x EC-> MP	1.000	.073		

LMP is positively influenced MP at β = .392, t = 4.104, p < .001 and f2 = .226. However, the interaction of LMP x EC does not statistically significant to MP (β = .593, t = 1.243, p = .214, f2 = .073) which means EC does not moderate the relationship between LMP and MP. Hence, variance explained of MP is only contributed by LMP and EC with the magnitude of 49.1% (R2 = .491). The significance of hypothesized relationships is depending on the value of t-statistics (i.e. empirical t-value must be larger than the critical t-value, to reject the null hypothesis). Commonly used benchmark of critical values in two-tailed tests are 2.33, 1.96, and 1.28, for p < .10, p < .05, and p < .01 respectively [44]. Meanwhile, p value represents the probability of error for assuming that a path coefficient is significantly different from zero[49]. p values of .01, .05, and .10 are also implying the confidence levels of 99%, 95%, and 90% respectively. In this study, t-statistics and p value is observed to decide whether the path coefficient (β) is statistically significant.

Path coefficient is the estimated path relationship between latent variables in a structural model which is identical to standardized beta (β) values in a regression model. Estimated path coefficients close to +1 represent a strong positive relationship and vice versa for negative values. The closer the estimated coefficients to 0, the weaker the relationship. Very low values close to 0 are usually non-significant (i.e., not significantly different from zero).[58] asserted that β values that are ranging from 0 to .10 may indicate the hypothesized relationship is not significant, while β values that are exceeding .20 are more likely indicating a significant relationship. Meanwhile, the values in between (i.e. .11 to .19) are cannot clearly determined the significance of hypothesized relationship.

In the same vein, confidence interval values also prove that H1 and H2, with all confidence interval values in Table 5 are positive for both lower limit (2.5%) and upper limit (97.5%). [49] stated that confidence interval provides an estimated range of values that is likely to include an unknown population parameter. It is determined by its lower and upper bounds, which depend on predefined probability of error and the standard error of the estimation for a given set of sample data. When zero does not fall into the confidence interval, an estimated parameter can be assumed to be significantly different from zero. In simple words, upper limit (UL) and lower limit (LL) values must be either both positive or both negative which indicates zero does not fall into the range of upper and lower bound values.

There is also no serious collinearity issue as indicated by VIF values in Table 5. Collinearity occurs when two or more predictor variables are highly correlated in a regression model [49]. VIF values below than 3.30 in Table 6 are implying that there is no serious collinearity among the predictors in this structural model [59]. The following subsections interpret results presented in Table 5 and Table 6 in detail following the hypothesized relationships.

5. DISCUSSION

5.1 Direct Relationship of LMP and EC on MP

Further, t-statistics of H2 is above 1.96 (i.e. t = 4.014) with p value is less than .01 which means there is a significant relationship between LMP and MP. Hence, H2 is accepted. In the same vein, H2 is also accepted at t = 3.719 and p < .001. These findings are in line with the study of [60] which is found the significant relationship between lean manufacturing practices towards performance in the research. In fact, lean has received attention from academics and practitioners alike as a competitive advantage source in both developing and developed economies. Likewise, study by [61] had found a positive connection between manufacturing performance and its implementation of lean manufacturing techniques.

5.1 Moderation of EC on Relationship between LMP and MP

The moderating effect of EC on LMP and MP relationship demonstrates t-statistics of H3 is below 1.96 (t = 1.243) and p = .214 which is more than .10. It means there is no significant interaction between LMP and EC, suggesting that EC does not moderate the relationship between LMP and MP. Thus, H3 is not accepted. However, the interaction plot diagram shows that the intersection between LMP and EC curves will eventually appear at some point (see Figure 2). Since the two linear curves in Figure 2 are not really parallel to one another, there is a chance that interactions between these two variables will occur, given considerable condition such as larger sample sizes.

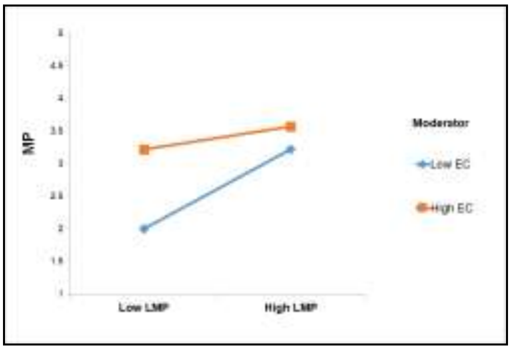

Fig-2: *Interaction plot between LMP and EC*

6.0 LIMITATIONS AND RECOMMENDATIONS

Although mail questionnaires provide opportunities to study a wide geographical area to include various manufacturing firms across Malaysian regions in a short time period, it is associated with low response rates. Some of the firms in the sample were unwilling to complete the questionnaire due to some reasons including confidential issue and time constraints.

Since this is the first time of examining the relationship of lean manufacturing practices and manufacturing performance with the moderating effect of ethical climate in Malaysia's manufacturing organizations, definitely some limitations or boundaries exist in conducting this research such as 1) Lack of cooperation from the representative of manufacturing organization in Malaysia due to time constraints and privacy of information.2) The evidence to support the findings of this study is quite limited due to past studies that have shown most of the researches have been conducted in different setting and variables. Lack of study pertaining moderating effect of ethical climate in manufacturing industries.

Even though there are limitations to this study, but this research can be further explored in different directions in order to attain comprehensive understanding of lean manufacturing practices, manufacturing performance and ethical climate in the future. Future researcher has the opportunity to further explore several potential problem as follow.

Firstly, the result of moderating effect might be change if the number of respondent could be increased. Future researcher should be tested the role of moderating effect by sustain the ethical climate in order to prove that it is a good variable to play a role as a moderator. This is because the current result shows the tendency of to get the positively moderate due to the interaction plot diagram shows that the intersection between lean manufacturing practices and ethical climate curves will eventually appear at some point. Researcher believes that numbers of respondents will affect the moderation result. Consequently, it can be extended the literature as well.

7.0 CONCLUSIONS

Lean manufacturing practices is the important mechanism that should be applied in the organization. It has been contended by [62] that it is the most crucial word for any organization in this present world. Beside, Lean manufacturing practices also has made the manufacturing organization doing more with less, which this study propositions to explore on the subject of relationship of lean manufacturing practices and manufacturing performance. Besides, the organizations need to fully adopt and implement the company's code of ethics in order to succeed in lean implementation. Besides, lean and ethics need to integrate and walk "side by side" to gain the best results and involve co-workers who can acknowledge the ethical codes in their task with their customers and carrying out regular work. In fact, according to [63] it is essential to compare the values lean stood for with the ethical codes used in the industry in order to identify potential interactions and misalignment. Consequently, the awareness of this study was derived after identifying the fragmented and discrepancies result of past studies.

Therefore, as has been reported by Economic Planning Unit, it is hoped that manufacturing organization in Malaysia returns high benefit to Malaysia's socio-economic upon their adaptation of lean manufacturing practices. Aforementioned, manufacturing industry should be put attention since manufacturing sector contribute the third largest in Malaysia economic [64]. Predominantly, lean manufacturing practices provides a better insight to Malaysia's manufacturing organizations by taking into account manufacturing performance and ethical climate of the organizations. As a result, other than able to stabilize the manufacturing industry, at once it also can encourage foreign to invest in Malaysia and put the country in the eyes of the world.

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