

Lean Management and HRM Practices in Relation towards Operational Performance: a Structural Model

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Abstract—This study examined the relationship between lean management and operational performance with the mediating effect of human resource management (HRM) practices in Malaysia local authorities. Participants reported their perceptions of lean management implementation (philosophy, process, people and partners, and problem solving), resultant operational performance (efficiency and effectiveness), and four dimensions of HRM practices: selection and hiring, training and development, performance evaluation, and rewards and incentives. The evaluation of structural model of Partial Least Square-Structural Equation Modeling (PLS-SEM) using SmartPLS3 showed the superiority of the models in which: (1) philosophy significantly and positively affected effectiveness performance, (2) rewards and incentives significantly affected both efficiency and effectiveness performances, (3) philosophy significantly and positively affected all the four dimensions of HRM practices, and (4) rewards and incentives mediate the relationship between philosophy and both efficiency and effectiveness performance. The implications of these results are discussed, especially regarding the effect of philosophy on operational performance in organization.

Keywords— *Lean Management; HRM Practices; Operational Performance; Structural Model*

1. INTRODUCTION

Effort to introduce lean management (LM) in public sector with the role plays by the people in the organization have gained increased acceptance as public sector at the federal, state and local levels evaluate new methods to reduce waste, increase efficiency and effectiveness in organization. LM is about people and the foundation of LM is to instil in the employees a desire for continuous improvement [61, Latham, Almost, Mann and Moore, 2005]. Recent literature identifying barriers to LM transformation suggests that the largest hurdles faced by organizations pursuing LM transformation are people-related [51, 85].

The relationship between LM-performance in organization is complex [65,83] and the existence of human resources (HRs) and cultural change can alter the nature of the relationship [10, 37, 65] found that establishing a LM organizational culture very much depends on the organization's ability to select, develop, engage, and inspire HRs through effective performance management strategies. However, a number of recent studies state that not enough research has been conducted into the HRs aspects associated with the implementation of LM [6, 17], especially in public sector. It also was observed that most studies on LM have been conducted in Western context. It is argued that additional studies are required in different non-Western contexts

in order to get a broader view of the concept [41] and to understand whether Western models could be applied in other contexts, particularly in the Asian countries.

Thus, this study offers a different perspective with the key focus is to investigate the mediating effects of human resource management (HRM) practices in the relationship between LM and operational performance (OP) in the Malaysia local authorities (LAs). This study examines LM from an organization's resource-based view (RBV) theory, which explores HRs as key resources which are formed by employees' selection and hiring, training and development, performance evaluation, and rewards and incentive of the organization. It demonstrates the important role of HRM practices in developing resources that are imperfectly imitable and difficult to duplicate. Accordingly, an organization's HRs can be identified as a strategic resource in achieving competitive advantage when it adds value to the organization, when it contributes uniquely to the organization's success, when it is difficult to be substituted, and when continual investment in it decreases the likelihood of imitation by competitors [53, 93].

This study is crucial since the greatest impact the HRM practices can have on a LM transformation is to educate and train on skills and behaviors on what respect for people really means and looks like to buy in engagement and commitment from everyone in the organization for continuous improvement. One of the distinctive features of LM and HRM practices is that better performance is achieved through the people in the organization. The main research question addressed by this study is whether LM enhances OP directly or indirectly through the support of the HRM practices. Answers to this question may enlarge our knowledge about the role of HRM practices in mediating the relationship between LM and OP in organization. In order to address the question, the study employed data collected among LAs in Malaysia. The study empirically tested the hypotheses to elicit not only general support or reject conclusion but also to explore the nature of the relationship among LM, HRM practices and OP in organization.

The present paper is structured into five parts. Section 1 discusses the introduction, while Section 2 underlines the hypotheses development. The methodology used to measure the relationship between the exogenous and endogenous constructs is presented in Section 3. Section 4 presents the analysis and empirical results of the structural model, followed by discussion on findings and conclusion in Section 5.

2. HYPOTHESES DEVELOPMENT

A. The Relationship between Lean Management and Operational Performance

The relationship between LM and OP would appear to be an important characteristic of an effective LM journey. Historically, the resulting association between an organization's performance and LM has been ambiguous, the evidence therefore, is mixed at best on whether the importance placed on LM positively affects OP [5, 19, 51, 52, 69, 76, 78, 80, 88]. The relationship however varies depending on context and type of organizations involved. In fact, while there is no consensus in the debate on the direction of this relationship, the primary argument by academics is that implementation of LM will positively affect performance and lead to competitive advantage [35, 58, 59, 60, 63, 64, 84]. The four principles (4P) dimensions measuring LM such as philosophy, process, people and partners, and problem solving [34, 61] could be explored in the present study to predict OP in Malaysia public sector. Therefore, this research overall predicts the direct relationship is a positive one, and further hypotheses that:

H1: LM has a positive and significant relationship with OP of the organization.

B. The Relationship between HRM Practices and Operational Performance

For the past two decades, researchers have linked HRM practices to manufacturing performance [54], OP [1, 13], organizational effectiveness and performance [33], and competitive advantage [57]. Even though the effects of HRM on performance have not been totally clarified, various studies from different countries produce evidence that the effective management of people results in better performance in organization e.g. [1, 7, 8, 16, 39, 56, 74]. Although, it has been generally agreed that HRM practices are positively associated with OP, however, there is still need for additional research to be undertaken to provide more evidence to support the HRM practices-OP relationship [4] from different cultural context such as public sector in Malaysia. The universal use of four dimensions measuring HRM practices such as selection and hiring, training and development, performance evaluation, and rewards and incentives [9, 11, 18, 64] could be explored in the present study to predict OP in Malaysia public sector. Therefore, this research overall predicts the direct relationship is a positive one, and further hypotheses that:

H2: HRM practices have positive and significant relationship with OP of the organization.

C. The Relationship between Lean Management and HRM Practices

The application of LM into service sector has further increased the relevance of HRM practices in a LM context [68]. LM provides HRM practices an opportunity to review its internal architecture and design to prove more useful in a LM context [68]. Some previous studies provide evidence that the employees evaluate their lean work experience favorably due to their exposure to multi-skills, team work and opportunities for participation, i.e. their exposure to HRM practices [93, 96]. Thus, HRM practices are relevant to LM for mainly three reasons: they aim to bring LM an integration of business strategy with quality and performance [12], a committed workforce and increased flexibility in terms of organization and job design [95], and positive employee attitudes [40, 100]. Therefore, this research overall predicts the direct relationship is a positive one, and further hypothesizes that:

H3: LM has a positive and significant relationship with HRM practices of the organization.

D. The Mediating Effect of HRM Practices

The previous researchers have suggested that LM and HRM practices can interact in order to improve OP in the organization. One of the distinctive features of LM and HRM practices is that better performance is achieved through the people in the organization. [30] showed how LM programs include some HRM practices. Their analysis made clear how the implementation of these human practices, together with JIT programs, provides significant explanation for the differences in performance measures [17]. [71] believed that supporting HRM practices were necessary for successful implementation of flexible work organization. Following the same line, [81] showed a strong relationship between JIT and what they called infrastructure practices, including employee management. This is consistent with [2] finding that HRM practices (training, compensation, multifunctional, and recruiting and selection) moderate the relationship between JIT and performance. A quantitative study of LM implementation in manufacturing has also found evidence that despite a positive role of HRM on the operations of an organization in a LM context, its role is indirect and mediated through LM [31, 84]. [55] also noted that HRM practices have a direct influence or effect on subordinate attributes such as human skills, attitudes and behavior, the so-called HRM outcomes, which in turn enhances OP. In a study of high performance work practices, [53] also found that investments in HRM practices resulted in lower turnover, greater productivity, and increased organizational performance through their impact on employee skill development and motivation [98].

The most influential articles about LM related to HRM practices are the studies by [64] and most recently research by [90]. A RBV is utilized as a theoretical foundation for the framework of their studies. [64] reviewed the study that analyzed the impact of HRM practices in the lean transformation success to improve competitive advantage. The author view HRM practices as a driver in the relationship between lean transformation success and performance of the organization. [90] reviewed the study that analyzed the role of workforce development in the relationship between lean production and OP. They view workforce development as a moderator in the relationship between LM and OP of the organization. Following the same line, the current study examines the mediating effect of HRM practices in the areas of staffing, training, performance evaluation and rewards [64]. It is expected that these practices can mediate the relationship between LM and OP in Malaysia public sector. Accordingly, it is hypothesized that:

H4: HRM practices mediate the relationship between LM and OP of the organization.

3. RESEARCH METHODOLOGY

This research utilizes Partial Least Square-Structural Equation Modeling (PLS-SEM) approach for data analysis and utilizes SmartPLS 3 to investigate the impact of HRM practices on LM and OP in organization. The PLS-SEM analysis estimates the parameters for the link between the indicators and their respective latent variables (LVs), and the link between the different LVs. With this estimation approach, the results of PLS-SEM may be described and interpreted as a combination of two models: (1) measurement model, and (2) structural model [24, 43]. These two models are assessed separately in a two-step process [44]. This paper focuses on the second step, i.e. structural model evaluation.

Prior to the specific evaluation of the structural model, the study performed the measurement model to evaluate the validity and reliability of the indicators to ensure that the indicators are representing the constructs of interest [24, 44]. A confirmatory factor

analysis (CFA) is performed to confirm unidimensionality of the indicators that reflect the underlying constructs [89, 94], i.e. to ensure that all the variables included in the models were best represented by the LVs as the study framed them. This procedure is recommended in the literature to confirm that the tested models include highly coherent constructs that are clearly defined and measured [70]. The results of the measurement model evaluation suggest that measurement model has demonstrated satisfactory reliability and validity as all fundamental criteria has been achieved. For simplicity, these results are not included here but they imply that the measurement model which we finally applied, was the most appropriate in terms of fit and coherence with the data.

The structural model reflects the relationships between the exogenous and endogenous constructs [44, 48, 66], with the main focus is maximizing the variance explained (R^2) for the endogenous constructs as well as determining the size and significance of all the paths coefficients. In the structural model, the hypotheses are tested by assessing the path coefficients, which are standardized betas [3, 28]. Table 1 illustrates the ten first-order constructs (FOCs) computed for LVs scores.

Table 1: First-order constructs computed for latent variable scores.

Second-Order Constructs (Code)	First-Order Constructs	Code for Constructs	Code for Indicators
Lean Management (LM)	Philosophy	LMph	LMph1 – LMph4
	Process	LMpr	LMpr1 – LMpr7
	People and Partners	LMpp	LMpp1 – LMpp3
	Problem Solving	LMps	LMps1 – LMps3
HRM Practices (HRM)	Selection and Hiring	HRMsh	HRMsh1 – HRMsh5
	Training and Development	HRMtd	HRMtd1 – HRMtd5
	Performance Evaluation	HRMpe	HRMpe1 – HRMpe6
	Rewards and Incentives	HRMri	HRMri1 – HRMri6
Operational Performance (OP)	Efficiency	OPey	OPey1 – OPey6
	Effectiveness	OPes	OPes1 – OPes4

All possible outer and inner links are drawn in SmartPLS 3 software to test the proposed research model. Figure 1 presents the PLS-SEM model of the study. Given that the FOCs are reflective in nature, the mode of measurement for indicators is specified as Mode A, with Table 1 providing the legend for indicators and constructs. In the figure, the paths are the hypothesized relationships between exogenous and endogenous constructs. The rectangular boxes represent the indicators, which are the individual items on the questionnaire. The latent variable ‘philosophy (LMph)’ is measured by four indicators, ‘process (LMpr)’ is measured by seven indicators, ‘people and partners (LMpp)’ and ‘problem solving (LMps)’ are measured by three indicators each, ‘selection and hiring (HRMsh)’ and ‘training and development (HRMtd)’ are measured by five indicators each, ‘performance evaluation (HRMpe)’ and ‘rewards and incentive (HRMri)’ are measured by six indicators each, ‘efficiency (OPey)’ is measured by six indicators, and ‘effectiveness (OPes)’ is measured by four indicators. Based on these factors, the PLS-SEM model for this study contains only reflective measurement model.

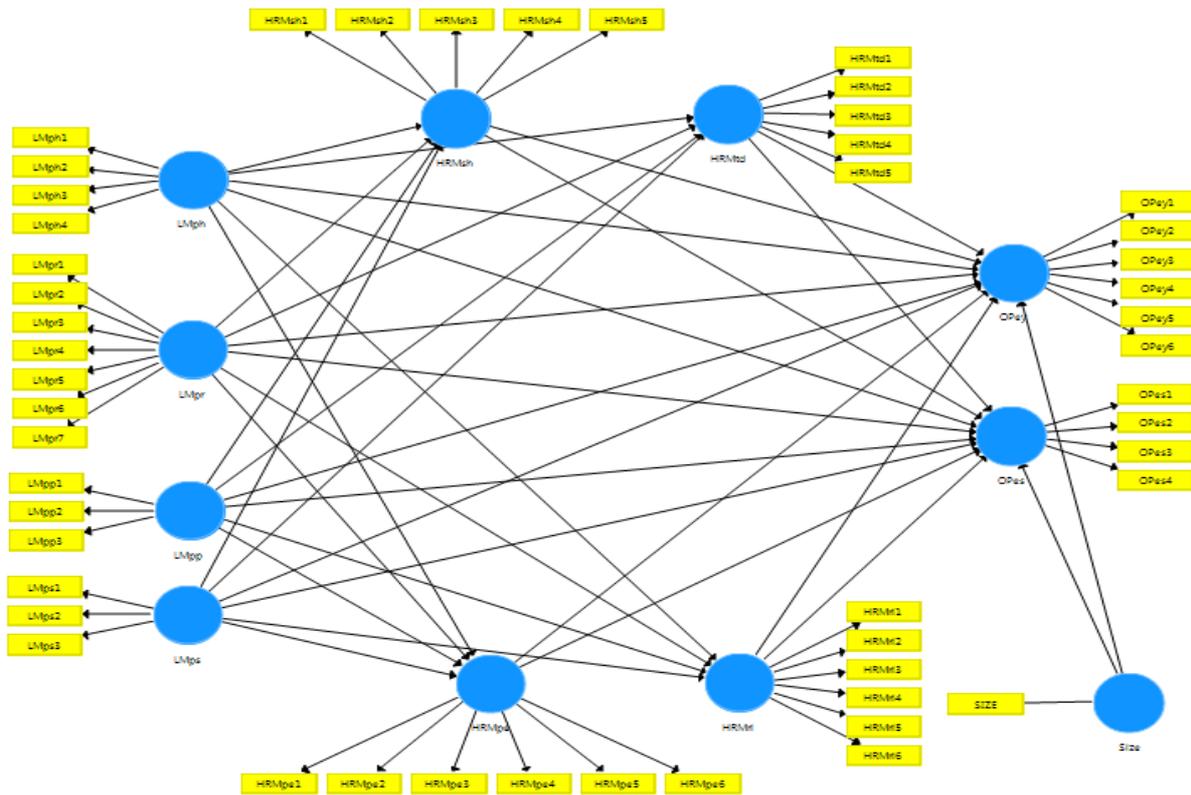


Figure 1: PLS-SEM Model.

4. ANALYSIS AND EMPIRICAL RESULTS

The PLS-SEM model tests hypotheses H1-H4 of the study. In testing the PLS-SEM model, the study uses interaction approach [66], which examine the relationship of LM and HRM practices as well as their effect on OP. First, the study reveals the nature of the relationships between LM and OP if the effects of the HRM practices are omitted (H1). Then the study examine the nature of the relationships between HRM practices and OP (H2). This analysis is followed by examining the nature of the relationships between LM and HRM practices (H3). Then the study explores the mediating effects of HRM practices on the relationship between LM and OP (H4).

Evaluation of Structural Model

Following the standard procedure in performing PLS-SEM [24, 42, 45], the assessment of structural model is based on five step guidelines, which includes: (1) assessment of collinearity; (2) assessment of significance and relevance of the path coefficients, (3) assessment of coefficient of determination (R^2), (4) assessment of effect sizes (f^2) and (5) assessment of predictive relevance Q^2 .

Assessment of Collinearity

Variance inflation factor (VIF) is the core measure for assessment of collinearity issues in the structural model. The VIF indicates how much of an indicator's variance is explained by the other indicators of the same construct [91]. A rule of thumb states that VIF greater than 10 denotes a harmful level of collinearity [49]. However, [42] suggests that VIF above 5.0 in the predictor constructs implies high collinearity. There are no critical levels of collinearity when VIF values are less than 0.5 [43]. Table 2 presents the VIF values of all the predictor constructs in the structural model. Results indicate that VIF values are below the recommended threshold value of 5.0, indicating there are no significant level of collinearity among the predictor constructs [42]. These findings, collectively, signify the success of the present study in conceptualizing and measuring latent constructs as the reflective FOCs.

Table 2: Collinearity values among exogenous constructs.

Construct	HRMpe	HRMri	HRMsh	HRMtd	OPes	OPey
HRMpe					3.819	3.819
HRMri					2.395	2.395
HRMsh					3.151	3.151
HRMtd					3.666	3.666
LMph	2.617	2.617	2.617	2.617	2.992	2.992
LMpp	3.041	3.041	3.041	3.041	3.315	3.315
LMpr	2.777	2.777	2.777	2.777	2.970	2.970
LMps	2.843	2.843	2.843	2.843	3.513	3.513

Assessment of Significance and Relevance of Path Coefficients

The higher the path coefficient, the stronger the effect of the exogenous construct on the endogenous construct. The t-values are used to evaluate the statistical significance of each path coefficient. As a rule of thumb [25, 46], a significant path coefficient can be represented by the two tailed p-value of 0.05 or less. Critical t-value for a two-tailed test is 1.96 at the 0.05 significance level [44]. Hence, in the present study, a path coefficient is significant if the critical t-value is equal to or greater than 1.96. Table 3 presents the bootstrap results for evaluating the relationship between the exogenous and endogenous constructs. The study bootstrapped the model with 5000 samples. It can be seen from the table that, with regard to the proposed relationships, the results provide support of positive significant relationships for fourteen hypotheses: H1.2d, H2.1d, H2.2d, H3.1a, H3.1b, H3.1d, H3.2a, H3.2c, H3.2d, H3.3a, H3.3c, H 3.3d, H3.4a, and H3.4b. These coefficients are significant at a level of p<0.05. Eighteen other hypotheses are not supported with t-statistics less than 1.96, thus are not significant at the level of p<0.05.

Table 3: Results of bootstrapping for structural model evaluation.

No.	Hypotheses		Path Coefficient	T Statistics	P Values	Significant
H1:	LM → OP					
1	H1.1a	LMph → OPey	0.051	0.552	0.581	Not
2	H1.1b	LMpr → OPey	0.105	1.020	0.308	Not
3	H1.1c	LMpp → OPey	0.080	0.700	0.484	Not
4	H1.1d	LMps → OPey	0.173	1.486	0.137	Not
5	H1.2a	LMph → OPes	-0.067	0.691	0.489	Not
6	H1.2b	LMpr → OPes	0.073	0.720	0.472	Not
7	H1.2c	LMpp → OPes	0.106	0.949	0.343	Not
8	H1.2d	LMps → OPes	0.229	2.011	0.044	Yes

Table 3 continues ...

... Table 3 continues

H2:	HRM Practices → OP					
9	H2.1a	HRMsh → OPey	-0.051	0.517	0.605	Not
10	H2.1b	HRMtd → OPey	0.015	0.129	0.897	Not
11	H2.1c	HRMpe → OPey	0.118	1.138	0.255	Not
12	H2.1d	HRMri → OPey	0.333	3.814	0.000	Yes
13	H2.2a	HRMsh → OPes	-0.084	0.857	0.391	Not
14	H2.2b	HRMtd → OPes	0.002	0.019	0.984	Not
15	H2.2c	HRMpe → OPes	0.207	1.710	0.087	Not
16	H2.2d	HRMri → OPes	0.306	3.813	0.000	Yes
H3:	LM → HRM Practices					
17	H3.1a	LMph → HRMsh	0.242	3.123	0.002	Yes
18	H3.1b	LMpr → HRMsh	0.224	2.699	0.007	Yes
19	H3.1c	LMpp → HRMsh	0.103	1.243	0.214	Not
20	H3.1d	LMps → HRMsh	0.316	3.101	0.002	Yes
21	H3.2a	LMph → HRMtd	0.298	3.172	0.002	Yes
22	H3.2b	LMpr → HRMtd	0.068	0.781	0.435	Not
23	H3.2c	LMpp → HRMtd	0.301	3.455	0.001	Yes
24	H3.2d	LMps → HRMtd	0.204	2.167	0.030	Yes
25	H3.3a	LMph → HRMpe	0.206	2.863	0.004	Yes
26	H3.3b	LMpr → HRMpe	0.064	0.759	0.448	Not
27	H3.3c	LMpp → HRMpe	0.204	2.320	0.020	Yes
28	H3.3d	LMps → HRMpe	0.403	5.423	0.000	Yes
29	H3.4a	LMph → HRMri	0.283	3.033	0.002	Yes
30	H3.4b	LMpr → HRMri	0.214	2.361	0.018	Yes
31	H3.4d	LMpp → HRMri	0.137	1.410	0.159	Not
32	H3.4d	LMps → HRMri	0.134	1.325	0.185	Not

Assessment of Coefficient of Determination (R²)

The R² is critical in evaluating a structural path model, as it represents the amount of variance in the endogenous constructs that is explained by the model [20, 24]. R² is a range from 0-1. When R² is closer to 1, the predictive accuracy is higher [44]. According to [25], R² values of 0.67, 0.33, or 0.19 for endogenous LVs in the inner model can be described as substantial, mediate, or weak, respectively. Whereas, the explanatory power of the exogenous LVs is “0” because they are not determined by other LVs [66] In the current study, the endogenous LVs are HRM practices and OP. Table 4 shows the explanatory power of the endogenous LVs in the PLS model. The results indicate quite robust model with 62.4% (R² = 0.624) of the variance in performance evaluation (HRMpe), 46.9% (R² = 0.469) of the variance in rewards and incentives (HRMri), 62.2% (R² = 0.622) of the variance in selection and hiring (HRMsh), and 60.8% (R² = 0.608) of the variance in training and development (HRMtd) are explained by the 4P dimensions of LM. The structural model also explains a considerable amount of 50.9% (R² = 0.509) of the variance in effectiveness (OPes), and 51.5% (R² = 0.511) of the variance in efficiency (OPey) are explained by the 4P dimensions of LM and four dimensions of HRM practices, thus explaining in the upper range of moderate R² values.

Table 4: Explanatory power of endogenous latent variables.

Endogenous Latent Variables	R Square
HRMpe	0.624
HRMri	0.469
HRMsh	0.622
HRMtd	0.608
OPes	0.509
OPey	0.511

Assessment of Effect Size (f²)

The effect size (f²) is calculated to measure the influence a selected exogenous construct has on the R² values of an endogenous construct [24, 43] Based on Cohen’s f² value, the effect size of the path is weak at the structural level if f² is 0.02, mediate if f² is 0.15, and strong if f² is 0.35 [24, 43]. Table 5 summarizes the results of the effect size.

Table 5: Summary of results of effect size

Hypotheses	Effect Size	Result	Hypotheses	Effect Size	Result
Lean Management → Efficiency			Lean Management → Selection and Hiring		
LMph → OPey	0.002	-	LMph → HRMsh	0.059	Weak
LMpr → OPey	0.008	-	LMpr → HRMsh	0.048	Weak
LMpp → OPey	0.004	-	LMpp → HRMsh	0.009	-
LMps → OPey	0.017	-	LMps → HRMsh	0.093	Weak to Mediate

Table 5 continues...

... Table 5 continues

Lean Management → Effectiveness			Lean Management → Training and Development		
LMph → OPes	0.003	-	LMph → HRMtd	0.087	Weak to Mediate
LMpr → OPes	0.004	-	LMpr → HRMtd	0.004	-
LMpp → OPes	0.007	-	LMpp → HRMtd	0.076	Weak to Mediate
LMps → OPes	0.030	Weak	LMps → HRMtd	0.037	Weak
HRM Practices → Efficiency			Lean Management → Performance Evaluation		
HRMsh → OPey	0.002	-	LMph → HRMpe	0.043	Weak
HRMtd → OPey	0.000	-	LMpr → HRMpe	0.004	-
HRMpe → OPey	0.007	-	LMpp → HRMpe	0.036	Weak
HRMri → OPey	0.095	Weak to Mediate	LMps → HRMpe	0.152	Mediate
HRM Practices → Effectiveness			Lean Management → Rewards and Incentives		
HRMsh → OPes	0.005	-	LMph → HRMri	0.058	Weak
HRMtd → OPes	0.000	-	LMpr → HRMri	0.031	Weak
HRMpe → OPes	0.023	-	LMpp → HRMri	0.012	-
HRMri → OPes	0.079	Weak to Mediate	LMps → HRMri	0.012	-

Referring to Table 3 (Results of Bootstrapping for Structural Model Evaluation) and Table 5 (Summary of Results of Effect Size), the analysis reveals that:

- (i) Problem solving significantly and positively impacts effectiveness with a weak effect size.
- (ii) Rewards and incentives significantly and positively impact efficiency with a weak to mediate effect size.
- (iii) Rewards and incentives significantly and positively impact effectiveness with a weak to mediate effect size.
- (iv) Philosophy, process, and problem solving significantly and positively impact selection and hiring with a weak, weak, and weak to mediate effect size respectively.
- (v) Philosophy, people and partners, and problem solving significantly and positively impact training and development with a weak to mediate, weak to mediate, and weak effect size respectively.
- (vi) Philosophy, people and partners, and problem solving significantly and positively impact performance evaluation with a weak, weak, and mediate effect size respectively.
- (vii) Philosophy, and process significantly and positively impact rewards and incentives with a weak effect size.

Assessment of Predictive Relevance Q^2

Q^2 measures the extent to which the model's prediction is successful [91]. A value of $Q^2 > 0$ confirms the presence of predictive relevance [42, 49]. Table 6 summarizes the results of Q^2 . All the Q^2 values of reflective endogenous constructs of the current study are above "0", which confirms the presence of predictive relevance and showing that the model's prediction is successful.

Table 6: Summary of results: Q^2

Endogenous Constructs	Q^2
HRMpe	0.425
HRMri	0.320
HRMsh	0.411
HRMtd	0.420
OPes	0.329
OPey	0.328

Evaluation of Mediating Effects

In testing the mediating effects of HRM practices, this study adopted [99] guidelines. These guidelines have recently been used by [70]. The typology of mediation models is used to determine the type of mediations or non-mediation according to the criteria listed below:

- (i) Complementary mediation occurs if indirect effect "a x b" and direct effect "c" are significant and have the same directions.
- (ii) Competitive mediation occurs if indirect effect "a x b" and direct effect "c" are both significant and have opposite directions.
- (iii) Indirect-only mediation occurs if indirect effect "a x b" is significant, but not "c".
- (iv) Direct-only non-mediation occurs if direct effect "c" is significant, but not indirect effect "a x b".
- (v) No effect non-mediation occurs if both direct "c" and indirect effect "a x b" are insignificant.

There are several implications for the type of mediation or non-mediation established. First, when the first three cases; complementary, competitive and indirect-only mediation occur, the data supports the hypotheses for mediation. Second, in both complementary and competitive mediation, the mediator identified is consistent with the hypothesised theoretical framework, and the significant direct effect "c" signals that there is second possibly omitted mediator which can be examined in any future study. The sign of the direct effect signals for the sign of an omitted indirect path. Third, indirect-only mediation implies that the mediator identified is consistent with hypothesised theoretical framework and there is no need to test for further indirect effects. The sign of the direct effect in direct only non-mediation implies that there is yet undiscovered mediators. Finally, the no effect non-mediation is a failure for testing mediation [99].

The classification of mediation or non-mediation is identified based on whether direct effect "c" is significant or not. The t-values for direct effect "c" (4P dimensions of LM → two dimensions of OP) are obtained from Table 3 (Results of Bootstrapping for Structural Model Evaluation). The t-values are used to evaluate the statistical significance of each path coefficient. Critical t-value for a two-tailed test is 1.96 at the 0.05 significance level [44]. Table 7 summarizes the mediating effects of HRM practices.

Table 7: Mediating effects of HRM practices.

No.	Hypotheses	Path Coeff.	T Statistics	P Values	Sig.	Type of Mediation
H4.1.1a	LMph -> HRMsh -> OPey	-0.012	0.491	0.624	Not	5
H4.1.1b	LMpr -> HRMsh -> OPey	-0.011	0.486	0.627	Not	5
H4.1.1c	LMpp -> HRMsh -> OPey	-0.005	0.381	0.703	Not	5
H4.1.1d	LMps -> HRMsh -> OPey	-0.016	0.485	0.627	Not	5
H4.1.2a	LMph -> HRMsh -> OPes	-0.020	0.760	0.448	Not	5
H4.1.2b	LMpr -> HRMsh -> OPes	-0.019	0.793	0.428	Not	5
H4.1.2c	LMpp -> HRMsh -> OPes	-0.009	0.573	0.567	Not	5
H4.1.2d	LMps -> HRMsh -> OPes	-0.027	0.804	0.421	Not	5
H4.2.1a	LMph -> HRMtd -> OPey	0.005	0.125	0.901	Not	5
H4.2.1b	LMpr -> HRMtd -> OPey	0.001	0.077	0.939	Not	5
H4.2.1c	LMpp -> HRMtd -> OPey	0.005	0.124	0.901	Not	5
H4.2.1d	LMps -> HRMtd -> OPey	0.003	0.114	0.910	Not	5
H4.2.2a	LMph -> HRMtd -> OPes	0.001	0.019	0.985	Not	5
H4.2.2b	LMpr -> HRMtd -> OPes	0.000	0.012	0.991	Not	5
H4.2.2c	LMpp -> HRMtd -> OPes	0.001	0.019	0.985	Not	5
H4.2.2d	LMps -> HRMtd -> OPes	0.000	0.017	0.986	Not	4
H4.3.1a	LMph -> HRMpe -> OPey	0.024	1.020	0.308	Not	5
H4.3.1b	LMpr -> HRMpe -> OPey	0.007	0.549	0.583	Not	5
H4.3.1c	LMpp -> HRMpe -> OPey	0.024	0.916	0.360	Not	5
H4.3.1d	LMps -> HRMpe -> OPey	0.047	1.096	0.273	Not	5
H4.3.2a	LMph -> HRMpe -> OPes	0.043	1.461	0.144	Not	5
H4.3.2b	LMpr -> HRMpe -> OPes	0.013	0.633	0.527	Not	5
H4.3.2c	LMpp -> HRMpe -> OPes	0.042	1.221	0.222	Not	5
H4.3.2d	LMps -> HRMpe -> OPes	0.083	1.589	0.112	Not	4
H4.4.1a	LMph -> HRMRI -> OPey	0.094	2.444	0.015	Yes	3
H4.4.1b	LMpr -> HRMRI -> OPey	0.071	1.869	0.062	Not	5
H4.4.1c	LMpp -> HRMRI -> OPey	0.046	1.289	0.198	Not	5
H4.4.1d	LMps -> HRMRI -> OPey	0.045	1.190	0.234	Not	5
H4.4.2a	LMph -> HRMRI -> OPes	0.087	2.469	0.014	Yes	3
H4.4.2b	LMpr -> HRMRI -> OPes	0.066	1.811	0.070	Not	5
H4.4.2c	LMpp -> HRMRI -> OPes	0.042	1.290	0.197	Not	5
H4.4.2d	LMps -> HRMRI -> OPes	0.041	1.133	0.257	Not	4

Note: *Type of Mediation: (1) Complementary Mediation (Partial Mediation), (2) Competitive Mediation, (3) Indirect-Only Mediation (Full Mediation), (4) Direct-Only Non-Mediation, and (5) No-Effect Non-Mediation.

Results presented in Table 7 (Mediating Effects of HRM Practices) indicate that, there are two significant hypotheses:

- i) H4.4.1a: Rewards and incentives serve as an indirect-only (full) mediator for the relationship between philosophy and efficiency. In this regard, philosophy does not have a significant direct effect on efficiency. Instead, philosophy impacts efficiency only through rewards and incentives. The variance accounted for (VAF) value shows that 64.83% of the total effect of philosophy on efficiency is explained by the indirect-only effect of rewards and incentives.
- ii) H4.4.2a: Rewards and incentives has indirect-only (full) mediator on the relationship between philosophy and effectiveness. In this regard, philosophy does not have a significant direct effect on effectiveness. Instead, philosophy impacts effectiveness only through rewards and incentives. The VAF value shows that 56.49% of the total effect of philosophy on effectiveness is explained by the indirect-only effect of rewards and incentives.

5. DISCUSSION ON FINDINGS AND CONCLUSION

A. Discussion on Hypothesis H1

Examining hypothesis H1, i.e. the relevance of significant relationships between LM and OP, the results show that only problem solving has a positive and significant relationship with effectiveness of the organization, the rest of the hypotheses are insignificant. However, the insignificant relationship between philosophy and OP is explainable by the fact that, philosophy impacts both efficiency and effectiveness through rewards and incentives.

This finding in general, supports the argument that the higher the leanness, the greater will be the positive effects on OP [30, 32, 84, 93]. It also provides support for the assertion made by [61], who stated that, the continuously solving problems in organization could drives organizational learning. This is because, identifying root causes of problems and preventing them from occurring is the main focus of continuous learning system. Tough analysis, reflection, and communication of lessons learned are central to improvement as is the discipline to standardize the best-known practices, which then lead to improve OP in organization. Interestingly, these findings respond to criticisms by previous scholars who point out that LM is focusing too much on internal efficiency and production metrics, so is only an improvement for internal efficiency not for the customer [35, 77]. Other researchers also agree with this issue and stated that most of the studies do not examines the effectiveness of LM implementation as a culture of problem-solving which consider it from a holistic perspective [35, 79].

As such, the result indicates that problem solving of LM is expected to assist Malaysia public sector to an improvement of their effectiveness performance. This suggests that, public sector in Malaysia wishing to attain a higher level of effectiveness should focus more on problem solving rather than philosophy, process, and people and partners in designing their LM systems.

B. Discussion on Hypothesis H2

Examining hypothesis H2, i.e. the relevance of significant relationships between HRM practices with OP, the results show that, only rewards and incentives have positive and significant relationship with both efficiency and effectiveness of the organization, the rest of the hypotheses are insignificant.

These results are consistent with a considerable body of previous researches which implied that rewards and incentives have positive impact on performance [14, 22, 36]. Most of the studies have found that an effective compensation and reward process enhances productivity, sales and overall performance of organization [33]. An organization that implements rewards system on performance will have workers that are more likely to engage and motivated to participate in activities that improve the organization's overall performance [75]. In line with this, [4] stated that, a comprehensive, transparent and client-based performance appraisal system enhances organization performance. [92] conducted a survey of international food companies and positively linked the employee reward system to firm growth [64]. Accordingly, [27] stated that rewards and compensation considerably affect organizational outcomes. Competency-based rewards and pay enhances the quality of goods and services, improves subordinates' behaviour, and decreases accidents rates in organizations, thereby improving OP. Therefore, there is clear evidence that compensation and reward effectively affect OP [4].

As such, the result indicates that rewards and incentives may help Malaysia public sector to improve their OP in term of both efficiency and effectiveness. This suggests that, public sector in Malaysia wishing to attain a higher level of OP in term of efficiency and effectiveness should focus more on rewards and incentives rather than other three dimensions of HRM practices in designing their HRM systems.

Discussion on Hypothesis H3

Examining H3, i.e. the relevance of significant relationships between LM with HRM practices, the results show that, three dimensions of LM (philosophy, process, and problem solving) positively contribute to explaining the variance in selection and hiring; three dimensions of LM (philosophy, people and partners, and problem solving) positively contribute to explaining the variance in both training and development, and performance evaluation; and two dimensions of LM (philosophy and process) positively contribute to explaining the variance in rewards and incentives.

These results are consistent with a considerable body of previous researches which implied that LM is directly dependent upon the extent to which HRs within the organization actively support and participate in the LM transformation process. Previous studies suggest the importance of HRM practices in influencing the successful implementation of LM [15, 81, 93]; the organizations that combined LM practices with HRM practices outperformed the organizations that did not do so [32, 63]. Therefore, finding, selecting, and investing in individuals that fit within the broader LM strategy can lead to greater organizational transformation success rates [62, 64]. [38] in his study highlights the importance of recruiting in the success of LM implementation. In LM environment also, the extensive training and development is a necessary to advance employees capabilities of becoming more perceptive to the acquisition of new skills knowledge [17], and is a necessary prerequisite for empowerment to work [73], thus an increase in performance outcomes [21, 84] via enhanced productivity can be attained [63]. [82] also mentioned that investment in skills and capabilities are essential while keeping the employees as the most valuable resources. Employees also need training to engage in improvement activities and problem-solving techniques. [23, 97]. Besides, the relationship between employees and supervisors or managers is facilitated by performance [29]. [86] found a significant positive relationship between developmental performance evaluation and elements of LM, namely JIT. Lastly, there is also a need to adapt the reward systems when organizations implement LM [50].

It can be concluded that in general, the results are consistent with previous studies indicating that LM and HRM practices are closely related and can interact in order to improve OP [17, 64, 87, 90, 100]. Moreover, given that LM and HRM practices are valuable management system within the organizational structure, the findings supported the RBV theory [64, 90]. The result indicates the importance of selection and hiring, training and development, and performance evaluation in the success of LM implementation in Malaysia public sector. This is followed by rewards and incentives that also play the important part in the successful of LM implementation. This suggests that, public sector in Malaysia wishing to attain a higher level of LM implementation should focus more on selection and hiring, training and development and performance evaluation, followed by reward and incentives in designing their LM systems.

Discussion on Hypothesis H4

Examining hypothesis H4, i.e. the mediating role of HRM practices, the results indicated that, rewards and incentives significantly mediate the relationship between philosophy and both efficiency and effectiveness performance. These results are consistent with [2] finding that compensation moderate the relationship between JIT and performance. Based on the issues of implementing LM to improve OP, an organization must understand LM as a long-term philosophy where the right processes will produce the right results and value can be added to the organization by continuously developing people and partners, while continuously solving problems to drive organizational learning [76]. The writers and some studies in this field suggest that the resource-based view (RBV) perspective can explain how superior performance can be achieved and maintained [64, 90], given the organization's future lies in the degree of efficiency and continuous commitment to manage the key resources effectively that would be strengthened by the ability to continuously upgrade the level of efficiency and management skill [47]. [34] stated that, Toyota's continued success at implementing tools and techniques stems from a deeper business philosophy based on its understanding of people and human motivation.

Conclusion

It can be concluded that in general, the results are consistent with a wide body of research indicating that LM represents a change in the production system model that calls for integration of human and technological practices [72]. The inclusion of some HRM practices related to employee development can boost certain aspects of LM which then results in increased OP outcomes due to higher inventory turns, lead-time reduction, and increased quality [67, 90]. [71] believed that supporting HRM practices were necessary for successful implementation of flexible work organization. Following the same line, [81] showed a strong relationship between JIT and what they called infrastructure practices, including employee management. A quantitative study of LM implementation in manufacturing has also found evidence that despite a positive role of HRM on the operations of an organization in a LM context, its role is indirect and mediated through LM [31, 84]. Moreover, given that LM and HRM practices are valuable management system within the organizational structure, the results are consistent with the theory, which illustrates the role of HRM practices that intervene in the relationship between LM and performance [64, 90].

In respect of the importance of operations management, the findings provide some revealing insights into how organizations have managed to improve their performance through adopt high level of LM. HRM practices are extensively undertaken to provide various additional improvements in OP. In other words, this study provided empirical evidence that LM can lead Malaysia LAs to improve their OP in terms of efficiency and effectiveness.

The lack of significance to these findings may be due to sample frame, since the study focuses only on Malaysia LAs, and no other public sector agencies. Furthermore, in Malaysia, LM is still yet to be considered as mature concept as there are still many organizations that are not applying LM either as a system-wide approach or partial LM implementation [26]. It takes time and effort to use LM on a broader scale in Malaysia public sector, although the organization is less characterized by functional boundaries [35].

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