The Impact of Human Resource Management Bundles on Innovation in Malaysia

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Abstract

There is relentless pressure on firms, especially those operating in fast-cycle markets, to continuously engage in innovation so that they may continue to earn profits and grow. This article examines how human resource management (HRM) contributes to organizational innovation in Malaysia, mediated by knowledge exchange and combination (KE&C). The independent variable of HRM is decomposed into the ability, motivation and opportunity (AMO) enhancing components, while innovation is viewed from the perspectives of product, process, administrative and overall innovation. Application of the Hayes' PROCESS software to the sample of 212 managers from 40 Malaysian firms showed both direct and mediated impacts. The motivation-enhancing HRM bundle has direct and positive impacts on product, process and administrative innovation, while the ability-enhancing HRM bundle has direct and positive impacts on administrative innovation. Furthermore, motivation-enhancing and ability-enhancing HRM bundles have direct and positive impacts on overall innovation. There are also smaller positive mediated impacts of opportunity-enhancing and ability-enhancing HRM bundles on product innovation, opportunity-enhancing and ability-enhancing HRM bundles on process innovation, and opportunity-enhancing and ability-enhancing HRM bundles on administrative innovation. Finally, opportunity-enhancing and ability-enhancing HRM bundles have mediated impacts on overall innovation. The research findings and conclusions are discussed.

Keywords: Human resource management bundles, knowledge exchange and combination, process innovation, product innovation, administrative innovation

1. Introduction

Human resource management has assumed greater prominence in today's turbulent business environment as organizations face challenges of increased global competition, internationalization of technology and productivity of labor (Bratton and Gold, 2007). While Malaysia has put into place many measures to ensure that the country becomes more innovative, the fact remains that innovation is ultimately an organization-level phenomena that requires the organizations to make changes to their products and services so that they can continue to remain relevant and viable to their customers. This research examines how human resource management (HRM) contributes to organizational innovation. While extant research has established the positive impacts of HRM on innovation, the relationship between HRM and organizational innovation remains a black box.

This article decomposes HRM, the independent variable, into the ability-enhancing, motivation-enhancing and opportunity-enhancing bundles. Ability-enhancing HRM will enhance

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the capacity of employees to perform, whereas motivation-enhancing HRM will provide the right incentives and environment for performance. Finally, opportunity enhancing HRM provides employee with adequate opportunities to perform well. There is broad agreement that bundles of human resource practices are more effective than just introducing them individually (MacDuffie, 1995; Barney, 1995; Guest, Conway and Dewe, 2004).

Organizational innovation is the dependent variable of this research. It is further divided into product, process and administrative innovations. Since HRM can impact innovation both directly and indirectly, the mediator of knowledge exchange and combination (KE&C), has been included in this study. A total of 300 questionnaires was distributed to 40 firms in Kuala Lumpur and Selangor, after discussions with their management. Two hundred and nineteen completed survey forms were collected from the firms. However, seven forms were found to have far too many missing data and illogical entries to be of use and were excluded from the final analysis. The final dataset of 212 managers was used to produce the results of this research. The underlying factor structure of this research is first analyzed using factor analysis, followed by an examination of the reliability of the items used to measure our variables. The hypotheses of the research are uncovered through the use of the PROCESS model (Hayes, 2013).

1.1 HRM Bundles

Many previous studies have demonstrated the impact of human resource management (HRM) either by focusing on a particular human resource function like compensation (Gerhart and Milkovich, 1990), or recruitment and selection (Terpstra and Rozell, 1993) or on a range of human resource practices (Singh, 2003; Gould-Williams and Mohamed, 2010). These studies have measured the impact of human resource management on many different dependent variables ranging from attitudinal changes among employees to productivity and even profitability of the organization.

However, subsequent research has shown that bundles of human resource practices are more effective than just introducing them individually (MacDuffie, 1995; Barney, 1995; Guest, Conway and Dewe, 2004). For example, bundling the practices of recruitment and selection and training and development into the ability-enhancing HRM bundle will produce greater innovation than the impact produced by recruitment and selection. In the same way, we could bundle performance appraisal and rewards into the motivation-enhancing bundle and autonomy and participation into the opportunity-enhancing bundle.

Ability-enhancing HRM focuses on the right kinds of knowledge, skills and abilities of employees to perform, whereas motivation-enhancing HRM will provide the right incentives and environment for performance. Finally, empowerment enhancing HRM ensures that the employees are given autonomy in their work and allowed to participate in decisions. These three components have often been summarized in the mathematical formula $P = f (A, M, O)$ (Boxall and Purcell, 2008). The central idea behind the approach of bundles of human resource management practices is that the practices are complementary to each other and have synergistic effects when bundled together.

1.2 Organizational Innovation

The Oxford Dictionary defines innovation as the introduction of new ideas or products. This definition implies that innovation involves change. However, this definition is too general and there is a need to further narrow it down.

Drucker (1998) who was one of the earliest scholars to define innovation, defined it as the means by which entrepreneurs create new wealth-producing resources or endow existing resources

with enhanced potential for creating wealth. In a similar vein, Freeman and Soete (1997) defined innovation as the commercialization of technology to produce new products and services.

Zaltman, Duncan and Holbek (1973) provide further clarity on innovation when they clarify that innovation is any idea or practice that is new to the organization adopting it. This means that innovation occurs so long as an organization is adopting it for the first time, though it may have been in existence for some time (Van de Ven, 1986). Researchers have also identified different ways to classify innovation. For example, innovation has been classified as incremental versus radical, or into various types such as product, process and administrative innovations (Damanpour, 1991; Gopalakrishnan and Damanpour, 1997; Kimberley and Evanisko, 1981). Product innovation can mean a totally new product, its technical specifications and improvements made to it. Process innovation, on the other hand, refers to the introduction of a significantly method of doing things that improves production of the product. Finally, administrative innovation is concerned with the organizational arrangements that can facilitate innovation, which is concerned mainly with coordination and monitoring work in the organization.

Toivenen and Tuominen (2009) examined innovation in the service sector from the perspective of product, process, market and organization. Kahn (2018) defined innovation in terms of outcome, process and mindset. He includes as outcome, product innovation, process innovation, marketing innovation and organizational innovation. He further clarifies that process innovation is the way innovation is organized to produce the desired outcome whereas mindset is the requirement for the organizational members to develop a commitment to innovation. In this research, we decompose innovation into the product, process and administrative typology.

1.3 Knowledge Exchange and Combination (KE&C)

There are research findings confirming that KE&C among employees in an organization can lead to greater innovation. However, researchers have identified many mediators, between human resource management and innovation, with overlap amongst each other.These include social capital, knowledge sharing, organization climate, intellectual network, intellectual capital, knowledge management, absorptive capacity (Cohen and Levinthal, 1990) and also, knowledge exchange and combination (KE&C), which is the term used in this study.However, as pointed out by Donnelly (2019), the assumption made by many researchers that employees want to share their knowledge with each other needs to be scrutinized by researchers. The reality is that without intervention from their organizations, the interaction between tacit and explicit knowledge would not lead to innovation (Nonaka, 1994). Herschel, Nemati and Steiger (2001) stress that it is the conversion of tacit to explicit knowledge that is of key importance in knowledge creation. Nahapiet and Ghoshal (1998) emphasized that social capital facilitates the creation of new intellectual capital.

Gold, Malhotra and Segars (2001) found that organizations need to put in place a knowledge infrastructure comprising technology, structure and culture together with capacity to acquire, convert and apply knowledge so that the organization can enjoy economic value.Chiu, Hsu and Wang (2006) drew on Social Cognitive and Social Capital theories to find that the variables of social interaction ties, trust, norm of reciprocity and identification increased quantity of knowledge sharing but not knowledge quality. KE&C refers to the capacity of employees in a firm to exchange knowledge with each with the intention of combining them, so as to come out with new products (Collins and Smith, 2006). Cummings (2004) found that knowledge sharing is more effective when work groups participated in sharing information, know-how and feedback with parties outside of the group in a study of 182 work groups in a telecommunications firm. Denford and Ferriss (2018) found that exploration, integration and exploitation both within and between firms relies on three

different organizational capacities: absorptive, combinative and desorptive. While much attention has been given to the first two capacities, the third, desorptive, is less well known. Lichtenthaler and Lichtenthaler (2010) defined desorptive capacity as the capacity of the firm to identify and transfer technology in the outward technology transfer process. Desorptive capacity is much more difficult to develop than its opposite, absorptive capacity, which involves adoption and assimilation of technology into a company.

1.4 HRM Bundles, KE&C and Innovation

The relationship between HRM bundles, KE&C and innovation has been found in many studies. However, some of the earlier studies did not combine the HRM practices into HRM bundles using the AMO framework but used HRM practices like training, performance appraisal and staffing as their independent variables. Chen and Huang (2009) in a study of 146 firms, found that human resource practices have positive relationships with knowledge management capacity, which in turn, has a positive impact on innovation. Tan and Nasurdin (2011) in a study of 171 manufacturing firms in Malaysia, found that the human resource practice of training had a positive relationship with product, process and administrative innovation. Performance appraisal was positively and significantly related to administrative innovation. However, other human resource practices like career management, reward system and and recruitment were unrelated to the 3 types of innovation. In addition, training has indirect effects on product, process and administrative innovation through knowledge management whereas performance appraisal has an indirect effect on administrative innovation through knowledge management. Kianto, Saenz and Arumburu (2017) in a study of 180 Spanish firms established that intellectual capital positively mediates knowledge based HRM and innovation. They measured intellectual capital as comprising 3 components, human structural and relational capital, which overlaps with the concept of KE&C, which is used in this study. Ozbag, Esen and Esen (2013) based on primary data collected from 122 medium and large organizations, found that HR capabilities influence knowledge management (KM) capability, which contributes to innovation. Moreover, HRM capabilities have both direct and indirect effects on innovation, mediated by knowledge management capabilities.

In their research, Chang, Gong and Shum (2011) discovered that the two HRM functions of training exert influence on both radical and incremental innovation in a study of 196 hotel and restaurant companies. Shipton, West, Dawson, Birdi and Patterson (2006) found that the human resource practices of training, induction, team working, appraisals and exploratory learning all contribute to innovation in their study of 22 UK manufacturing companies. Seeck and Diehl (2017) in their literature review of 33 cases on the impact of HRM on innovation, found, among other things, for the HRM-innovation link, mediated by creativity and knowledge management. Donate, Pena and Sanchez de Pablo (2016) uncovered, among other things, the positive links between collaborative HRM practices and social capital, which in turn influence innovation. Social capital acts as the medium through which networks and knowledge exchange contribute to innovation.

In their study of 150 Finnish technology firms, Ritala, Olander, Michailova and Husted (2014) came to the conclusion that external knowledge sharing led to positive effect on innovation. However, knowledge leakage by employees negatively affected innovation.

As such, we hypothesize that:

H1: *The ability-enhancing, motivation-enhancing and opportunity-enhancing HRM bundles will each have direct and positive impacts on product innovation.*

H2: *The ability-enhancing, motivation-enhancing and empowerment-enhancing HRM bundles will each have direct and positive impacts on process innovation.*

 H3: *The ability-enhancing, motivation-enhancing and empowerment-enhancing HRM bundles will each have direct and positive impacts on administrative innovation.*

H4: The ability-enhancing, motivation-enhancing and empowerment-enhancing HRM bundles will each have indirect and positive impacts on product innovation mediated by KE&C.

H5: The ability-enhancing, motivation-enhancing and empowerment-enhancing HRM bundles will each have indirect and positive impacts on process innovation mediated by KE&C.

H6: The ability-enhancing, motivation-enhancing and empowerment-enhancing HRM bundles will each have indirect and positive impacts on administrative innovation mediated by KE&C.

H7: The ability-enhancing, motivation-enhancing and empowerment-enhancing HRM bundles will each have direct and positive impacts on overall innovation.

H8: The ability-enhancing, motivation-enhancing and empowerment-enhancing HRM bundles will each have indirect and positive impacts on overall innovation mediated by KE&C.

Overall innovation in H7 and H8 is the combination of the 3 types of innovation used in this study.

1.5 HRM Bundles and Control Variables

The three demographic variables that have been included as control variables are age, tenure and education. Porter and Donthu (2006) found that older and less educated people perceived more access barriers to technology. Thus, it is likely that our findings should uncover a negative relationship between age and innovation and a positive relationship between education and innovation. Agarwal and Prasad (1999) did not find any relationship between tenure and ease of use of technology. In the same vein, tenure and innovation may not be related in this study.

1.6 Conceptual Framework

The conceptual framework used in our study is shown in figure 1. As shown in the figure, the three human resource bundles are the independent variables, knowledge exchange and combination (KE&C) is the mediating variables and the three types of innovation are the dependent variables. The fourth dependent variable is the overall innovation, which is the combination of the 3 types of innovation.

Independent Variables	Mediating Variable	Dependent Variables
1) Ability-enhancing HRM Bundle 2) Motivation-enhancing HRM Bundle 3) Opportunity-enhancing HRM Bundle	Knowledge Exchange and Combination (KE&C)	1) Product Innovation 2) Process Innovation 3) Administrative Innovation 4) Overall innovation*

*Note: Overall innovation is the combination of product, process and administrative innovation.

Figure 1: Conceptual Framework

2. Methodology

2.1 Data Collection

A structured survey with two sections was distributed to 300 respondents in 40 firms in Kuala Lumpur and Selangor, who are entry-level, mid-level and senior-level managers. The first section of the survey form consisted of demographic variables like age, gender, tenure, years of education and managerial grade. The second section contained Likert 5 point scale items on the three bundles of HRM, the mediating variable of KE&C and the dependent variables, which are the three types of innovation and overall innovation, measured by the index of innovation, which combines the scores of the 3 types of innovation used in this study.

The sampling used was non-probability convenient sampling. A total of 219 completed survey forms were collected from 40 firms. However, seven forms were found to have far too many missing data and illogical entries to be of use and were excluded from the final analysis. The final dataset of 212 managers was used to produce the results of this research.

2.2 Measures

Measures were taken from published sources. The first section of the survey form consisted of demographic variables like age, gender, tenure, years of education and managerial grade. The remaining questions contained Likert 5-point scale items on the three bundles of HRM, human capital, employee performance and POS. The items for the three HRM bundles were from Vermeeren (2014). The knowledge exchange and combination items are from Collins and Smith (2006) and the items on the three types of innovation are from Nasution, Mavondo, Matanda and Ndubisi (2011).

2.3 Factor and Reliability Analyses

Exploratory factor analysis with SPSS version 23 was conducted on the dataset to ensure that its underlying factor structure conforms to what was being measured. All the Likert scale items which was used in the survey were factor analyzed using the method of Principal Axis Factoring. The rotation used was Promax since the variables were known to be correlated to each other (Meyers et. al., 2013). The KMO Measure of Sampling Adequacy was 0.89 and Bartlett's Test of Sphericity was significant ($p < 0.01$). The total variance explained was 58 percent. The seven factors extracted were the 3 HRM bundles (ability-enhancing HRM, motivation-enhancing HRM and opportunity-enhancing bundles) the 3 types of innovation (product, process and administrative innovation) and knowledge exchange and combination.

The Cronbach's alpha for the HRM bundles came to 0.89 for the 3 items related to ability-enhancing, 0.83 for the seven items of motivation-enhancing HRM and 0.92 for the 11 items in opportunity-enhancing HRM. The Cronbach's alpha for the eight items on knowledge exchange and combination was 0.87. Finally, the Cronbach's alpha for the 3 types of innovation came to 0.72 for the 3 items related to process innovation, 0.89 for the 5 items on product innovation and 0.84 for the 3 items on administrative innovation.

2.4 Common Method Bias

To reduce common method bias since data are collected from one group of respondents, respondents were informed in the survey form that the survey was anonymous and confidential and to answer as honestly as possible. Secondly, items used to measure variables are taken from published sources with high reliability.

3. Results

3.1 Data Analysis

SPSS version 23 was used to compute means, standard deviations and Pearson's correlations. The PROCESS macro (Hayes, 2013) was used to test the hypotheses developed for this study.

3.2 Means, Standard Deviations and Pearson's Correlations

Means, standard deviations and correlations are shown in Table 1. There were 106 females and 86 males in the sample. The mean age is 34 years with an average job tenure of 7.4 years. The average years of education for the sample was 14.7 years. The mean scores on the remaining variables shown in the table, from skill-enhancing HRM to employee performance, range from 3.67 to 4.06, which means that the mean score is well above average to good, since we have measured these five variables on a 5-point Likert scale. There are low to high correlations between variables 4 to 10 in the table, which are the main variables of interest in the study, ranging from 0.00 to 0.76. We can expect that the independent variables would be able to explain the dependent variables in our study. We also checked the Variance Inflation Factor (VIF) of the variables used for our hypothesis's tests. Researchers are divided on the cut-off points for VIF to establish multicollinearity. In fact, the cut-off values range from a high of 10 all the way down to 4 (O'Brien, 2007). Our VIF values are between 1.7 to 2.2. We next examine the results of our hypotheses tests.

Table 1: Means, standard deviations and correlation

		Mean	SD	1	2	3	4	5	6	7	8	9
1.	Age	33.78	10.3									
2.	Tenure	7.41	6.68	0.75**								
3.	Education (in years)	14.69	1.98	-0.20	-0.23**							
4.	Ability-enhancing	4.06	0.62	-0.16*	0.13	0.00						
5.	Opportunity – enhancing	3.91	0.70	0.30**	0.58**	-0.02	0.63**					
6.	Motivation – enhancing	3.98	0.63	0.26**	0.36**	0.02	0.59**	0.56*				
7.	Knowledge exchange & combination	3.91	0.55	0.09	0.09	0.08	0.48**	0.44**	0.31**			
8.	Product innovation	3.78	0.76	0.12	0.18*	0.04	0.60**	0.44**	0.52**	0.57		
9.	Process innovation	3.92	0.62	0.01	0.00	0.16*	0.55**	0.37**	0.42**	0.56**	0.76**	
10.	Administrative innovation	3.67	0.71	0.08	0.12	-0.02	0.58**	0.46**	0.48**	0.51**	0.76**	0.66**

N=212; *p<0.05; **p<0.01

3.3 Results of Hypotheses Tests

The results of our hypotheses tests are shown in Tables 2 to 5A.

Table 2: Results of Regression Analysis (Product Innovation)

	Model 1 KE & C	Model 1 Product Innovation	Model 2 Product Innovation
	β	β	β
Age	ns	ns	ns
Tenure	ns	ns	ns
Education (in years)	ns	ns	ns
Ability – enhancing HRM	0.181*	ns	ns
Opportunity – enhancing HRM	0.337**	ns	ns
Motivation – enhancing HRM	ns	0.316**	0.297**
KE&C	na	na	0.397**
Product innovation	na	na	na
Process innovation	na	na	na
Administrative innovation	na	na	na
R^2	0.225	0.358	0.480
F	9.933**	19.030**	26.917**

N = 212; *p<0.05; **p<0.01;
KE&C = Knowledge Exchange & Combination; β = Standardized Beta Coefficient
ns = not significant; na = not applicable
Note: Regression results are shown in Tables 2, 3 and 4 for the 3 types of innovation. Model 1 is the total effect model and model 2 the direct effects model. Bootstrap results to show indirect effects (Preacher and Hayes, 2008), are shown in Tables 2A, 2B and 2C.

Table 2A: Bootstrap Results based on Hayes' Macro (Product Innovation)

		Product Innovation			
		Effect	SE	Boot LLCI	Boot ULCI
Ability-enhancing HRM	Total	0.272**	0.070	0.135	0.409
	Direct	0.200**	0.064	0.074	0.325
	Indirect[α]	0.072[ч]	0.032	0.011	0.135
Opportunity – enhancing HRM	Total	0.131[чч]	0.075	-0.017	0.279
	Direct	-0.003[чч]	0.070	-0.142	0.135
	Indirect[α]	0.134[ч]	0.049	0.040	0.231
Motivation – enhancing HRM	Total	0.316**	0.076	0.166	0.467
	Direct	0.297**	0.069	0.162	0.433
	Indirect[α]	0.019[чч]	0.053	-0.075	0.137

Table 2A: Bootstrap Results based on Hayes' Macro (Product Innovation) cont.

Note: [a] mediated through knowledge exchange and combination (KE&C)
*p<0.05; **p<0.01
ц = significant based on confidence intervals; цц = not significant based on confidence intervals

Table 3: Results of Regression Analysis (Process Innovation)

	Model 1 KE&C	Model 1 Process Innovation	Model 2 Process Innovation
	β	β	β
Age	ns	-0.200*	-0.192*
Tenure	ns	ns	ns
Education (in years)	ns	0.141*	ns
Ability – enhancing HRM	0.181*	0.151*	ns
Opportunity – enhancing HRM	0.337**	ns	ns
Motivation – enhancing HRM	ns	0.335**	0.317**
KE&C	na	na	0.377**
Product innovation	na	na	na
Process innovation	na	na	na
Administrative innovation	na	na	na
R^2	0.225	0.249	0.359
F	9.933**	11.347**	16.352**

*p<0.05; **p<0.01
KE&C = Knowledge Exchange & Combination; β = Standardized Beta Coefficient
ns = not significant; na = not applicable
Note: Regression results are shown in Tables 2, 3 and 4 for the 3 types of innovation. Model 1 is the total effect model and model 2 the direct effects model. Bootstrap results to show indirect effects (Preacher and Hayes, 2008), are shown in Tables 2A, 2B and 2C.

Table 3A: Bootstrap Results based on Hayes' Macro (Process Innovation)

		Process Innovation			
		Effect	SE	Boot LLCI	Boot ULCI
Ability-enhancing HRM	Total	0.151*	0.075	0.003	0.299
	Direct	0.083	0.071	-0.056	0.222
	Indirect[a]	0.068ц	0.031	0.009	0.130
Opportunity – enhancing HRM	Total	0.092 цц	0.081	-0.068	0.252
	Direct	-0.035цц	0.078	-0.189	0.119
	Indirect[a]	0.127ц	0.049	0.032	0.222
Motivation – enhancing HRM	Total	0.335**	0.082	0.172	0.497
	Direct	0.317**	0.076	0.166	0.467
	Indirect[a]	0.018цц	0.048	-0.074	0.121

Note: a mediated through knowledge exchange and combination (KE&C)
*p<0.05; **p<0.01
ц = significant based on confidence intervals; цц = not significant based on confidence intervals

Table 4. Results of regression analysis (Administrative Innovation)

	Model 1 KE&C	Model 1 Administrative Innovation	Model 2 Administrative Innovation
	β	β	β
Age	ns	ns	ns
Tenure	ns	ns	ns
Education (in years)	ns	ns	ns
Ability – enhancing HRM	0.181*	0.235**	0.176**
Opportunity – enhancing HRM	0.337**	0.213**	ns
Motivation – enhancing HRM	ns	0.288**	0.272**

Table 4. Results of regression analysis (Administrative Innovation) cont.

KE&C	na	na	0.329**
Product innovation	na	na	na
Process innovation	na	na	na
Administrative innovation	na	na	na
R^2	0.225	0.340	0.424
F	9.933**	17.625**	21.452**

*p<0.05; **p<0.01
KE&C = Knowledge Exchange & Combination; β = Standardized Beta Coefficient ns = not significant; na = not applicable
Note: Regression results are shown in Tables 2, 3 and 4 for the 3 types of innovation. Model 1 is the total effect model and model 2 the direct effects model. Bootstrap results to show indirect effects (Preacher and Hayes, 2008), are shown in Tables 2A, 2B and 2C.

Table 4A: Bootstrap Results based on Hayes' Macro (Administrative Innovation)

		Administrative Innovation			
		Effect	SE	Boot LLCI	Boot ULCI
Ability-enhancing HRM	Total	0.235**	0.070	0.096	0.374
	Direct	0.176*	0.067	0.044	0.308
	Indirect^a	0.060ꚗ	0.026	0.006	0.108
Opportunity – enhancing HRM	Total	0.213**	0.076	0.063	0.363
	Direct	0.103	0.074	-0.043	0.249
	Indirect^a	0.111ꚗ	0.040	0.030	0.188
Motivation – enhancing HRM	Total	0.288**	0.077	0.135	0.440
	Direct	0.272**	0.072	0.129	0.414
	Indirect^a	0.016ꚗꚗ	0.043	-0.061	0.111

Note: [a] mediated through knowledge exchange and combination (KE&C)
*p<0.05; **p<0.01
ꚗ = significant based on confidence intervals; ꚗꚗ = not significant based on confidence intervals

Table 5: Results of Regression Analysis (Overall Innovation)

	Model 1 *KE&C*	*Model 1* *Overall Innovation*	*Model 2* *Overall Innovation*
	β	β	β
Age	ns	ns	ns
Tenure	ns	ns	ns
Education (in years)	ns	ns	ns
Ability – enhancing HRM	0.181*	0.219**	0.153**
Opportunity – enhancing HRM	0.337**	0.146*	ns
Motivation – enhancing HRM	ns	0.313**	0.295**
KE&C	na	na	0.368**
Product innovation	na	na	na
Process innovation	na	na	na
Administrative innovation	na	na	na
R^2	0.225	0.369	0.497
F	9.933**	20.003**	28.839**

*p<0.05; **p<0.01
KE&C = Knowledge Exchange & Combination; β = Standardized Beta Coefficient
ns = not significant; na = not applicable
Note: Regression results are shown in Tables 2, 3 and 4 for the 3 types of innovation. Model 1 is the total effect model and model 2 the direct effects model. Bootstrap results to show indirect effects (Preacher and Hayes, 2008), are shown in Tables 2A, 2B and 2C.

Table 5A. Bootstrap Results based on Hayes' Macro (Overall Innovation)

		Overall Innovation			
		Effect	SE	Boot LLCI	Boot ULCI
Ability-enhancing HRM	Total	0.219**	0.062	0.097	0.342
	Direct	0.153**	0.057	0.041	0.264
	Indirect[a]	0.067[ɥ]	0.029	0.008	0.121
Opportunity – enhancing HRM	Total	0.146*	0.063	0.013	0.278
	Direct	0.022	0.063	-0.102	0.145
	Indirect[a]	0.124[ɥ]	0.044	0.035	0.207
Motivation – enhancing HRM	Total	0.313**	0.068	0.178	0.448
	Direct	0.295**	0.061	0.175	0.416
	Indirect[a]	0.018[ɥɥ]	0.049	-0.070	0.127

Note: [a] mediated through knowledge exchange and combination (KE&C)

*$p<0.05$; **$p<0.01$

ɥ = significant based on confidence intervals; ɥɥ = not significant based on confidence intervals

Table 6 summarizes the results of our hypotheses tests. All beta values used are standardized.

Table 6: Results of Hypotheses Tests

Hypothesis	Effect	p-value/BC CI	Decision
H1: The ability-enhancing, motivation-enhancing and opportunity-enhancing HRM bundles will each have direct and positive impacts on product innovation.	Only the motivation enhancing HRM bundle has a direct and positive impact on product innovation, with a beta of 0.297.	$p < 0.01$.	Supported for motivation enhancing HRM bundle only. See Table 2.
H2: The ability-enhancing, motivation-enhancing and empowerment-enhancing HRM bundles will each have direct and positive impacts on process innovation.	Only the motivation enhancing HRM bundle has a direct and positive impact on product innovation, with a beta of 0.317	$p < 0.01$.	Supported for motivation enhancing HRM bundle only. See Table 3.
H3: The ability-enhancing, motivation-enhancing and opportunity-enhancing HRM bundles will each have direct and positive impacts on administrative innovation.	Motivation-enhancing and ability-enhancing HRM have direct and positive impacts on administrative innovation, with betas of 0.272 and 0.176.	$p < 0.01$ for both bundles	Supported for motivation-enhancing and ability-enhancing HRM bundles. See Table 4.
H4: The ability-enhancing, motivation-enhancing and opportunity-enhancing HRM bundles will each have positive impacts on product innovation mediated by KE&C.	Opportunity-enhancing and ability-enhancing HRM have mediated impacts of beta 0.134 and 0.072 respectively, on product innovation.	BC, CI 0.040, 0.231 0.135, 0.409.	Supported for opportunity-enhancing and ability-enhancing HRM bundles. See Table 2A.
H5: The ability-enhancing, motivation-enhancing and opportunity-enhancing HRM bundles will each have positive impacts on process innovation mediated by KE&C.	The opportunity-enhancing and ability-enhancing HRM bundles have mediated impacts on process innovation, with betas of 0.127 and 0.068 respectively.	BC, CI 0.032, 0.222 0.009, 0.130.	Supported for opportunity-enhancing and ability-enhancing HRM bundles. See Table 3A.
H6: The ability-enhancing, motivation-enhancing and opportunity-enhancing HRM bundles will each have direct and positive impacts on administrative innovation mediated by KE&C	The opportunity-enhancing and ability-enhancing HRM bundles have mediated impacts on administrative innovation, with betas of 0.111 and 0.060 respectively.	BC, CI 0.030, 0.188 0.006, 0.108	Supported for opportunity-enhancing and ability-enhancing HRM bundles. See Table 4A.
H7: The ability-enhancing, motivation-enhancing and opportunity-enhancing HRM bundles will each have direct and positive impacts on overall innovation.	Motivation-enhancing and ability-enhancing HRM have direct and positive impacts on the index of innovation, with betas of 0.295 and 0.153 respectively.	$p < 0.01$.	Supported for motivation-enhancing and ability-enhancing HRM bundles. See Table 5.
H8: The ability-enhancing, motivation-enhancing and opportunity-enhancing HRM bundles will each have direct and positive impacts on overall innovation mediated by KE&C.	Opportunity-enhancing and ability-enhancing HRM bundles have mediated impacts on the index of innovation, with betas of 0.124 and 0.067.	BC, CI 0.035, 0.207 0.008, 0.121	Supported for opportunity-enhancing and ability-enhancing HRM bundles. See Table 5A.

4. Discussion and Conclusion

As can be seen in Table 6, there is broad support for both direct and mediated impacts from the findings. The direct and positive impacts are:

  (i)   Motivation-enhancing HRM bundle on product, process and administrative innovation with betas of 0.297, 0.317 and 0.272;
  (ii)   Ability-enhancing HRM bundle on administrative innovation with beta of 0.176; and
  (iii)   Motivation-enhancing and ability-enhancing HRM bundles on overall innovation with betas of 0.295 and 0.153.

The indirect and positive impacts are generally smaller in magnitude and are:

  (i)   Opportunity-enhancing and ability-enhancing HRM bundles on product innovation, mediated by KE&C with betas of 0.134 and 0.072;
  (ii)   Opportunity-enhancing and ability-enhancing HRM bundles on process innovation, mediated by KE&C, with betas of 0.127 and 0.068 respectively;
  (iii)   Opportunity-enhancing and ability-enhancing HRM bundles on administrative innovation, mediated by KE&C, with betas of 0.111 and 0.060; and
  (iv)   Opportunity-enhancing and ability-enhancing HRM bundles on overall innovation, mediated by KE&C, with betas of 0.124 and 0.067.

These findings are broadly in line with those found by previous research. This study has made four contributions. First, it has tested and found that the Ability, Motivation and Opportunity (AMO) framework can be successfully applied in a Malaysian setting. Most previous findings using the AMO framework have been done in western settings. Secondly, it has shown that the motivation-enhancing HRM bundle has direct impacts on innovation whereas the opportunity-enhancing HRM bundle impact innovation through KE&C. However, the ability enhancing HRM bundle has both direct and indirect impacts on innovation. Further research could be done to explain why this is so. Thirdly, it has demonstrated that KE&C is an important mediator that can explain the impact of HRM bundles on innovation above and beyond the direct impacts in the case of opportunity-enhancing and ability-enhancing HRM bundles. Finally, it is a much needed addition to the Malaysian literature on the relationship between HRM and innovation. So far, little work has been done in this area.

This study has certain limitations. The first is the cross-sectional design. It would certainly be beneficial to conduct studies with longitudinal designs to improve the validity of results. This is especially true in studies like the present one, where human resource bundles take time for their impacts to be felt. Damanpour (1988) reminds us that studies of innovations must take into account the types of organizations operating in different environments. Thus, it may be helpful to make comparisons among organizations in different sectors, such as manufacturing versus service and non-profit sectors in studying impacts of HRM bundles. Sector could be included as a control variable in future studies. Furthermore, contextual variables like leadership, culture, structure, strategy and technology could be included as additional independent variables. It is possible that these contextual variables are more important than the three HRM bundles in Malaysia and be able to explain a greater percentage of the variance in the dependent variable (Jackson and Schuler, 1995).

Previous research on Malaysian HRM has demonstrated the importance of HRM practices to innovation. Tan and Nasurdin (2011) in a study of 171 manufacturing firms in Malaysia, found that the human resource practice of training had a positive relationship with product, process and administrative innovation. Performance appraisal was positively and significantly related to administrative innovation. However, other human resource practices like career management,

reward system and recruitment were unrelated to the 3 types of innovation. In addition, training has indirect effects on product, process and administrative innovation through knowledge management whereas performance appraisal has an indirect effect on administrative innovation through knowledge management. Overall, the findings in this study underscore the relationship between human resources, knowledge management and innovation, which will be important for firm survival and growth in the years to come.

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