Antecedents of CKMS Strategic Planning (CKMS^{2}P) Model towards CKMS Effectiveness in Public Higher Learning Institutions

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***Abstract*—This paper is aimed to investigate the relationships between 11 strategies proposed as the antecedents in the Collaborative Knowledge Management Strategic Planning (CKMS^{2}P) Model towards CKMS effectiveness by applying the model in the public higher learning institutions (PHLI). This study used Partial Least Square (PLS) and Structured Equation Modelling (SEM) tools to analyze the finding. A survey was done to gauge respondents' perspectives, pertaining the strategies proposed in the model. A total of 233 respondents data participated in the survey which conducted in 5 PHLIs was analyzed using SmartPLS, have resulted a positive relationships between all strategies towards CKMS effectiveness in the PHLI. The finding suggested that all strategies proposed in the CKMS^{2}P Model have a high potential in increasing the CKMS effectiveness in the organization if implemented comprehensively.**

***Index Terms*—Collaborative Knowledge Management System Strategic Planning; Knowledge Management Strategy; Knowledge Management System.**

I. Introduction

Knowledge has become an organization's assets to build and empower the human capital in terms of skills and quality, specifically in the public higher learning institutions (PHLI). The importance to manage the knowledge effectively and efficiently leads to the needs to have a guideline in developing and implementing CKMS in the PHLI.

The implementation of KM in HLI globally is not new. The knowledge sharing activities among knowledge experts, academic and nonacademic workers, and student in many HLI have being executed decades ago through forum, meeting, discussion or knowledge management system (KMS) [1]. However, it is reported that the implementation of KM in PHLI were having constraints due to political interference and bureaucratic issues since majority of PHLI were funded by the Government [2].

Despite the fact that PHLI is providing higher education quality and programs, the strategic direction towards achieving the PHLI goals is somehow more challenging. However, the performance of PHLI could be enhanced by executing a comprehensive strategy to overcome this issue. Thus, this research proposed a CKMS^{2}P Model which act as a guideline on how to achieve the organization's goal by developing and implementing the right and proper KMS strategically and collaboratively.

The proposed model includes the detail action plans to support the strategy in developing and implementing a comprehensive CKMS, which to be executed by the CKMS developers and implementers, from analyzing the system requirements, determine the system technologies and infrastructure, system development, system testing, system implementation, system maintenance and support, system evaluation and system enhancement.

By implementing this model, the issues pertaining CKMS usage in the organization or institution is believed to be eliminated, resulting a better implementation of CKMS to achieve organizational goals.

II. Conclusion and Future Research

The results of all the correlation findings confirmed the significant relationships on all hypotheses developed from the CKMS^{2}P Model. This means that the strategies proposed in the CKMS^{2}P Model have a significant impact on the CKMS effectiveness in the organization. The relationship between IS1 which is the strategy to establish an initiation plan and analysis and IS6, the strategy to control in the management of the system (β=0. 843) and the relationship between KMPS2 which is the strategy to inculcate the collaborative knowledge sharing culture in the system and KMPS1 which is the strategy to enhance knowledge capturing capabilities (β=0. 797) were found to be highly significant among all supported hypothesis.

This concludes that the successful implementation of CKMS in the organization is strongly driven by the action plans in the initiation plan and analysis strategy, the control in the management of the system strategy, knowledge sharing strategy and knowledge capturing strategy, with the support from the other strategies in the CKMS^{2}P Model as the antecedents of the model.

The results also conclude that the strategies listed in the model, support the development and implementation of CKMS in the organization. The measurement items or action plans of each strategy, which guide the CKMS developers and implementers to develop and implement CKMS in detail, shows significant values which confirm that the CKMS^{2}P Model is sufficient to help the organization enhancing the CKMS usage optimally.

However, the scope of this research is limited to five PHLI which might be different from other organization in terms of policy and organization's culture. This research also executed in the limited time, which is not enough to evaluate the real effect after implementing CKMS^{2}P in the organization in long run. The scope of this research does not cover the

external factors in developing and implanting CKMS such as political interference, economic impact and the governments changing policy which might give some potential impact on the execution of the CKMS project.

III. RESEARCH MODEL

The strategy elements found in previous CKMS strategic model by executing systematic literature review (SLR), have gone through the process of synthesizing which resulted a list of 11 strategies as depicted in Table 1 [3]. In this model, the KM Process (KMP) strategies must correlate with implementation strategies (IS) to maximize the impact on CKMS effectiveness in the organization/institution.

Table 1
Strategies Listed in CKMS^{2}P Model

KMP Strategy	Knowledge Capturing	KMPS1: Enhance the capturing capabilities in the system
	Knowledge Sharing	KMPS2: Inculcate the collaborative knowledge sharing culture in the system
		KMPS3: Enhance the searching capabilities in the system
	Knowledge Storage	KMPS4: Strengthen the storage infrastructure and security
	Knowledge Application	KMPS5: Enhance the usage capabilities of the system
Implementation Strategy	IS1: Establish initiation plan and analysis	
	IS2: Deploy the awareness and practitioner's development program	
	IS3: Deploy a reward and recognition program	
	IS4: Improve the sustainability and system performance	
	IS5: Enhance knowledge reliability and relevancy	
	IS6: Increase control in the management of the system	

One of the most essential strategy in the CKMS implementation is the awareness and practitioner's development program. This strategy consists of the change management activities, training, establishment of learning culture and the development of Community of Practice (CoP) and mentoring program which are claimed to be important to encourage knowledge sharing among the knowledge workers [4]. [5] reported in his SLR finding that the awareness programs will create a significant impact on knowledge sharing activities. The program was claimed to increase trust and rapport among the knowledge workers and provide better understanding on the important of knowledge to be shared in the system [6]. Thus, the hypothesis is proposed as below:

H1: The awareness and practitioner's development program strategy (IS2) has a positive influence on knowledge sharing strategy (KMPS2).

Many scholars claimed that reward and recognition program can increase the urge to share knowledge among knowledge workers since people always attracted to returns that are obtained as a result of their action taken [5], [7]. The rewards can be awarded in the form of promotion, a chance to undergo training, certificate of appreciation and also in the form of money [8]. This suggests that the reward and recognition program can positively motivate the knowledge sharing activities in the organization. Based on this argument, the hypothesis is proposed as below:

H2: Reward and recognition program strategy (IS3) has a positive influence on knowledge sharing strategy (KMPS3).

In CKMS^{2}P, the enriching of knowledge sharing strategy includes the establishment of virtual collaborative platform to ensure the knowledge workers can interact with others who interested to share knowledge among them [9-12]. Knowledge is captured when knowledge workers feels the necessity to share their knowledge with others in the organization, realizing that their knowledge is important and needed by others [7, 13]. With the availability of virtual collaborative platform to share interest in the system, indirectly the knowledge workers will have the intention to capture their knowledge in the system [14]. When more valuable knowledge captured in the system, it forms the knowledge foundation of the organization and is believed that the effectiveness of the CKMS will be increased [15]. Therefore, the hypotheses are proposed as below:

H3: Enriching the knowledge sharing strategy (KMPS2) has a significant impact on the knowledge capturing strategy (KMPS1); and

H4: Knowledge capturing strategy (KMPS1) has a positive impact on the CKMS effectiveness in the organization.

The organization of knowledge in the knowledge storage strategy which applies knowledge mapping, metadata, taxonomies, domain ontologies and other related approaches in the CKMS repository, provides a platform in which the knowledge is located and managed systematically in the system to ensure easier searching and better knowledge utilization [16]. With the facilities in knowledge storage, the knowledge will be more reliable and relevant to the user. Therefore, the hypothesis proposed is as below:

H5: Strengthening the knowledge storage strategy (KMPS4) has a significant impact on the strategy to enhance knowledge reliability and relevancy (IS5).

Knowledge reliability is crucial to ensure the knowledge retrieved or shared can be trusted while knowledge relevancy initiates accurate knowledge to facilitate users' work processes in the organization [17, 18]. The stated knowledge qualities are very important to support a better result in knowledge searching activities [19]. The efficient searching capabilities in the system will eventually leads to CKMS effectiveness in the organization [20]. Hence, the hypotheses proposed are:

H6: The strategy to enhance the knowledge reliability and relevancy (IS5) has a significant impact on the strategy to enhance searching capabilities in the system (KMPS3); and

H7: The enhancement of searching capabilities in the system (KMPS3) will positively influence the CKMS effectiveness in the organization.

In most of the recent studies on KMS strategic planning in the collaborative environment, the strategy to establish the initiation plan and analysis on the development and implementation of KMS project was claimed as the core strategy since the action plans supporting the strategy were aligned with the organizational strategic mission and vision. The setting of organizational goal, analysis of current business process and knowledge needed, the setting of KPI, project timeline and financial support will indirectly influence the top management to involve, eventually control and manage the development and implementation of CKMS to ensure a successful project implementation. When there is a management control, the utilization of knowledge in the system is believed to be increased. Following these arguments, the following hypotheses are proposed:

H8: The initiation plan and analysis strategy (IS1) has a significant impact on the management control of the system strategy (IS6); and

H9: The management control of the system strategy (IS6) has a positive impact on knowledge application strategy (KMPS5).

The system quality and performance and often reported by previous scholars to have significant impact on the intention to use CKMS [18, 21, 22]. The knowledge users were found positively motivated to use CKMS if the system quality and performance is effectively and efficiently able to operate to fulfil their objective. The increment of CKMS usage is believed would increase the CKMS effectiveness in the organization. Thus, the hypotheses are proposed as below:

H10: The strategy to improve the sustainability and system performance (IS4) has a significant impact on knowledge application strategy (KMPS5); and

H11: The application strategy (KMPS5) has a positive impact on the CKMS effectiveness in the organization.

The strategies act as an antecedent to the model towards the CKMS effectiveness in the organization/institution Therefore, the hypotheses model of CKMS²P is as depicted in Figure 1.

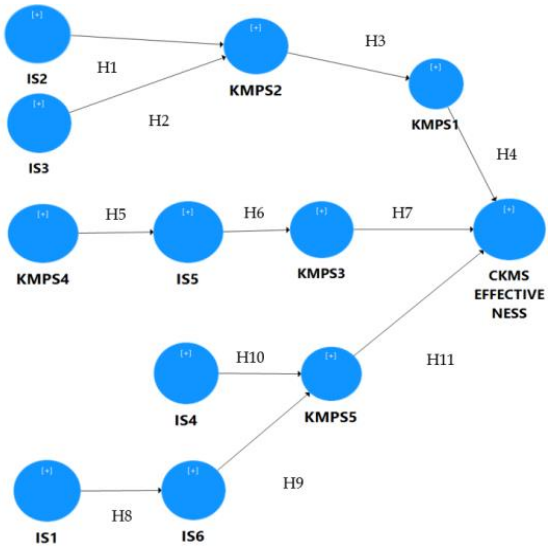

Figure 1: The Hypotheses for CKMS²P Model

IV. Research Methodology

The method used is in this study is a quantitative method by distributing questionnaires to gauge the respondents' opinions on the research model. The survey used ordinal type of data collection by applying 7-Likert Scale category to gauge opinion from the respondent about the synthesized strategies and action plans to support all the strategies in the model. The survey was then created using online survey tools to be distributed by e-mail, WhatsApp application and Facebook to the selected respondents. The survey contains 70 questionnaire items in total which constructed based on SLR to be answered by the respondents.

A. Sample and data

The respondents were selected purposively in 5 PHLI in Klang Valley, Malaysia to ensure that only the targeted respondents will be participated in the survey. A total of 237 respondents have participated in the survey, however, only 233 respondents counted in the analysis due to some responses identified as maximum measures. From that number, a total of 10 CKMS managers (4.3%), 19 system developers or equivalent (8.2%), 201 CKMS users (86.3%) and 3 other type of respondents which are 1 manager and 2 CKMS project management team (1.3%) were involved in this survey.

The data collected shows that majority of the respondents (94.8%) claimed to have at least 3 years' experience in using CKMS while 5.2% respondents stated that they had less than 3 years' experience in using CKMS. This indicates that majority respondents cover the major roles in developing, implementing, managing and using CKMS with sufficient experience in using CKMS. In terms of the familiarity on the terms of "strategy", the mean of this item was 6.38 which indicates that most of them aware of the meaning of strategy and fit to answer the questionnaire. The distribution of respondents in this survey is shown in Table 2.

Table 2
The Respondents' Demographic

Respondent's Demographic		Frequency	Percentage (%)
University	Universiti Putra Malaysia (UPM)	44	18.9
	International Islamic University (UIA)	49	21.0
	National University of Malaysia (UKM)	46	19.7
	University of Malaya (UM)	39	16.7
	Universiti Teknologi MARA (UiTM)	55	23.6
Roles	CKMS Project Manager	10	4.3
	CKMS Developer/ Information Technology Professional@ Equivalent	19	8.2
	CKMS User	201	86.3
	Other:	3	1.3
Experience	Less than 3 years	12	5.2
	3 to 5 years	192	82.4
	5 to 10 years	26	11.2
	More than 10 years	3	1.3

B. Data Analysis

The analysis applied Structured Equation Modelling (SEM) by evaluating the R2 values (i.e., explained variances) and the path coefficients (i.e., loadings and significance). SEM is selected because of its ability in measuring not only the hypothesized structural linkages among variables but the correlation between a variable and its respective measures. This research adopted the Partial Least Square (PLS-SEM) since it is more robust without concerning about the normality of data distribution and can be used to analyze small sample size of data [23].

1) Measurement Model

In this research, the observed indicators, which are the action plans supporting every strategy proposed, form or build the constructs which are the strategy proposed. Therefore, the appropriate mode of measurement model for this research is a formative model. The assessment of formative model should be focusing on observed indicators' weight rather than indicators' loading. The elimination of observed indicators is only executed when both indicator's weight (t-value >1.96, p value<0.05) and minimum loading of 0.5, fail to be achieved [24, 25]. The results of measurement model are as depicted in Table 3. The indicators' weight and loading resulted a sufficient reading where all indicators surpassed the required measurement except for items IS1_4, IS1_12, IS2_3, IS4_1, IS4_2 and IS4_6 which failed to meet the minimum requirements. The

results show significantly, a sufficient indicators validity for the model where p value <0.05.

Table 3
Convergent Validity Results

	Measurement Item	Weight T Statistics (O/STDEV)	Factor Loading
EFF: CKMS Effectiveness	EFF_1	4.048	0.714
	EFF_2	6.076	0.642
	EFF_3	6.542	0.708
	EFF_4	3.542	0.607
	EFF_5	5.194	0.610
	EFF_6	5.211	0.749
	EFF_7	2.435	0.537
	EFF_8	4.753	0.644
IS1: Establish initiation plan and analysis	IS1_1	4.309	0.824
	IS1_10	2.112	0.726
	IS1_11	2.892	0.738
	IS1_2	3.052	0.651
	IS1_3	0.637	0.706
	IS1_5	5.365	0.774
	IS1_6	2.401	0.660
	IS1_7	2.238	0.687
	IS1_8	2.876	0.727
	IS1_9	3.042	0.531
IS2: Deploy the awareness and practitioner's development program	IS2_1	1.094	0.809
	IS2_2	6.807	0.821
	IS2_4	3.378	0.758
	IS2_5	4.679	0.873
IS3: Deploy a reward and recognition program	IS3_1	5.566	0.784
	IS3_2	3.137	0.698
	IS3_3	4.364	0.833
	IS3_4	5.124	0.804
IS4: Improve the sustainability and system performance	IS4_3	9.303	0.898
	IS4_4	2.368	0.712
	IS4_5	4.512	0.668
	IS4_7	3.154	0.643
	IS4_8	3.608	0.708
IS5: Enhance knowledge reliability and relevancy	IS5_1	8.345	0.852
	IS5_2	6.558	0.716
	IS5_3	7.390	0.746
IS6: Increase control in the management of the system	IS6_1	6.565	0.822
	IS6_2	6.967	0.820
	IS6_3	2.051	0.792
	IS6_4	3.672	0.783
	IS6_5	3.333	0.745
	IS6_6	2.686	0.603
KMPS1: Enhance the capturing capabilities in the system	KMPS1_1	6.769	0.800
	KMPS1_2	5.785	0.621
	KMPS1_3	8.551	0.805
	KMPS1_4	6.725	0.797
KMPS2: Inculcate the collaborative knowledge sharing culture in the system	KMPS2_1	5.323	0.766
	KMPS2_2	7.714	0.786
	KMPS2_3	8.843	0.820
	KMPS2_4	6.022	0.634
KMPS3: Enhance the searching capabilities in the system	KMPS3_1	8.484	0.804
	KMPS3_2	2.756	0.621
	KMPS3_3	7.377	0.820
	KMPS3_4	6.937	0.803
KMPS4: Strengthen the storage infrastructure and security	KMPS4_1	1.600	0.762
	KMPS4_2	0.994	0.763
	KMPS4_3	3.949	0.896
	KMPS4_4	2.782	0.850
	KMPS4_5	1.600	0.727
	KMPS4_6	3.489	0.734
KMPS5: Enhance the usage capabilities of the system	KMPS5_1	5.972	0.805
	KMPS5_3	3.873	0.705
	KMPS5_4	3.744	0.626
	KMPS5_5	9.306	0.760
	KMPS5_6	6.260	0.819

2) Structural Model

The structural model comprises of the assessment of collinearity, path coefficient (β, t-value), coefficient of determination (R2), effect size to R2 (f2), predictive relevant (Q2) and model fitness [26]. The bootstrapping was done with 5000 resample to assess the path and hypothesis significance [25]. The results of structural model with values of VIF, β and t-value are as depicted in Table 4, as well as the results for collinearity assessment and path coefficient of the hypothesized relationships. The collinearity assessment was executed by calculating the Variance Inflation Factor (VIF) to investigate the existence of high correlation or redundancy between some constructs [27]. It is recommended that the value of VIF is in the range t of 0.2< VIF <5 [25]. The results show that the values of all VIFs were in the acceptance level, thus, confirmed that the constructs were free from collinearity problem.

The assessment on the significant of path coefficient for every hypothesized relationship was done by assessing the β and t-value (bootstrapping). Based on the results, all hypothesized relationships show positive coefficients where the measures (β) were all on the range of 0 to 1. The t-value resulted a statistically significant for all hypotheses where the p value <0.05 and the t-values were larger than 1.96. Thus, all hypotheses suggested in this model were supported.

Table 4
The Structural Model Assessment

Hypothesis	Relationship	VIF	Path Coefficient β	t-value	Hypothesis Result
H1	IS2 -> KMPS2	2.47	0.328	6.11	Supported
H2	IS3 -> KMPS2	2.47	0.516	9.20	Supported
H3	KMPS2 -> KMPS1	1.00	0.797	47.39	Supported
H4	KMPS1 -> CKMS_EFFECTIVE	4.39	0.249	4.87	Supported
H5	KMPS4 -> IS5	1.00	0.761	28.49	Supported
H6	IS5 -> KMPS3	1.00	0.786	32.81	Supported
H7	KMPS3 -> CKMS_EFFECTIVE	4.52	0.286	4.68	Supported
H8	IS1 -> IS6	1.00	0.843	65.29	Supported
H9	IS6 -> KMPS5	2.71	0.555	8.48	Supported
H10	IS4 -> KMPS5	2.71	0.326	8.64	Supported
H11	KMPS5 -> CKMS_EFFECTIVE	4.72	0.334	5.03	Supported

The R^2 analysis was done to assess coefficient of determination which is to examine the combine effect of cumulated observed indicators towards constructs. The recommended values of R^2 which are ranged from 0 to 1, measured as weak, moderate and substantial when the values are 0.25, 0.5 and 0.75 [25]. From the finding as depicted in Figure 2, the R^2 for CKMS effectiveness measured at 0.672 which is moderate towards substantial which explained the 67.2% of the variance in the CKMS effectiveness in the organization. The R^2 values of KMPS2 (0.628), KMPS1 (0.634), IS5 (0.580), KMPS3 (0.618), KMPS5 (0.685) and IS6 (0.711) were above 0.5, indicating an overall moderate model.

The assessment of effect size to R2 will determine how small or large the effect of the observed indicators to the constructs. It is necessary to perform this test by assessing the f2 values to justify the significant of path coefficient which was proposed as small, medium and large when the f2 values

are 0.02, 0.15 and 0.35 [25], [28]. The results of effect size are shown in Table 5. The results show that all of the f2 values exceeded 0.005 values, which indicates that the observed indicators were substantially contributes to explaining the construct.

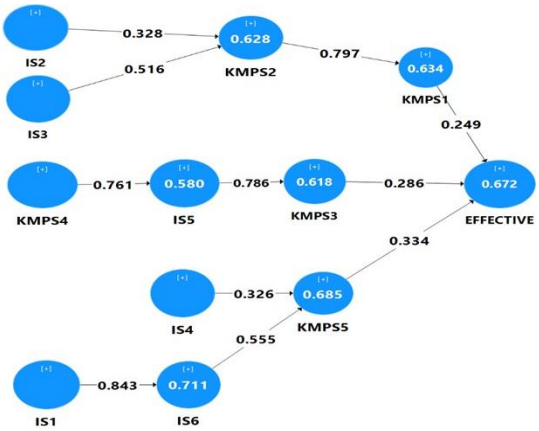

Figure 2: The Structural Model (PLSSEM Path Model)

Table 5
The Effect Size to R^2

Relationship	f^2	Effect Size
IS1 -> IS6	2.465	large
IS2 -> KMPS2	0.125	small to medium
IS3 -> KMPS2	0.310	medium to large
IS4 -> KMPS5	0.149	medium
IS5 -> KMPS3	1.618	large
IS6 -> KMPS5	0.429	large
KMPS1 -> CKMS_EFFECTIVENESS	0.050	small to medium
KMPS2 -> KMPS1	1.736	large
KMPS3 -> CKMS_EFFECTIVENESS	0.055	small to medium
KMPS4 -> IS5	1.379	large
KMPS5 -> CKMS_EFFECTIVENESS	0.081	small to medium

The assessment of predictive relevant (Q^2) by applying the blindfolding procedure in SmartPLS was done to test for the cross validated redundancy of each constructs. The results in Table 6 show that all Q2 values are above 0 which indicates that the observed indicators have predictive relevant for the constructs. The last assessment was to identify model fitness through the assessment of Standardized Root Mean Square Residual (SRMR) which recommended to be lesser than 0.08 (Hu et al., 1999). The result shows that the value of SRMR is 0.074 which indicates a good fit of the model.

Table 6
The Result of Effect Size, Predictive Relevant and Model Fitness

Construct	R^2	Q^2	SRMR
CKMS_EFFECTIVENESS	0.672	0.405	0.074
IS5	0.580	0.331	
IS6	0.711	0.393	
KMPS1	0.634	0.409	
KMPS2	0.628	0.401	
KMPS3	0.618	0.347	
KMPS5	0.685	0.354	

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