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AN EXPLORATORY FACTOR ANALYSIS FOR MEASURING KNOWLEDGE MANAGEMENT COMPONENT CONSTRUCT IN MALAYSIAN PUBLIC HIGHER EDUCATION

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ABSTRACT:
This research intended to establish a valid and reliable instrument for measuring the knowledge management component (KMC) through Exploratory Factor Analysis (EFA), which consists of eight construct including work coordination, communication, interaction information system, knowledge sharing, management information system functionality, intranet quality, information system integration and network capability. The questionnaire used in this research was adapted from Rodriguez and Edwards (2014) by using the Likert scale from 1 to 5. There were 107 questionnaires were collected to do the EFA by using principal axis factoring (PAF) as extraction and direct oblimin as rotation. Kaiser-Meyer-Oklin (KMO) and Bartlett test of sphericity was also reported as well as Cronbach's Alpha to test the reliability for the remaining items. The results show that the factor loading of every item in the constructs is higher than 0.6, meanwhile, the Bartlett test of sphericity was highly significant (p=.000). Furthermore, the KMO for sampling adequacy was excellent (0.88) which indicated that the sample size of this research is adequate. Besides, value of Cronbach's Alpha for all 45 items also higher than the rule of thumb 0.7, hence, show that these items are all reliable. Thus, from the validity and reliability test, the instrument in this research has been affirmed that it is stable and consistent across the sample. Moreover, this research was applied to the public higher education (PHE) in Malaysia. This research targeted risk committees, internal auditors and top managements as they were regarded as the most knowledgeable and more appropriate to provide reliable information on various aspects in an organization. Lastly, this research contributes to the measurement of the KMC, particularly in the PHE. Besides, the results from EFA extracts eight factors of KMC, which measured by 45 items revealed that those items are applicable in this research.

INTRODUCTION

For higher education, Adhikari (2010) defined KM as:

"The structured process of creating, transmitting, filtering, summarizing and delivering explicit and tacit knowledge in order to generate distinctive value which can be employ to improve the environment of teaching and learning".

In other words, it means that the higher education is responsible to manage the KM as it is vital to generate a value in order to enhance their performance and also to create the stable environment for teaching and learning. Besides, KM also encourages the higher education to obtain, transfer and utilize the knowledge in an effective and efficient ways so that they achieved their success (Adhikari 2010).

Higher education has been known as the critical and strategic sectors and one of the major contributors towards the country's growth as they are striving towards knowledge-economy. It is also one of the sector in Malaysia that have experienced a positive growth in the mid of 1990s (Eam et al., 2016). Nevertheless, Ariff et al. (2014) stated that they have poor knowledge management in managing the multidimensional risk after been granted an autonomous status due to less exposure on how to conduct the risk management process, the tools and technology to use to conduct that process and the strategy to manage the risk were not exposed to them. Therefore, this will caused them to have limited understanding and knowledge as well as the risk terms to execute the risk as it was usually based on corporate terminology (Ahmad et al., 2016; Rivard, 2013). Therefore, it is vital to measure the knowledge management component construct particularly in public higher education and its role in risk management process.

Despite from that, Edwards (2009) stated that there are three components that frequently been portrayed under knowledge management which are people, process and technology. The origin of these components under KM has been found by Leavitt on 1964 which known as Leavitt "diamond" model. However, Leavitt "diamond" model does not have the process components but it has task and structure together with people and technology components (Qureshi et al. 2017). This is because, Edwards (2011) stated that it is crucial to consider and include the process components as it is not only referring to knowledge management processes but also referring to business processes.

Figure 1 shows the KM components and how these three components connected to each other. As such, People help design and then operate the Processes and Processes determine the need for Technology and Technology provides support for People.

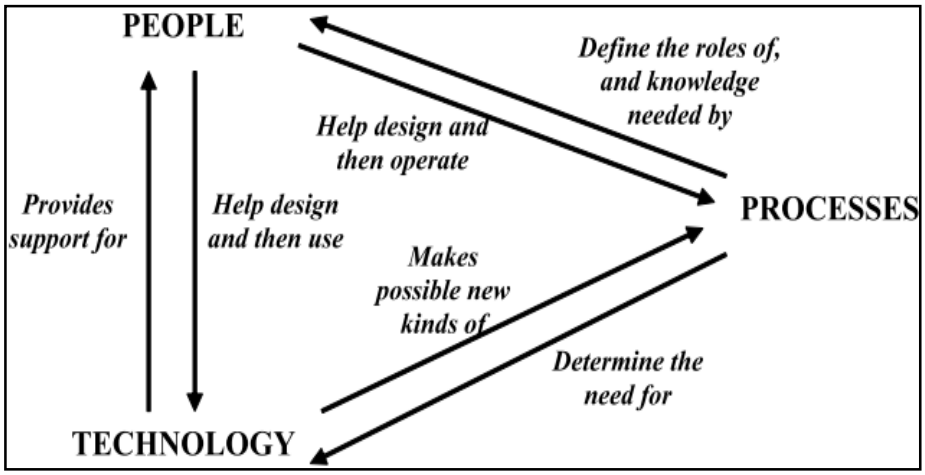

Figure 1: The Knowledge Management components (People, Process, and Technology)
Source: Edwards (2009)

The concepts of KM in the area of risk management has not been discussed precisely, however the three components of people, process and technology has been identified as an important things to validate the risk management activities. Based on the study done by Rodriguez (2010), the first components which is people are referring to communication among employees in organization, particularly the risk management committee, which based on risk management actions, risk control and also ERM. Hence, this research follows the knowledge management components that been discussed by Edwards (2009).

The extent of literature such as, Anukrati, Hassan and Rishi (2017), Sireteanu and Grigoruta (2007) also supported that the knowledge management components consists of people, process and technology. Nevertheless, Rodriguez and Edwards (2014) has emphasized that the component of people consists of three variables which is work coordination, communication and interaction information system, while component of process consists only one variable namely knowledge sharing and lastly, the component of technology consists of four variables which is management information system functionality, intranet quality, information system integration and network capability. Therefore, these indicated that there are eight variables under knowledge management component. Hence, all of these eight variables will be utilized in this research.

Thus, the main objective of this research is to discover appropriate items to be used in the instrument. Precisely, this research aim to establish a valid and reliable instrument for measuring the knowledge management component (KMC) through Exploratory Factor Analysis (EFA). This research was applied in the public higher education (PHE) in Malaysia by targeting risk committees, internal auditors and top managements as they were the most knowledgeable and more appropriate to provide reliable information on various aspects in an organization.

METHODOLOGY

This research was utilized the self-administered survey for the data collection. The questionnaire was adapted from Rodriguez and Edwards (2014) and been modified in order to fit with the area of this research. The questionnaire were

then distributed to risk committees, internal auditors and top managements. The survey was composed from eight construct which is the first construct was related to work coordination, consists of 6 items, second construct was related to communication, consists of 5 items, third construct was related to interaction information system, consists of 7 items, fourth construct was related to knowledge sharing, consists of 5 items, fifth construct was related to management information system functionality, consists of 5 items, sixth construct was related to intranet quality, consists of 6 items, seventh construct was related to information system integration, consists of 6 items and lastly the eight construct was related to network capability, which consists of 5 items. All of the construct of this research were using the Likert scale from 1 to 5 in order to be consistent and to compare the findings, since the questionnaire that was adapted from previous researches was also using a five-point Likert-scale. This can be supported by Saleh and Ryan (1991) which stated that five-point scale was utilized instead of seven-point scale in order to compare reliability coefficients with other research that also using five-point Likert-scale. Additionally, most of previous researches was suggested this scale such as (Dawes, 2008; Dillman, et al. 2009; Fink, 1995). The five-point Likert-scale was employed throughout the instrument, with the use of the terms where 1 = strongly disagree and 5 = strongly agree.

Moreover, content validity, face validity and criterion validity were done as a pre-test for the instrument. Content validity was done by content experts, while face validity was done by language experts (English), and lastly, the criterion validity was done by a statistical expert. After all of these completed, the questionnaire was distributed to the 10 respondents to obtain their feedbacks and comments, and also to check the consistency in their responses. After the changes has been done based on the pre-test result, a pilot test was performed by distributing 200 questionnaire with 107 copies returned which is more than enough to analysed through the exploratory factor analysis (EFA) in order to examine whether the items for a construct share a single underlying factor and if they are unidimensional (Awang, Lim and Zainudin, 2018; Hoque et al., 2018; Yahaya et al., 2018).

RESULTS AND DISCUSSION

Table 1 illustrates the means and standard deviations of knowledge management components and Cronbach's alpha of the eight constructs. Basically, these construct were tested together for EFA using 45 items and each item was measured using Likert-scale of 5, where 1 = strongly disagree and 5 = strongly agree. The mean score and standard deviation for every item shows that the score distribution is consistent since the standard deviation for every item is less than 1.0 and generally the respondents were satisfied with all of the items as the mean score greater than 3.

Table 1: Descriptive analysis for items measuring knowledge management component

Labels	Items	*M*	*SD*
People (Work coordination)			
wc1	*The organization encourages multidisciplinary work.*	4.06	0.67
wc2	*The organization encourages interdepartmental work.*	4.00	0.70
wc3	*There are good web-based collaboration tools.*	3.79	0.81

wc4	*People in organization are willing to work with multiple groups.*	3.94	0.76
wc5	*There are guiding principles for working with different groups.*	3.74	0.85
wc6	*There are standards for using collaboration tools.*	3.65	0.83
People (Communication)			
cm1	*The communication between risk management committee of different department is good.*	3.61	0.81
cm2	*The communication within risk management committee is good.*	3.85	0.88
cm3	*The communication environment promotes the exchange of different points of view on risk management.*	3.66	0.76
cm4	*There is an appropriate environment to get conclusions easily during meetings.*	3.79	0.85
cm5	*The communication environment promotes team work.*	3.89	0.79
People (Interaction information system (IS))			
iis1	*People's interaction from different risk management areas was decent.*	3.71	0.74
iis2	*People's interaction from different risk management areas was accurate.*	3.65	0.80
iis3	*People's interaction from different risk management areas was understandable.*	3.64	0.73
iis4	*People's interaction from different risk management areas was usable.*	3.66	0.80
iis5	*People's interaction from different risk management areas was well-defined.*	3.63	0.77
iis6	*People's interaction from different risk management areas was relevant.*	3.67	0.77
iis7	*People's interaction from different risk management areas was up-to-date.*	3.64	0.76
Process (Knowledge sharing)			
ks1	*People in organization are willing to share knowledge of risk.*	3.81	0.78
ks2	*The availability of documentation for sharing risk knowledge is good.*	3.69	0.84
ks3	*There is a good knowledge sharing of risk management committee to experience the assessing of risk by themselves.*	3.72	0.87
ks4	*There is an appropriate environment to discuss the risk management problem interdepartmentally.*	3.73	0.83
ks5	*There is an appropriate environment to share solutions on risk management problem.*	3.74	0.76
Technology (Management information system (MIS) functionality)			
misf1	*The system provides support to the risk management process.*	3.67	0.82
misf2	*The system provides access for people in organization to experience the risk analysis by themselves.*	3.55	0.88
misf3	*The system provides adequate data management support.*	3.61	0.93
misf4	*The system provide appropriate environment to improve work flow.*	3.79	0.87
misf5	*The system provide appropriate environment to work with multiple groups in managing risk.*	3.65	0.98
Technology (Intranet quality)			
iq1	*The Intranet provides access to collaboration tools.*	3.52	0.91
iq2	*The Intranet provides access to all applications used in risk management.*	3.49	0.84

iq3	*The Intranet provides access to the proper risk data.*	3.46	0.90
iq4	*The Intranet facilitates interaction in risk problem-solving process.*	3.50	0.87
iq5	*The Intranet supports communication among risk management committee.*	3.49	0.94
iq6	*The Intranet supports risk management controls.*	3.50	0.92
Technology (Information system integration)			
isi1	*The standardized systems are used to exchange the risk information.*	3.64	0.76
isi2	*A common data structure is used to align the organizational objectives with risk management.*	3.60	0.81
isi3	*A common data warehouse is used to improve risk knowledge.*	3.64	0.86
isi4	*A common user interface is used to provide access for people from different risk management areas.*	3.63	0.82
isi5	*A common report system is used to achieve the consistency of interpretation towards the results of risk performance.*	3.57	0.84
isi6	*A common application access is used to support risk management processes.*	3.56	0.80
Technology (Network capability)			
nc1	*There is an enterprise portal structure for supporting interdepartmental work.*	3.65	0.69
nc2	*There are collaboration tools that easily available to support different risk management areas.*	3.56	0.75
nc3	*People in organization use web-based workspaces to manage the risk.*	3.44	0.72
nc4	*Solutions are created because of interdepartmental work.*	3.55	0.76
	Sharing the knowledge with others is easy.		

Note: $n = 107$

EFA was conducted to assess the underlying structure of the 45 knowledge management component items using PAF as the extraction method and direct oblimin rotation; conducted on the pilot sample (n = 107). This was performed to examine whether the items for a construct share a single underlying factor and if they are unidimensional. The Kaiser-Meyer-Oklin (KMO) and Bartlett test of sphericity were executed in order to test the suitability of running factor analysis. The results in Table 2 shows the result of Bartlett's test of sphericity is significant with $\chi 2$ (df = 990, n = 107) = 5318.88, p = .000 and Kaiser-Meyer-Olkin (KMO) higher than .6 which is .88, which indicated that the sample size of this research is sufficient (Awang, 2015; Hoque et al., 2018; and Noor et al., 2015). Hence, the pilot data of this research are acceptable.

The results of EFA based on the pattern matrix are illustrated in Table 3. The factor loading for every item were generally high (>.6) (Awang, Lim and Zainudin, 2018 and Yahaya et al., 2018). Thus, no items were removed. Furthermore, the scree plot in Figure 1 suggested that eight-factor solution is a reasonable assumption.

Additionally, the results in Table 4 show that eight factors with an eigenvalue > 1.0 explained almost 79% of the total variance. Therefore, this shows that the total variance explained is acceptable since it exceeds the minimum 60%

(Awang, 2015; Hoque et al., 2018; Noor et al., 2015; Yahaya et al., 2018). Hence, this high percentage of total variance explained indicates the strong relationship exists among the group of variables in this research.

Lastly, the results of internal reliability in Table 5 shows the Cronbach's alpha for the entire construct is higher than rule of thumb 0.7, indicate that all of the items under the construct are reliable and can be used in this research.

Table 2: KMO and Bartlett's test score

Kaiser-Meyer-Olkin measure of sampling adequacy		.88
Bartlett's test of sphericity	*Approx. Chi-Square*	5318.88
	df	990
	Sig.	.000

Table 3: EFA of knowledge management component

Factors and items	Factor							
	1	2	3	4	5	6	7	8
iis3: People's interaction from different risk management areas was understandable.	0.91							
iis5: People's interaction from different risk management areas was well-defined.	0.86							
iis4: People's interaction from different risk management areas was usable.	0.86							
iis2: People's interaction from different risk management areas was accurate.	0.81							
iis6: People's interaction from different risk management areas was relevant.	0.75							
iis1: People's interaction from different risk management areas was decent.	0.73							
iis7: People's interaction from different risk management areas was up-to-date.	0.69							
misf4: The system provide appropriate environment to improve work flow.		0.96						
misf2: The system provides access for people in organization to experience the risk analysis by themselves.		0.91						
misf5: The system provide appropriate environment to work with multiple groups in managing risk.		0.9						
misf3: The system provides adequate data management support.		0.89						
misf1: The system provides support to the risk management process.		0.87						
cm2: The communication within risk management committee is good.			0.91					
cm5: The communication environment promotes team work.			0.86					

cm4: There is an appropriate environment to get conclusions easily during meetings.			0.81					
cm3: The communication environment promotes the exchange of different points of view on risk management.			0.79					
cm1: The communication between risk management committee of different department is good.			0.75					
nc3: People in organization use web-based workspaces to manage the risk.				0.84				
nc2: There are collaboration tools that easily available to support different risk management areas.				0.83				
nc1: There is an enterprise portal structure for supporting interdepartmental work.				0.8				
nc4: Solutions are created because of interdepartmental work.				0.75				
nc5: Sharing the knowledge with others is easy.				0.64				
wc1: The organization encourages multidisciplinary work.					0.79			
wc3: There are good web-based collaboration tools.					0.79			
wc4: People in organization are willing to work with multiple groups.					0.79			
wc5: There are guiding principles for working with different groups.					0.78			
wc6: There are standards for using collaboration tools.					0.78			
wc2: The organization encourages interdepartmental work.					0.75			
iq6: The Intranet supports risk management controls.						0.86		
iq4: The Intranet facilitates interaction in risk problem-solving process.						0.81		
iq2: The Intranet provides access to all applications used in risk management.						0.79		
iq3: The Intranet provides access to the proper risk data.						0.78		
iq1: The Intranet provides access to collaboration tools.						0.78		
iq5: The Intranet supports communication among risk management committee.						0.75		
isi5: A common report system is used to achieve the consistency of interpretation towards the results of risk performance.							0.88	
isi4: A common user interface is used to provide access for people from different risk management areas.							0.84	

isi3: A common data warehouse is used to improve risk knowledge.							0.8	
isi6: A common application access is used to support risk management processes.							0.72	
isi2: A common data structure is used to align the organizational objectives with risk management.							0.68	
isi1: The standardized systems are used to exchange the risk information.							0.61	
ks4: There is an appropriate environment to discuss the risk management problem interdepartmentally.								0.89
ks5: There is an appropriate environment to share solutions on risk management problem.								0.78
ks3: There is a good knowledge sharing of risk management committee to experience the assessing of risk by themselves.								0.65
ks2: The availability of documentation for sharing risk knowledge is good.								0.63
ks1: People in organization are willing to share knowledge of risk.								0.62

Note: n = 107

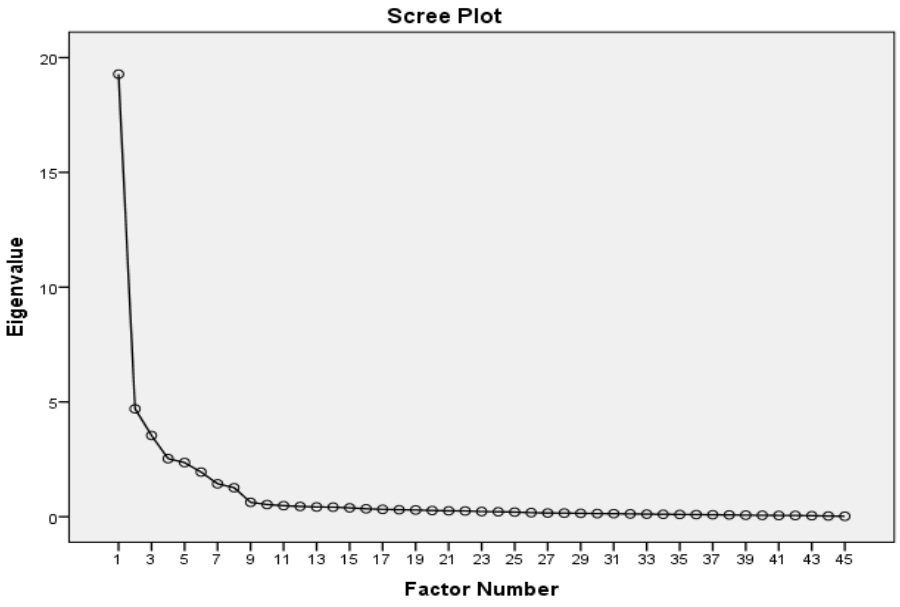

Figure 2: Scree plot (Eight-factor extraction)

Table 4: The total variance explained

Factor	Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
1	19.07	42.37	42.37

2	4.52	10.04	52.41
3	3.33	7.41	59.82
4	2.30	5.11	64.93
5	2.11	4.69	69.61
6	1.76	3.92	73.53
7	1.23	2.74	76.27
8	1.06	2.35	78.62

Table 5: The Cronbach's alpha for internal reliability

Factor	Reliability Statistics		
	Name	Number of items	Cronbach's alpha
1	*Work coordination*	6	.93
2	*Communication*	5	.94
3	*Interaction IS*	7	.95
4	*Knowledge sharing*	5	.94
5	*MIS functionality*	5	.96
6	*Intranet quality*	6	.97
7	*IS integration*	6	.96
8	*Network capability*	5	.93

CONCLUSION

This research contributes to the measurement of the KMC, mainly in the PHE context. The results from EFA extracts eight factors of KMC, which measured by 45 items revealed that those items are applicable in this research as the Bartlett test of sphericity was highly significant and KMO for sampling adequacy was excellent (more than 0.6), while all the factor loading exceeds 0.6 (minimum threshold) and lastly the Cronbach's Alpha value higher than rule of thumb 0.6. Hence, it is affirmed that the validated instrument in this research is stable and consistent across the samples (Rauf, Jabar and Mansor, 2019a; 2019b; 2020; Rauf, Mansor and Jabar, 2018), and can be used for future researches to measure knowledge management component (KMC) in other context.

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