

The Report of Structural Equation Modeling Analysis Results at Malaysian University Libraries

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Abstract - The evolutionary of Knowledge Management (KM) has become the key concern for librarians and libraries. This paper reported a SEM through a Confirmatory Factor Analysis (CFA) result that involves 305 lead users at six selected Malaysian university libraries through an online survey. As such, a structural equation modeling (SEM) has been used to generate a versatile statistical modeling tool in the social sciences research. It's gained popularity across many disciplines, due to its generality and flexibility. This is to elicit opinion of the lead users on the relationship between knowledge processes (i.e. creation, acquisition, capture and sharing) and KM practices. In this regards, the major contribution of this study is to provide groundwork of empirical evidence about knowledge processes and its relations with KM practices at Malaysian university libraries. It is hoped that this structural model could become one of a theoretical model foundation in KM practices in Library and Information Science environment. Furthermore, this research can also be executed in other countries to explore the status of KM practices in other parts of the world.

Keywords - Knowledge Management Practice, Malaysia, Library Users' Satisfaction, Structural Equation modeling, Confirmatory Factor Analysis (CFA)

1. INTRODUCTION

Structural Equation Modeling (SEM) is an extension of the general linear model (GLM) that enables a researcher to examine a set of regression equation simultaneously. Structural Equation Modeling (SEM) is a technique used for specifying and estimating models of linear relationships among variables (Hair, Black, Babin, Anderson, & Tatham, 2006; R.C. MacCallum & Austin, 2000). More specifically, various theoretical models can be tested in SEM that hypothesis how sets of variables define constructs and how these constructs are related to each other (Schumacker & Lomax, 2004). The use of SEM techniques in this study is the most suitable way to evaluate the fit of the proposed model (Hair, et al., 2006; R.C. MacCallum & Austin, 2000; Scandura & Williams, 2000; Schumacker & Lomax, 2004). Hair, et al. (2006) and Awang (2012) hold a similar opinion that SEM is a "new analytical tool" or "current trend" which in the recent decade, that gains a wider acceptance to be "the dominant multivariate technique" in academic and social

science studies. In fact, SEM is also a technique which has many advantageous capabilities such as SEM is able to estimate multiple and interrelated dependence relationships; it is able to characterize unobserved conceptions in these relationships; it is capable to correct measurement errors in estimation processes; and it is capable to identify a model describes the whole set of relationships. One major reason for SEM being applied in this study is due to its ability to execute simultaneous multiple assessments comprehensively (Hair, et al., 2006; Scandura & Williams, 2000; Tasmin & Woods, 2007). However, Schumacker and Lomax (2004) noted that researchers which use SEM are becoming more aware of the need to use multiple observed variables to better understand their area. In this regards, the objectives of this paper are formulated as follows:

- (1) To investigate the types of knowledge process in KM practices at the library.

- (2) To compare significant relationships between knowledge creation, knowledge capture, knowledge acquisition and knowledge sharing associated with KM practices.
- (3) To evaluate the significant relationships between knowledge processes toward KM practices.

In addition, this study presents following hypotheses and intends to test four (4) hypothetical statements to supported or not supported relationships in this study.

H_1 – There is a significant influence of Knowledge Creation (KCr) on KM Practices.

H_2 – There is a significant influence of Knowledge Acquisition (KAc) on KM Practices.

H_3 – There is a significant influence of Knowledge Capture (KCa) on KM Practices.

H_4 – There is a significant influence of Knowledge Sharing (KSh) on KM Practices.

Tomarken and Waller (2005) stated that SEM has become such an increasingly popular data analytic option that has a number of strengths. The advantageous feature in SEM noted by Tomarken and Waller (2005) is the ability to specify latent variable models that provide separate estimates of relations among latent constructs and their manifest indicators (i.e. the measurement model) and the relations among constructs (i.e. the structural model). Secondly, the strength of SEM is the availability of measures of global fit that can provide a summary evaluation of even complex models that involve a large number of linear equations. That is why these studies keen to use SEM by looking how fit and significant types of knowledge processes (i.e. Latent constructs) toward KM practices. Third, SEM also allows researchers to directly test the model of interest (Tomarken & Waller, 2005). According to MacCallum, et al. (1996), the theoretical hypothesis in SEM is often aligned with the null hypothesis, which specifies that the model fits exactly or at least approximately. Lastly, SEM is also an exceedingly broad data analytic framework that is associated with unique capabilities relative to the statistical procedures.

2. RELATED WORK

There are numerous KM model exists that could influence KM practices in the organizations, but not much KM model exists in the university or academic library environment especially in country like Malaysia. As such, this study specifically focus on main KM process in the Malaysian university libraries. However, the prior KM model exists in the organizations should be considered as long as it's support the knowledge process in KM practices (Hassan and Al-Hawari, 2003; Claycomb, *et al.*, 2002). In this regards, to increased the importance of KM, some scholars have focused on successful KM implementation, systematic and process approaches (Abdolshah & Abdolshah, 2011). These process approach, for example known as knowledge creation, knowledge discovery, knowledge maintenance, and knowledge sharing, knowledge implementation and etc. (Choi & Lee, 2002; Daneshgar & Bosanquet, 2010; Gayton, 2008; Mehri, Farhad, & Rahmatollah, 2008; Parirokh, Daneshgar, & Fattahi, 2008). In sum, there are five models/theories quoted in different perspectives related to knowledge processes which suitable to apply in this study and their applications only mentioned and critically discuss in Table 1. In contrast, Lai and Chu (2000) state that knowledge process have similarities in many aspects. Before investigating KM in practice, researchers and scholars must integrate these KM frameworks into one to serve as a framework (Lai & Chu, 2000). Hence, there are five models/theories has been reviewed. These selected process will work as the basic study in seeking a relationship between types of knowledge process and KM practices at Malaysian university libraries. These knowledge process such as Knowledge Create, Acquisition, Capture, Sharing, Record and Preserving will be design as a whole relationship and becoming a propose latent construct toward KM practices. Therefore, Table 1 indicated the existing of development models/theoriest made by prior researchers based on current knowledge processes exists in the organizations.

Table 1: The Comparatie Matrix of KM Process and the Reviews KM Models

Model 1 KM Capabilities Models <i>Gold, et al.</i> (2001)	Model 2 Knowledge Activities Model <i>Lytras, et al.</i> (2002)	Model 3 SECI Model <i>Nonaka and</i> <i>Takeuchi</i> (1995)	Model 4 The Building Blocks Model <i>Probst (1998)</i>	Model 5 Records Continuum Model <i>Upward (2000)</i>	Combined KM Model/ Process
Application	Create	Socialization	Identification	Create	Create
Acquisition	Acquire	Externalization	Acquisition	Pluralise	Acquisition
Conversion	Share	Combination	Use	Organize	Share
Protection	Capture	Internalization	Distribution	Capture Records	Capture Record
	Codify		Preservation		Preserving
	Store		Development		

3. METHODS

A set of questionnaire was developed based on the comprehensive prior literature review to set a measurement standard to construct structural model fit. Every each of the items were developed using a unique code namely KCr1, KCr2, KCr3, KCr4, KCr5 and KCr6 for Knowledge Creation. These unique codes were designed in the process of structural model design in CFA level. Each of these items (observed variables) attached to latent variable. In addition to, the process of structural modeling involves four general stages such as specification, estimation, evaluation, and modification. In the specification stage, the model need to be developed, tested and converted into a format that a computer program can understand. In the estimation stage, a fitting function and obtain parameter estimates of the model need to be chosen. In this evaluation stage, the test of model fit and other indices of fit need to be interpreted by AMOS. In the modification stage, the original model need to be modified in accordance with the information obtained in the previous stage as well as theory. This mode of theory testing appears to be justifiable as long as it can be safely assumed that theoretical fit and empirical fit are perfectly related (Olsson, Foss, Troye, & Howell, 2000). The better the empirical fit and the more statistically significant the parameter estimates in the

theoretical model (Olsson, et al., 2000). Moreover, modification indices (Awang, 2012; Hair, et al., 2006) in combination with theoretical considerations provide the basis for improvements of the original model in this study.

4. RESULTS

As shown in Table 2, the respondents' were asked their experience and knowledge to examine the usage of university libraries. 96.4% of the respondents were rated "Yes" KM Practice should be applied in the university libraries. But, 3.6% of respondents were rated "No" which KM practice should not be applied. In fact, 31.1% of respondents think that knowledge sharing is the most applicable in the library. 22.6% of respondents think that knowledge record is the most applicable in the library. However, 14.4% of respondents think knowledge acquisition is the most applicable rather than knowledge sharing and record. 14.1% of the respondents feel that knowledge creation is the most applicable types. 12.8% of the respondents feel that knowledge preserving is the most applicable types rather than 4.9% of respondents feel that knowledge capture is the most applicable types in the library. In this regards, the results indicated the existing of knowledge processes in KM practices at Malaysian university libraries.

Table 2: KM experiences

Variable		Frequency	%
KM Practice Apply	Yes	294	96.4
	No	11	3.6
Types of KM Practices	Knowledge Creation	43	14.1
	Knowledge Acquisition	44	14.4
	Knowledge Capture	15	4.9
	Knowledge Sharing	95	31.1
	Knowledge Record	69	22.6
	Knowledge Preserving	39	12.8

KRe and KPr good to be practice	Strongly Disagree	2	0.7
	Disagree	11	3.6
	Moderate	39	12.8
	Agree	137	44.9
	Strongly Agree	116	38.0

Furthermore, the model in Figure 1 indicated a Confirmatory Factor Analysis (CFA) procedure to access all constructs involved in the study. The data are the score of 305 lead users (PhD candidate) on four

knowledge construct activities. The arrows from the factors to the variables represent linear regression coefficients or 'factor loadings' (Awang, 2012; Hair, et al., 2006; Hox & Bechger, 1998).

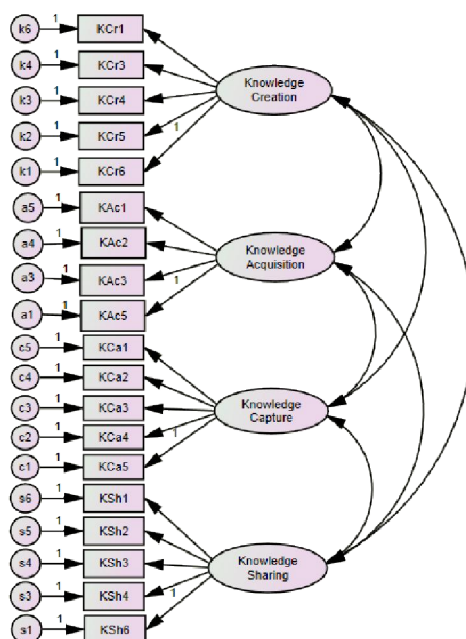


Figure 1: Confirmatory Factor Analysis (CFA) model

The Maximum Likelihood Estimation (MLE) in Table 3 shows that Knowledge Creation, Acquisition, Sharing

and Capture are significant influence and supported in KM practices.

Table 3: Maximum Likelihood Estimation (MLE) result

	Estimate	S.E.	C.R.	P	Label
KMP <--- Knowledge_Acquisition	.494	.110	4.477	***	Supported
KMP <--- Knowledge_Capture	.422	.084	5.026	***	Supported
KMP <--- Knowledge_Sharing	.186	.051	3.630	***	Supported
KMP <--- Knowledge_Creation	.301	.068	4.407	***	Supported

***Indicate a highly significance at < 0.001

In Table 4, the result indicated that five determiners are ratio of cmin-df, goodness-of-fit index (GFI), normed fit index (NFI), comparative fit index (CFI), and root mean square error of approximation (RMSEA). The model fit

indices are all within specifications (Hair, et al., 2006). Therefore, Cmin/df is 1.610 (spec. < 2.0), GFI = 0.944 (spec. > 0.95), NFI = 0.930 (spec. > 0.95), CFI = .972 (spec. > 0.95), and RMSEA = 0.045 (spec. < 0.080).

Table 4: Model fit result

Model	CMIN	DF	P	CMIN/DF	GFI	NFI	CFI	RMSEA
Default model	177.152	110	.000	1.610	.944	.930	.972	.045
Saturated model	.000	0			1.000	1.000	1.000	
Independence model	2542.817	171	.000	14.870	.325	.000	.000	.214

Subsequently, the structural model is the second stage and last step in the SEM approach. This model integrated and correlate with all factors in the KM

constructs. It also provides a structural link from the KM process to the KM practices as shown in Figure 2.

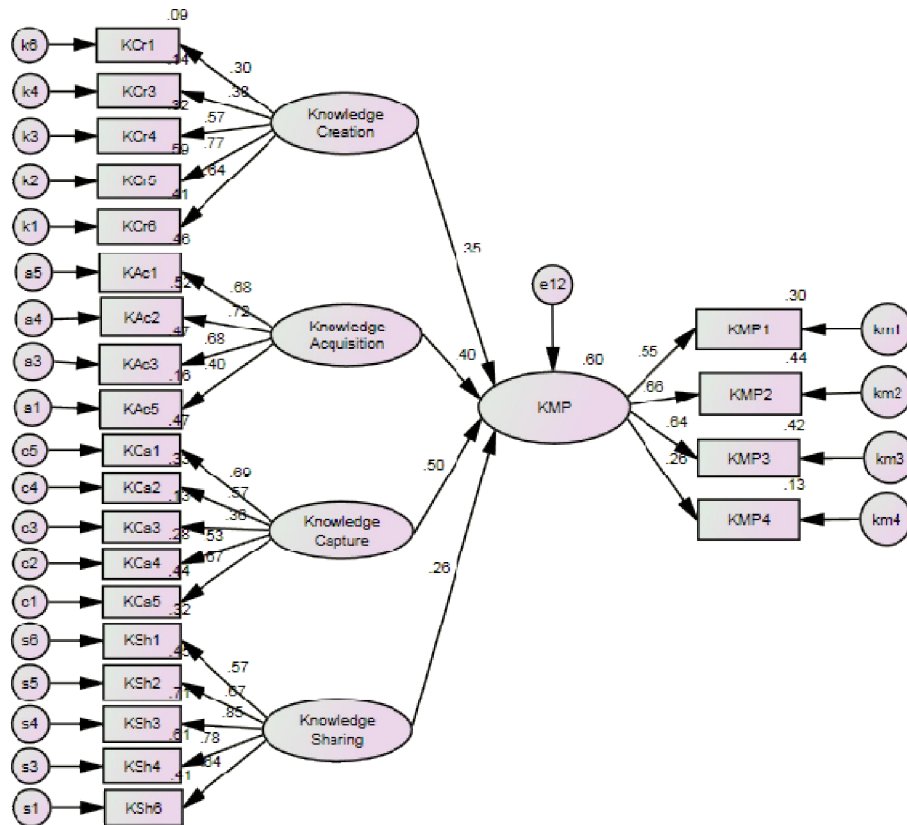


Figure 2: Structural model of KM processes and its relation with KM practices

The structural model result in Figure 2 shows the achieved stable model fit estimation. The indicators of fit: Cmin/df = 2.887 (Cmin = 525.519 , df = 182); GFI = 0.858; NFI = 0.836; CFI = 0.884; RMSEA = 0.079. In sum, Figure 2 empirically shows that KM processes has a highly significant influence ($\beta=0.60$, $p=.0001$) on KM practices. These indices suggested that the structural model provided a good fit to the data at hand and yielded a corroborating value for the good model fit. Besides, the importance of understanding the KM process in organizations becoming essential for organizations to obtain the benefit from KM processes (J. Mavodza, 2010; Judith Mavodza & Ngulube, 2012).

5. IMPACT TO KNOWLEDGE MANAGERS, ADMINISTRATION AND USERS

A great amount of knowledge expert (i.e. both in and outside the libraries) is possessed by knowledge manager, library administration and users (Sarrafzadeh, Martin, & Hazeri, 2010; Tandale, Sawant, & Tandale, 2011). In university, knowledge manager (i.e. librarians) has to make sure that all the knowledge process discussed above applied in their daily practices. Impact to the knowledge processes, they have to become expert and know how to handle and channel the processes to meet their user satisfaction. Mavodza (2010) quoted Branin (2003) suggestion that whether librarians working in administration, collection management, reference, or technical services, they must take on new roles as knowledge managers. In this new role, librarians is becoming knowledge management developers, which working more closely with faculty and students to design,

organize, and maintain a broader range of knowledge. Another suggestion impact to administration was made by Wen (2005), the library director should consider him/herself as the chief knowledge officer of the entire organization and should work together with the CIO, heads of the planning department, the Computer and Information Technology (CIT) Center, the human resources management department, the finance department, etc. to design and develop such a knowledge management system which built on existing computer and information technology infrastructures, including upgraded intranet, extranet, and Internet, and available software programs to facilitate the capture, analysis, organization, storage, and sharing of internal and external information resources for effective knowledge exchange among users, resource persons (faculty, researchers, and subjects specialists, and so on.), publishers, government agencies, businesses and industries, and other organizations via multiple channels and layers. Therefore, knowledge must be renewed and expanded to prevent it from becoming stagnant. Last but not least, the impact of knowledge to the users. Yaacob, *et al.* (2011) noted that the user also can be called community of knowledge (CoK) or the community of practice (CoP). It is a group of people who share information, insight, experience, and technology in any area of common interest. Community of practice may operate at a workgroup, departmental, or corporate level and allow contributors and users of knowledge to set their own ground rules for their exchanges. According to Yaacob, *et al.*, librarians and information professionals need to have the right perceptions in the area where their common interests have shifted from the traditional library services to the much-sought after knowledge management. Their perceptions of KM must, not only be in line with the demand of the communities, but they must also draw the distinctions between the library and information services and the KM services. In this regards, librarians are at a critical juncture and they need to become a good candidates to assist the company or organization's attempt to implement successful KM practices. In the near future, Takala, *et al.* (2006) urged that, the most likely challenges will be the identification of the possible tasks to ensure customers have positive experience about products and services (before-, during-, and after-used). With this regards, higher customer satisfaction does not mean higher income in a proportionate way (Takala, *et al.*, 2006).

6. CONCLUSION

The primary aim of this paper is to outline the research objectives and the procedure in Structural Equation Modeling (SEM) followed by developing

questionnaire scales to measure knowledge process in KM practices at Malaysian university libraries. The scales are measured for each of knowledge creation, knowledge acquisition, knowledge capture, knowledge sharing, knowledge record and knowledge preserving. By measuring the types of KM processes in KM practices using Confirmatory Factor Analysis (CFA), it is revealed that these KM processes have a significance influence with a higher cut-off Goodness-of-Fit Index (GFI) $\geq .95$ and RMSEA (spec. ≤ 0.08). However, the results proved that the structural model of KM processes has strong relationships with KM practices. In fact, all four hypotheses were discussed earlier indicated a significant relationship.

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