

## The Report of Structural Equation Modeling Analysis Results: A Study at Malaysian University Libraries

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**Abstract:** Structural equation modeling (SEM) is a versatile statistical modeling tool which uses in the social sciences research. Recently, in Library and Information Science (LIS) environment, structural equation modeling has gained popularity across many disciplines, due perhaps to its generality and flexibility. Its estimation techniques, modeling capabilities and breadth of application are expanding rapidly. This paper reported a structural equation modeling through a Confirmatory Factor Analysis (CFA) result, which involves 305 lead users at six selected Malaysian university libraries through an online survey. This is to elicit opinion of the lead users on the relationship between Knowledge Management Practice (KMP) and Library Users' Satisfaction (LUS). AMOS 18 was utilized to analyze research data. Furthermore, the major contribution of the paper is to provide groundwork empirical evidence about knowledge management processes and its relations with Knowledge Management Practice (KMP) at Malaysian university libraries. It is hoped that this structural model could be accepted as a novelty model foundation in knowledge management practice in Library and Information Science environment.

**Key words:** Knowledge Management Practice, Malaysia, Library Users' Satisfaction, Structural Equation modeling, AMOS, Confirmatory Factor Analysis (CFA)

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### INTRODUCTION

Structural Equation Modeling (SEM) is an extension of the general linear model (GLM) that enables a researcher to test 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; 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 structural equation modeling (SEM) techniques in this study is the most suitable way to evaluate the fit of the proposed model (Hair, *et al.*, 2006; MacCallum & Austin, 2000; Schumacker & Lomax, 2004). In addition, Hair *et al.* stated that SEM is a "new analytical tool" which in the recent decade, 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). In addition to, Schumacker and Lomax (2004) note that researchers which use SEM are becoming more aware of the need to use multiple observed variables to better understand their area. Therefore, the objectives of this paper are formulated as follows:

RO1. To investigate the type and level of knowledge management practices in the library.

RO2. To compare significant relationships between knowledge creation, knowledge capture, knowledge acquisition and knowledge sharing associated with Knowledge management practices.

RO3. To evaluate the significant influential relationship between KM practices and library users' satisfaction.

Hence, this study presents following hypotheses and intends to test the four hypothetical statements to be supported or not supported in this study.

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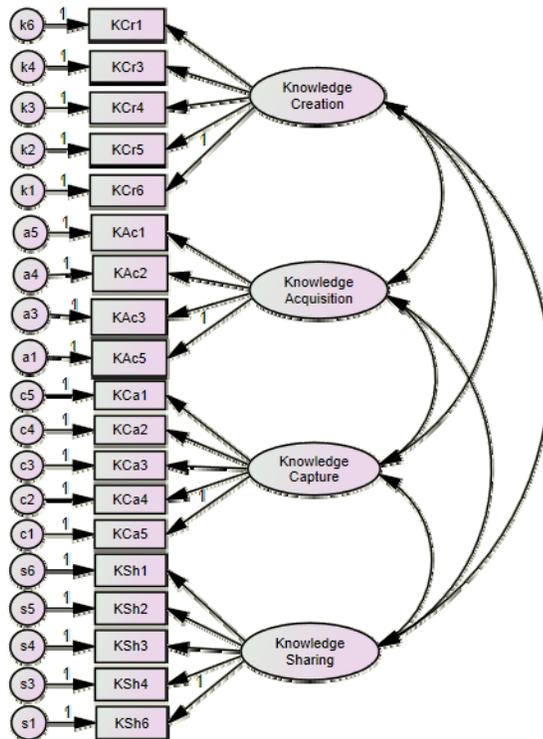
- $H_1$ – There is a significant influence of Knowledge Creation (KCr) on KM Practices.
- $H_2$ – There is a significant influence of Knowledge Acquisition (KAc) on KM Practices.
- $H_3$ – There is a significant influence of Knowledge Capture (KCa) on KM Practices.
- $H_4$ – There is a significant influence of Knowledge Sharing (KSh) on KM Practices.

**Methods:**

A set of questionnaire developed in this study was based on the comprehensive literature review (see Appendix 1) to set a measurement standard to construct structural model fitted. Every each of items develops were used unique code namely KCr1, KCr2, KCr3, KCr4, KCr5 and KCr6 as 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 in combination with theoretical considerations provide the basis for improvements of the original model in this study.

**Results:**

The model in Figure 1 indicates 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’ (Hox & Bechger, 1998).



**Fig. 1:** Confirmatory Factor Analysis (CFA) model

The Maximum Likelihood Estimation (MLE) in Table 1 shows that Knowledge Creation, Acquisition, Sharing and Capture are significance influence and supported in KM practices.

**Table 1:** 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

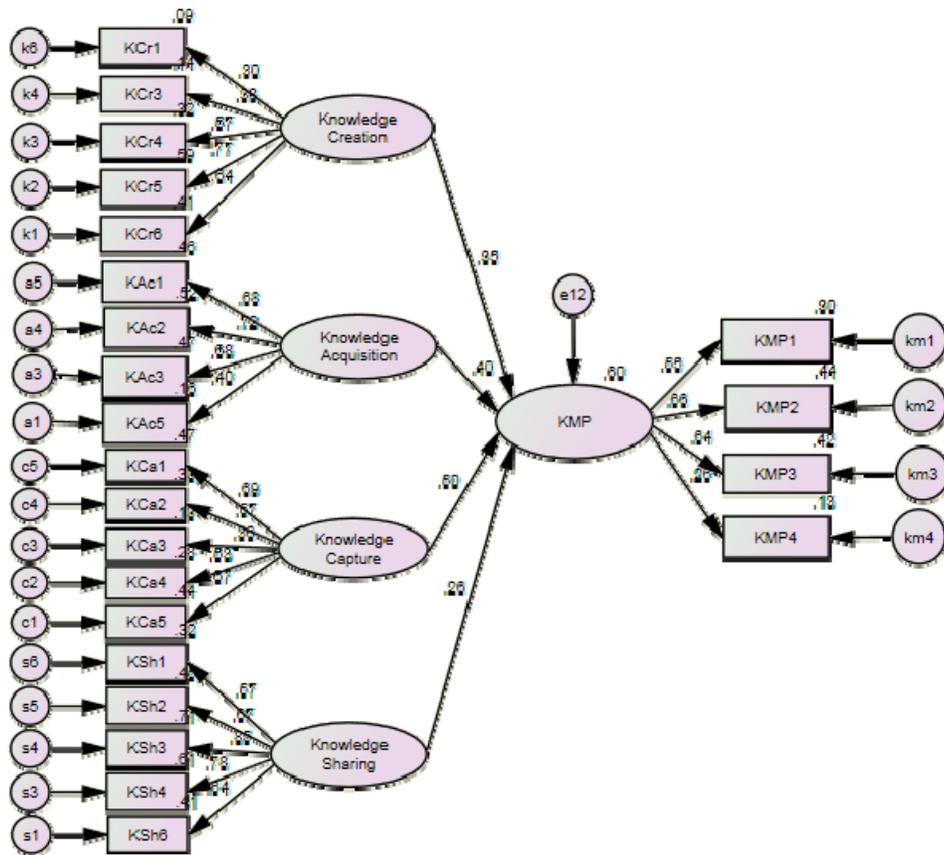
\*\*\*Indicate a highly significance at< 0.001

In Table 2, the result indicates 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 2:** 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 integrates and correlates all factors to the KM constructs. It also provides a structural link from the KM process to the KM practices in Figure 2.



**Fig. 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).

**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 KM practices and Library Users' Satisfaction 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 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.  $\leq 0.08$ ). However, the results prove that the structural model of KM processes have strong relationship between KM practices. In fact, all four hypotheses were discussed earlier indicates a significant influential relationship. In addition, this research can also be executed in other countries to explore the status of knowledge management practices in other parts of the world.

**ACKNOWLEDGEMENT**

The authors would like to acknowledge his PhD supervisor for guiding this paper. The authors are also indebted to the prior literature research that has been made in any anonymous journal referees related to Knowledge Management (KM) and Library and Information Sciences (LIS) environment. The author also wishes to thank the editor for extensive assistance in the final revision of the paper to be published.

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Appendix 1: Sample of KMP-LUS Questionnaire

Kmp-Lus Questionnaire

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Linkage Between Knowledge Management Practices And Library Users' Satisfaction At Malaysian University Libraries

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**Part A: Demographic**

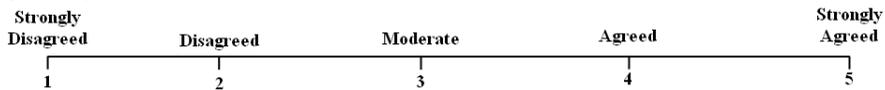
Name of your Institution/University: .....

1	UUM		11	UNIMAP	
2	USM		12	UNITEN	
3	UPSI		13	UPNM	
4	UiTM		14	UTHM	
5	UPM		15	UKM	
6	UM		16	UTeM	
7	UIAM		17	USIM	
8	UTM		18	UMT	
9	UNIMAS		19	UMP	
10	UMS		20	UMK	

1. Gender  
 Male                     Female
2. What is your age group?  
 21-25 years old         26-30 years old         31-35 years old         36-40 years old  
 Over 41 years old
3. Semester of study:  
 1     2     3     4     5     6     7     8     9     10
4. Do you think KM Practice should be applied in the library?  
 Yes                     No
5. Which types of Knowledge Management Practice do you think is most applicable in the library?  
 Knowledge Creation     Knowledge Acquisition         Knowledge Capture          
 Knowledge Sharing  
 Knowledge Record     Knowledge Preserving
7. “Knowledge Record (KRe)” and “Knowledge Preserving (KPr)” is good to be practiced in the university/academic libraries?  
 Strongly Disagree                     Disagree         Moderate         Agree                      
Strongly Agree

**Part B: Knowledge Management Process:**

For each statement, please indicate by ticking [ ✓ ] in the box that best matches the degree of its impact according to your experience.



Section 1: Knowledge Creation (KCr)						
Items	Question	S D	D	M	A	S A
KCr1	I believe that my University Library creates new knowledge.					
KCr2	I believe that my University Library uses students' feedback for knowledge creation.					
KCr3	I feel that my University Library needs to manage consciously and explicitly the processes associated with the creation of knowledge.					
KCr4	I feel that knowledge creation process typically involves a number of individuals.					
KCr5	Knowledge creation implies more participation of library users.					
KCr6	Knowledge creation involves all the management effort.					
Section 2: Knowledge Acquisition (KAc)						
Items	Question	S D	D	M	A	S A
KAc1	I feel that knowledge acquisition needs to be among the goal of my University Library.					
KAc2	I feel that my University library as an organization may need to look outside its own boundaries to outsource or acquire new knowledge.					
KAc3	I believe that the library can acquire knowledge through training programs, conferences, seminars and workshops.					
KAc4	My University Library uses to buy products or resources in the form of manuals, blueprints, reports and research reports for their students.					
KAc5	I know that University Library is subscribing to online databases, electronic journals and electronic books for Communities of Practice.					
Section 3: Knowledge Capture (KCa)						
Items	Question	S D	D	M	A	S A
KCa1	I feel that my University Library should develop ways of capturing internal knowledge to identify people's expertise.					
KCa2	I feel that my University Library needs to be aware of the aim for capturing the knowledge that exists within them.					
KCa3	My University library streamlines its day-to-day operations towards capturing institutional memory (books, documents, videos, databases, etc.)					
KCa4	I know that University library is the central department to initiate knowledge capture.					
KCa5	I know that if the knowledge capture is organized, it would be easier for me to identify and use the knowledge.					
Section 4: Knowledge Sharing (KSh)						

Items	Question	S D	D	M	A	S A
KSh1	My University library encourages sharing culture within Communities of Practice (CoP).					
KSh2	My University library encourages student to provide feedbacks; whenever I attended conferences, workshops, seminars or training.					
KSh3	My University library encourages the use of Institutional Repository (IR) to share the knowledge within the university communities.					
KSh4	I know that my University library encourages the use of face-to-face conversations inclusive of meetings, gatherings, discussions, etc.					
KSh5	I feel that my University library needs to promote sharing activity among librarians, student, staffs etc.					
KSh6	My University library staff always prepared themselves with useful knowledge and willing to share when needed.					
<b>Section 5: Knowledge Record (KRe)</b>						
Items	Question	S D	D	M	A	S A
KRe1	I know that my University library streamlines its daily operations to record institutional memory (documents, videos, theses, patents, etc.)					
KRe2	My University library records and organizes library special collection.					
KRe3	I feel that my University library do the record keeping guided by level of confidentiality, security, etc.					
KRe4	I know the University library will have no doubt of maintaining its own records to serve as a memory of the past for future references.					
KRe5	My University library is fully computerized and provides Internet services for the purpose of seeking and retrieving all universities' records.					
KRe6	I know that knowledge record is important and good to be practiced.					
<b>Section 6: Knowledge Preserving (KPr)</b>						
Items	Question	S D	D	M	A	S A
KPr1	I know that my University library streamlines its daily operations to preserve institutional memory (documents, videos, theses, patents, etc.).					
KPr2	I feel that my University library is responsible for preserving records, or gaining knowledge.					
KPr3	I feel that modern day University library needs to get outside the routines of the traditional library (cataloguing, indexing, etc.) to preserving knowledge.					
KPr4	I know that my University library has concentrated on the preservation of their materials or collections from loss.					
KPr5	I believe that knowledge preservation is important and good to be practiced.					
<b>Section 7: Knowledge Management Practices</b>						
Items	Question	S D	D	M	A	S A
KMP 1	I feel that KM practices have the potential to make my University libraries more relevant.					
KMP 2	I know that KM practices and its processes are related and have a significant influence.					
KMP 3	I feel that for my University library to accomplish its KM Practices, it all depends on the quality of products and service delivery.					
KMP 4	I know that my University library has developed and applied KM practices in Library collection services and other library services to encourage the use of knowledge.					
<b>Section 8: Library Users' Satisfaction</b>						
Items	Question	S D	D	M	A	S A
LUS1	I feel that the availability of resources (products and services) in library has a significant influence on user satisfaction.					
LUS2	My library is embedding knowledge management practice in processes, products and services in order to meet user satisfaction.					
LUS3	I feel that my University library has taken serious attention to user's complaint to meet their user satisfaction.					
LUS4	I feel that my University library needs to pay more attention in generating new knowledge to meet user satisfaction.					
LUS5	I feel that obtaining loyal users is by having products and services that meet customer's requirement.					
LUS6	I know that library user satisfaction is influenced by user expectation.					