

An Empirical Study of Factors Influencing the Use of Knowledge Management Systems in A Public Sector Organization

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Abstract- The main purpose of this study is to explore the factors influencing the use of knowledge management systems (KMS). The research model was built on the basis of task-technology fit (TTF) framework as well as DeLone and McLean's information systems success model. Data were collected by using a questionnaire survey sent to a public sector organization in Taiwan, and structural equation modeling (SEM) was used to analyze hypothesized relationships between the constructs in the research model. The implications of the findings for knowledge management systems practice are discussed. Moreover, the limitations, contributions and future research of this study are examined. Finally, this paper provides a valuable reference for business managers and information systems executives whom are initiating or conducting knowledge management exercises in the e-business era, and for researchers interested in the fields of e-business and knowledge management.

Keywords- Knowledge Management Systems (KMS); Structural Equation Modeling (SEM); Task-Technology Fit (TTF); Information Systems Success Model

I. INTRODUCTION

The development and applications of knowledge management systems (KMS) was consistently identified as one of critical issues facing information systems managers and academic researchers in the e-business era [1,2,3,4]. Knowledge management (KM) includes different procedures for creating, securing, coordinating, combining, retrieving and distributing knowledge [2,5]. Knowledge management systems (KMS) are a way of managing organizational knowledge that is widely implemented by organizations [6].

Recently, numerous studies have been conducted empirical studies on KMS. For example, Poston and Speier [1] conducted four interrelated laboratory experiments to examine how content ratings and credibility indicators affect KMS users' search and evaluation processes and decision performance. Doong and Wang [2] conducted a questionnaire survey to identify the predictors of diverse usage behaviour towards personal knowledge management systems. Hahn and Wang [7] conducted a field experiment to investigate the appropriateness of knowledge management systems (KMS) designs for different organizational knowledge processing challenges. Meera and Rahila [3] evaluated the efficacy of knowledge management systems in the organizations situated in the geographical region. Raman and Jennex [8] examined the role and relevance of knowledge management systems in light of emergency preparedness. Xu and Quaddus [4] used a mixed methodology approach (including field study, pilot survey and state survey) to investigate the factors influencing the adoption and diffusion of knowledge management systems. Although these studies have provided much insight into the predictors of usage behavior relating to KMS, empirical research relating to the use of KMS for public sector organizations has been seldom examined.

The main purpose of this study is to explore the factors influencing the use of knowledge management systems in the public sector organization by conducting an empirical study. Specifically, the research model and hypothesized relationships were empirically tested using the structural equation modeling (SEM) approach, supported by AMOS software. The results provide a valuable reference for information systems executives and business managers, as well as for researchers interested in information systems management and knowledge management in the e-business era.

II. LITERATURE REVIEW

A. Knowledge Management Systems

Knowledge is one of those organizational properties which are possessed by individual organization members, including practical knowledge, high-level technical capabilities, etc [9]. Knowledge management systems refer to a class of information systems applied to manage organizational knowledge [10]. A knowledge management system (KMS) is an IT-based system developed to support and enhance the organizational processes of knowledge, including creation, storage, retrieval, transfer, and application to perform knowledge tasks to increase organizational and individual productivity and innovation [11,12,13,14]. It is destined to play a variety of roles, in support of organizational knowledge management processes [10].

B. Information Systems Success Model

Information systems (IS) are critical to increase effectiveness and efficiency in the delivery phase of organizations. DeLone and McLean [15] proposed the most widely accepted conceptualization of IS effectiveness among similar researchers. The model comprises six theoretical dimensions (including system quality, information quality, service quality, intention to use, user satisfaction and net benefits), it evaluates success as an improvement in organizational effectiveness. Figure I shows the information systems success model.

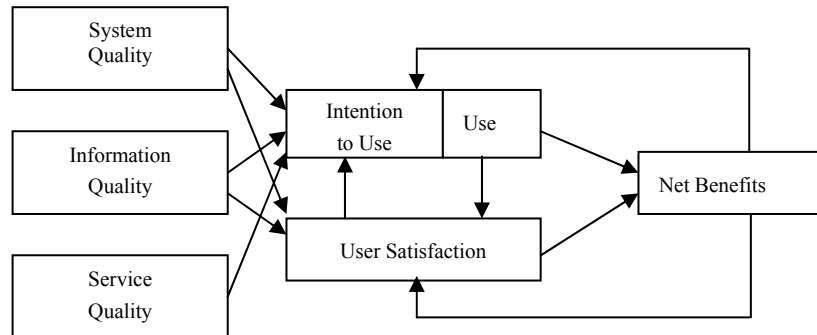


Fig. I Delone and Mclean's (2003) information systems success model

C. Task-Technology Fit (TTF) Model

Tasks are dimensions which can be narrowed down to non-routineness and interdependence, thus they are defined as actions carried out by individuals in turning inputs into outputs [16]; technology features which are well aligned with pre-determined tasks, would consistently lead to better utilization of technology and subsequent job performance improvement [16]. It is the core of a formal construct known as task-technology fit (TTF) which is the match-making of the capabilities of the technology to the demands of the task [16]. Figure II illustrates the model.

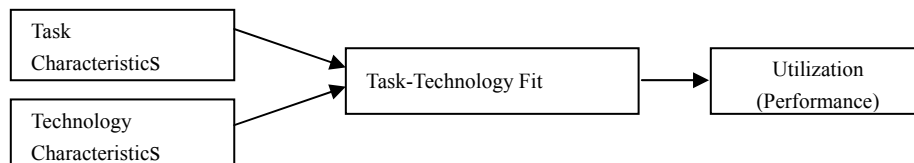


Fig. II Task-technology fit (TTF) model source: [16]

III. RESEARCH MODEL AND HYPOTHESES

The research model (Figure III) was established based on the information systems success model of Deloan and McLean [15], as well as task-technology fit (TTF) of Goodhue and Thompson [16], and was further developed using organizational and information systems management theory as reference disciplines. Each of the constructs in the model and research hypotheses is described and explained below.

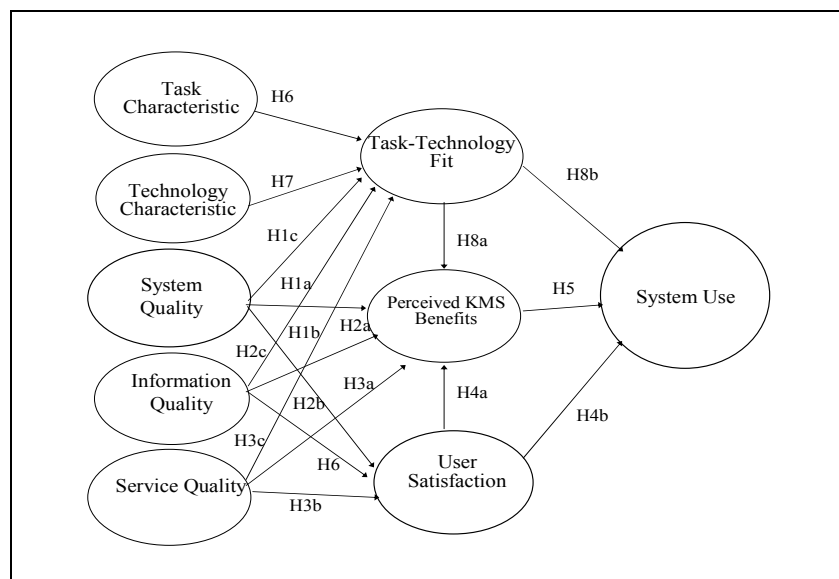


Fig. III Research model

O'Dell and Grayson [17] defined knowledge management as a people helping mechanism which allows for sharing and putting information into action, in ways that strive to improve overall organizational performance; it is also destined to determine future product innovations, developments and marketing strategies [18]. Significantly, the challenge is “system quality”; however, facilitating those functions depends entirely on the system being independent from the knowledge which it contains [10]. Hence, the following hypotheses are proposed:

H1a. The system quality of KMS is positively associated with perceived KMS benefits.

H1b. The system quality of KMS is positively associated with user satisfaction.

H1c. The system quality of KMS is positively associated with task-technology fit.

KMS improvements enable the building of information systems which can be used “any place and any time”, throughout and within their framework. Burke and Jurrant [19] further argued that the crucial role played by information, in enhancing a competitive strategy, the success of any information system depends completely on solid good quality [20]. Accordingly, the following hypotheses are proposed:

H2a. The information quality of KMS is positively associated with perceived KMS benefits.

H2b. The information quality of KMS is positively associated with user satisfaction.

H2c. The information quality of KMS is positively associated with task-technology fit.

Technology may trigger in users positive and negative feelings simultaneously. According to previous empirical findings, there exists a relationship between perceived ease of usage and perceived usefulness [21,22]. Significantly, users’ previously formed expectations concerning the system’s service, and their actual experience with the service performance, shall determine their final confirmation level, which influences perceived usefulness and satisfaction with the use of information systems [21,22]. Thus, the following hypotheses are proposed:

H3a. The service quality of KMS is positively associated with perceived KMS benefits.

H3b. The service quality of KMS is positively associated with user satisfaction.

H3c. The service quality of KMS is positively associated with task-technology fit.

System use and interactivity are important determinants of overall user satisfaction relevant to system quality [23]. More specifically, knowledge utilization plays a key role in the success of KMS [24]. Therefore, the following hypotheses are proposed:

H4a. The user satisfaction is positively associated with perceived KMS benefits.

H4b. The user satisfaction is positively associated with system use.

The main benefit of knowledge utilization for individuals is individual learning, which will help them make better decisions and accomplish their job more efficiently [25]. Following those words, the following hypothesis is proposed:

H5. The perceived benefit significantly and positively affects system use.

Knowledge management systems are developed to support the knowledge management for the organizations [10]. Tasks dimension can be narrowed down to non-routineness and interdependence [16]. The fit between IT and task affects individual job performance. As such, the following hypotheses are proposed:

H6. The task characteristic is positively associated with task-technology fit.

H7. The technology characteristic in KMS is positively associated with task-technology fit.

Information systems are “the fit pre-requisites” among task requirements, individual abilities, the functionality and interface of the technology [26]; more strongly, they are related to performance rather than to utilization [16,27]. Thus, the following hypotheses are proposed:

H8a. The task-technology fit is positively associated with perceived KMS benefits.

H8b. The task-technology fit is positively associated with system use.

IV. RESEARCH METHODOLOGY

A. Sample and Data Collection

The sample basis of this research was adopted from a public sector organization in Taiwan, by using a questionnaire survey. Targeted respondents were selected because they had good insight into the resources and the effects of KMS within their organization. The authors had sent out 300 questionnaires and received 230 useful responses, an effective response rate of around 76.7%.

B. Measures Development

Research variables were defined as concise as possible with multiple indicator items. From available literatures on knowledge management, knowledge management systems, and information system success model theory, the authors had adopted variables which have been used and validated by other researchers in similar fields. DeLone and McLean IS Success Model established was measured by using 33 items describing six latent, amended from the work of DeLone and McLean [15], Jennex and Olfman [24] as well as Wu and Wang [28]. Items to Task-Technology Fit (TTF) were measured by using 13 item describing three latent scale based on the work of Goodhue & Thompson [16], as well as Liang et al. [29]. All variables were measured with multiple items on a five point Likert-type scale, ranging from (5) strongly agree to (1) strongly disagree.

C. Instrument Development

The questionnaire was refined through rigorous pre-testing. The pre-testing focused on instrument clarity, question wording and validity. Two rounds of pre-testing were conducted. During the first round of pre-testing, three professors of information systems field were invited to critique the questions and wordings. The comments of these three individuals then were resulted as the basis for revisions to the construct measures. During the second round of pre-testing, a revised questionnaire was pre-tested by 25 KMS users from the public sector organization. Each of these users had significant experience in the use of KMS. The users were given the questionnaire and asked to examine it for meaningfulness, relevance, and clarity. Following a second revision based on the test results, the revised questionnaires were sent to the 300 KMS users of the public service sector organization in Taiwan.

D. Data Analysis

The research model depicted in Figure III was analyzed primarily using the structural equation modeling (SEM), supported by AMOS software. Numerous researchers in the past have proposed a two-stage model-building process, when applying structural equation modeling [30,31,32] in which, measurement models were tested prior to testing the structural model. It is often necessary to omit a number of indicators, in order to produce a suitable measurement model [33]; hence, items with lower squared multiple correlations or non-significant factor loadings (t-values lower than |1.96|) were eliminated. Furthermore, the structural model specifies causal relationships among the latent variables.

V. DATA ANALYSIS AND RESULTS

A. Sample Characteristics

Targeted respondents were KMS users, and had already worked in the public service sector organization for an average of 13 years. The respondents came from diverse branch, with Taipei branch 4.9 per cent, Northern branch 24.6 per cent, Tai-Zhong branch 28.7 per cent, South branch 15.2 per cent, Kao-Ping branch 24.6 per cent and East branch 2.0 per cent. This result implies that KMS is carried out in a wide each branch. Overall, it would suggest that the results are entirely positive, as the staffs of this public service sector organization have all acquired a clear understanding of the knowledge management systems being used; also, that there was no significant differentiation between branches, thereafter having applied the analysis of variance (ANOVA).

B. Measurement Model and Scale Validation

The measurement model included 46 items describing CFA for latent independent variables, including five latent constructs: system quality, information quality, service quality, task characteristic, and technology characteristic. CFA for latent dependent variables included four latent constructs: task-technology fit, perceived KMS benefits, user satisfaction, and system use. The ratio of χ^2 to the degrees of freedom, and other indices such as goodness of fit index (GFI), Bentler's comparative fit index (CFI), root mean square error of approximation (RMSEA) adjusted goodness-of-fit index (AGFI), normed fit index (NFI), Bentler and Bonett's non-normed fit index (NNFI), and incremental fit index (IFI) were used to judge the goodness of fit of the model.

However, a word of caution is needed regarding these indices, since some of them are influenced by sample size and the ratio of indicators per factor (p/r) [34]. The rule of thumb for NNFI and CFI is that the value should exceed 0.9. Furthermore, the ratio of χ^2 to the degree of freedom should be less than 2, and RMSEA should be less than 0.05. Final results of confirmatory factor analysis indicated that the revised measurement model fitted the data reasonably well. The goodness of fit indices are summarized in Table I. All model fit indices exceeded their respective common acceptance levels, demonstrating that the measurement model exhibited an appropriate fit with the data. Nevertheless, items with factor loading values lower than 0.5 were abandoned from further analysis. Six item (Tas04, Tas05, Tec03, Sys04, Inf09, Inf10) were therefore deleted from consideration, leaving a total of 40 items for more detailed analysis.

TABLE I FIT INDICES FOR MEASUREMENT MODEL

Fit indices	Criteria	Latent independent variables	Latent dependent variables
χ^2 / df	<3	1.178	1.293
GFI	>0.9	0.967	0.949
AGFI	>0.9	0.930	0.900
RMSEA	<0.06	0.028	0.036
NFI	>0.9	0.983	0.974
NNFI	>0.9	0.970	0.955
CFI	>0.9	0.997	0.994
IFI	>0.9	0.997	0.994

In the confirmatory analysis, convergent validity is the extent to which each measure correlates with other measures of the same construct; in addition, composite reliability means that a set of latent construct indicators provide consistent measurements [34]. All factor loadings of the items in the model were greater than 0.5. All latent constructs had a higher composite reliability than the benchmark of 0.6 recommended by Bagozzi and Yi [35]. Table II shows that all factor loadings of the items in the model were greater than 0.5. All latent constructs had a higher composite reliability than the benchmark of 0.6 recommended by Bagozzi and Yi [35].

TABLE II STANDARDIZED ESTIMATES AND T-VALUES

Latent Variables	Observe Variables	MLE Estimate		Composite Reliability	AVE
		Factor Loadings	t-value		
Task Characteristic	Tas1	0.812	6.828***	0.8649	0.6810
	Tas2	0.853	13.609***		
	Tas3	0.810	13.182***		
Technology Characteristic	Tec1	0.781	5.457***	0.8109	0.6826
	Tec2	0.869	6.886***		
System Quality	Sys1	0.802	13.545***	0.9024	0.6982
	Sys2	0.865	15.103***		
	Sys3	0.843	12.800***		
	Sys5	0.831	12.362***		
Knowledge or Information Quality	Inf1	0.802	13.878***	0.9377	0.6530
	Inf2	0.825	14.376***		
	Inf3	0.823	14.326***		
	Inf4	0.828	15.811***		
	Inf5	0.805	15.003***		
	Inf6	0.797	17.738***		
	Inf7	0.811	14.114***		
Service Quality	Inf8	0.772	13.101***	0.9322	0.7337
	Ser1	0.798	16.347***		
	Ser2	0.904	21.857***		
	Ser3	0.904	21.605***		
	Ser4	0.888	20.508***		
Task-Technology Fit	Ser5	0.781	15.079***	0.8689	0.5708
	Fit1	0.797	18.623***		
	Fit2	0.748	16.506***		
	Fit3	0.722	11.657***		
	Fit4	0.701	11.115***		
User Satisfaction	Fit5	0.804	13.262***	0.9362	0.8304
	Sat1	0.908	23.481***		
	Sat2	0.939	24.075***		
Perceived KMS Benefits	Sat3	0.886	20.901***	0.9269	0.7188
	Per1	0.712	14.157***		
	Per2	0.818	13.268***		
	Per3	0.903	13.150***		
	Per4	0.909	13.208***		
System Use	Per5	0.881	12.903***	0.9040	0.6547
	Use1	0.759	15.685***		
	Use2	0.804	14.091***		
	Use3	0.853	13.061***		
	Use4	0.784	12.060***		
	Use5	0.842	12.315***		

Significant at the P: *<0.05 , **<0.01 , ***<0.001

C. Structural Model and Hypotheses Testing

Hypothesized relationships were tested by using maximum-likelihood (ML) simultaneous estimation procedures [30]. The global fit statistics suggest that the model has an adequate fit (Chi-square/d.f.=1.764, GFI=0.817, NFI=0.882, NNFI=0.934, IFI=0.945, CFI=0.944, RMSEA=0.058). Wu and Wang [28] provided discussion from their literature review, that since success measures in the KMS area were under development rather than firmly established, hence, the goodness-of-fit indices suggested were used: GFI > 0.85, AGFI > 0.8, RMSEA < 0.05, NFI and NNFI > 0.8 [36,37]. The proposed model presented the estimates of the parameters of the structural model. Table I below shows 16 hypothesized relationships, ten of which were statistically significant.

Given an adequate measurement model, as expected, hypotheses H2b and H2c were supported. These implied that increased information quality of the KMS would be associated with increased user satisfaction and task-technology fit. But hypothesis H2a was not supported. For service quality, hypothesis H3a, H3b and H3c were supported. Nevertheless, service quality had a significantly positive effect on task-technology fit, perceived KMS benefits, and user satisfaction,

We found that information quality was the main determinant of task-technology fit ($\gamma = 0.638$, $P < 0.05$). Task characteristic and system quality had no significant effect on task-technology fit. Technology characteristic, information quality, and service quality provided for the explanation filling up to 65% of the variance contained in task-technology fit ($R^2 = 0.647$). That service quality was the main determinant of perceived KMS benefits ($\gamma = 0.157$, $P < 0.01$), system quality and information quality were not. Service quality explained for 84% of the variance contained in perceived KMS benefits ($R^2 = 0.839$). In addition, information quality was the main determinant of user satisfaction ($\gamma = 0.521$, $P < 0.001$). System quality was not. Technology characteristic, information quality and service quality explained for 65% of the variance contained in user satisfaction ($R^2 = 0.650$).

Hypothesis H4a and H8a were proven to be supported, due to the fact that hypothesis H3a was equally supported by the data. User satisfaction, task-technology fit, and service quality, all had a significantly positive effect on perceived KMS benefits. Altogether, they accounted for 84% of the variance. However, user satisfaction ($\beta = 0.287$, $P < 0.001$) and task-technology fit ($\beta = 0.618$, $P < 0.001$) contributed more to satisfaction rather than to the service quality ($\gamma = 0.157$, $P < 0.05$). Thus, hypothesis H4b and H8b were also supported, but hypothesis H5 was not. It would be suggested that a higher level of user satisfaction ($\beta = 0.450$, $P < 0.001$) and task-technology fit ($\beta = 0.731$, $P < 0.001$) contributed could lead to a higher level of KMS use. They together explained for 77% of the variance in system use ($R^2 = 0.772$), as well as indicating that user satisfaction and task-technology fit were dawnning significant positive effects on system use in a KMS context.

TABLE III RESULTS OF HYPOTHESES TESTING

Hypotheses	Paths	Path Coefficients	t-value
H1a	System Quality → Perceived KMS Benefits	-0.108	-1.455
H1b	System Quality → User Satisfaction	0.102	1.102
H1c	System Quality → Task-Technology Fit	-0.085	-0.814
H2a	Information Quality → Perceived KMS Benefits	0.050	0.489
H2b	Information Quality → User Satisfaction	0.521	***4.936
H2c	Information Quality → Task-Technology Fit	0.638	*5.225
H3a	Service Quality → Perceived KMS Benefits	0.157	**2.417
H3b	Service Quality → User Satisfaction	0.239	**3.094
H3c	Service Quality → Task-Technology Fit	0.246	***2.831
H4a	User Satisfaction → Perceived KMS Benefits	0.287	***4.215
H4b	User Satisfaction → System Use	0.450	***5.583
H5	Perceived KMS Benefits → System Use	-0.214	-1.420
H6	Task Characteristic → Task-Technology Fit	0.022	0.422
H7	Technology Characteristic → Task-Technology Fit	0.228	***3.726
H8a	Task-Technology Fit → Perceived KMS Benefits	0.618	***7.331
H8b	Task-Technology Fit → System Use	0.731	***5.231

Significant at the P: * < 0.05 , ** < 0.01 , *** < 0.001

VI. DISCUSSION AND CONCLUSIONS

The empirical results show that ten of the sixteen hypothesized relationships were found to be significant; the results of our study indicated that technology characteristic, information quality and service quality all have a significantly positive influence on task-technology fit and user satisfaction; also, service quality had a significantly positive influence on perceived KMS benefits. In addition, task-technology fit and user satisfaction had a direct effect on KMS use. In the KMS context, the authors found that user attitude is affected by beliefs about technology characteristic, information quality, and service quality, which in turn affected KMS use. Users' beliefs about the KMS characteristic and quality shaped their attitude and this affects their KMS

use. In particular, the empirical results showed that information quality and service quality had a significantly positive influence on user satisfaction. It can be interpreted as a response to the user expectations concerning system quality discrepancy; they want their KMS to be of high system quality, have high service quality, or information quality, but also provide substantial benefits.

Another implication of the research finding is that, task characteristic and system quality of the KMS did not significantly and directly influence on task-technology fit and perceived KMS benefits. Information quality has a positive influence on task-technology fit and user satisfaction, and service quality has a positive influence on task-technology fit, user satisfaction and perceived KMS. The relationship between system quality and perceived KMS is non-significant. System quality does not directly affect the user satisfaction and task-technology fit. The goals of the KMS are to manage and disseminate organizational knowledge, and then leverage overall knowledge value. Thus, it is important for users to acquire and utilize helpful knowledge from the KMS; user's perception thus depends on the quality of the contents and outputs of the KMS, rather than only the system performance and its functions. Moreover, we found that task-technology fit and user satisfaction had positive influence on perceived KMS benefits and system use, but that perceived KMS benefits had no significant positive effect on system use. Users' satisfaction is defined as the result of a cognitive and affective evaluation, where some comparison standard is measured against actual perceived performance; if the perceived performance exceeds expectations, users will be satisfied.

This study has the following limitations. First, while the subjects are employees of a public sector organization in Taiwan, yet cultural differences may exist between Taiwan and other countries. Second, besides the factors considered in this study, numerous other organizational, behavioral and technological factors may also affect the use of KMS, and future studies should consider more general organizational, behavioral and technological factors.

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