Knowledge Management Systems for Higher Education Institutions: An Empirical Study of Success Factors

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ABSTRACT
The number of KMS being implemented in higher education institutions (HEIs) has been increasing. However, there has been relatively little research to examine the factors that contribute to the success of KMS in HEIs. This study contributes to bridging this gap by examining the factors that influence the success of knowledge management systems (KMS) in higher education institutions (HEIs) by considering organizational and technological factors. The research model was based on DeLone and McLean IS success model, and modified to include organizational factors. The data was collected from 204 academicians in Malaysian public universities, and was confirmed of their reliability and validity using partial least square approach. It is hoped that the proposed model can be used as guidelines by stakeholders in implementing successful KMS in higher education.

Keywords: higher education, knowledge management, success factors.

1 INTRODUCTION
Higher education institutions (HEIs) play a crucial role in producing the human capital required for knowledge production that helps economic growth and development. Thus, there is a growing concern for HEIs to move to a new paradigm shift: knowledge management. Knowledge management combines processes, people and technologies with the aim to manage knowledge that is important to the organization (Alavi & Leidner, 2001). It is about making sure that people have the knowledge they need, where they need it, when they need it – the right knowledge, in the right place, at the right time. In the USA, the Institute of the study for Knowledge Management in Education, issued the report that singled out KM as the important strategy for making education institutions as learning organizations (Petrides & Nodine, 2003). In UK, the case study reported that seven institutions were actively engaged in KM (Cranfield & Taylor, 2008). In Malaysia, most of the universities have offered KM courses for undergraduates and postgraduate programmes (Chowdhury, 2007).

The advent of information technology that can give a great contribution to organization’s ability to transfer and sharing valuable knowledge contributes to the use of knowledge management systems (KMS) in higher education. KMS are not necessarily the expert systems or any intelligent systems; as a matter of fact, the choice of KMS can be from simple email to groupware systems or from video conferencing to Internet applications such as electronic discussion forums, and bulletin boards (Ali, Sulaiman, and Cob, 2014) as well as social media (Bogdanov, Limpens, Li, El Helou, Salzmann, & Gillet, 2012). One of the challenges in the implementation of KMS is KMS are not used by employees to share their knowledge. A number of researchers view that KM processes such as gathering, disseminating, and using knowledge can influence innovativeness and creativity that can enhance organizational performance (Darroch, 2005; Lee & Choi, 2003). However, this will not happen if the employees are hoarding their knowledge, or none of employees are interested to use knowledge retrieved from KMS, leading to the failure of KMS. In other organizations such as business and healthcare organizations, it is reported that the challenge in having successful KMS lies on the cultural and organizational issues (Kulkarni, and Ravindran, & Freeze, 2007; Ali, Tretiakov, & Whiddett, 2009). For HEIs to sustain their KMS, it is crucial to learn the lessons from these organizations to ensure that KMS in HEIs will continue to succeed, and not only remain as a management fad. HEIs need to be cognizant and aware of the factors that will influence the success of a KM initiative so that the full benefits of KM can be realized.

Although there has been significant research on the study of KM in HEIs, there is little empirical work on the factors that contribute to the success of KMS in HEIs. Our study contributes to bridging this gap by examining the factors that contribute to the success of KMS in HEIs.
II THEORETICAL FRAMEWORK

A. DeLone and McLean IS Success Model

The most profound research on system success to date is that of DeLone and McLean’s (1992) IS success model. Their model has been considered as a useful framework for evaluating IS success in organizations and has been widely applied in various contexts.

The model suggests that IS success can be assessed using three different levels and six interrelated dimensions as shown in Figure 1:

DeLone and McLean (1992) proposed that both system quality and information quality have impact on user satisfaction and system usage. Consequently, these will result in impact on individual user, which in turn will be reflected in the organization as well.

The proposed KMS success model for HEIs adopted the DeLone and IS Success model (1992, 2003) as a theoretical framework, and was modified by taking into consideration organizational factors. The organizational factors such as leadership, incentive, and culture of sharing were found to affect the KMS success in prior studies (Davenport and Prusak, 1998; Alavi, Kayworth & Leidner, 2006). Similarly, the KMS success model by Ali et al. (2009) and Kulkarni et al. (2007) proposed that leadership, and incentive are two critical factors contributing to the success of KMS. However, Ali et al. (2009) and Kulkarni et al.’s (2007) KMS success model were proposed in healthcare and business organizations respectively, which may not suit higher education environment. The constructs of DeLone & McLean IS (1992, 2003) success model included in this study are knowledge content quality (KQC), KMS system quality (KMS SQ), perceived usefulness (PU), and user satisfaction (US), which we refer to as technological factors.

We included organizational factors such as leadership, and incentive, which were adapted from Ali et al. (2009) and Kulkarni et al. (2007). We also included culture of sharing, subjective norm, and training as other organizational factors that are perceived as important in the context of higher education (Cranfield & Taylor, 2008; Riege, 2005). KMS use for sharing and KMS use for retrieval are used as the outcome variables for measuring KMS success, which is similar to the proposed study by Ali et al. (2009). Ali et al. (2009) proposed that KMS use be divided into two dimensions: sharing and retrieval, as these two dimensions were found to have been affected by different factors in prior studies (He and Wei, 2009).

III RESEARCH MODEL AND HYPOTHESES

The resulting KMS success model and its hypotheses are shown in Figure 2.

Knowledge content quality (KQC). KQC is the extent to which users perceive knowledge contributed by knowledge owner is of good quality. In academic environment, academicians have relatively similar job descriptions that are teaching, research, and service. With the implementation of information technology, academicians are expected to share knowledge via information technologies such as electronic discussion forum, emails, and intranet. In this situation, knowledge is expected to be of high quality for others to access via KMS. If they find knowledge shared via electronic discussion forums are not useful, they are unlikely to share knowledge or retrieve knowledge. Studies have found that knowledge content quality has a positive impact on perceived usefulness (PU) (Wu and Wang, 2006). This has led to the following hypothesis:

Hypothesis 1: KQC has a significant and positive effect on PU.

KMS System Quality (KMS SQ). KMS system quality in our model is a measure of how well the KM systems support and enhance the activities of knowledge sharing and knowledge retrieval. If the system provided is not stable, not user-friendly,
difficult to use, not reliable and accessible, they will find the system is not useful and therefore, it is unlikely that the employees (especially workers who are "technophobic") will use it. Academicians have to access high volume of knowledge for their teaching and research, thus, having a high quality system is likely to increase their belief on the usefulness of KMS for sharing and accessing knowledge. Prior studies have proven the significance of system quality in influencing the KMS Use via Perceived Usefulness (Kulkarni et al., 2007; Wu and Wang, 2006). This has led to the following hypothesis:

Hypothesis 2: KMS SQ has a significant and positive effect on PU.

User Satisfaction (US). User satisfaction in our model is measured on user satisfaction with the sharing and retrieval capabilities of the KM system, the adequacy and quality of knowledge needed, and user satisfaction that the system can enhance job performance. This finding has also been proven to be significant in the KMS context by Wu and Wang (2006) who found that user satisfaction gives positive impact to KMS use. Kulkarni et al. (2007) found that user satisfaction with KM initiatives significantly affects knowledge use. When the employees are satisfied that the system meets their needs, they feel more inclined to use KMS for knowledge sharing and are more encouraged to retrieve knowledge for reuse. Prior studies demonstrated that US has a strong and positive effect on KMS use, being determined by PU, KCQ, and KMS SQ (Kulkarni et al., 2007; Wu and Wang, 2006). In line with these studies, we propose that PU, KCQ, and KMS SQ together determine US. This has led to the following hypotheses:

Hypothesis 3: PU has a significant and positive effect on US
Hypothesis 4: KCQ has a significant and positive effect on US
Hypothesis 5: KMS SQ has a significant and positive effect on US.

Wu and Wang (2006) found that US has a positive impact on KMS Use while Kulkarni et al. (2007) found that US significantly affects Knowledge Use. When academicians are satisfied that the system meets their needs, they feel more inclined to use KMS for knowledge sharing and are more encouraged to retrieve knowledge for reuse. Therefore, it is proposed that user satisfaction has a direct effect on the use of KMS for knowledge sharing and retrieval. This has led to the following hypotheses:

Hypothesis 6: US has a significant and positive effect on KMS Use for Sharing.
Hypothesis 7: US has a significant and positive effect on KMS Use for Retrieval.

Perceived Usefulness (PU). Perceived usefulness is defined by Davis (1989, p. 320) as "the degree to which a person believes that using a particular system would enhance his or her job performance". In IS, the tendency to use the system is higher if they believe that using the system can improve their performance. This situation is similar in KMS as using KMS to share and access knowledge can improve their job performance. In the study by Wu and Wang (2006), it was found that PU had a strong and positive effect on KMS use. This has led to the following hypotheses:

Hypothesis 8: PU has a significant and positive effect on KMS use for sharing.
Hypothesis 9: PU has a significant and positive effect on KMS use for retrieval.

Training (TR). In this study, training is defined as the exposure given to the academicians with regards to KM and KMS, such as training via seminars, workshops, etc. Training is posited to facilitate user participation in the study by Sabherwal, Jeyaraj & Chowa (2006). Aggelidis, & Chatzoglou (2009) found that training affects behavior intention indirectly through facilitating condition and facilitating condition affects perceived usefulness. They suggested that future research should have training as an independent construct. In this study, we treat training as an independent construct and are perceived to affect KMS use through perceived usefulness. The study by Agarwal and Prasad (1999) provides empirical support that training had a positive effect on the success of implementation via perceptions of usefulness. It is believed that training can increase knowledge or compensate for lack of knowledge in using KMS, and thus influence academicians’ beliefs on the usefulness of using KMS, hence improving the chances of successful KMS use by HEIs. This has led to the following hypotheses:

Hypothesis 10: TR has a significant and positive effect on PU.

Subjective norm (SN). The existing theory of social psychology, such as the theory of planned behavior (TPB) (Azjen, 1991), suggests that attitudes and subjective norm shape a person’s intention to perform a behavior. Subjective norm has received considerable empirical support as a factor that determines behavioral intention (Taylor & Todd, 1995). Subjective norm in this study is defined as
the degree to which an academician perceives that his/her colleagues believes he or she should contribute or seek knowledge via KMS. Xu and Quaddus (2005) found that social norm, i.e. influence from colleagues does have an impact on people’s acceptance and use of KMS. Venkatesh and Davis (2000) found that SN affected PU if use of the system is voluntary. Knowledge sharing among academicians is perceived to be voluntary since their nature of work requires collaboration with other academicians in producing research work. Therefore, SN is perceived to be an important factor to influence their perceptions of the usefulness of KMS to share or retrieve knowledge. This has led to the following hypothesis:

Hypothesis 11: SN has a significant and positive effect on PU.

Culture of sharing (CS). One of the most important conditions for the success of KM initiatives in organizations is a knowledge friendly organizational culture (Davenport and Prusak, 1998). A major cultural shift would be required to change their employees’ attitudes and behaviour so that they willingly and consistently share their knowledge and insights (Alavi et al., 2006). Consistent with this view, Ruppel and Harrington (2001) indicated that employee acceptance of or resistance to knowledge-sharing should be considered as a management and corporate culture issue rather than a technology issue. Cultural values, such as knowledge-friendly culture, openness, and trust, will lead to positive KM behaviours (Alavi et al., 2006; Boudreau& Lakhani, 2012). This is aligned with the study by Park, Ribiere, and Schulte (2004), which found a significant positive correlation between the successful implementation of KM technology and culture. Knowledge sharing in higher education is already a common practice whereby the academicians share their knowledge through teaching, research and collaboration with industries; however, this culture is normally practiced through conferences, workshops, seminars and publications. For knowledge to be captured and used frequently by other academicians, using KMS may provide more benefits as the system provides the facilities for contributing and accessing knowledge as and when needed. However, the use of KMS for sharing and accessing knowledge should be promoted as a culture in HEIs so that they can realize the usefulness of KMS. This has led to the following hypothesis:

Hypothesis 12: CS has a significant and positive effect on PU.

Leadership (LS). Leadership is one of the critical factors that has been emphasized in KM research (Politis, 2001; DeTienne et al., 2004; Singh, 2008; Von Krogh, Nonaka, & Rechsteiner, 2012). Some studies focus leadership as the role of chief executive officers (Awazu & Desouz, 2004), and some use the term top management (Thong, Yap & Raman, 1996). DeTienne et al. (2004) refers the term ‘leader’ to anyone from the Chief Executive Officer (CEO) and board of directors to the unofficial opinion leader. They view that leaders at all levels such as supervisors, managers, and executives can act as role models in using a KM system, and thus encourage others to do the same. In organizations, it is important that the leaders ‘walk the talk’ and not merely provides ‘lip service’. Previous KM studies assert that lack of commitment of top leadership to sharing organizational knowledge and the absence of role models who exhibit the desired behavior can impede knowledge sharing among employees (Davenport et al., 1998; Kulkarni et al., 2007; Chen, Chang, Tseng, Chen, and Chang, 2013). This is aligned with the survey conducted to 431 U.S. and European organizations by Ruggles (1998), who found that more than 67 per cent of respondents admitted that leaders can overcome resistance to knowledge sharing. Ultimately, effective leaders who model appropriate behaviors, will motivate employees to use KMS to share and to retrieve knowledge. Based on the above discussions, we offer the following hypotheses:

Hypothesis 13: LS has a significant and positive effect on KCQ
Hypothesis 14: LS has a significant and positive effect on KMS use for sharing.
Hypothesis 15: LS has a significant and positive effect on KMS use for retrieval.

Incentive (INC). The use of incentives has been highlighted in previous studies as a critical element for KMS success that must not be overlooked (Kulkarni et al., 2007; Zhang, & Zhang, 2014). Orlikowski (1993), for example, found that the failure of the use of Lotus Notes was because of lack of incentives. Markus (2001) was in the opinion that rewards and incentives that are included as part of performance assessment will positively influence the desired behavior of knowledge contributors, particularly when they are pressed for time or competing with each other on the basis of performance. In higher education, where the quality of knowledge content is desired, the rewards should stimulate more contribution of knowledge sharing with high quality of knowledge content. Incentives have been found to have a strong influence on
knowledge contribution via KMS (Vitari, Moro, Ravarini, & Bourdon, 2007). Incentives are not likely to impact people for KMS use for retrieval because we believe that they will likely retrieve the knowledge only if they find it useful to them. Hence, incentives are perceived to influence knowledge content quality as well as KMS use for sharing.

Hypothesis 16: INC has a significant and positive effect on KCQ.
Hypothesis 17: INC has a significant and positive effect on KMS use for sharing.

IV RESEARCH METHODOLOGY
An online survey was used to collect data for testing the proposed model. The definition of KMS was included as the introductory note of the survey. The survey consisted of two sections. In the first section, the subject was asked to indicate his or her degree of agreement with each item using a seven-point Likert scale (1=strongly disagree, 7=strongly agree). The second section was on the respondent’s profile. The respondents were asked to complete both sections.

The questionnaire (72 items) developed in this study is based on the study proposed by Ali et al. (2009) who used the existing items in prior studies and had confirmed their reliability, convergent and discriminant validity. Scales for the training construct were based on the literature review.

Email requests for completing the online survey were sent to 950 academicians in Malaysian public universities. The academicians include local lecturers, tutors, and foreign lecturers. The online questionnaire was kept open for four weeks. One reminder email was sent two weeks later, and the second reminder was sent a week after the first reminder. A total of 204 completed questionnaires (response rate was about 22%) were used in the analysis.

V RELIABILITY AND VALIDITY

In order to validate our model, this paper employs the partial least squares (PLS) technique which is widely used in the IS field. PLS simultaneously models structural and measurement paths (Chin, 1998). Three tests were used to assess convergent validity: reliability of questions, composite reliability of constructs, and average variance extracted (AVE) by constructs (Fornell & Larcker, 1981).

Convergent validity of scale items was assessed using three criteria suggested by Fornell and Larcker (1981): (1) all item factor loadings should exceed 0.70, (2) composite reliability (CR) for each construct should exceed 0.80, and (3) average variance extracted (AVE) for each construct should exceed 0.50. In this study five items had factor loading values lower than 0.7 and were therefore, deleted from consideration, leaving a total of 67 items for further analysis. Five items that were found less than 0.7 are: (1) knowledge content quality (1 item); (2) leadership (2 items); (3) user satisfaction (1 item); (4) KMS system quality (1 item). Internal consistency was assessed by looking at the composite reliability (CR) value. Table 1 shows that composite reliabilities of all constructs (after dropping five items) exceeded the required minimum of 0.80. Further, the AVEs ranged from 0.64 to 0.75 which are well above the recommended threshold of 0.50, exhibiting acceptable convergent validity.

<table>
<thead>
<tr>
<th>Measures</th>
<th>CR</th>
<th>AVE</th>
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<tr>
<td>Culture of Sharing</td>
<td>0.94</td>
<td>0.64</td>
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<tr>
<td>Incentive</td>
<td>0.91</td>
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<tr>
<td>Knowledge Content Quality</td>
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<tr>
<td>KMS Use for Retrieval</td>
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<tr>
<td>KMS Use for Sharing</td>
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<td>Leadership</td>
<td>0.95</td>
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<td>Perceived Usefulness</td>
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<td>Subjective norm</td>
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<td>KMS system quality</td>
<td>0.94</td>
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<td>Training</td>
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<tr>
<td>User Satisfaction</td>
<td>0.92</td>
<td>0.69</td>
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</table>

Table 2 confirms the discriminant validity. This is determined by the diagonal values representing the square root of the average variance extracted (AVE) for each construct is greater than the level of correlations involving the constructs.

<table>
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<tr>
<th>Correlation between constructs</th>
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<td>1</td>
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Note: 1 – culture of sharing; 2 – incentive; 3 – knowledge content quality; 4 – KMS use for retrieval; 5 – KMS use for sharing; 6 – leadership; 7 – perceived usefulness; 8 – subjective norm; 9 – KMS system quality; 10 – Training; 11 – user satisfaction.

V CONCLUSION
This study examined the factors that determine the success of KMS in HEIs by combining organizational and technological factors in the same
model using the DeLone and McLean IS success model (1992) as a theoretical framework. The results of reliability and validity of the proposed factors demonstrates the adequacy of this model for hypotheses testing in future work.

This study makes a significant contribution to knowledge and understanding in KM as well as to KM practitioners for implementing KMS success in their organizations, specifically in HEIs.

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