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Research paper

A Success Model for Semantic Technology based - Knowledge Management Systems: an Empirical Investigation

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Abstract

Provision of sufficient knowledge to users is the ultimate goal of a knowledge management system (KMS). Unfortunately, existing KMS's rely on human effort for access to desired knowledge. Semantic technologies have become a force for paradigm shift in KMS research. They aim to enable the delivery of the right knowledge to the right person and in the right context. Nevertheless, research gap exists on success models for the evaluation of semantic KMS. Most studies only focus on traditional KMS success. Hence, this paper proposes a model to predict the success of semantic KMS. The Relationship between two independent quality dimensions; knowledge and system quality, with two dependent constructs; perceived benefit and user satisfaction was examined through 5 formulated hypotheses. Using a survey method, questionnaires were administered to academicians in Malaysian public higher institutions. Out of a total 221 returned questionnaires, 199 valid responses were used for analysis. Contrary to the expectation, no direct relationship was found between knowledge quality, searchability, and user satisfaction. However, the result indicated that user satisfaction with semantic KM systems is positively associated with user perceived benefit of the system, which is strongly associated with the searchability of the system. Also, a weak association between knowledge quality and perceived benefit was revealed. Findings from the study highlights that, for success to be achieved, user's perception of benefit from the semantic KMS is key. This can be achieved if the system can provide adequate searchability and satisfactory quality of knowledge.

Keywords: *Empirical investigation; Knowledge management systems; Semantic knowledge management; Sematic web technologies; Success model.*

1. Introduction

Spending on Information Technology (IT) and their budgets continue to rise even in the face of economic downturns [1]. Knowledge management systems (KMS), the IT infrastructure enabling knowledge management (KM), continue to be deployed throughout industries, governments, hospitals, education, and other institutions. This is as a result of the realization of the economic value of knowledge in today's economy, and its potential in offering a sustainable competitive advantage [2]. Regardless of size, sector, specialty, or ownership, every enterprise attempts to create value out of the knowledge that is embedded in its employees and processes. Effective knowledge management (KM) has become a crucial management mandate even for enterprises that seem to use little knowledge [3]. In practice, the importance of the use of KM systems for KM activities has widely been discussed in literatures [4]–[7]. The prevailing aim is mostly to make knowledge accessible and reusable to an enterprise [8]. For this reason, continuous IT innovation has been one of the crucial efforts in current KMS research. One of such innovations driving a paradigm shift in KM and KMS is semantic web (SW) technology [9].

Existing studies [10], [11] indicate strong evidence that suggests SW technologies may lead to desired improvements in KMS, since information is provided in a well-defined manner, enabling machines and humans to work in cooperation [12]. The technology can help in improving the application and re-use of relevant knowledge, reduce ambiguity, and provide easy integration in KMS [13]. However, as the dependency on new technologies increases, so does the need to assess their potential success. It is important to measure the success of information systems (IS), in order to make the value of an IS evident to an enterprise [14], [15]. For such purpose, organizations have moved beyond the traditional financial measures such as return on investment. Emphasizing the need for better and more consistent metrics, researchers have proposed success models such as in [16], [17]. Although many studies have proposed [18]–[20] and evaluated [21], [22] KMS success in different settings, there is limited study that demonstrate that these models can evaluate the performance of semantic KM systems. Furthermore, how semantic KM systems success is achieved has not been clearly articulated in the literatures. Therefore, the purpose of this study is to propose and test a model to measure the success of semantic KM systems through an adaptation of the widely accepted KMS success models.

This study contributes to the body of knowledge by embarking on a complete assessment of the usefulness of existing KMS success models in evaluating semantic KM systems. The paper is structured as follows: First, a review of literature on KMS and SW is presented, followed by a specification of KM system success and existing models. Operationalization of the constructs used in the study and evaluation of their psychometric properties follows. A description of the approach used in obtaining and classifying the research is then presented, followed by result and analysis. Finally, implications for the research, limitations and conclusion follows.

2. Literature Review

As a research tradition, literature review is usually embarked upon early in a study, to gain understanding of what others have done on a topic of interest. Similarly, this section presents a discussion that borders around KMS and SW technology. The aim here is to provide readers a brief overview of the underlying concepts of both fields of study.

2.1. Knowledge Management Systems (KMS)

Both in theory and practice, KMS literatures are predominant. In general, knowledge management systems extensively utilize domain specific knowledge to support problem solving and decision support [23]. They are IT-based systems used by organizations to manage their knowledge resources [3]. According to [24], KMS focuses on bringing together organizational explicit knowledge, easily documented and shared knowledge of know-what, procedures of performing tasks, interpretation guidelines, examples of past problem resolutions. Besides the knowledge concept, fundamental in understanding KMS is the system concept. In basic terms, system is a set of elements that interact to achieve a common goal [25]. The KM systems concept is thus an interaction between people, technology and knowledge. Here, KMS is described as special type of information system that "supports activities related to the acquisition, generation, codification, storage, transfer, retrieval, and use of knowledge within organizations" [3]. By definition, KMS may be seen from two different perspectives: Technical perspective, and Socio-technical perspective. From the technical perspective, KMS is an integration of a set of advanced software and hardware infrastructure, to support knowledge work by allowing free access to and increased sharing of knowledge [4]. This school of thought identify a number of key technologies that include groupware, messaging, browsers, document management, search and retrieval, data mining visualization, push technology, group decision support, and intelligent agents for effective support of knowledge work (refer to fig. 1).

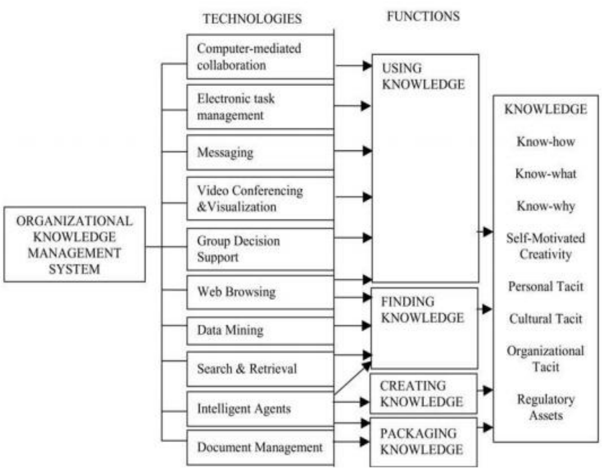

Fig. 1: Technical perspective of a knowledge management system. Adapted from [4]

According to the socio-technical perspective, KM is best achieved through optimized interaction between technology and social aspects. That is, balanced interplay between corporate culture, technology infrastructure, knowledge process and people [5], [26] (refer fig. 2). On a more neutral ground, KMS can be described according to the characteristics outlined in table 1. [27] discusses the following benefits of KM systems:

1. Awareness: Employees seeking knowledge know where to find it, saving time and effort
2. Accessibility: Individual and group tacit knowledge is easily converted to explicit knowledge and made accessible to anyone that may need it
3. Availability: Combined knowledge and experience is readily available for use wherever needed (i.e. regardless of physical location of the knowledge seeker), increasing responsiveness
4. Timeliness: Knowledge is available whenever it is needed

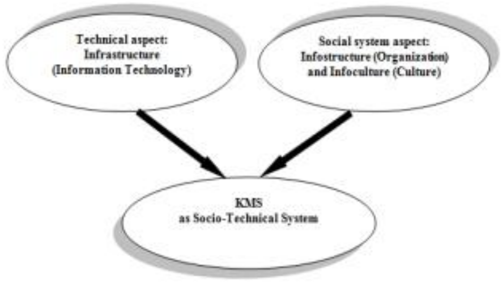

Fig. 2: KM as socio-technical system. Adapted from [26]

Table 1: Characteristics of KMS. Adapted from [28]

KMS Characteristics Component	Explanation of Component
Goals	▪ Bring knowledge from the past to bear on present activities, thus resulting in increase levels of organizational effectiveness (Lewis and Minton (1998); Stein and Zwass (1995). ▪ As the technological part of KM initiative that also comprises person-oriented and organizational instruments targeted at improving the productivity of knowledge work (Maier (2004))
Processes	▪ Developed to support and enhance knowledge-intensive task, processes, or projects (Detlor , 2002); Jennex and Olfmann (2003)) ▪ Supported knowledge processes such as, knowledge creation, organization, storage, retrieval, transfer, refinement and packaging, (re) use, revision, and feedback, also called the knowledge life cycle, ultimately to support knowledge work (Davenport et al. (1996))
Comprehensive Platform	▪ KMS is not an application system targeted at single KM initiative, but a platform that can be used either as IT to support knowledge processes or integrating base system and repository in which KM application systems are built (Maier (2006)) ▪ There are two platform categories, the first user-centric approach with focus on processes, and IT-centric approach which focuses on base system to capture and distribute knowledge (Jennex and Olfman (2003))
Advanced Knowledge Services	KMS are ICT platform consist of a number of integrated services ▪ Basic services such as, collaboration, workflow management, document and content management, visualization, search and retrieval (Seifried and Eppler (2000)) ▪ Advanced services such as, personalization, text analysis, clustering and categorization to increase the relevance of retrieved and push information, advanced graphical techniques for navigation, awareness services, shared workspace, and learning services as well as the integration of reasoning about various sauces on the basis of shared ontology (Bair (1998); Borgoff and Parechi (1998); Maier (2004))
Knowledge Instruments	▪ KMS are applied in a large number application area (Tsui, 2003) ▪ KMS specially support KM instruments (Alavi and Leidner (2001); McDermott (1999); Tsui (2003)) ▪ KMS offers targeted combination and integration of knowledge services that together foster one or more KM instruments (Maier , 2006))
Specifics of Knowledge	KMS help to assimilate access to sources of knowledge, and with the help of shared context, increase the breadth of knowledge sharing between persons rather than storing knowledge itself (Alavi and Leidner (2001))
Participants	Users play roles of active, involved participants in the knowledge network forested by KMS (Maier, 2006))

2.2. Semantic Web Technology

Semantic web (SW), an extension of the current web, is a vision to provide solution to the problems of data access and system delegation [29]. As discussed in literatures, the huge amount of data on the current web is largely interpretable only by humans, with limited machine support [30]. Berners Lee thus suggests enriching the data with machine-processable semantics, better enabling computers and people to work in cooperation [12]. SW technology provides a common framework which allows the sharing and re-use of data across application, enterprise, and community boundaries. According to [30], the following points summarize the direction of the SW:

1. Provide a common syntax for machine understandable statements
2. Establish common vocabularies
3. Agreeing on a logical language
4. Using the language for exchanging proofs

Figure 3 shows layers of the SW as suggested by [12]. At the lowest end of the layer are bedrock technologies that provide basics for the SW. Uniform resource identifiers (URIs) and Unicode provide a standard for referring to entities, and exchanging symbols respectively. Extensible Markup Language (XML)and XML schema aims to provide a common syntax and the definition of grammars for valid XML documents, while also fixing a notation for describing labelled trees [31].

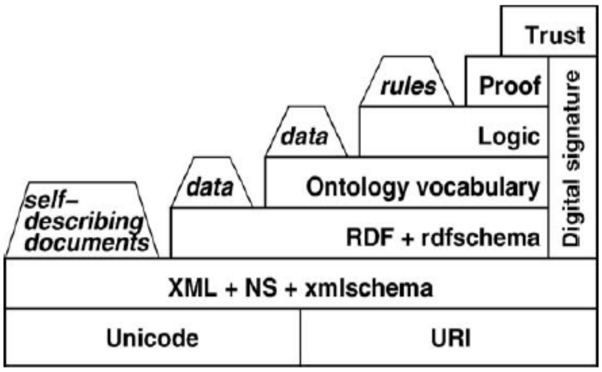

Fig. 3: Layers of the Semantic Web. Adapted from [30]

The middle layer contains technologies that enable the building of SW applications. Key here is the Resource Description Framework (RDF), which allows the formalization of document contents to allow for integration and interoperation between distributed data. This stage is considered the first layer that makes information machine understandable. Statements are created in the form of resources, properties and statements as triples. The mechanism for defining domain specific properties and classes of resources is RDF schema. It provides a basic vocabulary of RDF. RDF and RDF schema together offers simple representation for web resource knowledge. For data access, SPARQL is the standard W3C query language. It is an SQL-like language which is designed to evaluate queries against RDF datasets, and is also able to handle complex structure queries [29].

A backbone of the entire structure is ontology, which links "formal semantics understandable to a computer with real world semantic understandable to humans" [32]. OWL is the recommended specification of W3C for expressivity in object and relation descriptions [33]. Top of the layer contains ideas that should be implemented to realize SW capability. Cryptography, Trust and Proof is to ensure that the SW statements are from trusted source. Finally, the user interface layer enable humans to use the applications [31].

2.3. Semantic Knowledge Management Systems

SW is one of the technologies that has been driving a paradigm shift in KM, while also supporting electronic commerce and other web services [9],[11]. Indeed, one way of thinking about semantics in KMS is the delivery of knowledge in the right context, i.e. that which can lead to effective action. The aim is to allow for a much more advanced KMS which is able to do the following [34]:

1. To organize knowledge in abstract spaces according to its meaning.
2. To support maintenance through automatic checks for inconsistencies and the extraction of new knowledge.
3. To support answering of queries over several documents.
4. To enable the restrictive view of certain parts of information or even parts of documents

As discussed earlier, a very promising application area of the SW is KM. Figure 4 illustrates research areas for the application of SW technologies in KM.

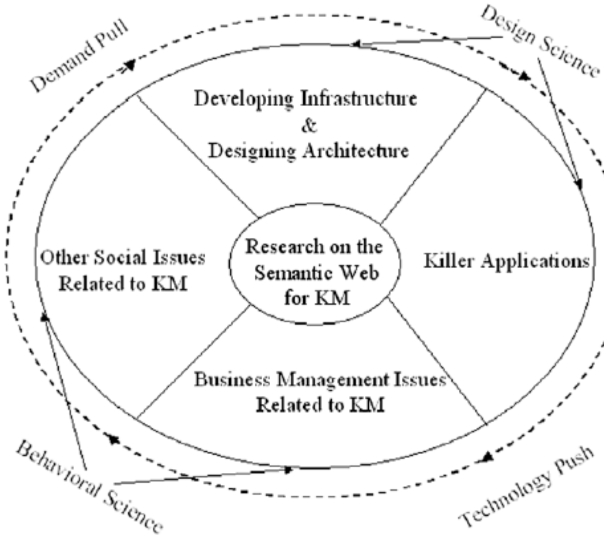

Fig. 4: Research areas of the semantic web in KM [9]

According to figure 4, the first block of research which concentrates on developing infrastructure and design of architectures is today the most researched area. At the early stage of research, infrastructure development was the main focus. Researchers concentrated on providing infrastructures that will enable rapid development of architectures to guide implementation of the technology in different domains. In a study of semantic web adoption from the technology innovation perspective, [35] presented existing studies along the classification in figure 4, as adapted in table 2. The remaining research areas not presented in the table have not been adequately captures in existing literature [35].

3. Specification of KMS Success and Proposed Model

Generally, IS success is defined as the extent to which a system achieves its desired goals [14], [16]. Due to shared similarities with information systems, published research on KMS success predominantly use the IS success theories [36]. Particularly, the D&M IS success model, built on the premise that the output of a communication system can be measured at technical, semantic, and effectiveness levels [37], has been the basis for most KMS success models. After a 10 year update of the initial model, six inter-related constructs were proposed namely: information quality, system quality, service quality, intention to use, user satisfaction, and net benefit [16].

3.1. KMS Success Models

According to [3], KMS development and implementation in any organization is primarily embarked upon in order to achieve certain perceived benefits, which include process-oriented results and organizational outcomes. To this end, [18], [38] proposed a three criteria framework to assess KMS success models as follows:

1. How well the model fits the actual KMS success factors
2. The degree to which the model has a theoretical foundation
3. If the model can be used in the two types of approaches to building a KMS

Table 2: Research areas of the semantic web and previous studies. Adapted from [35]

Research areas	Detailed areas	Examples of previous works
Infrastructure, architecture, and tools	Standards for Semantic Web technologies	RDF (Resource Description Framework) (2004), RDFa (Resource Description Framework-in-attributes) (Adida and Birbeck, 2008), RDFS (2004), GRDDL (Gleaning Resource Descriptions from Dialects of Languages) (2007), OWL (Web Ontology Language) (2004), OWL2 (2009), SWRL (Semantic Rule Markup Language) (2004), RIF (Rule Interchange Format) (2009), SPARQL (Query Language for RDF) (2008), SAWSDL (Semantic Annotations for WSDL) (2007), OWL-S (Semantic Markup for Web Services) (2004), WSDL (Web Services Description Language) (2001), WSML (Web Service Modeling Language) (2005), WSMO (Web Service Modeling Ontology) (2005)
	Methodology, techniques, and ontology	Cardoso (2007), Christopoulou and Kameas (2005), Du et al. (2009), Eriksson (2007), Fensel (2002), Kalfoglou and Schorlemer (2003), Kaza and Chen (2008), Noy and Klein (2004)
	Tools for editing ontology, annotating, browsing, searching, and reasoning	Protégé (Noy et al., 2001), TopBraid, Swoogle (2007), Sindice (Tummarello et al., 2007), Tabulator (Berners-Lee et al., 2006), SWOOP, Jena, KAON, OntoBroker, Pellet, Abu-Hanna et al. (2005), Oren et al. (2008), Benjamins et al. (2005), Gennari et al. (2003), Dzbor et al. (2007)
Applications	Retrieval and search	Ding et al. (2004), Tamma (2010)
	Knowledge management	Chen et al. (2007), d'Aquin et al. (2005), Davies et al. (2003), Fensel (2001, 2002), Joo and Lee (2009)
	Social web and collective intelligence	Bojars et al. (2008), Gruber (2008), Mika (2005)
	Semantic desktop	Gnowsis (Sauermann, 2005), Iturrioz et al. (2008), Quan et al. (2003), Tummarello et al. (2006)
	Web services and ubiquitous computing	Christopoulou and Kameas (2005), Forte et al. (2008)
	E-commerce and e-business	D'Aubeterre et al. (2008), Fensel et al. (2001a, 2001b)

Using these criteria, the current study assessed and considered four existing KMS success models for evaluation and subsequent adaptation to measure semantic KMS success. Models considered include those presented in the studies of Jennex and Olfman [18], Wu and Wang [20], Kulkarni et. al. [19], and that of Halawi et. al. [23]. In these models, several inter-related variables believed to influence KMS success were examined. Table 3 presents a summary of the variables in these models. It is important to note at this point that, the current study is conducted in the context of system. Therefore, antecedents and outcomes from the examined models are mainly the system related (i.e. technological) variables.

Table 3: Summary of KMS success variables

Constructs	[18]	[19]	[20]	[23]
System quality	X	X	X	X
Knowledge/Information quality	X	X	X	X
Service quality				X
Intention to use/perceived benefit	X		X	X
Use/user satisfaction	X	X	X	X
Net benefits	X			
Perceived usefulness		X		
KM system success				X

3.2. Proposed Model

The conceptual model proposed in this study has been developed based on the four success models assessed in the previous section. According to the analysis in table 3, all four reviewed models have three similar constructs in common, namely: system quality, knowledge/information quality, and use/user satisfaction. Next construct with a majority application in the prior models is intention to use/perceived benefit. Similarly, the proposed model adapts the four constructs from these studies as system quality, knowledge quality, user satisfaction, and perceived benefit to predict the success of semantic KMS as illustrated in figure 5. However, the system quality dimension has been adapted to the semantic KMS (SKMS) context.

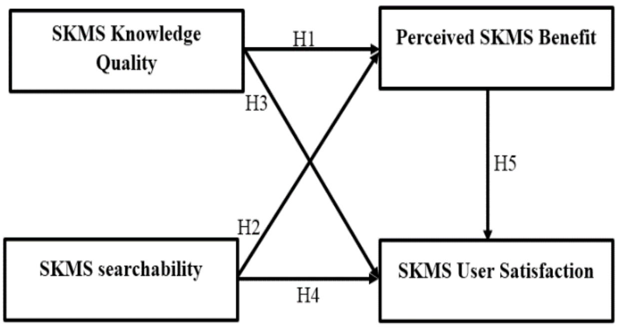

Fig. 5: The Semantic KMS (SKMS) Success Model

The conceptual model proposed herein, exclude service quality as a measure of success based on the findings that, in any given KM system, service quality is part of the system quality construct [18]. Also, since the semantic KMS Success Model aims at the delivery of contextual knowledge which can lead to action, the Knowledge/Information Quality dimension is named knowledge quality similar to that in [19], [23]. Furthermore, intention to use as a dimension to measure success has been debated when the use of a system is voluntary. As it is, the use of a KMS is largely voluntary, thus this model used perceived benefit rather than the expanded intention to use/perceived benefit dimension. Likewise, similar argument of voluntary use holds in the use/user satisfaction dimension. Hence the use of user satisfaction alone as a construct in the proposed model. Finally, the proposed extension of existing models for semantic KMS success leads to an additional construct that will aid in examining the applicability of the four constructs from literatures in evaluating semantic KMS success. Descriptions on operationalization of the constructs in the conceptual model follows:

1. SKMS Knowledge Quality**:** Prior research stress the importance of knowledge quality as a dimension to measure KMS success [18]–[20], [23]. This dimension captures the provision of the right knowledge with sufficient context and

its availability to the right users at the right time. In other words, this construct reflects the quality of output available from the KMS. It has been measured through the relevance, accuracy, timeliness, comprehensibility, completeness, applicability, presentation flexibility, and related variables of knowledge output. In this context, users are more likely to be linked to needed knowledge when the quality of KMS knowledge is high. Moreover, when individuals view a semantic KMS as adequately meeting their knowledge needs, it leads to the users believing that the semantic KMS is beneficial to them, and also lead to more satisfaction with the semantic KMS. This leads to the proposed hypothesis H1 and H3.

2. SKMS Searchability: This reflects the system quality dimension contextualized according to the vision of semantic technologies in KM [10]. It refers to the technical infrastructure and interface of the semantic KM system, which largely depends on its intended operational characteristics of the system [20]. In this instance, it indicates how well the semantic KM system guides users seeking for knowledge that resides in the system, actually find the knowledge. This is consistent with the arguments in [34], [39] that posits semantics in KM as mainly to support effective delivery of required knowledge to users. Furthermore, the ability to locate relevant information is one of the most critical quality aspect and obvious functionality of a KMS [40]-[42]. Encompassing the system quality dimensions, this construct is concerned with accessibility, ease of use, whether errors exist in the system, search capability, response time, flexibility, and stability [19], [20]. Also, it evaluates the reliability and predictability of a system independent of the knowledge produced by the system [20]. To further strengthen this argument, prior literature indicates that access to knowledge, which is reflected by this construct, may be more important than the content of knowledge in shaping the way individuals evaluate the value of a knowledge source [40]. Hence, improved KMS searchability would lead to better knowledge obtained. Thus, increase in the searchability of a semantic KM system will positively influence users perceived benefit and satisfaction with the semantic KMS. This is consistent with the relationship between system quality, perceived benefits, and user satisfaction from previous models.
3. Perceived SKMS Benefit: Consistent with prior studies, perceived benefit is defined as the extent to which users of a system believe that available capabilities existing within the system improves their performance and effectiveness. Not only does it capture user feelings, this construct also captures the general system effectiveness. Prior studies indicate that perceived benefit would lead to increased user satisfaction [18], [20], [23]. This is also included in hypothesis H5 of this study.
4. SKMS User Satisfaction: This construct is defined in line with previous research, as the degree to which users believe that the semantic KM system meets their knowledge requirements. [17] argues that user satisfaction captures a wider range of cost and benefit of IT investments than perceived benefit.

Table 4: Formulation of Hypothesis

	Hypothesis	Reference
H1	Quality of knowledge is positively associated with perceived benefit of a semantic KMS	[18]–[20], [23]
H2	Searchability is positively associated with perceived benefit of a Semantic KMS	[18]–[20], [23]
H3	Quality of knowledge is positively associated with user satisfaction of a semantic KMS	[18]–[20], [23]
H4	Searchability is positively associated with user satisfaction of a Semantic KMS	[18]–[20], [23]
H5	Perceived SKMS benefit is positively associated with user satisfaction of a semantic KMS	[18], [20]

The relationship between these constructs is applicable in a semantic KM system because it is also a type of knowledge management system that promotes adequate access to knowledge. From the model in figure 5, five research hypotheses were formulated for this study (refer to table 4).

4. Research Methodology

For this study, quantitative research method was employed, making use of survey methodology using questionnaire as data collection method. Although structured interview was conducted with experts, this alone does not make the study mixed approach as discussed in [56].

Figure 6 illustrates the research framework followed in this study. To keep the study manageable, two questions were formulated as follows:

1. What are the appropriate dimensions for the evaluation of semantic KM system success?
2. What is the nature of relationship between these dimensions?

Based on these questions, a thorough assessment of prior models of KMS success was conducted early into the study, resulting in a four-dimension model and five hypotheses as illustrated by figure 5 and table 4 respectively. To test the proposed hypothesis, this study adapted measures for each variable from prior research and conducted experts review to validate the operationalization of the constructs and the proposed conceptual model. Consequent to a validated model and instrument, pilot study was embarked upon using subjects within the public higher institutions in Malaysia. The sample group used were all users of knowledge management systems. A total of forty surveys were self-administered and 28 valid responses were returned, representing approximately 70% response rate. Overall result from the pilot study indicated that the data collection instrument was well understood, while other observations were taken into consideration for the design of the final data collection instrument.

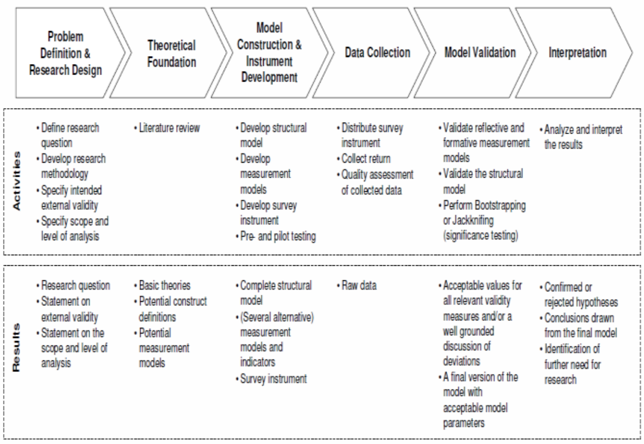

Fig. 6: Framework for applying PLS in structural equation modelling. Adapted from [43]

For the final study, data was collected using the questionnaire survey instrument designed and validated from the pilot study. The questionnaire was self-administered and also emailed to the population. Academicians in Malaysian public universities were the target population, but the study only used data from those who had used knowledge management systems. Out of a total 221 respondents, 18 responded negatively to the use of KMS, while another 4 had a substantial portion of their responses missing. In all, 22 respondents were removed from further studies, leaving a total 199 for the analysis. Table 5 shows the characteristics of respondents in this study. As shown, the respondents represent a substantial sample of academicians, indicating that the data can be used to explain academician's perception of success for semantic KM systems.

Table 5: Characteristics of Respondents

	Number	Percentage (%)
Role		
Staff	83	41.7
Students	116	58.3
Years of KMS usage		
New user	11	5.5
More than 1 year	188	94.5
IT skills/experience		
Expert	37	18.6
Advanced	84	42.2
Intermediate	66	33.2
Novice (limited skills)	12	6.0

5. A Step before the Final Submission

SmartPLS software, version 3.2.7, was used to perform data analysis [44]. Based on the suggestion for a reflective causal model assessment [45], [46], a two-phased approach was used. First, the measurement model was assessed through the validity and reliability measures of the constructs. The second phase involved hypotheses testing using the structural model. The following sections provides a detailed description of the analysis.

5.1. Evaluation of the Measurement Model

When assessing a reflective measurement model, reliability and validity are the two most important measures to look at [47]. This includes testing for internal consistency, convergent validity, and discriminant validity[47]. Internal consistency aims to measure the extent to which items of the same construct are related, which indirectly determines how well the items actually measure the construct they are meant to measure. Traditionally, Cronbach's alpha (CA) is used for this assessment, with a high score of greater than or equal to 0.70 indicating that items of the same construct have similar meanings [48]. Alternatively, composite reliability (CR) can be used to assess reliability. Mainly used to overcome some deficiencies of CA, the recommended CR threshold is also 0.70 or higher [49]. According to table 6, both CA and CR values obtained from the measurement model satisfy this requirement.

Convergent validity (CV) measures the extent to which items of the same construct converge in comparison to items from other constructs. [47] describes average variance extracted (AVE) as the most commonly applied criterion for CV. Alternatively, indicator/factor loadings may be used to evaluate CV. 0.708 loadings signifies that at least 50% of an indicator's variance is explained by the latent variable [47]. According to [45], [50], [51], loadings less than 0.708 but not lower than 0.4 can be accepted if AVE is achieved. To achieve AVE, 0.50 or higher is required [52]. As shown in table 6, all constructs in the proposed model achieved AVE indicators higher than the 0.50 threshold, indicating that the variance of the constructs' is greater than the variance caused by the respective measurement errors. Furthermore, all item loadings were within the acceptable range, haven obtained loadings of between 0.596 to 0.950. Collectively, these suggests that all constructs possess adequate convergent validity.

Table 6: Internal consistency reliability and convergent validity assessments

Constructs	CA	CR	AVE>0.5	SKMS-KQ	SKMS-S	SKMS-PB	SKMS-US
SKMS Knowledge Quality	0.954	0.938	0.527				
KQ1				0.697			
KQ2				0.763			
KQ3				0.724			
KQ4				0.722			
KQ5				0.774			
KQ6				0.747			
KQ7				0.737			
KQ8				0.724			
KQ9				0.719			
KQ10				0.724			
KQ11				0.679			
KQ12				0.674			
KQ13				0.745			
KQ14				0.731			
Table 6 cont…							
SKMS Searchability	0.934	0.940	0.595				
S1					0.858		
S2					0.856		
S3					0.827		
S4					0.727		
S5					0.816		
S6					0.759		
S7					0.596		
S8					0.700		
S9					0.766		
Perceived SKMS Benefit	0.925	0.929	0.634				
PB1						0.907	
PB2						0.901	
PB3						0.905	
PB4						0.818	
PB5						0.640	
PB6						0.829	
PB7-Khow						0.678	
PB8-Kwhat						0.860	
PB9-Kwhy						0.538	
SKMS User Satisfaction	0.889	0.947	0.900				
US1							0.948
US2							0.950

Table 7: Fornell & Larcker assessment of discriminant validity

	P-SKMS-B	SKMS-KQ	SKMS-S	SKMS-US
P-SKMS-B	**0.796**			
SKMS-KQ	0.629	**0.726**		
SKMS-S	0.759	0.728	**0.771**	
SKMS-US	0.770	0.549	0.619	**0.949**

Table 8: HTMT assessment of discriminant validity

	P-SKMS-B	SKMS-KQ	SKMS-S	SKMS-US
P-SKMS-B				
SKMS-KQ	0.632			
SKMS-S	0.782	0.780		
SKMS-US	0.798	0.588	0.670	

On the other hand, discriminant validity evaluates the extent to which measures of different constructs differ from one another [53]. In other words, discriminant validity checks whether a construct does not measure something different. For this purpose, several criterion including Fornell and Larcker [52], heterotrait-monotrait (HTMT) ratio of correlation [53], and cross loadings [54] are commonly used. Accordingly, these measures were respectively examined in the current study. Tables 7 and 8 shows the assessment of discriminant validity using Fornell & Larcker, and HTMT. In table 7, it is observed that the square root of AVE extracted for each construct is larger than their inter-construct correlation, except for the SKMS-KQ construct. This suggests that these constructs are satisfactorily dissimilar. HTMT values obtained for all constructs established discriminant validity, further strengthening the result from table 7, while providing satisfactory discriminant validity for the SKMS-KQ construct. In summary, evaluation of the measurement model in this study shows a satisfactory level of reliability and validity of the latent variables.

5.2. Evaluation of the Structural Model

Haven recorded a satisfactory measurement model, the structural model can be examined to test the hypothesized relationships between constructs. The coefficient of determination, denoted by R^2 depicts the amount of variance explained by the endogenous latent variables [55]. According to [51], an endogenous latent variable would have a substantial, moderate, or weak R^2 with values of 0.75, 0.50, or 0.25 respectively. Standardized path coefficient (β) on the other hand examines the strength of relationship between all exogenous and endogenous latent variables in a model. Figure 7 shows the β coefficients, p-values and R^2 values for each endogenous construct.

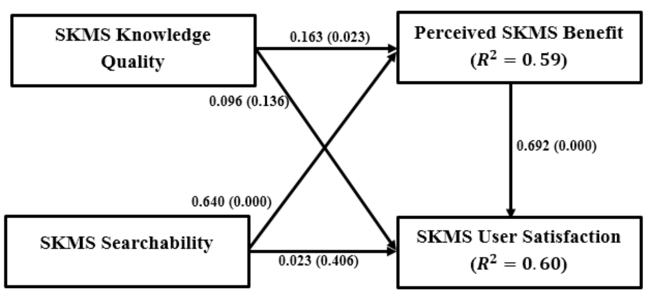

Fig. 7: Structural model for SKMS success model with β coefficients, p-values and R^2 values

As expected, hypotheses H1, H2, and H5 were supported. This implies that increased knowledge quality of a semantic KMS is associated with an increase in user perceived benefit of the system and subsequently user satisfaction with the semantic KMS. Similarly, increased searchability is positively associated with perceived benefit and increased SKMS user satisfaction. In accordance with findings from previous studies, the result shows that searchability (β=0.64) (corresponding to the system quality construct) contributes more to perceived benefit than knowledge quality (β=0.096). Although figure 7 shows no significant direct association between knowledge quality and searchability with user satisfaction (i.e. H3 and H4), they, together with perceived benefit, explain about 60% of the variance in user satisfaction. Overall, it can be deduced that the variance of latent constructs in this study is explained by the structural model.

To further ascertain the strength of relationship of all variables on the independent variable user satisfaction, the total effects of each dependent variable on user satisfaction are determined. This allowed for examining of total direct and indirect effects of a variable on its dependent variable [55]. Table 9 provides a summary of the total effects of all exogenous latent variable in the structural model. The result indicates that hypotheses H3, H4, and H5 proposed in this study are supported. Knowledge quality and searchability constructs that did not have direct significant association with user satisfaction (i.e. H3 and H4) are found to have positive association. In other words, increase in the quality of knowledge in a system, and the searchability of the system are associated with increase in user satisfaction with the system.

Table 9: Total effects on user satisfaction

Hypotheses	Path description	t-value	p-value
H3	Knowledge quality → User satisfaction	1.928	0.027
H4	Searchability → User satisfaction	5.029	0.000
H5	Perceived benefit → User satisfaction	9.645	0.000

Note: t-value at 1.65, $p < 0.05$

The result in table 9 further establish the fact that searchability is the most influential exogenous variable (i.e. over knowledge quality) in the present study.

6. Discussions and Limitations of Study

Most empirical studies on success models have concentrated on examining traditional KM systems. What was unclear is whether the constructs and relationships presented in the reviewed KMS models would be applicable to semantic based KMS. Hence, this study specified a semantic KMS success model, derived from well-established KMS success models [18]-[20],[23]. All five hypothesized relationships were significant, providing considerable support for the model. Contrary to previous studies, it was found that no direct association exists between knowledge quality, searchability, and user satisfaction in the semantic KMS context. However, these constructs indirectly affect the satisfaction of users through influencing their perception of benefits, which was found as the most significant path to user satisfaction in this study. The practical implication of this finding is that KM experts can be guided on where to place more emphasis when improving KMS effectiveness.

For these findings to be generalizable however, it is essential that further studies be conducted to truly establish the validity of the model. This includes further assessing the model across a variety of samples in different contexts, cultures, and nations. Also, other external factors from the social and managerial perspective that may influence semantic KMS success were not considered in this study. Future research may thus look at these variables and examine their effect on the semantic KM system success.

7. Conclusion

Semantic web technologies, being one of the driving forces of today's web technologies, has captured the attention of KM researchers and practitioners. This paper is an attempt to contribute to the growing literatures that cover the application of semantics in KM. Specifically, the study provided a model to assess the success of semantic KM systems, thereby filling a gap that exists between the continued investments in semantic KM and the actual performance of such systems. Results from this study identified to four major variables related to the success of semantic KM systems: knowledge quality, searchability, perceived benefit, and user satisfaction. Empirical findings reveal that satisfaction with semantic KM systems is highly dependent on users perceived benefit from the system. Accordingly, perceived benefit is strongly related to the searchability of the system while slightly being affected by the quality of knowledge in the system. This implies that a semantic KM system should provide adequate searchability to enable users of the system find the right knowledge at the right time, in the right context. Investments should therefore be more in improving the searchability of the system.

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