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THE RELATIONSHIP BETWEEN CRITICAL SUCCESS FACTORS, PERCEIVED BENEFITS, AND USAGE INTENTION OF MOBILE KNOWLEDGE MANAGEMENT SYSTEMS IN THE MALAYSIAN SEMICONDUCTOR INDUSTRY

Audrey Poh Choo Cheak	Faculty of Business, Multimedia University, Melaka, Malaysia	pccheak@mmu.edu.my
Chin Wei Chong*	Faculty of Management, Multimedia University, Cyberjaya, Malaysia	cwchong@mmu.edu.my
Yee Yen Yuen	Faculty of Business, Multimedia University, Melaka, Malaysia	yyyuen@mmu.edu.my
Irene Yoke Chu Leong	Academy of Language Studies, University Technology MARA, Melaka, Malaysia	irene@uitm.edu.my

* Corresponding author

ABSTRACT

Aim/Purpose	This study examined the relationship between critical success factors (CSFs), perceived benefits, and usage intention of Mobile Knowledge Management Systems (MKMS) via an integrated Technology Acceptance Model (TAM) and Information Systems Success Model (ISSM).
Background	This study investigates the CSFs (i.e., Strategic Leadership, Employee Training, System Quality, and Information Quality) that impact the usage intention of KMS in mobile contexts which have been neglected. Since users normally consider the usefulness belief in a system before usage, this study examines the role of perceived benefits as a mediator between the CSFs and usage intention.
Methodology	A survey-based research approach in the Malaysian semiconductor industry was employed via an integrated model of TAM and ISSM. At a response rate of 59.52%, the findings of this study were based on 375 usable responses. The data collected was analyzed using the Partial Least Squares with SmartPLS 3.0.

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Contribution	This study contributes to the body of knowledge in the areas of mobile technology acceptance and knowledge management. Specifically, it helps to validate the integrated model of TAM and ISSM with the CSFs from knowledge management and information system. In addition, it provides the would-be adopters of MKMS with valuable guidelines and insights to consider before embarking on the adoption stage.
Findings	The findings suggest that Employee Training and Information Quality have a positive significant relationship with Perceived MKMS Benefits. On the contrary, Strategic Leadership, System Quality, and Perceived User-friendliness showed an insignificant relationship with Perceived MKMS Benefits. Additionally, Employee Training and Information Quality have an indirect relationship with MKMS Usage Intention which is mediated by Perceived MKMS Benefits.
Recommendations for Practitioners	The findings are valuable for managers, engineers, KM practitioners, KM consultants, MKMS developers, and mobile device producers to enhance MKMS usage intention.
Recommendations for Researchers	Researchers would be able to conduct more inter-disciplinary studies to better understand the relevant issues concerning both fields – knowledge management and mobile computing disciplines. Additionally, the mediation effect of TAM via Perceived Usefulness (i.e., perceived MKMS benefits) on usage intention of MKMS should be further investigated with other CSFs.
Future Research	Future studies could perhaps include other critical factors from both KM and IS as part of the external variables. Furthermore, Perceived Ease of Use (i.e., Perceived User-friendly) should be tested as a mediator in the future, together with Perceived Usefulness (i.e., perceived MKMS Benefits) to compare which would be a more powerful predictor of usage intention. Moreover, it may prove interesting to find out how the research framework would fit into other industries to verify the findings of this study for better accuracy and generalizability.

Keywords	Technology Acceptance Model, Information Systems Success Model, mobile knowledge management systems, strategic leadership, employee training, system quality, information quality, perceived benefits, perceived user-friendly, usage intention

INTRODUCTION

Knowledge Management (KM) is defined as a generic set of processes or procedures that enable employees to consume or utilize the plethora of knowledge that is available within an organization to its full potential (Ahmadi, 2012; Derballa & Pousttchi, 2004; Zurita et al., 2008). The KM processes are characterized by how the knowledge is created, validated, presented, distributed, and applied by the employees. Moreover, within the present knowledge economy milieu, organizations differentiate themselves by how well they deliver the right information to the right person at the right time and place, and by how well they act on that information to improve their services, sales, and productivity. In other words, an organization's ability to achieve a competitive advantage depends on effective decision-making, higher productivity, and improved customer relationship (Sook-Ling et al., 2015). Hence, many organizations have implemented knowledge management systems (KMS) to gain a competitive edge by enhancing internal knowledge assets (Cham et al., 2016; Gressgård, 2015; H.-F. Lin, 2013; Simlai & Ghosh, 2017; Wang & Wang, 2016). In moving forward, KM has become a vital source of core competency and for the most part, a lifeline for nearly all organizations in today's competitive business environment. Interestingly, KM has been around since the 1960s and traditionally, the capture and distribution of knowledge has been a strictly controlled process. However, this new mobile market environment calls for more flexibility, mobility, and greater collaboration, both within an organization and external to it with customers and business partners. In fact, mobility is the platform where companies can continuously deliver innovations that distinguish themselves in this highly competitive, hyper-connected world. To foster the aforesaid contexts, organizations need new ways of producing, authoring, capturing, disseminating, and assessing knowledge - taking KM mobiles.

Mobile Knowledge Management Systems (MKMS) strive to amalgamate two leading fields explicitly, mobile computing and KM jointly as one, to manage the pool of knowledge accessible within an organization (Tazari et al., 2004). MKMS is termed as "a management process in the course of which mobile communication techniques in conjunction with mobile devices are employed for the creation, validation, presentation, distribution or application of knowledge" (Derballa & Pousttchi, 2004, p. 587). Prior researchers concurred that the crucial benefit of MKM is the improvement of knowledge access, regardless of its spatial and temporal restrictions. In Malaysia, the research on MKM can be found in the work of Chuan and Alias (2004), and R. Abdullah and Qasem (2016). They reviewed the architecture or framework of several mobile-based application systems to come out with a proposed architecture for a mobile knowledge management system in higher education institutions. Similarly, R. Abdullah et al. (2008) examined and developed a framework for mobile KM within the bioinformatics domain specifically in herb plantations. It helped improve the process of gathering, organizing, refining, analyzing, and disseminating biological knowledge among biologists in a more collaborative manner. Within the same context, Ismail and Ahmad (2015) conducted a study on personal knowledge management (PKM) that was used to analyze the patterns of sharing and managing knowledge among workers/managers via mobile devices, particularly, in managing teams or groups during project development and implementation. Noticeably, past and recent studies have focused on building prototypes and were mainly non-empirical.

Malaysian Investment Development Authority (MIDA, 2020) reported that the growth of semiconductors will continue to be at the forefront of growth in the Electronics and Electrical industry in Malaysia. This fast-moving industry will be supporting several other applications such as industrial, automotive, transportation, medical, energy, aerospace, and most importantly, the Internet of Things (IoTs). Furthermore, semiconductor companies like Infineon, Siemens, and Intel have already embarked on KM implementation (Curley, 2004; Franz et al., 2002) and possess technology infrastructures that have surpassed that of others. They are well-equipped with mobile technology facilities in terms of mobile solutions, mobile devices, and communication standards. Moreover, mobile workers such as engineers, technicians, and managers are commonly found in semiconductor companies. In view of the limited past literature on MKMS, this study included a preliminary interview to apprehend the issues (if any) and the status of MKMS usage in the Malaysian context, particularly in the semiconductor industry. During the interview, industry experts from five semiconductor companies revealed that with the evolution of mobile Internet technology, most of the existing KMS features/tools can be supported via mobile devices. The KMS features/tools were obtained by preparing a checklist of the main KMS features which was adapted from a study by Lai (2009) and later shown to the industry experts. These experts were asked to identify features that are currently used and any newly added features of KMS. The finalized list of KM tools comprised personal information management integration (e.g. to-do-list, calendar, contacts, and email); instant communication (e.g. instant messaging, remote-control functions like a meeting room, and application sharing); document-based repository (e.g. document management system that capture, store, search and retrieve documents); enterprise information portal integration (e.g. business intelligence portal, SAP NetWeaver); data mining (e.g. engineering data analysis for process engineers); knowledge map, workflow automation, and expert system. Therefore, for the aforementioned reasons, the semiconductor industry was chosen as a subject of interest in this study to explore MKMS usage intention.

Despite the advent of 5G and IoTs and with the efforts put in by organizations in deploying mobile devices to their employees, many are still resisting mobile technology adoption. A recent survey revealed that approximately 66% of employees were resistant to the adoption of mobile transformation (SOTI, 2019). The results of the survey were similar to the International Data Corporation prediction for Malaysia that organizations were unconvinced in accomplishing 'Returns on Mobility' (Data&StorageAsean, 2014). This means that organizations were skeptical on adoption of enterprise mobility applications or solutions despite excessive attempt made to deploy mobile devices to their employees.

While the literature on knowledge management covers various issues, it lacks comprehensive studies on factors and variables of the adoption of KMS, particularly in mobile contexts. Therefore, this study investigates the critical success factors (i.e., strategic leadership, training, system quality, and information quality) that impact KMS usage intention in mobile settings which have been neglected. Since users would normally consider the usefulness belief in the system before usage, this study also examines the role of perceived MKMS benefits as a mediator between the determinants (i.e., the four critical success factors) and usage intention.

The following section of this paper presents the theoretical background to the study which is based on DeLone and McLean's model and Davis' Technology Acceptance Model. Next is a discussion of literature related to the variables used in this study that led to the development of hypotheses. This is followed by a description of the research method employed. Subsequently, the results of the survey are reported in detail. Finally, the discussion, implication, and conclusion with suggestions for further research are presented.

THEORETICAL BACKGROUND

DeLone and McLean's (D&M) model, which is known as the Information Systems Success Model (ISSM), was developed to measure IS success in terms of technical, semantic, and effectiveness aspects of the IS (Mardiana et al., 2015). The technical aspect of IS success is determined by 'system quality'; on the other hand, semantic success is gauged through 'information quality', while elements such as 'use, user satisfaction, individual and organizational impact' are used to evaluate the IS effectiveness. Practitioners and academics acknowledged that IS success is a difficult concept to define and measure. Moreover, a systematic literature review from 2010 to 2020 performed by Sabeh et al. (2021) exposed that there were very few studies that investigated the 'adoption' of a system using D&M ISSM compared to the aspects of 'success' and 'utilization'. Hence, the D&M IS model needs further validation and testing. This way, a comprehensive IS success framework can be remodeled, specifically, the adoption attributes. This process will take into consideration the intense transformation in the IS approach, notably, the emergence and the mushrooming of the Internet, social media, and mobile technology.

The Technology Acceptance Model (TAM), on the other hand, uses its two main belief constructs, namely, perceived usefulness and perceived ease of use. TAM presumes that external variables predict usage intention via their effects on perceived usefulness and perceived ease of use. However, several studies have examined the comparative impact of different external variables on them, or the direct impact of external variables on usage intention without perceived usefulness and perceived ease of use. Moreover, limited studies were done to examine TAM's assumption that they fully mediate the effect of external variables on usage intention. Agarwal and Prasad (1999) and Venkatesh and Morris (2000) revealed that both perceived usefulness and perceived ease of use fully mediated the effects of external variables on usage intention. Despite this, Burton-Jones and Hubona (2006) surmised that the full-mediation assumption is overemphasized. Notwithstanding, TAM has strong predictive power when concerning the intention to use technology.

On the contrary, since the subject under study is mobile knowledge management, it is important to understand that the success of KM implementation is also determined by its critical success factors (CSFs), such as organizational cultures, top management support, staff training, IT infrastructure, and so forth. Yeh et al. (2006) posit that KM CSFs or enablers are the driving force that unites knowledge management in their case study of two multinational semiconductor companies in Taiwan. Other researchers like Ajmal et al. (2010) focused on the effectiveness of KM CSFs in project-based businesses in Finland. More recent studies by Abdelrahman and Papamichail (2016), and Jennex (2017) concurred on the importance of KM and the ability to acknowledge the critical elements for the successful implementation of KMS to achieve a competitive advantage. This includes a knowledge strategy that focuses on training for the employees, followed by top management support involving leadership, staff training, and a well-defined objective for the KMS implementation. From the past studies reviewed, it is viable to distinguish that most CSFs for implementing KMS revolved around top management support and staff training. Therefore, it is vital to find out whether these two factors are still applicable in the context of 'mobile' KMS. Hence, in this study, KM CSFs (i.e., Strategic Leadership and Employee Training) can be considered as the external variables of TAM. Another two external variables are system quality and information quality, which are stemmed from the notion of IT infrastructure of KM CSFs. Since system quality and information quality determined the technical success of IS, hence, they would contribute to the IS critical success factor. With that, there are four external variables (i.e., two from KM CSFs and two from IS success factors) incorporated into the integrated TAM and ISSM to describe technology usage intention.

Literature Review and Hypotheses development

Based on the past literature review, the following hypotheses were proposed. Figure 1 depicts a research model with the formulated hypotheses.

Hypotheses Related to KM Success Factors

Strategic Leadership

In this study, the researchers adopted the 'strategic leadership' paradigm that focuses on the top management's support and commitment, together with their strategic plan and proactive leadership towards KM concepts in implementing mobile knowledge management activities. According to Martinsons et al. (2017), strategic management comprises proper alignment with strategic goals and priorities, a clear KM vision, and top management who is supportive of and committed to KMS projects. Strategic leadership theorists have stressed that the performances of organizations are extremely dependent on the decision-making process made by their top management (Hambrick & Mason, 1984). Furthermore, strategic leadership is the main reason for knowledge management (Nonaka et al., 2000) and organizational learning (Vera & Crossan, 2004). An effective leader will ensure that the KM strategy aligns with organizational strategy (Theriou et al., 2010). Closely related to the concept of strategy is the development of a compelling and shared vision for pursuing KM. For instance, top management or leaders should establish a set of clear perceptions, vision and mission, instruction, and direction, sharing of opinions, and willingness to support and understand the value of KM and its activities. Management support has a strong and significant relationship with the perceived usefulness of knowledge for promoting knowledge transfer and innovation (Brachos et al., 2007). Moreover, recent studies have shown that management support is crucial in other systems like ERP and helped shape users' opinions on how useful the system is (Costa et al., 2016; Nwankpa & Roumani, 2014), in hospital information systems used by nurses in training hospitals (Barzekar et al., 2019), cloud computing usage intention among employees working in Saudi Arabian hotels (Tarhini et al., 2017), and e-government adoption intention in Yemen among government sectors as the respondents (Al-Haderi et al., 2018). Taking the above into consideration, the following hypothesis related to strategic leadership is formulated:

Hypothesis 1: Strategic leadership has a positive relationship on perceived MKMS benefits.

Employee training

Employees' IT skills should not be overestimated simply because they belong to the 'Net Generation' and are currently using KMS or are familiar with mobile technologies. Choi (2000) emphasized that sufficient training in KM is very important for an organization to provide managers and employees with the information, knowledge, and skills to fulfill their responsibilities in terms of job performance and work ethics. In view of the complexity of MKMS, 'knowledge transfer' can be exigent. Training is crucial for employees to effectively manage all the functionalities and responsibilities (Bingi et al., 1999). Ideally, proper training should take place as early as possible, and it should be comprehensive. With appropriate training procedures, knowledge creation can be successfully developed through three stages which are: (1) inquire and infer, (2) invent and inspire, and (3) install and inspect (Choi, 2000; S. L. Cohen & Backer, 1999). A successful KMS in KM perspective could create business value, generate competitive advantages to organizations' profitability and enhance employees' performance. Besides, practicing the KM perspective in training employees to identify the benefits of using KMS can provide them with opportunities, rewards, a better understanding of the concept of knowledge sharing, and continuous learning in order to survive in highly competitive knowledge economy markets (Choi, 2000; Rossett, 1999). Apart from KM, other areas of study such as in healthcare (Barzekar et al., 2019), revealed that when correct targeted training is gained, nurses would be able to recognize the benefits of the hospital information system in assisting them to perform their routine work effectively. Thus, the following hypothesis is proposed:

Hypothesis 2: Employee training has a positive relationship on perceived MKMS benefits.

Hypotheses Related to IS Success Factors

System quality

The role of IT in KM is an important aspect for any organization which intends to use technology for managing their knowledge assets. IT with the aid of mobile technology can provide knowledge from the mass of information stored in all and any parts of an organization. Good system designs enable decisive interactions, control organizational activities, and offer accurate and abundant information to minimize uncertainty. The definition of system quality varies among the researchers based on past literature. DeLone and McLean (2003) defined it as the measures of the information processing system itself and is determined by functionality such as ease of use, reliability, flexibility, data quality, portability, integration, and importance. As explained by Chien and Tsaur (2007), system quality refers to system performance such as data accuracy, system efficiency, and response time. However, Wixom and Todd (2005) and Ghobakhloo et al. (2010) stated that system quality is measured by reliability, flexibility, integration, accessibility, and timeliness. Thus, high system quality is a desirable characteristic of an information system (Petter et al., 2008), as it provides a positive impact on perceived usefulness (Floropoulos et al., 2010; Hidayah et al., 2020; Zheng et al., 2013), because of better efficiency and effectiveness in performance (Karkin & Janssen, 2013; Nugroho & Prasetyo, 2018). In moving forward, the third hypothesis is formulated:

Hypothesis 3: System quality has a positive relationship on perceived MKMS benefits.

Information quality

Information quality denotes the output quality of information which is generated by the information system (DeLone & McLean, 2003). The authors postulated that information quality is deliberated based on accuracy, timeliness, completeness, relevance, and consistency. According to J. H. Wu and Wang (2006), 'information quality' can be used interchangeably with 'knowledge quality' when the IS being studied is KMS. The authors concentrated on the aspects of content, context, and linkage quality of knowledge. Correspondingly, Jennex (2017) portrayed knowledge quality as the quality of the output or result produced by the KMS which can be evaluated by the knowledge content process (i.e., identifying sources/users, storing, capturing of knowledge), richness (i.e., accurate, timely, sufficient context) and linkages (i.e., knowledge/topic mapping, directory of experts). Studies by J. H. Wu and Wang (2006) and Jennex (2017) have similar sub-dimensions for knowledge quality. Thus, the criteria of knowledge quality considered by J. H. Wu and Wang (2006) and Jennex (2017) were consistently related and were utilized in assessing the research of MKMS usage intention. In a study of an information-exchange virtual community, it was revealed that a strong relationship existed between the two variables, i.e., information quality and perceived individual benefits (Zheng et al., 2013). Comparable studies by Nugroho and Prasetyo (2018) demonstrated that quality information generated by companies' accounting software would determine employees' perceptions of the benefits of the software. Similar results were discovered in Yemen's e-government adoption intention study among managers and employees of governmental organizations (Al-Haderi et al., 2018). Hence, the below hypothesis is derived:

Hypothesis 4: Information quality has a positive relationship on perceived MKMS benefits.

Hypotheses Related to Perceptions Regarding MKMS

Perceived user-friendly

Generally, the main focus in information system (IS) development would be the end-user ease of using the IS as it is a norm that users prefer a simpler and easier system for routine usage. Hence, IT systems and software developers should develop user-friendly IS which would stimulate current and future acceptance and use of the IS (Branscomb & Thomas, 1984; Davis, 1989; King, 1999). Moreover, the key driver towards the success of KMS would be focused on the user requirement when designing and delivering a KMS (King, 1999) and the common user requirement refers to the user-friendliness of the IS (i.e., easy to understand and use). Xu and Quaddus (2012) acceded that perceived user-friendly or ease of use is an extremely crucial determinant. In their field study of KMS in Australian companies, participants concurred that KMS has to be beneficial, otherwise potential adopters who were users and organizations would not be keen to adopt or use it. Furthermore, a KMS must have the characteristics of user-friendliness and ease of use, or else potential adopters will not adopt or use it even though it is beneficial. KMS must be user-centered which means requirements of a system are customized to individual needs considering that knowledge that is stored in the corporate database would be futile if it is not utilized by the users, i.e., the employees. (Xu & Quaddus, 2012). Davenport and Glaser (2002) stated that the failure of knowledge-sharing programs is usually due to the reasons that they make it harder or in other words less easy, for users to carry out their jobs. Studies spanning diverse fields such as education (Mokhtar et al., 2018; Yalcin & Kutlu, 2019), healthcare (Barzekar et al., 2019; Dou et al., 2017), small medium enterprise, and ERP adoption (Costa et al., 2016; Mayeh et al., 2016) inferred that perceived ease of use has a direct and positive influence on perceived usefulness. In this study, the researchers have substituted TAM's 'perceived ease of use' with 'perceived user-friendly', which emanated from the study of Xu and Quaddus (2012) on KMS. Hence, below is the hypothesis formulated:

Hypothesis 5: Perceived user-friendly has a positive relationship on Perceived MKMS benefits.

Perceived benefits of MKMS

The Perceived Usefulness construct originated from Davis' Technology Acceptance Model (Davis, 1989) and was later modified and redefined in D&M's Information System Success model as Net Benefits (DeLone & McLean, 2003), a factor that determines IS success (Kulkarni et al., 2006; Rai et al., 2002; J. H. Wu & Wang, 2006). Petter and McLean (2009) defined net benefits as the impact an IS has on an individual, group, organization, industry, society, etc., which can be determined based on perceived usefulness, organizational performance, and influence on work practices. Holsapple and Joshi (2000), McGill and Hobbs (2003), and J. H. Wu and Wang (2006) argued that although it was more appropriate to evaluate system benefits in terms of numeric costs (i.e. tangible benefits) such as cost saving, market expansion, reduced search costs, time-saving, and increased sales, the figures might be influenced by other factors such as intangible system impacts and environmental variables such as internal integration, improved information and processes, and customer service, resulting in inaccurate measurements. Since there are no proper guidelines for measuring net benefits, some researchers have utilized the opinions of those users that use the IS (i.e., perceived usefulness or perceived system benefits) to be the measurement metric (J. H. Wu & Wang, 2006). For this study, net benefits denote perceived system benefits which represent the belief or valuation of benefits of the MKMS as perceived by users in enhancing their job performance, productivity, and overall work-life quality. This is comparable to TAM's perceived usefulness which is described as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989). Briefly, perceived system benefits or perceived usefulness determines intention towards system usage following the studies done by E. Park and Kim (2014) on mobile cloud services adoption intention; F. Abdullah et al. (2016) in their study on e-learning among students; Bailey et al. (2017) with their findings of mobile payment among USA consumers, and Li et al. (2019) on the determinants of cloud service transformation intentions within SMEs. In short, Al-Rahmi et al. (2021) and AlYoussef, (2020) debated that perceived usefulness was a strong determinant for several studies on mobile technology usage.

Nevertheless, Agarwal and Prasad (1999), Al-Ammary et al. (2014), Al-Gahtani and King (1999), Burton-Jones and Hubona (2006), Y. Chen et al. (2013), Clegg et al. (1997), Davis (1989), Hackman and Oldham (1975), Igbaria et al. (1995), Igbaria and Zinatelli (1997), O'Brien (2002), and Y. Park et al. (2012) concluded that all external factors, for instance, demographics, level of education, system characteristics, the role of technology, tenure in the workforce, prior and similar experience, participation in training, personality traits, user involvement, task characteristics, internal/external computing support, internal/external training, and management support are anticipated to influence usage intention and system usage through ease of use and usefulness. Likewise, in a study on KMS preadoption stage by Xu and Quaddus (2009), it was revealed that external stimuli comprising a variety of aspects ranging from individual differences, organizational, task complexity, and organic matters will affect KMS adoption in an indirect manner through their effects being mediated by perceived benefits (i.e., perceived usefulness) of KMS. In short, perceived system benefits not only capture users' feelings or beliefs (J. H. Wu & Wang, 2006) but might also capture part of the impact of the external variables on usage intention.

Other areas of study, such as a financial information system in an Indonesian university by Martono et al. (2020), an electronic record management system in Yemen's oil and gas industry (Hawash et al., 2021), and a personalized location-based mobile tourism application (C.-C. Chen & Tsai, 2019), showed that system quality had an indirect effect on users' intentions through perceived usefulness. Likewise, the perceived usefulness of a branded sports mobile app mediates the influence of the app's quality and also its content or information on its usage intention among participants from several fitness centers and sports parks in Korea (Won et al., 2022). Hence, it is desirable to use such a construct as the mediating variable in predicting MKMS usage intention. With this elaborated discussion, the following hypotheses are formulated:

> **Hypothesis 6**: Perceived MKMS benefits have a positive relationship on usage intention of MKMS.
>
> **Hypothesis 7a**: The effect of strategic leadership on usage intention of MKMS is mediated by the perceived benefits of MKMS.
>
> **Hypothesis 7b**: The effect of employee training on usage intention of MKMS is mediated by the perceived benefits of MKMS.
>
> **Hypothesis 7c**: The effect of system quality on usage intention of MKMS is mediated by the perceived benefits of MKMS.

Hypothesis 7d: The effect of information quality on usage intention of MKMS is mediated by the perceived benefits of MKMS.

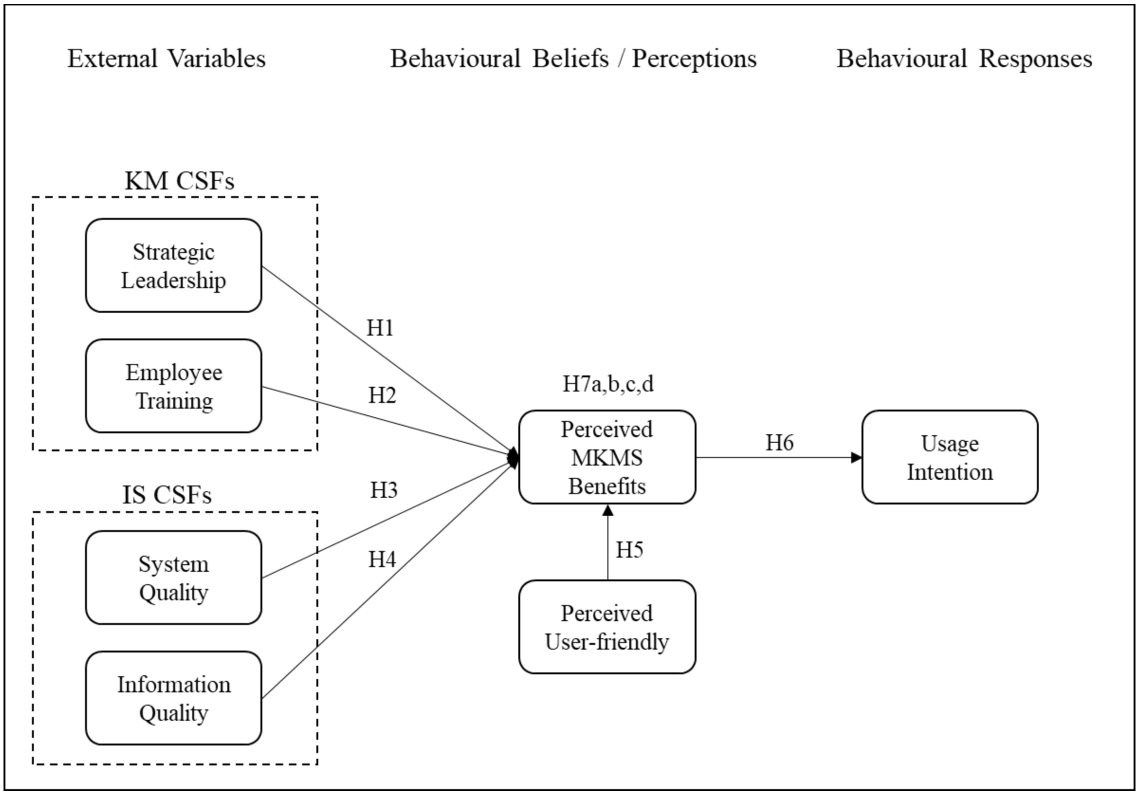


Figure 1. Research model

RESEARCH METHODOLOGY

This study integrates the two models, which are TAM and ISSM, to congregate the objectives of the study. Variables were constructed to empirically test the hypotheses developed in this study. A quantitative method was employed for this study which focused on a structured questionnaire approach as the basic research instrument. The questionnaire was reviewed by four academicians from two separate universities and later pre-tested by eleven senior engineers from a selected semiconductor company. Based on the feedback, the questionnaire went through a minor change. The revised questionnaire is divided into two major parts. The first part captured the respondents' demographic profiles while the second part had questions that were related to each variable found in the research model. A five-point Likert scale was employed to measure all the questions. The scale ranged from '1' to '5' with '1' representing 'strongly disagree' to '5' being 'strongly agree'. The survey items were adapted from previous studies in the related areas of KMS and mobile technology. Furthermore, all the selected items were revised to ensure their consistency and relevancy in the context of KMS via mobile technology. Table 1 illustrates the sources of the extraction and modification for the questions to be adapted to the KMS context from a mobile perspective.

The targeted population refers to the semiconductor companies in Malaysia as semiconductor companies like Infineon and Intel have already embarked on KM implementation (Curley, 2004). Thus, they possess technological infrastructures that have surpassed that of others as they are well-equipped with mobile technology facilities in terms of mobile solutions, mobile devices, and communication standards. As an initial step, the list of semiconductor companies was identified from the Electronics and Electrical category under the manufacturing section in the Federation of Malaysian Manufacturers (FMM) directory. This list underwent further scrutiny and comparison against another list obtained from the Malaysian Investment Development Authority (MIDA) to verify that the companies identified were truly semiconductors. There were altogether 90 semiconductor companies in Malaysia. The next step was to contact all these organizations to determine whether they were using KMS. Once confirmed, these KMS users were briefed on the purpose of the study and were invited to be willing participants in the survey. Out of 90, only 15 companies willingly agreed. Next, they were asked to provide an estimation of the engineer population in their respective organizations. No listing of engineers' names was obtained. Finally, only 2% of the engineer population from each organization participated in the self-administered questionnaires. Thus, for the purpose of this study, engineers who were working in semiconductor companies were selected to be the unit of analysis. These subjects were chosen due to their job scope which was mobility in nature – they were often mobile within their premises and outside the premises too. Considering the aforesaid context, this study utilized a non-probability purposive sampling.

Within four months, 630 self-administered questionnaires were used to collect data from the respondents of this study. At the end of the data collection phase, only 375 valid data out of 470 questionnaires were obtained and analyzed, at a response rate of 59.52%.

Table 1. Sources of measurement items

Constructs	Measurement items	Number of items*	Source/adapted from
Strategic Leadership	SL1, SL2, SL3, SL4, SL5, SL6, SL7, SL8	8 (8)	Gold et al. (2001); Hung et al. (2005)
Employee Training	ET1, ET2, ET3, ET4, ET5	5 (5)	Hung et al. (2005)
System Quality	SQ2, SQ3, SQ4	3 (4)	J. H. Wu & Wang (2006)
Information Quality	IQ1, IQ2, IQ3, IQ4, IQ5, IQ6, IQ7	7 (7)	J. H. Wu & Wang (2006)
Perceived MKMS Benefits	PB1, PB2, PB3, PB4, PB5, PB6	6 (6)	J. H. Wu & Wang (2006)
Perceived User-friendly	PF1, PF2	2 (2)	Xu & Quaddus (2012)
Usage Intention	IN1, IN2, IN3, IN4, IN5	5 (5)	Wixom & Todd (2005)

* Final number of items (Original number of items)

ANALYSIS AND RESULTS

The structural equation modeling with partial least square (PLS-SEM) using SmartPLS version 3.0 was employed to analyze the data. In addition, a two-phase analytical process was performed: (1) testing the measurement model to check on reliability and validity, and (2) examining the structural model to test the relationship between the variables. Further investigation on the significant levels for path coefficients and factor loadings was performed using bootstrapping analysis with a resample of 5000 (Chin, 1998; Ramayah et al., 2018).

MEASUREMENT MODEL ASSESSMENT

The convergent validity is ascertained via measuring the factor loadings, average variance extracted (AVE), and also composite reliability (CR). Table 2 depicts that all factor loadings meet the threshold value of 0.708 or higher (Hair et al., 2017), the AVE value for every construct was larger than the proposed value of 0.50 (Hair et al., 2017), and composite reliability coefficients were above the recommended value of 0.70 (Fornell & Larcker, 1981).

Next, the Heterotrait-Monotrait (HTMT) ratio of correlations, also known as multitrait and multimethod matrix, is utilized to determine the discriminant validity (Henseler et al., 2015). HTMT is able to achieve greater specificity and sensitivity rates contrasted with cross-loadings and the Fornell-

Larcker criterion when testing for discriminant validity (Ramayah et al., 2018). Table 3 demonstrates that all the values meet the criterion of $HTMT_{.90}$ which were below 0.90. This infers that discriminant validity has been verified. Furthermore, HTMT inference results demonstrated that the confidence interval at 90% did not exhibit a value of 1 on any of the constructs, hence further verifying the existence of discriminant validity between the constructs. To enhance discriminant validity, item SQ1 from the System Quality construct is removed.

Table 2. Convergent validity

Construct/Item	Loading	AVE	CR
Employee Training		0.640	0.898
ET1	0.839		
ET2	0.805		
ET3	0.870		
ET4	0.722		
ET5	0.752		
Information Quality		0.701	0.942
IQ1	0.837		
IQ2	0.850		
IQ3	0.836		
IQ4	0.870		
IQ5	0.852		
IQ6	0.815		
IQ7	0.796		
Perceived MKMS Benefits		0.714	0.938
PB1	0.851		
PB2	0.848		
PB3	0.861		
PB4	0.824		
PB5	0.851		
PB6	0.834		
Perceived User-Friendly		0.912	0.954
PF1	0.949		
PF2	0.960		
Strategic Leadership		0.670	0.942
SL1	0.774		
SL2	0.827		
SL3	0.817		
SL4	0.821		
SL5	0.841		
SL6	0.851		
SL7	0.837		
SL8	0.785		

Construct/Item	Loading	AVE	CR
System Quality		0.803	0.924
SQ2	0.907		
SQ3	0.888		
SQ4	0.893		
Usage Intention		0.718	0.927
IN1	0.845		
IN2	0.885		
IN3	0.834		
IN4	0.842		
IN5	0.831		

Table 3. Heterotrait-Monotrait (HTMT)

	Employee Training	Information Quality	Perceived MKMS Benefits	Perceived User-Friendly	Strategic Leadership	System Quality	Usage Intention
Employee Training							
Information Quality	0.282 CI.90 (0.182, 0.389)						
Perceived MKMS Benefits	0.385 CL.90 (0.292, 0.475)	0.684 CL.90 (0.616, 0.751)					
Perceived User-Friendly	0.192 CL.90 (0.094, 0.309)	0.647 CL.90 (0.560, 0.714)	0.501 CL.90 (0.398, 0.591)				
Strategic Leadership	0.621 CL.90 (0.544, 0.695)	0.172 CL.90 (0.087, 0.278)	0.196 CL.90 (0.108, 0.292)	0.167 CL.90 (0.078, 0.272)			
System Quality	0.253 CL.90 (0.151, 0.376)	0.809 CL.90 (0.754, 0.856)	0.606 CL.90 (0.514, 0.690)	0.875 CL.90 (0.825, 0.913)	0.163 CL.90 (0.071, 0.276)		
Usage Intention	0.357 CL.90 (0.263,0.453)	0.424 CL.90 (0.332, 0.502)	0.561 CL.90 (0.466, 0.649)	0.366 CL.90 (0.265, 0.455)	0.338 CL.90 (0.236, 0.447)	0.419 CL.90 (0.325, 0.510)	

Structural Model Assessment

The results of the hypotheses testing are presented in Table 4 and Figure 2. It is indicated in Table 4 that the R^2 value for Perceived MKMS Benefits was 0.451 which signified that 45.1% of the variance in Perceived MKMS Benefits is explained by strategic leadership, employee training, system quality, information quality, and perceived user-friendliness. The Perceived MKMS Benefits construct, in turn, impacted the rate of 26.7% of the variance in the usage intention based on the R^2 value of 0.267. Both of the R^2 values were higher than 0.26 which is the threshold acclaimed by J. Cohen (1988) that signifies the model is substantial. Results from the evaluation of the hypotheses (H1 to H6) revealed that only three relationships are found to have t-values that were greater than 1.645 at the one-tailed test, hence, significant at the significance level of 0.05. From the three relationships, construct Employee Training and Information Quality are found to significantly influence Perceived MKMS Benefits whereas Perceived MKMS Benefits influenced Usage Intention. It is observed that Information Quality is a more significant predictor of Perceived MKMS Benefits as compared to Employee Training. Therefore, H2, H4, and H6 are supported, whereas H1, H3, and H5 are not supported.

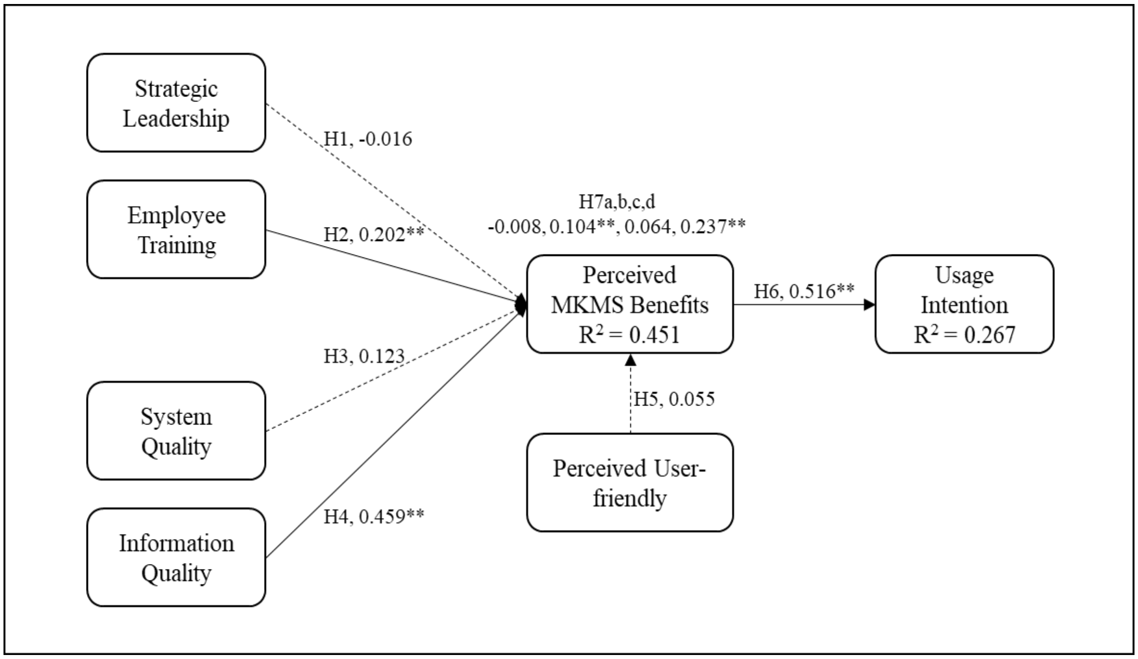
In an attempt to test the mediation effect, Preacher and Hayes' (2004, 2008) mediation analysis method which is known as 'bootstrapping the indirect effect' was utilized. Table 4 depicts that Perceived MKMS Benefits mediates only the relationship between Employee Training (β=0.104, t=0.028, p<0.01), Information System (β=0.237, t=6.052, p<0.01), and Usage Intention. The results were further confirmed by the confidence interval bias corrected (CIBC) test. The indirect effects at

95% CIBC for the two discovered indirect effects are Employee Training (0.053, 0.160) and Information Quality (0.167, 0.318). Hence, only H7b and H7d are supported for the mediation analysis results.

Table 4. Results of structural model assessment (hypotheses testing)

Hypothesis	Relationship	Std. Beta	Std. Error	t-value	CIBC LL	CIBC UL	Decision	R^2
H1	Strategic Leadership → Perceived MKMS Benefits	-0.016	0.054	0.299	NA	NA	Not Supported	0.451
H2	Employee Training → Perceived MKMS Benefits	0.202	0.054	3.714**	NA	NA	Supported	
H3	System Quality → Perceived MKMS Benefits	0.123	0.084	1.468	NA	NA	Not Supported	
H4	Information Quality → Perceived MKMS Benefits	0.459	0.058	7.861**	NA	NA	Supported	
H5	Perceived user-friendly → Perceived MKMS Benefits	0.055	0.066	0.843	NA	NA	Not Supported	
H6	Perceived MKMS Benefits → Usage Intention	0.516	0.051	10.063**	NA	NA	Supported	0.267
H7a	Strategic Leadership → Perceived MKMS Benefits → Usage Intention	-0.008	0.026	0.317	-0.061	0.038	Not Supported	
H7b	Employee Training → Perceived MKMS Benefits → Usage Intention	0.104	0.028	3.762**	0.053	0.160	Supported	
H7c	System Quality → Perceived MKMS Benefits → Usage Intention	0.064	0.044	1.448	-0.018	0.153	Not Supported	
H7d	Information Quality → Perceived MKMS Benefits → Usage Intention	0.237	0.039	6.052**	0.167	0.318	Supported	

**$p<0.01$, CIBC=Confidence Interval Bias Corrected, LL=Lower Level at 2.5%, UL=Upper Level at 97.5%



Note: **p<0.01, Solid lines indicate significant indirect effects.

Figure 2. Results of the structural model

DISCUSSION OF FINDINGS

STRATEGIC LEADERSHIP

From the results, strategic leadership was not significantly related to perceived MKMS benefits. Along the same line, Xu and Quaddus (2012) found that management support did not influence the perceived usefulness of KMS, although prior studies had discovered it to be significant in other technology adoption or diffusion studies. The discovery was made when they conducted a study in Western Australia to test the model that they had developed in 2005 from a qualitative study by interviewing key personnel from six different organizations. In another study to evaluate end-user computing (EUC) acceptance, management support was also found not to have any impact on perceived usefulness (Y.-L. Wu et al., 2007). Correspondingly, Schepers et al. (2005) examined two types of leadership qualities, which are transactional and transformational, as predictors of the perceived usefulness of recent technologies. Their study revealed that the correlation between transformational leadership and perceived usefulness was significant but transactional leadership quality did not exhibit a substantial relationship with perceived usefulness. This concludes that a transformational leadership style that challenges employees to be more innovative and exploratory would have a more positive impact on the perceived usefulness of a technology. On the other hand, transactional leadership quality that often highlights the usefulness of technology, in terms of establishing goals and aspirations, would possibly not be very useful in encouraging the usage of technology. The conclusion is that the impact of strategic leadership on perceived usefulness might be dependent on the type of leadership style adopted or practiced by managers in organizations. In other words, the leadership styles of top management are likely to influence the perceptions and attitudes of organizational employees towards how the systems might be beneficial in their daily work tasks.

Employee Training

Based on the results, employee training had a significant and positive relationship with perceived MKMS benefits. Equally, in other systems such as enterprise resource planning (ERP) study, the findings revealed that good and effective training programs had a significantly positive effect on the perceived usefulness of system usage in organizations. These results are consistent with past findings (Bradley, 2008; Lee et al., 2010; Rajan & Baral, 2015; Ruivo et al., 2014; Youngberg et al., 2009). In this study, it is discovered that employee training was not the most significant predictor of Perceived MKMS Benefits as compared to Information Quality. This is in line with another empirical study on factors of ERP system usage, in which the training construct was found to be positively and significantly related to perceived usefulness, but it was the weakest predictor compared to the rest (Costa, 2016). Notwithstanding, training enables employees to interact and assess varieties of implications and effects of MKMS when applied to their daily tasks and on business processes as a whole. Training also allows employees to experience the various ways MKMS fits in with the current and future enterprise system usage. Besides, it helps to improve employees' ability to use the system to complete a particular task or job and with that, it is more likely to be effective in gaining user acceptance of MKMS. In addendum, training programs boost the employees' confidence and proficiency to use the systems. It also assists in raising awareness of the usefulness that can be perceived from the use of information technologies. As such, training has an effect on employees' beliefs about the usefulness of systems (Gist, 1987), thus, minimizing employees' anxieties and eradicating adverse impressions about the system.

System Quality

It is somewhat disappointing to discover that system quality did not have any impact on perceived MKMS as compared to the encouraging outcomes from previous literature. This finding is in line with the study on the assessment of KMS success, conducted among companies in Taiwan (J. H. Wu & Wang, 2006). The researchers debated that an excellent system in terms of reliability, compatibility, and adaptability with an acceptable response time does not necessarily mean that it would bring advantages to the users. It simply indicates that the MKMS is operating satisfactorily. Moreover, users may believe that the usefulness of MKMS has more to do with whether or not it can provide valuable information such as an updated, relevant, complete knowledge portal, and accurate directory of an organization's experts (i.e., information quality). As such, this justifies why system quality has no significant positive effect on perceived MKMS benefits as compared to Information Quality. Similar outcomes are discovered in Gambian's perception of the benefits of its e-government services (F. Lin et al., 2011) and the Philippines' e-tax filing (J. V. Chen et al., 2015). Hence, this indicates that there is no correlation between system quality and the perceived usefulness of the system concerned. Research on the intention to use a digital museum of sports literature among students studying in university, college, and junior college in Taiwan also yielded similar results, i.e., system quality has no significant effect on perceived usefulness (M.-C. Wu, 2013).

Information Quality

The purpose of the MKMS is to manage and distribute organizational information conveniently to all employees regardless of time and place, and ultimately assert the value of the information itself. Hence, it is essential for users to obtain and make the most of the information generated through the MKMS. The users' perception of usefulness thus relies on the quality of the content and output of the MKMS contrasted to the system performance and its functions or operations. This leads to the perception that users believe that sufficient and comprehensive information provided is beneficial and helpful but not to the degree of providing a system's ease of use. This brings to the discovery that information quality is positively and significantly related to perceived MKMS benefits. The outcomes were significantly corroborated and aligned with past studies (Lee et al., 2010; Shih, 2011;

Sohn, 2017; M.-C. Wu, 2013; J. H. Wu & Wang, 2006). The results of the relationship between Perceived Usefulness and Information Quality contrasted with System Quality, as in the context of e-government services in Gambia and the Philippines. Both studies show that there was a significant relationship between information quality and perceived usefulness (J. V. Chen et al., 2015; F. Lin et al., 2011). Better information quality enriches individuals' performance (Borek et al., 2014) in their usage of the electronic filing and payment system. Moreover, it improves the delivery of government services (Cegarra-Navarro et al., 2012; Hsieh et al., 2013). These imply that quality information obtained from governments significantly influences the usefulness of the system in the context of improving one's performance and also the service delivery.

Perceived User-friendly

Perceived user-friendly does not influence the perception of the benefits of MKMS. This discovery contrasts with previous research that identified the relationships to be substantial in the context of other technology acceptance findings. There are a few possibilities for this outcome. First, from the respondents' demographic profile, 61.6% of the respondents were those aged below 35 years old, known as millennials. The millennials or Generation Y were those that grew up during the Internet era and are very well-versed with the usage of the Internet, social media, and mobile devices. As a result, they could definitely operate any applications from their mobile devices without any difficulty. This means that they could easily and effortlessly migrate from using desktops or laptops in their routine work to mobile devices to access KMS such as Enterprise Information Portal Integration (e.g., SAP), Instant Communication (e.g., WebEx), Personal Information Management Integration (e.g., Microsoft Outlook), and other KMS tools. From a logical perspective, users or engineers would find MKMS beneficial for them if the system is adequately innovative and could enhance their overall work-life quality instead of solely being user-friendly (i.e., easy to learn and use) only. The outcome of this study supports the results of KMS adoption and diffusion among the companies in Australia by Xu and Quaddus (2012) as well as a study done in Azerbaijan based on university students' adoption of the online learning system (Chang et al., 2017).

Perceived MKMS Benefits (Mediator)

In this research, employees' Perceived MKMS Benefits have mediated the relationship between Employee Training and Usage Intention of MKMS along with Information Quality and Usage Intention. This relationship signifies that a portion of the effect of Employee Training and Information Quality on Usage Intention of MKMS is captured by Perceived MKMS Benefits. Hence, the Perceived MKMS Benefits among employees are considered a crucial factor in the attempt for organizations to increase the rate of intention to use MKMS and ultimately actual usage. This would suggest that semiconductor companies should focus on raising the awareness of MKMS Benefits among their employees to promote higher rates of usage intention. Moreover, semiconductor companies should conduct more frequent training on MKMS or arrange KM-related workshops for their employees. This move would ensure that they would be able to visualize the capabilities of MKMS in enabling them to accomplish tasks more efficiently. Besides, employees who know the potential of MKMS in providing quality information would then understand and appreciate the usefulness of MKMS in generating good information. This could be used to enhance job-related tasks that require information as input for decision-making. In short, the two identified critical success factors that have the highest effect on Perceived MKMS Benefits will eventually affect the employees' intention to use MKMS.

It was anticipated that Strategic Leadership would have a direct impact on Perceived MKMS Benefits and an indirect impact on Usage Intention, but the study has failed to prove the relationship. This could be because the construct's predictive capability was disconcerted. It could have occurred as three out of eight items used to measure Strategic Leadership were related to leadership styles known as transactional leadership which focused on setting targets and objectives (Schepers et al., 2005) that demand the usage of a technology. Thus, there is a possibility that these items might not be very effective in encouraging the usage intention of MKMS. System Quality was also anticipated to directly affect Perceived MKMS Benefits and indirectly on Usage Intention. However, the results proved otherwise as it is presumed that the knowledge management systems via a mobile platform are considerably stable, responsive, and flexible, so users face comparatively fewer difficulties while using it. Besides, the MKMS is easy to use, and its interface is easy to understand, making users acknowledge the system's user-friendliness instead of its usefulness or benefits. Therefore, the relationship between Strategic Leadership and System Quality on Usage Intention is not mediated by Perceived MKMS Benefits

Theoretical Implications

The outcomes of this study contribute toward the body of knowledge in the areas of mobile technology acceptance, IS success literature, and also knowledge management. With these, other researchers would be able to conduct more interdisciplinary studies to better understand the relevant issues concerning dissimilar fields. The results show that the mediation assumption of TAM via Perceived Usefulness is overstated. In fact, the mediation effect relies on the nature of external variables and IT/IS being considered. Subsequently, this study has helped to validate the new external variables (i.e., two IS success factors and two KM success factors) in this newly integrated framework. Although MKMS is seen as a technical system for which system and information quality were important technological attributes to consider, it was also a social system in which the user/individual and organizational (i.e., the KM CSFs) aspects were equally important factors that would determine usage intention of the system. In other words, the two IS success factors (i.e., system and information quality) and the two KM success factors (i.e., strategic leadership and employee training) can be considered socio-technical factors which contribute to the future study of socio-technical theory.

Practical Implications

The facts unearthed in this study are specifically crucial for managers who deal with KMS in mobile contexts. Top management of the semiconductor companies should diligently start developing a strategy as their support alone does not assure a positive influence on the perceived benefits of MKMS. They must scrutinize other determinants such as training that is more beneficial to encourage engineers to use MKMS. Management could give frequent and continuous training to instill confidence in the engineers to lead them to use MKMS. With premature exposure, it can increase acceptance and minimize the anxiety of using MKMS. Furthermore, training could inculcate knowledge and familiarity with MKMS values. It is exhibited in the results (Table 4) that engineers believe MKMS is beneficial from the significant relationship between Perceived Benefits and Usage Intention. Since Perceived Benefits play an important role in influencing intention to use MKMS, the advantages of MKMS should be regularly conveyed to engineers through effective training. This study can also aid MKMS developers and mobile device producers to acknowledge and assess the comparative effects of systems and information quality through mobile devices based on an engineer's standpoint. Since the results of this study indicate that information quality is more important than system quality, information quality (in terms of currency, consistency, format, relevancy, completeness, and accuracy) must be constantly enhanced and monitored as it evolves. This is to ensure that a system's effectiveness can be further improved which, in turn, will affect the Perceived MKMS Benefits towards MKMS Usage Intention.

Conclusions/Limitations and Future Research

The objective of this study was to uncover the relationship between critical success factors, Perceived MKMS Benefits, and usage intention of MKMS in the Malaysian semiconductor industry. Thus, an integrated model of TAM and ISSM was utilized. Two aspects of TAM were investigated which were the external variables (i.e., strategic leadership, employee training, system quality, and information quality) and the mediation effect of perceived usefulness (i.e., Perceived MKMS Benefits) which had received less attention. The results demonstrated the importance of Perceived MKMS Benefits as a mediator between the critical success factors and usage intention of MKMS. Amid the significance of Employee Training and Information Quality via the awareness of Perceived MKMS Benefits, it will provide a practical insight into the behavior of engineers that will facilitate management in the semiconductor industry to take the necessary actions to promote the awareness of Perceived MKMS Benefits. Initially, management had the perception that with their existing strategy and support, engineers will use the MKMS, but the results proved otherwise. Overall, the discoveries of the study can steer the management to revise their strategies, and leadership styles and look into other determinants that can elevate the usage intention of MKMS by implementing awareness programs that stress the importance of MKMS Benefits.

There are a few limitations in this study as not all the external variables that comprised KM and IS critical factors were fully tested. Moreover, another equally important TAM user belief construct besides Perceived Usefulness is Perceived Ease of Use which was not tested as a mediator in this study. Future studies could perhaps include other critical factors from both KM (e.g., organizational culture, employee involvement, organizational infrastructure, motivational aids, and performance measurement) and IS (e.g., service quality) as part of the external variables. In addition, Perceived Ease of Use should be tested as a mediator in the future, together with Perceived Usefulness to compare which one is a more powerful predictor of usage intention. Besides, it would be noteworthy to find out how the research framework would fit into other industries so that the findings can be verified for better accuracy and generalizability across the organizations in Malaysia.

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AUTHORS

Audrey Poh Choo Cheak is a lecturer at the Faculty of Business, Multimedia University, Malaysia. She is currently pursuing her PhD in the area of knowledge management in mobile context. Her areas of interests include knowledge management, technology management and mobile/Information systems.

Chin Wei Chong is an Associate Professor in the Faculty of Management at Multimedia University, Malaysia. She received her PhD from Multimedia University. Her publications have appeared in various international refereed journals, conference proceedings and book chapters. Her research interests include knowledge management, knowledge sharing, inter-organizational knowledge transfer, people management and behavior issues.

Yee Yen Yuen is a senior lecturer at the Faculty of Business, Multimedia University, Malaysia. His research interests are on knowledge management, information systems, usability studies, cross-cultural studies, disability studies and inclusive society. He has several well referred journal and conference publications on these topics. He also receives several local and international, government and private research grants and is actively supervising Master's and PhD students on these areas.

Irene Yoke Chu Leong is an Associate Professor at the Academy of Language Studies in University Technology MARA, Melaka, Malaysia. She graduated with a B.A (Hons) degree in English Studies from Universiti Kebangsaan Malaysia in 1986 and in 1994, she obtained a Master's degree from the University of N. Iowa, USA majoring in Computer Assisted Instruction (CAI). She earned her PhD in Computer Assisted Language Learning (CALL) from University Putra Malaysia in 2006 and since then, has actively presented and published research papers on Language teaching and learning. She is also actively engaged in collaborating with researchers from other disciplines and universities to expand her field of knowledge and interests.