KNOWLEDGE MANAGEMENT SYSTEMS IN HIGHER EDUCATION INSTITUTIONS IN THAILAND: A HOLISTIC MODEL OF ENABLERS, PROCESSES, AND OUTCOMES

A Dissertation

by

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ABSTRACT

Higher education institutions (HEIs) have applied knowledge management (KM) to leverage organizational knowledge in support of their institutional achievements. HEIs need a holistic conceptualization of how KM processes dynamically interact with KM enablers and outcomes, but seem to typically lack an inclusive KM model. This research study aimed to develop and test a correlational model linking KM key enablers and processes to quality performance of HEIs.

Data were collected using an online survey of 142 universities in Thailand with archival data. A key informant method was used with KM committee members serving as respondents. The 181 respondents from 60 universities voluntarily participated in the e-survey. After deleting inadmissible cases, 150 respondents were used as true response cases.

The exploratory factor analysis (EFA) constructed six scales describing KM enablers and processes: Technology, Strategic Context, Culture, Leadership with a Directive Role, Knowledge Transfer, and Knowledge Generation. Then, confirmatory factor analysis (CFA) with structural equation modeling (SEM) showed that the hypothesized model with seven factors (six EFA scales and quality performance score) was acceptable based on the following fit indices ($\chi^2 = 1581.515$, df = 845, $p < .001$; CFI = .809; TLI = .795; RMSEA = .083, 90% CI: .077 – .089; SRMR = .065). This hypothesized model adequately represented the actual data set. The thematic analyses from open ended questions provided emerging themes to support the hypothesized

model that focuses on human-oriented enablers, including leadership, individual attitudes, and levels of KM understanding.

This study revealed that knowledge becomes a process of individuals' insights, experiences, know-how, and values that are to be justified through social interactions among participants to make knowledge actionable and embedded in institutions' repositories and routines. Since knowledge requires dynamic management within each institution's system, KM provides the activity of creating and sharing knowledge across the whole system. HEIs require a dedicated position for KM oversight and need to find a way to enable members to participate in social interaction processes that make knowledge flow fluently throughout their institutions. With a well-organized KM system that consists of enablers, processes, and outcomes drawn from this study, KM will keep on track and stimulate individual, group, and organizational knowledge development and retention.

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CHAPTER I

INTRODUCTION

Most organizations recognize knowledge as a major resource to obtain and sustain competitive advantage. Knowledge has become an organizational asset that increases an organization's productive and adaptive capabilities (Marquardt, 2011). This organizational asset increases members' abilities to improve products, services, and changes in organizations' systems and processes. Knowledge helps to stimulate ideas and actions that result in performance improvement and innovation development.

Knowledge has resided in individuals during doing their jobs over the years. Knowledge in individuals helps their organizations keep their businesses intact because employees know product lines, operations, and customers; knowledge of all three assist a business in achieving its goals (Leonard & Walter, 2005). When individuals leave, organizations will lose not only their labor force but also their knowledge asset that evolved for the workplace. This knowledge asset— an intangible organizational resource in a form of individuals' insights and experiences— is not easy to develop overnight. Many organizations strive to retain their knowledge sustainably.

Knowledge management (KM) becomes a management approach to create knowledge value built in organizational members' mindsets (Leonard & Walter, 2005; Nonaka & Takeuchi, 2004). Individuals are a foundation unit in working with knowledge (O'Dell & Hubert, 2011). KM encourages a management strategy of "getting the right knowledge to the right people, in the right place, at the right time" (NHS

National Library for Health, 2005, p.2) and then ensuring people share and transfer their knowledge into action to improve their work performance. The primary goal of managing knowledge is to capture knowledge that serves the needs of employees and the organization's strategic goals (O'Dell & Hubert, 2011).

Previous studies indicated that, like other business organizations, higher education institutions (HEIs) can apply the KM approach to support their performance achievements (Kidwell, Vander Linde, & Johnson, 2000; Ramachandran, Chong, & Wong, 2013). HEIs can apply KM to support their missions by aiming at increasing knowledge-based activities in line with their institutional achievements, particularly the improvement of quality performance.

KM plays a significant role in quality performance in educational institutions. The famous international quality award, the Malcolm Baldrige National Quality Award (MBNQA), sets the KM category as one of the seven criteria for the Education Criterion Performance Excellence to examine educational organization performance (National Institute of Standards and Technology [NIST], 2013). This KM category is recognized as "the brain center for the alignment of the organization's operations with its strategic objectives" (NIST, 2011, p.40). KM becomes the practical means that provides a holistic view to measure, analyze, improve, and manage organizational knowledge (NIST, 2011). This holistic view provides valuable knowledge to enhance organizational improvement and competitiveness.

An effective KM model assists HEIs to implement and monitor their KM successfully. The KM model provides self-checks of KM enablers and processes that maximize the HEIs' capabilities to manage their knowledge assets.

Statement of the Problem

Over the past decade, KM has taken place in various settings, including businesses, service sectors, and academic sectors. However, few studies have explored KM in academic institutions (Ramachandran et al., 2013). HEIs are difficult because of the lack of an inclusive KM application. Firstly, researchers have been studying various KM enablers and processes. Heisig (2009) and Lehner and Haas (2010) conducted the latest two KM meta-analysis studies in business. Although these meta-analysis studies provide a cohesive and comprehensive list of KM enablers and processes, they have a limited basis of making inferences to the higher education context. Currently, not many KM research studies, especially research with large samples of academic institutions, have explored the unified KM processes and key success factors in higher education (Ramachandran et al., 2013).

Secondly, based on an extensive search of previous publications during 2001-2014 in Academic Search Complete (Ebsco) and ProQuest, Sunalai and Beyerlein (in press) found 22 publications that studied the KM application in the higher education arena. Eighteen publications described outcomes of KM in higher education performance. Most of these research studies used indirect measures to assess organizational performance. They used rating-scale surveys to ask respondents' opinions about their institutions' performance. These indirect data were used regardless of actual

evidence (Jupp, 2006) that could come in the form of a direct measure. Generally, various direct measures include scores from a performance management tool, such as Balanced Scorecard (Rašula, Bosilj Vukšić, & Indihar Štemberger, 2012), and performance scores assessed by an accrediting agency (Watcharadamrongkun, 2012). Out of 18 outcome studies, only one study (Watcharadamrongkun, 2012) used the direct measure of accreditation scores as the representative of KM outcomes.

Finally, HEIs need a holistic conceptualization of how KM processes dynamically interact with KM enablers and outcomes. During the past decade, only seven KM research studies in HEIs investigated the relationships of three KM themes— enablers, processes, and outcomes (Sunalai & Beyerlein, in press). For example, the most current study by Tan and Noor (2013) proposed a KM–knowledge sharing–collaboration research model. They also examined KM enablers, including individual, organizational, technological, and communication influences. Although they studied the relationship of the three KM themes, their study explored only one organizational performance aspect— collaboration research, which is a single angle of the multiple aspects of HEIs' missions. In addition, another study by Watcharadamrongkun (2012) examined the institution-wide performance represented by rating and accrediting scores; however, the KM enablers used in her study were limited to two organizational interfaces— structure and IT resources. These previous studies have a research gap in the completeness of the studied variables.

The overall state of KM— enablers, processes, and outcomes— is not inclusive in the higher education context. HEIs need empirical evidence to guide decisions for

better management of KM. The empirical research study helps explore whether or not and how KM influences HEIs' performance. This study leads to an understanding of the effect of KM enablers and KM processes on organizational performance in the context of academic institutions.

Purpose of the Study

The purpose of this study was to develop and test a correlational model linking KM enablers and processes on quality performance of HEIs. The outcomes of this study were twofold: (a) to support the process of HEIs acquiring an inclusive tool to measure and monitor their KM enablers and processes; and (b) to describe and empirically support the theoretical construct of how knowledge is dynamically managed within these institutions.

Conceptual Framework

The assumption of this study was that KM enablers affect KM processes that then contribute to effective organizational performance. This assumption was guided by three theories: knowledge creation, organizational epistemology, and contingency. These three theories focus on two aspects of inquiries: (a) the creation of knowledge at the individual, group, and organizational levels; and (b) the connectionist approach as a foundation of organizations' systems.

Knowledge Creation Theory

The knowledge creation theory aims to understand how knowledge is dynamically created within an organization (Nonaka & Takeuchi, 2004). This theory relies on an assumption that knowledge is created through social interactions between

tacit and explicit knowledge. Tacit knowledge has a cognitive dimension, such as mental models and conceptual frameworks (Nonaka, 1991). It can be described as experiences, know-how, competencies, or skills. Tacit knowledge is difficult to document. In contrast, explicit knowledge comes in the form of documents, formulas, contracts, process diagrams, and manuals (O'Dell & Hubert, 2011).

Organizational Epistemology Theory

The theory of organizational epistemology provides a theoretical cornerstone for a systematic and organization-wide KM model used in organizations. This theory involves interactions of individualized and socialized organizational knowledge as well as impediments to organizational knowledge (Dalkir, 2005).

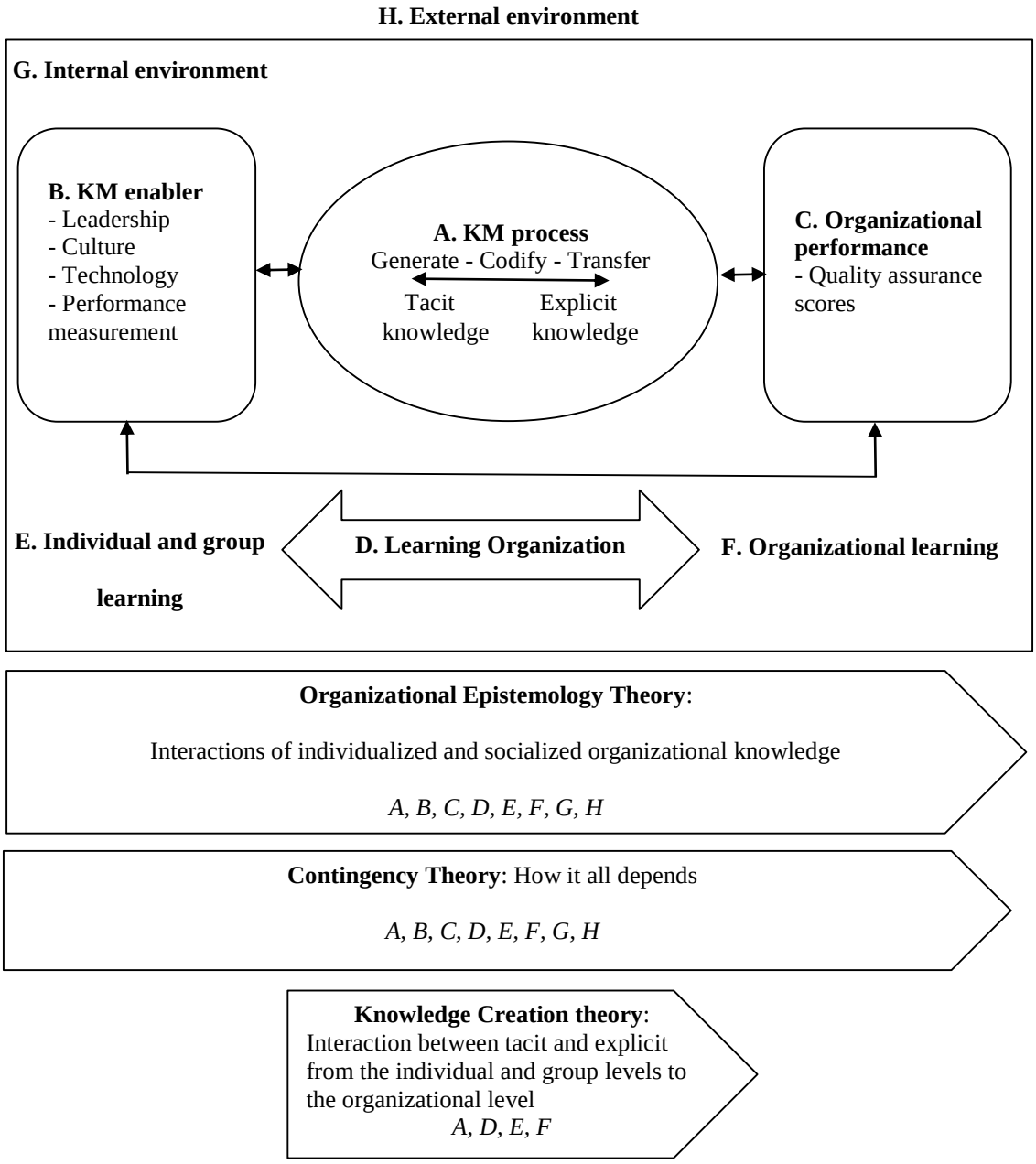
Contingency Theory

The contingency theory is often called the 'it all depends' theory (Burke, 2011). This theory takes the view that the management of an organization depends on environmental contexts of its organization— internal and external environments (Lawrence & Lorsch, 1967).

Development of Conceptual Framework

These aforementioned theories provide the lens to develop the conceptual framework of this study. This conceptual framework (Figure 1), modified from the study of Watcharadamrongkun (2012), shows the linkage of continuity and dynamism between a KM system and organizational performance.

Figure 1. **Conceptual Framework**



The KM system reflects how HEIs perform by using the KM approach to improve their performance. The KM process (A) displays the flow of knowledge in conjunction with tacit and explicit knowledge. Then KM enablers (B) associated with an organization can influence KM processes. These enablers include organizational contingency aspects that involve leadership, culture, technology, and performance measurement. Organizational performance (C), represented by quality performance scores, indicates the effectiveness of the organizational management through managing knowledge.

Proper management of knowledge develops a learning organization (D). HEIs have looked for ways to continuously transform themselves into learning organizations in which their individuals and groups can increase their performance improvement (Marquardt, 2011). A learning organization refers to an organization where members learn collectively and effectively and that transforms itself for better management through the use of knowledge across the organization (Marquardt, 2011). According to Marquardt (2011), learning in organizations can take place at three levels: individual, group, and organizational (E and F). Individuals are the basic unit of groups and organizations. Individual learning includes changes in knowledge, attitudes, and skills acquired through self-study, technology-based instruction, and observation. Group learning refers to an increase in knowledge, attitudes, and skills accomplished by and with groups. Organizational learning represents the enhanced intellectual and productive capacity gained through shared commitment (knowledge, beliefs, or assumptions of members) to the organization.

Although individuals and groups are the agents by which organizational learning occurs, their learning processes are influenced by a set of internal and external environments of their organizations. With this interrelated nature, organizational learning involves the sharing of knowledge, beliefs, or assumptions among individuals and groups.

Internal and external environments (G and H) are included in this framework. Other institutionalized aspects are not included in the KM enablers (B), such as university's missions, policies, sizes, and types, exist in the organization's internal environment. The outside organizational aspects, such as contexts of national culture, Ministry of Education's regulations, communities' requirements, and employers' expectations toward graduates, exist in the organization's external environment. These environmental aspects provide the context for this study. They impact how the HEIs think and act (Marquardt, Berger, & Loan, 2004). The environmental aspects are recognized, but they are not focal points of this investigation.

Significance of the Study

This study was primarily conducted in the field of Human Resource Development (HRD). HRD is defined as "a process for developing and unleashing human expertise through organization development and personnel training and development for the purpose of improving performance" (Swanson & Holton, 2001, p. 4). The purpose of HRD in this study focused on the learning improvement of individuals who contribute their competencies to organizational performance (Yang, 2004). Competencies in employees were primarily developed through learning processes

to improve work performance, which impacted the organization's development. Thus, two major links between KM and HRD were learning and Organization Development (OD). This study viewed learning as a process of creating knowledge in a workplace, while OD was viewed as an improvement at the organization level. The significance of this KM study in higher education within the context of HRD was discussed regarding theory, research, and practice.

Theoretical Significance

This KM study expanded the current scope of HRD theories. First, this study captured how learning at individual, group, and organizational levels contributed to institutions' performance through the creation of knowledge. It described and empirically supported the theoretical construct of how knowledge was dynamically created, shared, and used within these institutions through various learning processes. Therefore, the findings of this study proposed the values of learning in the KM field to extend the boundary of HRD theories.

Second, this study provided empirical content to explain the linkage of continuity and dynamism between three KM elements (enablers, processes, and outcomes). With the organizational lens, these findings contributed to a comprehensive OD approach that involves an interaction of organizational components (i.e., leadership, organizational culture, technology, KM processes, and performance scores).

Research Significance

Concerned with the research significance, this study applied quality assurance scores, one type of performance rating score, to represent the variable for organizational

performance. At present in the academic institution research, there is only one study, by Watcharadamrongkun (2012), related to the KM field that applied the performance rating scores as representative outcomes. This study suggested the application of quality assurance scores as the alternative organizational performance outcome for further OD research studies in other settings.

Practical Significance

The practical significance of this study was twofold. The first practical significance involved individual development. This study may increase an understanding of KM by recognizing institutions' performance as a part of the impact of individual and group learning. The understanding of the KM contribution may help HEIs better plan and implement individual and group learning efforts.

The second practical significance contributed to OD. The nature of KM offers a learning environment that enhances a commitment to lifelong learning in the institutions (Keeley, 2004). In the OD context, KM can shift an organization's learning paradigm to becoming a learning organization (Ramachandran et al., 2013). HEIs can use the proposed model from this study not only for better conducting their KM systems but also for transforming them to a learning organization.

Research Questions and Hypotheses

The research purpose of this study was to develop and test a correlational model linking KM enablers and processes to HEIs' outcomes. The assumption was that KM enablers affect KM processes that contributed to effective organizational performance. Thus, the research model was designed to represent the relationship between KM

enablers and processes and the relationship between KM processes and quality assurance performance scores to measure the impact of KM on organizational performance. This led to a research question as follows:

How do KM enablers and KM processes affect performance of HEIs?

This overarching question was supported by several research hypotheses (see Figure 2). These hypotheses were described more closely in the review of literature. The hypotheses were the following:

H1.1 Organizational culture will correlate positively and significantly with KM processes.

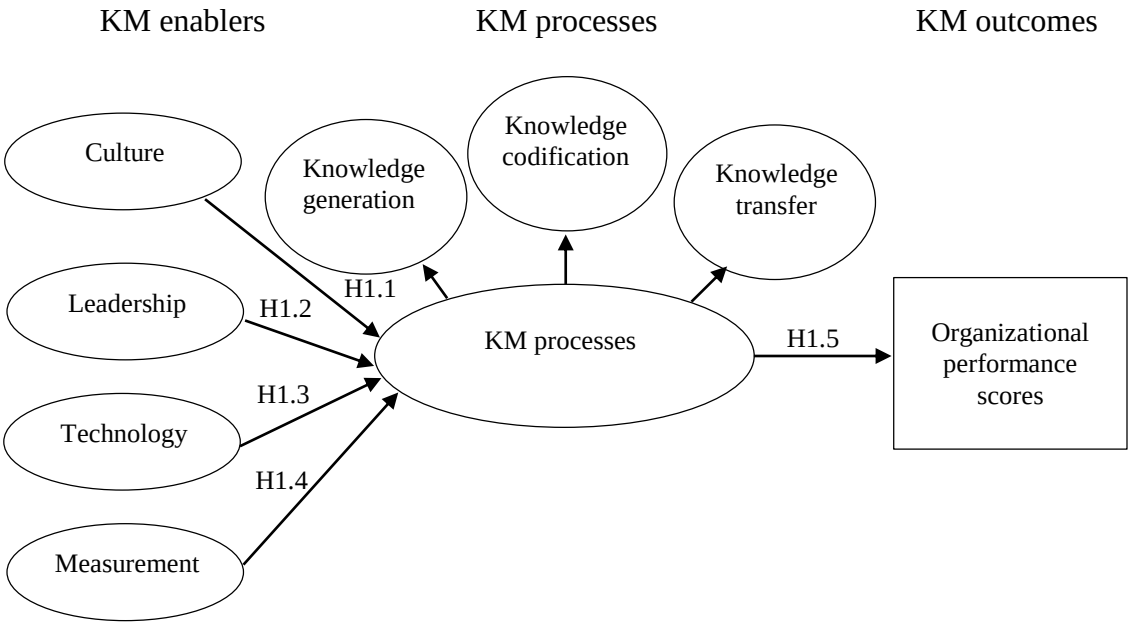
H1.2 Leadership will correlate positively and significantly with KM processes.

H1.3 Technology will correlate positively and significantly with KM processes.

H1.4 Performance measurement will correlate positively and significantly with KM processes.

H1.5 KM processes will correlate positively and significantly with organizational performance scores.

Figure 2. **Research Model**



Methodology and Methods

This study aimed to develop a KM model that could be generalized in the higher education arena. The mixed-method research design fit this research because it combined quantitative and qualitative research approaches. This study used the quantitative approach through statistical analysis to develop a KM correlational model. The quantitative procedures tested the relationships among KM enablers, processes, and outcomes, and develop the KM relationship model. Then this study used the qualitative approach through text analysis from open-ended questionnaire items. These qualitative data assisted in understanding the meaning of context, and a factor influenced and was influenced by the context (Brown, 1989; Guba & Lincoln, 2005). Such understandings produced a deep cause-and-effect interpretation. Thus the qualitative approach helped

develop the proposed KM model more contextually. The research procedures were briefly explained below.

Population and Sample

The population for this study consisted of 142 Thai higher education institutions (Bureau of Standards and Evaluation, 2015). The sample was 60 HEIs that granted the researcher permission to conduct the study. The unit of analysis was a university.

At least one key informant from each university was the targeted respondents to provide information at the organizational unit of analysis by reporting on behalf of their institutions. Key informants in this study were members of the KM committees who were responsible for managing the KM system at the institutional level.

Data Collection

Data came from two resources: a questionnaire survey and an archival source. A questionnaire survey in online version was provided for key informants in each institution. Archival data consisted of the QA performance scores from the Ministry's published database.

The questionnaire included four sections: institutional demographic information, KM enablers, KM processes, and open-ended questions. This study adapted the Knowledge Management Assessment Tool (KMAT), a widely recognized KM tool used in industry across countries, to collect the data for the HEI KM enablers and processes. Open-ended questions was included to ask the respondents to describe the internal factors that significantly support or block successful KM. These data provided both unique and contextual understandings of the state of KM in each university.

The second resource, called archival data, was derived from the QA scores from the academic year 2014 from the Bureau of Standards and Evaluation, the Commission of Higher Education (CHE) in Thailand. This study examined the archival data because these data were publicly available on the Commission's database called the CHE QA online system and they were expected to have better accuracy than the survey responses for QA data. Moreover, the archival data method could reduce the response burden for respondents to providing the QA scores.

Data Analysis

For the quantitative analysis to test a correlational model linking KM enablers and processes on organizational quality performance, this study used descriptive statistics, path analysis, exploratory factor analysis (EFA), and Confirmatory Factor Analysis (CFA) with structural equation modeling (SEM). SEM analyzed the overall model with the actual data set collected from the survey and the archival data to identify how well the model fit with these data. If the hypothesized model captures the data, this model can indicate the relationship of variables (Meyers, Gamst, & Guarino, 2013). Qualitative analysis involved a variety of coding, categorizing, and assigning meaning to the collected data.

Definition of Terms

This glossary defined a set of terms related to variables of this study. Each term included related and sequential meanings relevant to KM. These definitions were useful for developing a common understanding of the subject necessary for this research.

KM enablers refers to influential factors for managing knowledge efficiency and effectively (Gold, Malhotra, & Segars, 2001). Four enablers in this study includes organizational culture, leadership, information technology, and performance management. This study used this set of KM enablers from the KMAT tool by the American Productivity and Quality Center (APQC) because it denotes two major categories with a focus on human-oriented and organization-oriented factors that are able to lead to a foundational understanding of the entire KM system of any organization.

KM processes involves an organization's activities that manage a flow of knowledge throughout an organization (Heisig, 2009). This study applied the KM processes from the KMAT tool by APQC. The KM processes operate through three types of activities: generation, codification, and transfer. These three activities assist institutions in planning, implementing, and assessing of how well they manage knowledge.

Knowledge is a cognitive process of individuals' insights, experiences, know-how, and values (Dalkir, 2005) that are to be justified through social interactions among participants (Nonaka & Takeuchi, 2004) to make knowledge actionable and embedded in institutions' repositories and routines (Davenport & Prusak, 1998).

Knowledge codification is the activity of embedding knowledge by transforming tacit and explicit knowledge back and forth into organizational knowledge (Nonaka, 1991; Wiig, 1993). This embedded organizational knowledge, then, is made accessible so that organizational members can clearly understand and easily retrieve it (Coukos-Semmel, 2002; Ramachandran et al., 2013; Wiig, 1993). It aims to give permanence to

knowledge that may exist in forms that could be shared, stored, and combined to retain essential knowledge (Dalkir, 2005).

Knowledge generation refers to the activity of acquisition and development of knowledge (Ramachandran et al., 2013; Shoham & Perry, 2009). Knowledge generation has a purpose to build needed knowledge for the use of an organization.

Knowledge management (KM) is defined as an iterative process of handling actionable knowledge that results from individual, group, and organizational learning to improve organizational performance. This definition is influenced by (a) the integration of the economic and cognitive perspectives, and (b) the interactions between individuals, groups, and organizations when learning. This study focused on an intellectual capital as an organizational asset that can be managed. Then it finds a way to gain organizational actionable knowledge from the learning interactions between individuals, groups, and organizations through managing the flow of knowledge.

Knowledge transfer represents sharing and distributing of knowledge between an organization's members (Aujirapongpan, Vadhanasindhu, Chandrachai, & Cooparat, 2010; Shoham & Perry). It aims to apply knowledge to individuals' daily work that is embedded in organizational operations.

Leadership involves leaders' abilities to align KM with an organizational strategy and operations (Coukos-Semmel, 2002; Golden, 2009; Lee, 2007), promote values of KM (Arntzen, Worasinchai, & Ribière, 2009; Chumjit, 2012), and encourage individuals' learning to create individual, group, and organizational knowledge (Tan & Noor, 2013).

Organizational culture refers to an organizational environment and a behavioral pattern (Lee, 2007) that enables individuals and groups to learn and share their knowledge within an organization.

Organizational performance implies an integrated view of KM outcomes that results from managing organizational knowledge (Yoopetch, 2009). Organizational performance indicates the quality and effectiveness of the overall process of HEIs. This study used performance scores as the representative of institutional performance assessment.

Performance measurement refers to the collection of information about the efficiency and effectiveness of KM processes when managing the flow of knowledge (Lee, 2007; Ramachandran et al., 2013) and the productivity of individuals and organizations that results from the KM implementation (O'Dell & Hubert, 2011).

Technology refers to tools and processes that facilitate and sustain individual and collective activities (Marquardt, 2011) to help manage the flow of knowledge throughout an organization (Gold et al., 2001).

Summary

Chapter I provided an overview of this KM research study. It started with the introduction of what and why the research topic should be studied. In the last decade, KM has received a great deal of attention from scholars in various settings, including business, service, and academic sectors. However, few studies have explored KM implementation in the higher education context. HEIs are difficult because of the lack of an inclusive KM application. These institutions need a holistic conceptualization of how

KM processes dynamically interact with KM enablers and outcomes. Thus, the purpose of this study was to develop and test a correlation model linking KM enablers and processes to organizational quality performance of HEIs.

Chapter I also provided the conceptual framework that includes three theories (knowledge creation, organizational epistemology, and contingency) in relation to the creation of knowledge and the connectionist approach. This KM study in higher education intended to contribute to the HRD field covering its theory, research, and practice. It used the mix-method approach as its research methodology. Both quantitative and qualitative research methods were employed to collect data from 60 universities in Thailand.

Finally, chapter I presented delimitations and limitations to gain an understanding of the boundaries and the uncontrollable influences in conducting the study. It also defined the terms used in this study.

The next chapter offered a review of the literature related to KM. The first and second sections identified definitions of KM and its relevant concepts that assist in developing the KM definition of this study. Then the third section elaborated the conceptual framework. The fourth section discussed three KM components: enablers, processes, and organizational performance. Finally, the last section summarized previous research results regarding the relationship of the three KM components.

CHAPTER II

LITERATURE REVIEW

Chapter II provided literature relevant to a KM definition, a conceptual framework, and related constructs that lead to a hypothesized model. The extensive search, based on key words, was conducted on electronic databases, including Academic Search Complete (Ebsco), ProQuest, and Google Scholar, to summarize, assimilate, and synthesize the scholarly literature. Chapter II explained the development of the KM definition and its relevant concepts, including iterative process, knowledge, learning, and organizational performance. Literature sources in KM and higher education studies were scanned to identify the conceptual framework. This process was followed by illustrating the essence of KM enablers, processes, and organizational performance, which are the focus of this study. Finally, the explanation of KM in Thai HEIs was provided to gain an understanding about its context.

Definition of Knowledge Management

This section explains the development of KM definitions from various perspectives. Each perspective has its own assumption that guides the understanding of rationales of KM definitions. Furthermore, this section brings up various related concepts in the field of KM, such as knowledge, learning at different levels, and learning organization, to better understand the essence of KM. These terms are elaborated to provide an insight of the connection of these terms and KM.

Distinct Perspectives to Develop Knowledge Management Definition

The definition of KM has been controversial with respect to its complex nature (Lee, 2007). The multidisciplinary roots of KM are enumerated, including organizational science, information technology, information and library science, education and training, and sociology. Dalkir (2005) asserted that the multidisciplinary nature of KM represents "a double-edged sword" (p. 6). He explained that the diversity of KM provides an advantage because it is not too difficult for anyone to find a familiar foundation based on their backgrounds. For example, someone with technical database backgrounds can easily use their skill sets to design and implement knowledge repositories that will serve as the corporate memory for their organizations. In contrast, the multidisciplinary field of KM also presents some challenges due to its boundaries. Dalkir (2005) further noted that "KM is not and cannot be said to be a separate discipline with a unique body of knowledge" (p. 7). Some scholars view KM just as the management of information or the application of new business practices. Thus it is necessary to be able to describe what KM is. This description assists in constituting KM both as a discipline and as a field of practice, which distinguishes KM from other fields.

Although there has been a lack of consensus over a global definition of KM, there is a widespread agreement to the goal of KM. Many scholars admit that the common goal of KM is to leverage knowledge posed in an organization to an organization's advantage (Dalkir, 2005). KM represents a systematic approach to ensure the maximized utilization of knowledge, together with the potential of individuals' skills,

competencies, and ideas to create a more efficient and effective organization (Dalkir, 2005).

KM has been broadly applied not only for the business sector, but also for the higher education arena. The goal of KM in academic institutions also relates to the management of knowledge to achieve an institution's advantages (Coukos-Semmel, 2002; Mohayidin, Azirawani, Kamaruddin & Margono, 2007; Yusoff, Mahmood, & Jaafar, 2012). These advantages cover the achievement of higher education missions (teaching, conducting research, and community servicing) and improvement of organization management (developing strategic plans and improving decision making processes).

The review of the existing KM literature in higher education suggests that various KM definitions can be categorized into three distinct perspectives: economic, cognitive process, and information management (Lee, 2007; McCarthy, 2006; Wiig, 1993). Each perspective leads to underlying assumptions of each KM definition. The three perspectives are described below.

Economic perspective. The economic perspective originated from the traditional notion of economic resources, including land, labor, and capital (Wiig, 1993). One type of economic capital includes knowledge, which is recognized as an integral part of intellectual capital. From the viewpoint of the economic perspective, KM definitions involve the management of intellectual capital (Dalkir, 2005; Wiig, 1993). Intellectual capital is an intangible organizational resource that represents an individual's insight and experiences (such as contextual information, opinions, and stories) owing to its emphasis

on actionable knowledge and know-how (Dalkir, 2005; Wiig, 1993). Some KM definitions in higher education research influenced by the economic perspective include:

a) "The management of an organization's knowledge resources" (Yusoff et al., 2012, nd.).
b) "KM is related to a view advancing the organization goals by exploring and enhancing the asset of an organization, i.e., knowledge" (Rahimi, Arbabisarjou, Allameh, & Aghababaei, 2011, p. 19).
c) "The combination of processes of creating, capturing, and using knowledge to enhance organizational performance" (Coukos-Semmel, 2002, p. 30-31).
d) "Locating and identifying all of the concealed and open knowledge assets of an organization so that they can be used to attain the organization's goals" (Shoham & Perry, 2009, p. 244).
e) "A range of practices used by organizations to generate, store, and disseminate knowledge for reuse, especially in research, teaching and learning, decision making and others" (Mohayidin et al., 2007, p. 311).
f) "A key facility that a research university requires in order to provide a conducive environment for research and innovation" (Tan & Noor, 2013, p. 253).

These KM studies, which used the economic perspective to underlie their KM definitions, view knowledge as a key element for increasing an institution's productivity and efficiency. Consequently, KM has become one of the strategic solutions to achieve effective organizational performance.

Cognitive process perspective. The second perspective focuses on the cognitive process of knowledge creation at individual, group, and organizational levels. Related KM definitions are presented below.

a) "All personnel, facilities, and services associated with the creation, processing, and distribution of knowledge that an organization or its members possess and obtain" (Lee, 2007, p. 38).

b) "A systematic process of gathering, organizing, sharing and analyzing knowledge in terms of resources, documents and people skills within and across an organization" (Watcharadamrongkun, 2012, p. 9).

c) "An integrated and collaborative approach to the creation, organization, access, and use of cumulative knowledge that an organization possesses among its people, records, and documents. It addresses the actions that an organization should take to derive the greatest value from the experience and understanding of its people as well as from other internal and external sources." (Keeley, 2004, p. 2).

d) "A conscious strategy of putting both tacit and explicit knowledge into action by creating infrastructure and learning cycles that enable people to collectively use the knowledge of the enterprise" (American Productivity and Quality Center, 2000, p. 1).

e) "A systematic process of connecting people to people and people to the knowledge and information they need to effectively act and create new knowledge" (American Productivity and Quality Center, 2003, p. 8).

These aforementioned research studies investigate how knowledge is created, shared, and used between and among individuals within an organization. Individuals and their interactions become focal points of managing knowledge. The KM definitions of these studies highlight that knowledge depends on organizational members who create, share, and use it (Lee, 2007).

Information management perspective. Information management assumes that KM enhances the use of organizational knowledge through the management of information (Lee, 2007). An organization is responsible for cultivating usable knowledge and making it readily accessible across an organization (McCarthy, 2006). KM definitions under this category are termed as follows:

a) "Organizational processes that seek synergetic combination of data and information processing capacity of information technologies, and the creative and innovative capacity of human beings" (McCarthy, 2006, p. 15).

b) "The process of creating, capturing, and using knowledge to enhance organizational performance, such as documenting and codifying knowledge and disseminating it through databases and other communication channels" (Golden, 2009, p.19-20).

These KM definitions involve the technological processes of transforming data and information into knowledge. With the information management perspective, knowledge refers to a set of transformed information that is made available in a usable form. Then, knowledge enables an organization to learn and adapt to its changing environment.

The three perspectives provide the description of the nature of KM. Although KM is increasingly being viewed as the management of an organization's intangible resources (intellectual capital, data, or information), each perspective has unique characteristics that influence the development of KM definitions.

Knowledge Management Definition of This Study

The KM definition of this study uses an integration of the economic and cognitive perspectives. It focuses on intellectual capital as an organizational asset that can be managed. Intellectual capital is defined as the possession of knowledge, applied experience, and professional skills that provide organizations with value and a competitive advantage (Coukos-Semmel, 2002). Normally, intellectual capital is based on the process of exchanging knowledge within a workplace (Wiig, 1993). This process makes an organization's focus shift from the building of information systems to the development of learning at the individual, group, and organizational levels (Dalkir, 2005). Rather than viewing KM as the process of summing the information held by an organization's employees, the KM definition of this study attempts to find a way to gain organizational knowledge from employees' learning. It focuses on the learning interactions between individuals, groups, and organizations through managing the flow of knowledge.

From a viewpoint of the KM contribution, KM is expected to properly function so organizational members and organizations have abilities to use knowledge effectively to improve job performance and increase productivity. Effective KM should have the following characteristics: (a) all knowledge assets available in an organization are put to

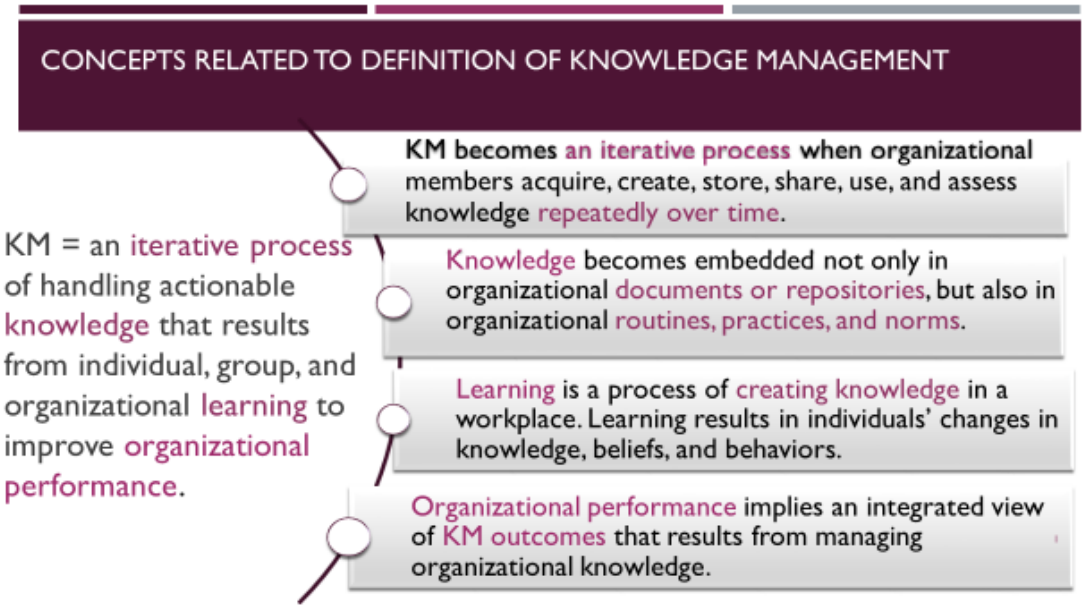
optimum use, (b) everyone can access the best knowledge at every place and time when they require, (c) crucial knowledge is converted into the form of understandable processes and structures, (d) knowledge is used successfully in the development of innovative products, services, and process, (e) individual learning experiences (positive and negative) are turned into knowledge and made available to others who can make use of them, and (f) there is a platform of lessons learned and best practices (Van der Spek & Spijkervet, 1997). These characteristics show how usable and accessible knowledge results from the interaction processes between organizational members through the leveraging of knowledge possessed by individual into organizational knowledge.

A good definition of KM should incorporate the managing of knowledge flow, coupled with the valuing of intellectual capital (Dalkir, 2005). The two underlying perspectives and the KM characteristics influence the development of the KM definition of this study. The term KM in this study is defined as *an iterative process of handling actionable knowledge that results from individual, group, and organizational learning to improve organizational performance.*

Relevant Concepts to Knowledge Management

The KM definition of this research study is constituted with multiple concepts, including an iterative process, knowledge, learning, and organizational performance. The key concepts drawn from the proposed definition can be explained as the following (Figure 3).

Figure 3. **Concepts Related to Definition of Knowledge Management**



Iterative Process

An iterative process, influenced by a process-orientation, consists of a reoccurring sequence of activities, with previously completed activities being repeated as subsequent activities (Rubenstein-Montano, Liebowitz, Buchwalter, McCaw, Newman, Rebeck, 2001). In the KM field, Nonaka (1991) is a scholar who developed his theory with the process-oriented approach. He noted that organizational knowledge originates from the iterative process of articulation (also known as externalization) and internalization. Articulation occurs when organizational members' tacit (uncodified) knowledge is captured as explicit (codified) knowledge. Internalization occurs when this captured explicit knowledge is then transformed into another employee's tacit knowledge. Organizational knowledge occurs through the intersection of tacit and

explicit knowledge during the interaction of organizational members. Nonaka's cycle is an iterative process directed by the interactions of the knowledge transformation.

KM becomes an iterative process when organizational members acquire, create, store, share, use, and assess knowledge repeatedly over time. This study has an underlying assumption that knowledge should flow within institutions through the iterative process. The iteration occurs through dynamic and interrelated KM activities consisting of creating, storing, sharing, and using through the support of assessing

This iterative KM cycle includes six activities (Sunalai & Beyerlein, in press). Acquire combines the accessibility, collection, and assimilation of acquired knowledge. Create involves the development of new knowledge or the replacement of existing knowledge. Store is the embedding and categorization of knowledge so that organizational knowledge can be easily retrieved. Share refers to the sharing and distributing of knowledge between an organization's members. Use aims to apply knowledge to individuals' daily work embedded in organizational operations. Assess includes two purposes—to provide the opportunity to reflect the use of shared knowledge and to evaluate the effectiveness of an overall KM process. The detailed explanation of KM processes will be discussed in the KM process section.

The management of knowledge is iterative in that it involves the refinement of the ongoing knowledge activities by the repetitive application of the activities. The refining process assumes an ongoing need for iterative improvement. The KM definition of this study is viewed as an iterative process that aims to assist an organization in performing better management of knowledge for its continual improvement.

Knowledge

Investigating the definition of knowledge is essential because it lays out the boundary of knowledge, which is aligned with the implementation of KM initiatives. Since scholars do not have a single definition of the knowledge term, reviewing the literature suggests that a way to understand this term is to explore perspectives that guide the development of its definition.

Distinct perspectives to define knowledge. The development of the knowledge term draws from various perspectives, and its definition can be categorized into three categories: economic, cognitive process, and semantic distinction. The first two categories are similar to the category of the KM definitions, whereas the last category focuses on the comparison with other similar terms.

Economic perspective. As mentioned in the KM definition section, the definition of knowledge can also be discussed with respect to the economic perspective. Knowledge is perceived as a valuable asset or intellectual capital. Some scholars claim that knowledge is not just another resource alongside traditional resources (production, land, and labor); rather, it is the most meaningful resource in today's workforce (Drucker, 1994). Based on the economic perspective, knowledge has become more valuable than traditional resources (Dalkir, 2005; Drucker, 1994). Given its importance as an asset, many organizations are interested in managing knowledge to maximize it for better advantage of an organization.

Cognitive process perspective. The cognitive process perspective emphasizes that knowledge results from social interaction processes. This perspective defines

knowledge as "the insights, understandings, and practical know-how that [individuals and organizations] possess" (Dalkir, 2005, p. 5). Nonaka and Takeuchi (2004) are widely recognized as scholars who influenced the development of the knowledge term in relation to the cognitive process. Their publication about knowledge creation has been cited over 3,000 times, according to Google Scholar database in November 2014. Nonaka and Takeuchi (2004) studied how knowledge is created at an individual level by examining the notion of tacit knowledge. To them, knowledge is a cognitive process of individuals' thoughts and experiences that are to be justified through social interactions between tacit and explicit knowledge. They endorse knowledge as an organizational resource, and also acknowledge the social interactions between and among individuals to create knowledge.

Semantic distinction perspective. In order to better understand the essence of knowledge in KM studies, it is important to compare it with other similar terms that consist of data and information. These terms have often been used interchangeably, without clear distinctions. The comparison can clarify semantic confusions and create consistency in the definition of knowledge (Lee, 2007).

Davenport and Prusak (1998) made distinctions between data, information, and knowledge. Data are sets of discrete and raw materials about events. Information normally represents a form of a document or an audible or visible communication that can impact decision making. Data become information when people add meaning to them through the process of contextualization, categorization, calculation, correction,

and condensation. The complete definition of knowledge defined by Davenport and Prusak (1998) is as follows:

> A fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms (p. 5).

In sum, knowledge refers to a set of transformed information that offers a framework to examine, evaluate, and link new experiences.

The three perspectives help establish the boundary of knowledge definitions. They provide the inquiries that scholars can use to conduct a knowledge study in various fields. A clear understanding of studied terms, such as knowledge, is essential because it guides researchers or scholars to accurately comprehend the nature of the terms.

Type of knowledge. Another distinguishing characteristic of knowledge can be viewed by its forms. Knowledge exists in two forms: explicit and tacit. The statement of Michael Polanyi (1997, p. 144), "We can know more than we can tell" portrays the sound explanation of tacit knowledge. According to Nonaka (1991) tacit knowledge is highly personal and has a cognitive dimension, such as mental models and conceptual frameworks. It can be described as experiences, know-how, competencies, or skills. In short, it is personal knowledge residing in individuals' heads. This type of knowledge is difficult to formalize, articulate, and document.

In contrast, explicit knowledge is formal and systematic (Nonaka, 1991). Explicit knowledge holds a form of written knowledge, such as documents, formulas, contracts, process diagrams, and manuals (O'Dell & Hubert, 2011). It is easily codified, communicated, and shared.

Observations drawn from definitions of knowledge. Regarding the literature review on the definitions of knowledge, the following observations are drawn:

a) Some previous studies used the terms knowledge and information interchangeably. These two terms have natural differences. Information comes in the form of transformed data while knowledge is the set of information derived from individuals' competencies, insights, experiences, know-hows, and values. Knowledge is a high-value form of information (Coukos-Semmel, 2002). If an organization uses these terms interchangeably, the management of knowledge will be conducted with different purposes. Using the term knowledge with the meaning of information can change the purpose of managing knowledge (Lee, 2007). It manages information in a computer-based information processing system rather than knowledge from individuals' insights. If these two terms are used similarly, the differences between "knowledge management and information management [will] be negligible" (Lee, 2007, p. 29).

b) Humans become the focal point of the creation of knowledge. Many studies are interested in the interactions of organizational members at the individual, group, and organizational levels. These members play their roles in KM in terms of creating, sharing, and using knowledge across an organization. Thus, knowledge is created and applied in their minds. Knowledge becomes embedded not only in organizational

documents or repositories, but also in organizational routines, practices, and norms (Davenport & Prusak, 1998). The latter form is considered more unique for each organization, because it is contextual knowledge that has evolved over the years and then has resided in individuals' and organizations' behaviors (Davenport & Prusak, 1998). Consequently, many organizations have attempted to find a way to improve individuals' interaction processes that enhance the flow of knowledge throughout their organizations.

Knowledge definition of this study. The definition of knowledge in this study is influenced by the economic perspective and the cognitive process. This study recognizes knowledge as an intellectual resource that is a result from individuals' competencies. Consequently, the definition of knowledge in this study involves intellectual capital that is *a combination of individual insights, experiences, know-how, and values that have potential to improve individual and organizational performance*.

Connection of knowledge management and knowledge. KM contributes to the transformation of information into knowledge. Davenport, Harris, De Long, and Jacobson (2001) explored a process of knowledge formation in an organization. They found that information exists in the form of raw data, then organizational members transform raw data into information by assigning it values. KM plays a role in this process. It assists individuals and organizations in transforming information into knowledge by analyzing causes and trends and by drawing conclusions. This transformation makes information more usable for an organization. Knowledge in the minds of organizational members is an organization's most valuable resource. If an

organization manages it efficiently, knowledge may transfer into intellectual capital so that the organization can use it to be more productive and competitive (Coukos-Semmel, 2002).

Learning

This study views learning as a process of creating knowledge in a workplace. The essence of learning needs to be discussed to provide a clear understanding of relationships between learning and the management of knowledge, which is a result from individual, group, and organizational learning. The literature of learning shows that a wide variety of the learning definitions exist. Researchers have explored how particular identities of learning are created and how learning processes are involved. This study discusses its definition and contribution to an organization with multiple levels.

Definition of learning. Scholars define learning as a process of gaining knowledge through developing (Sun, 2003). This term consists of three components: process, knowledge, and developing. The learning definition by Merriam, Caffarella, and Baumgartner (2007) addresses to two components of learning— process and developing. They stated that "learning is a cognitive process internal to the learner; it is what the learner does in a teaching-learning transaction, as opposed to what the educator does. Learning also includes the unplanned, incidental learning that is part of everyday life" (p.6). With their statement, learning includes a cognitive process of development that combines planned and unplanned activities taking place in individuals' daily lives. Learning in this context is treated as processes from formal and informal developing activities. It is embodied not only in conscious cognitive activities, but also in everyday

practices, actions, and conversations (Fenwick, 2008). The third component, knowledge, is a result of learning that refers to a change in an individual. This study views knowledge as a change in an individual's insights, experiences, know-how, and values.

The occurrence of learning has become an interesting issue over the years. Learning can occur through diverse aspects— "learning is active, constructive, goal-oriented, cumulative, self-regulated, [and] situated and collaborative" (Sun, 2003, p. 154). Learning is active and constructive because individuals do not passively learn. This means that acquiring knowledge involves a mindful activity that requires efforts and cognitive processes from learners. Learners actively construct their knowledge through interactions with their environment and through reorganizations of their own mental structures. Learning is goal-oriented because effective learning is motivated by an explicit awareness of individuals' goals. Learning results from a cumulative process with respect to formal and informal knowledge. Learning has a self-regulated nature. Learners manage and monitor their own knowledge acquisition. Learning involves situated and collaborative processes. It occurs in an interaction with social and cultural contexts through processes of communication, collaboration, and negotiation.

Levels of learning in organizations. Marsick and Watkins (1994) mentioned that learning results in individuals' changes in knowledge, beliefs, and behaviors. They stated that learning involves a social process and occurs at individual, group, and organizational levels.

Marquardt (2011) also supported Marsick and Watkins's statement. Learning in organizations can occur at three levels, and they depend on each other. Individuals are

the basic unit of groups and organizations. Individual learning includes changes in knowledge, beliefs, and behaviors acquired through self-study, technology-based instruction, and observation. Individual learning impacts the continual transformation of an organization because it enhances an organization's capability. Group learning refers to an increase in knowledge, beliefs, and behaviors accomplished by and with groups. Groups learn to generate knowledge by analyzing complex issues, solving problems collectively, and taking innovation actions. Group learning includes a process of aligning and developing groups' capacities to create desired knowledge for its members. Organizational learning represents the enhanced intellectual and productive capacity gained through shared commitment (knowledge, attitudes, or assumptions of members) to an organization. Organizational learning depends on an organization's mechanism, including policies, strategies, cultures, and resources to store knowledge.

Knowledge occurs when individuals develop habits of learning, including asking questions and giving feedback (Marsick & Watkins, 1994). Then they share their knowledge, gained from their learning, with others through varied methods, such as face-to-face conversation and virtual communication. This individual and group knowledge becomes an organization's knowledge. Organizational knowledge is, then, rewarded and supported through a shared learning commitment. Most scholars agree that organizations learn through individuals who learn, but individual learning does not guarantee organizational learning (Marsick & Watkins, 1994). It might be that individual learning does not transfer to a group effort or group learning cannot be put into action

(Marsick & Watkins, 1994). However, without individual learning, no organizational learning takes place because individuals are the basic unit of groups and organizations.

The most interesting observation from the arguments of Marsick and Watkins (1994) and Marquardt (2011) is that learning in an organization is not a single activity. Learning cannot occur without collaboration and participation in cultural and contextual activities and practices (Sun, 2003). A learning environment should be open to both formal and informal learning. Moreover, the effective learning environment should offer opportunities for social interaction.

Since there is confusion between organizational learning and learning organization, this study also discusses the distinction between these two terms. It starts with the term organization, which is a part of the two compared terms. Organization is an artefact and it does not exist in nature (Sun, 2003). Organization is created and sustained by humans. Consequently, organization is a social entity because it is composed of more than one person.

Organizational learning refers to a learning process of an organization and by an organization in a collective or organizational way (Sun, 2003). Organizational learning provides an organization's intellectual and productive capacity through shared knowledge, beliefs, or assumptions of an organization's members (Marquardt, 2011). For the learning organization study, organizational learning is a collective learning and improving process aiming to build up a learning organization (Marquardt, 2011).

Learning organization is a concept that offers an image of continuous learning and improving of an organization (Sun, 2003; Marsick & Watkins, 1994). It can be

expressed as an organization that continuously learns (Marsick & Watkins, 1994) and can transform itself into an adaptive environment (Marquardt, 2011). Learning organization functions as a vision (Sun, 2003). A vision encompasses a direction for the future that an organization wants to take. Learning organization serves as a guiding vision "that pictures an organization as a living organism with an open [and] powerful learning environment which inspires, facilitates and empowers the learning of its members so as to enhance its capacity for change, adaptability, improvement and competition" (p. 157). For this study, a learning organization refers to an organization where members learn collectively and effectively and which transforms itself for better management through the use of knowledge across the organization (Marquardt, 2011).

Marsick and Watkins (1994) proposed six imperatives to promote a learning organization: (a) create continuous learning opportunities, (b) promote inquiry and dialogue, (c) encourage collaboration and team learning, (d) establish systems to capture and share learning, (e) empower people toward a collective vision, and (f) connect an organization to its environment. This means that an organization empowers its people to create continuous learning by promoting open dialogue, encouraging collaboration and team learning, and acknowledging an interdependence of individuals, organizations, and communities in which they reside.

The significant observations from these two terms (organizational learning and learning organization) are the following. First, organizational learning refers to a learning process of an organization, whereas learning organization represents a concept

functioning as a vision. Second, both terms recognize the value of continuous learning, a process of knowledge creation and sharing, and a team-orientation.

Organizational Performance

The last concept in relation to the KM definition includes organizational performance. Organizational performance refers to the effectiveness and efficiency of an organization's overall process (Watcharadamrongkun, 2012). Several studies have explored the measurement of organizational performance. Organizational performance can combine both effectiveness (quality of results) and efficiency (quality of processes). KM benefits organizational performance as the following: (a) avoidance of costly organizational mistakes, (b) sharing of best practices within the organization, (c) faster and timely problem solving, (d) faster development and innovation, (e) better customer solutions and relations, and (f) gaining new business (Skyrme, 2000).

The common measurement to assess organizational performance can be classified into two dimensions: direct and indirect. The direct dimension consists of financial indicators, such as market share, stock price, price earnings ratio, R&D expenditure, and business growth (Chang, Lee, & Kang, 2005; Choi & Lee, 2003; Chuang, 2004); scores from performance management tools, such as Balanced Scorecard (Rašula et al., 2012); and performance score assessment by an accrediting agency (Watcharadamrongkun, 2012).

The indirect dimension focuses the perception of stakeholders (i.e. top management, staff, customers, and suppliers) toward organizational practices and results (Chuang, 2004; Gold et al., 2001; Rašula et al., 2012; Yoopetch, 2009). The latter

dimension can be grouped into three performance measurements, including efficiency, adaptability, and innovativeness (Aujirapongpan et al., 2010; Gold et al., 2001).

This study views organization performance as an organization's effectiveness and efficiency through managing knowledge. The explanation of organization performance will be expanded in the knowledge management components section.

Conceptual Framework

In constructing the conceptual framework of this study, this section starts with the explanation of three related theories. The guiding development theories for this work include three theories: knowledge creation, organizational epistemology, and contingency. These three theories are selected with respect to two aspects of inquiries: (a) the creation of knowledge at the individual, group, and organizational levels, and (b) the connectionist approach as a foundation of organizations' systems. Each theory is discussed in terms of its origin, summary, related research and findings, and implications to this research study.

Then, this section elaborates the development of conceptual framework. This framework is the synthesized work from literature relevant to a KM definition and its related concepts, and the guiding theories. It aims to propose the set of ideas to generate the studied conceptual framework, including the relationships among variables and the context surrounding the inquiry.

Knowledge Creation

The theory of organizational knowledge creation has achieved paradigmatic status since its publication in the mid-1990s (Gourlay & Nurse, 2005). The aim of the

knowledge creation theory is to understand how knowledge is dynamically created within an organization. This theory relies on the assumption that knowledge is created through social interaction between tacit and explicit knowledge.

Origin of the theory. Nonaka and Takeuchi developed an idea of knowledge creation in 1991 from a study of information creation in innovating Japanese companies (Gourlay & Nurse, 2005). Then, in 1993, they conducted another study to further test their emerging theory. The samples of this study were 105 Japanese male middle managers. The questionnaire survey comprised of 185 items, 38 of which concerned the content of organizational knowledge creation that was measured by the amount of time spent on specific activities. They used the hierarchical confirmatory factor analysis to confirm the hypothesis about the four-mode model called SECI, which is Socialization, Externalization, Combination, and Internalization. This study validated that knowledge creation comprised the four modes of knowledge conversion.

Subsequently, Nonaka and Takeuchi published a more extensive theoretical paper that was derived from the validated SECI model. In 1995, they wrote "The Knowledge-Creating Company" to propose the theory to explain the phenomenon of organizational knowledge creation focusing on the SECI model.

Summary of the theory. Nonaka and Takeuchi (2004) defined the organizational knowledge creation as "the capability of a company as a whole to create new knowledge, disseminate it throughout the organization, and embody it in products, services and systems" (Nonaka & Takeuchi 2004, p. 13). They asserted that knowledge is initially created by individuals. Then knowledge created by individuals becomes

organizational knowledge through processes described by their knowledge creation theory.

Nonaka and Takeuchi (2004) considered two dimensions of knowledge creation—epistemological and ontological. On the epistemological dimension, they described two types of knowledge—tacit and explicit. Explicit knowledge is the written knowledge that quite easily transfers from one person to another. In contrast, tacit knowledge is more difficult to articulate because it is often created from individuals' extensive experience. The other dimension, ontological, is knowledge processed form different levels, including individuals, group, organization, and beyond. In summary, the epistemological dimension is related to the conversion of knowledge from tacit to explicit, and from explicit to tacit. The ontological dimension is related to the conversion of knowledge from individuals to groups and further to organization (Bratianu, 2010; Gourlay & Nurse, 2005).

Combining these two dimensions, Nonaka and Takeuchi further develop a spiral model for knowledge creation. They mentioned that a spiral emerges when the interaction between tacit and explicit knowledge is elevated dynamically from lower levels to higher levels (from the individual level to the group and organizational levels). This spiral is created by the four modes of knowledge conversion through which knowledge is converted from one knowledge type to another. The modes of knowledge conversion include socialization (from tacit to tacit knowledge), externalization (from tacit to explicit knowledge), combination (from explicit to explicit knowledge), and internalization (from explicit to tacit knowledge).

Organizational knowledge can be created when explicit and tacit knowledge interact with each other. This interaction occurs through four modes of SECI: socialization, externalization, combination, and internalization.

Socialization is the transformation of tacit knowledge into tacit knowledge (Nonaka & Takeuchi, 2004). Tacit knowledge is created and shared through direct experiences. Socialization occurs when an individual shares tacit knowledge with another in face-to-face contact (Rahimi et al., 2011). This tacit knowledge is hard to formalize and to express using language because it is context related. An individual can acquire tacit knowledge directly from others without using language through an interaction, including observation, imitation, and practicing (Nonaka & Takeuchi, 2004).

Externalization is the transformation of tacit knowledge into explicit knowledge (Nonaka & Takeuchi, 2004). Tacit knowledge can be transformed into explicit knowledge through continuous interaction, such as dialogue and reflection. Externalization requires the expression of tacit knowledge and its translation into comprehensible forms that can be understood by others (Rahimi et al., 2011). Among the four modes of SECI, Nonaka and Takeuchi (2004) suggest that externalization is the most important mode because it creates new explicit knowledge from tacit knowledge. Externalization helps individuals clearly identify hidden tacit knowledge. It involves processes that help transform ideas into words, visuals, or figurative language (Keeley, 2004). For example, externalization is utilized to improve ideas that are created during formal meetings or brainstorming sessions.

Combination is the transformation of explicit knowledge into more complicated forms of explicit knowledge (Nonaka & Takeuchi, 2004). In other words, it is the activity of creating new formal knowledge that can be used directly by others. For combination, explicit knowledge is processed and categorized into different collections in order to create new knowledge, such as documented or discussed knowledge gained from meetings (Rahimi et al., 2011). This transformation is best supported by information systems through knowledge capture, categorization, and search (Keeley, 2004).

Internalization is the transformation of explicit knowledge into tacit knowledge (Nonaka & Takeuchi, 2004). Explicit knowledge is learned and then internalized into individuals' tacit knowledge. Internalizing knowledge is effective in developing a learning culture through experience-based learning (Rahimi et al., 2011). Experiences that took place in the past may change an individual's mental model. When this mental model is shared by members of the organization, tacit knowledge becomes part of the organizational culture (Keeley, 2004).

Along with the spiral model for knowledge creation, Nonaka and Takeuchi (2004) addressed "ba", the last element of knowledge creation. Ba is a Japanese term that refers to a place at a specific time (Chumjit, 2012). In the knowledge creation theory, ba is the shared context for creating knowledge and the place to create knowledge. Knowledge is always created within a context that consists participants and the way they participate. This context, which refers to the cultural, social, and historical setting, influences organizational members to make new experiences from social

interaction processes become contextual knowledge. An organization's contextual knowledge refers to specific knowledge about the elements of organization, such as products, services, and work processes.

The ba concept is similar to the situated learning approach in adult learning science. Situated learning considers of learning as a sociocultural phenomenon. Individuals' knowledge and skills are developed in the contexts that reflect how knowledge is obtained and applied in everyday situations (Stein, 1998).

In summary, the essence of the knowledge creation theory is based on four main ideas (Bratianu, 2010):

a) Knowledge creation at individual level is a direct result of the continuous dialogue between tacit and explicit knowledge.

b) There are four basic knowledge conversion processes: socialization, externalization, combination and internalization.

c) Knowledge creation at the organizational level is based on these four conversion processes and a spiral driving force.

d) Ba is one of the key mental factors that helps individuals interact with each other and then create knowledge derived from the contextual setting.

Research based on the theory. In higher education studies, Nonaka and Takeuchi's theory was used in four studies. Three studies used four modes of SECI to examine relationships between KM processes, and organizational processes as well as outcomes, including planning and decision-making (Keeley, 2004), KM enablers (Rahimi et al., 2011), and creativity (Rahimi et al., 2011). Differently, the study of

Chumjit (2012) used SECI as a lens to analyze how KM was implementation in academic institutions. The findings of these four studies are listed below:

Keeley (2004) examined the extent and effectiveness of KM processes in improving planning and decision-making in different types of 450 U.S. higher education institutions. The results revealed that SECI processes were significant contributors in improving planning and decision making.

Rahimi et al. (2011) investigated a relationship between SECI and creativity of 85 faculty members in the University of Isfahan. They found that there was a positive and significant relationship between SECI and creativity. Knowledge combination had the highest place in SECI, which was followed by externalization, socialization, and internalization.

Yusoff et al. (2012) used the SECI model to examine a relationship of KM processes and enablers from 21 faculty members in a Malaysian community college. The results indicated that there was no significant relationship between KM processes and enablers.

Chumjit (2012) conducted a qualitative research study using SECI as a framework to analyze how four Thai universities implemented KM. The findings showed that these universities had methods to manage knowledge transfer. All universities used a variety of knowledge transfer (such as community of practice, note taking, and database) to recreate knowledge across organizations. New knowledge was managed and installed in databases, and organizational members can access and use it for making decisions.

The knowledge creation theory in higher education studies has been used to examine relationships between KM processes and other organizational dimensions. Most studies applied the SECI model to investigate the KM processes used in an institution and then identified the relationship between the KM processes and management processes (i.e., planning and decision-making; Keeley, 2004) or outcomes (i.e., creativity; Rahimi et al., 2011). It should be noted that the element of this theory that was mostly used in previous studies is the SECI model. Other elements, such as ba, are not addressed.

Implication for this research study. The knowledge creation theory assists an understanding of roles of KM and how to apply KM into higher education institutions. Firstly, the knowledge creation theory assists an understanding of what and how knowledge flows within the workplace through the SECI model. The SECI model helps institutions plan, implement, and assess where the flow of knowledge is undergoing.

Secondly, this theory addresses the importance of building a learning platform (known as "ba" in the knowledge creation theory) that influences individuals' contextual knowledge. In order to accept new knowledge for the surrounding environment, people must have appropriate mental receptors that align with an organization's belief (Leonard & Swap, 2005). The mental receptors help shape new experiences into knowledge—not just information. It is vital to establish a learning environment in which people are encouraged to create, share, and use knowledge together for the benefits of the organization. Thus the effective learning platform with the ba concept is able to be a framework to study the creation of contextual knowledge within an institution.

Finally, the knowledge creation theory focuses on the interaction between individuals and organizations. Nonaka and Takeuchi (2004) pointed out that "knowledge is created only by individuals. In other words, an organization cannot create knowledge on its own without individuals" (p.16). An organization needs to support and stimulate knowledge-creating activities for organizational members. Thus organizational knowledge creation leads to an insight that an organization should facilitate processes that organizationally amplify individuals' knowledge and crystallize it at the group level.

Von Krogh and Roos's Organizational Epistemology

Von Krogh and Roos (1995, 1996) took an epistemological approach— the relationship between the knower and the knowable (Guba & Lincoln, 2005)— to manage organizational knowledge. They initiated a theory called 'organizational epistemology' that distinguishes between individual and social knowledge (Gomez, 1996). This theory emphasizes that knowledge resides both in individuals and in the relationships they form with others (Von Krogh & Roos, 1995). Both von Krogh and Roos as well as Nonaka and Takeuchi's theories involve the development of knowledge but their focuses are different. Krogh and Roos tried to understand the process of organizational knowledge development at the individual and social levels. Nonaka and Takeuchi focused on the transformation of tacit knowledge into explicit knowledge.

Origin of the theory. In 1995, von Krogh and Roos (1995, 1996) published a book called "Organizational Epistemology" to address the epistemological approach in organizational knowledge development. Then in 1998, they examined a nature of KM in organizations in terms of five factors: a mind-set of the individuals, communication in an

organization, an organizational structure, a relationship between organizational members, and management of human resources (Dalkir, 2005). They found that these five factors hinder the success of managing organizational knowledge for innovation, competitive advantage, and other organizational goals. They explained that if individuals do not value knowledge as a crucial component of an organization, the organization will have trouble in developing knowledge-based competencies. If individuals are not willing to share their experiences among groups on a basis of mutual trust and respect, there will be no generation of collective knowledge. Finally, if the top management of an organization does not acknowledge the individuals' knowledge contribution, individuals will lose their motivation to innovate and develop new knowledge for the firm.

Summary of the theory. Von Krogh and Roos (1995) applied the connectionist approach as a foundation of their organizational epistemology theory. They assumed that knowledge resides in and between an organization's members at a social level. This assumption leads to four issues to manage organizational knowledge as follows:

a) How and why individuals within an organization come to know.

b) How and why organizations, as social entities, come to know.

c) What counts for knowledge of the individual and the organization.

d) What are the impediments in organizational KM.

Organizational epistemology provides a theoretical cornerstone for a KM model used in organizations. It assists an understanding of dynamics of individualized and socialized organizational knowledge, and impediments to organizational knowledge.

Research based on the theory. The organizational epistemology theory was cited by 419 publications according to the Google Scholar search engine in November 2014. By randomly searching the first ten pages of Google Scholar, most publications cited it partly in their literature review. Only one study directly applied this theory to guide their study. Cook and Brown (1999) conducted a conceptual paper employing organizational epistemology as an approach to analyze the development of knowledge in an organization. They offered the notions of various kinds of knowledge, productive inquiry, dynamic affordance, and generative characters of knowing. These notions enrich the development of organizational knowledge in terms of knowledge creation, knowledge-based organizations, and the management of the intellectual capital.

Implication for this research study. Although the number of previous studies that applied the organizational epistemology theory are limited, this theory contributes to this research study in terms of an importance of interactions of individuals and their organizations in managing knowledge. Organizational epistemology is comprehensive and considers multiple factors existing in an entire organization (e.g., people, relationships between people and organizations, and organizational processes). It gives a clearer view that organizations need to put KM enablers in place that will stimulate the development of individual knowledge, group sharing of knowledge, and organizational knowledge retention.

Lawrence and Lorsch's Contingency Theory

The theory of Lawrence and Lorsch (1967) relates to a contingency theory that claims that there is no one best way for management to deal with an organization's

systems. Contingency theory is often called the "it all depends" theory because it views the management of an organization depending on the internal and external environmental contexts of the organization (Burke, 2011).

Origin of the theory. Lawrence and Lorsch (1967) initially studied ten US firms in three industries (plastic, food, and container) that confronted varying degrees of uncertainty, complexity, and change. They studied the relationships between environmental characteristics and effective organizational structures. The results showed that each organization had a different degree of differentiation. Organizations operating in uncertain, complex, and rapidly changing environments had more highly differentiated internal structure. Organizations in more homogeneous and stable environments were more formalized and hierarchical in their forms. Furthermore, they conducted other studies in different types of industries (i.e., steel, agriculture, hospitals, and telecommunication). The findings also confirmed their first results (Pugh & Hickson, 2007). They finally concluded that organizations must have internal structures as complex as the environments in which they operate.

Summary of the theory. Lawrence and Lorsch (1967) used an assumption of the open systems theory to develop their study. They defined an organization as a system of interrelated behaviors of people that has been differentiated into several distinct subsystems. Each subsystem performs a section of the task. The efforts of each subsystem are integrated to achieve effective performance of the system.

Their contingency theory tailors the organizational management to the sources of environmental uncertainties faced by the organizations (Burke, 2011). External and

internal environments influence organizations in a varied number of ways. The external environment includes labor markets, availability and cost of capital, competitors, governmental laws and policies, and ecological concerns. The internal environments vary in the forms of managerial assumptions about employees, organizational strategies, structures, and technologies used. Consequently, organizations and organizational sub-units need to adapt to the demands of their immediate environments (Pugh & Hickson, 2007).

To summarize, the contingency theory of Lawrence and Lorsch addresses the nature and characteristics of the multiple relationships beginning with the environment-organization interface (Burke, 2011). These relationships affect the interactions among all organizational elements within the entire organization.

Research based on the theory. Two previous research studies in the education context were influenced by the contingency theory. One used the qualitative approach, the other used quantitative for conducting research. Both studies applied this theory to develop a model or a framework that showed the influence of the internal environment on organization performance.

The qualitative research is represented by the study of Gregory and Jones (2009). They mentioned a research gap of their study that not many education studies emphasize the importance of contextual or environmental factors and teachers' conceptions that influence the approach of teachers. They applied the contingency theory to generate a model of teaching approaches for Australian university academics who teach heterogeneous student cohorts. The result of their study was the proposed contingency

model, comprised of four separate teaching approaches: distancing, adapting, clarifying, and relating. Their model emphasizes the interplay between structure (forces in the environment) and the agency of individual lecturers (forces in the lecturer) in determining teaching approaches.

Another study, the quantitative research conducted by Trisnaningsih (2013), applied the contingency theory as a lens to examine the relationship among lecturers' performance in an Indonesian university and their behavioral aspects. The researcher used path analysis to analyze the relationship among four variables: lecturers' performance, organizational commitment, professional commitment, and motivation. The results showed that individuals' performance is likely to depend on the internal environment— lecturers' commitment to their institutions.

Implication for this research study. The contingency theory raises an awareness of how the environment-organization interface impact organization's systems. This theory influences the development of this study's conceptual framework that focuses on the interaction among systems, subsystems, and their components systematically.

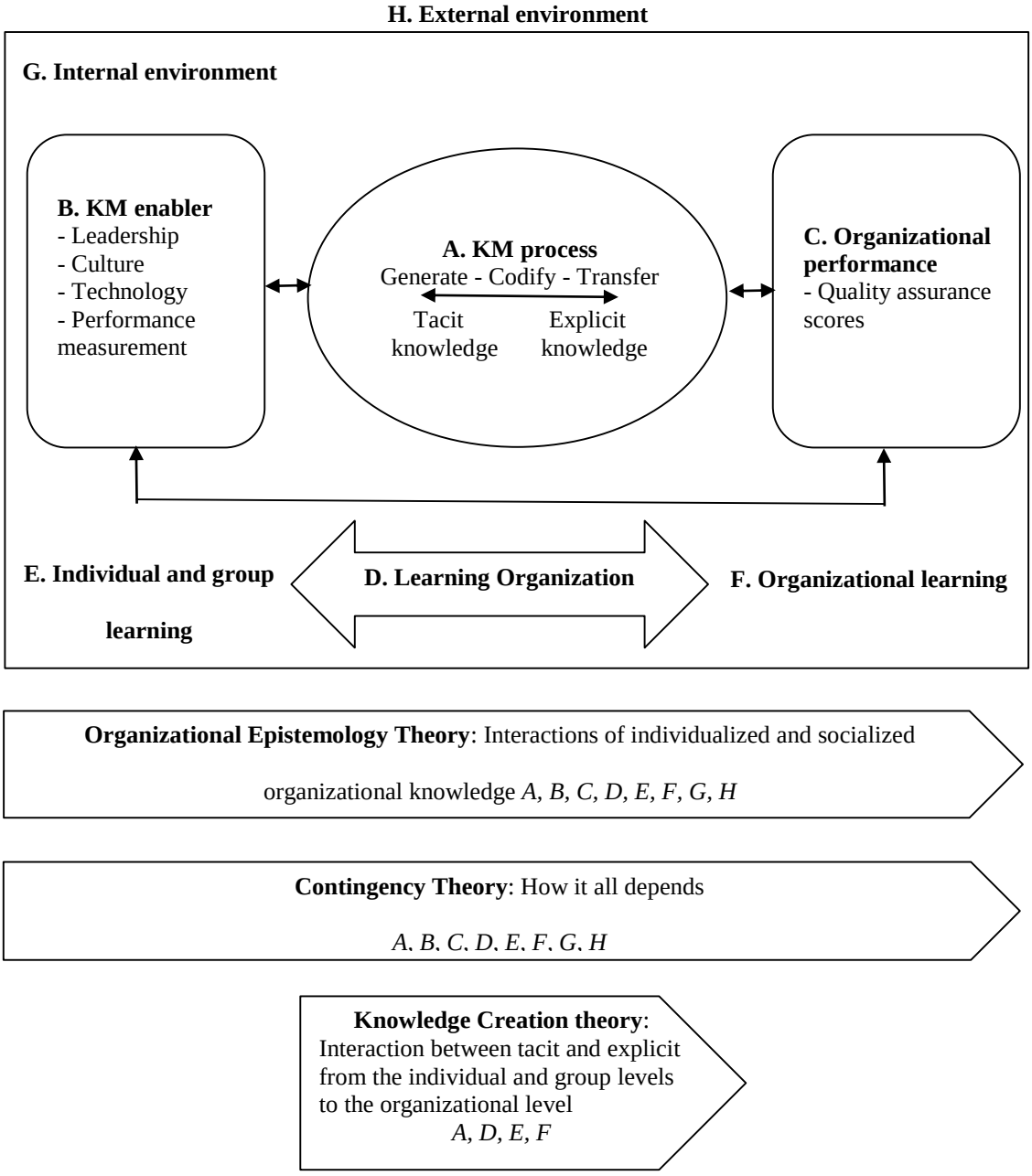
Development of Conceptual Framework

The conceptual framework developed here is based on the relationships between the KM enablers, KM processes, and organizational performance. The three aforementioned theories can be applied to generate the ideas surrounding the study. This conceptual framework (Figure 4), modified from the study of Watcharadamrongkun (2012), shows the iterative process between KM and organizational performance. This

study assumes that knowledge should flow within institutions through the iteration that occurs through dynamic, continuous, and interrelated KM activities. The management of knowledge is also iterative in that it involves the refinement of the ongoing knowledge activities by the repetitive application of the activities. This KM definition aims to assist an institution in performing better knowledge management to continually improve performance.

This study applies the economic perspective and the cognitive process perspective to define the term KM. KM refers to an iterative process of handling actionable knowledge that results from individual, group, and organizational learning to improve organizational performance. This KM definition expects to gain organizational knowledge from employees' learning. Furthermore, this study is interested in the learning interactions between individuals, groups, and organizations through managing the flow of knowledge. Knowledge here is treated as an intellectual capital that combines individual insights, experiences, know-how, and values. This knowledge has the potential to improve individual and organizational performance. Knowledge plays significant roles in a workplace because it becomes embedded in organizational documents or repositories, routines, practices, and norms (Davenport & Prusak, 1998). These forms of knowledge are contextual and unique because they reside in individuals' and organizations' behaviors.

Figure 4. **Conceptual Framework**



The KM process (A), including activities of generating, codifying, and transferring knowledge, displays the flow of knowledge in conjunction with tacit (uncodified) and explicit (codified) knowledge. KM enablers (B) associated with an organization can influence KM processes. These enablers include organizational contingency aspects that involve leadership, culture, technology, and performance measurement. Organizational performance (C), represented by quality performance scores, indicates the effectiveness of the organizational management through managing knowledge. Since KM processes, enablers, and organizational performance are the studied variables of this study, they will be more explained in the next section entitled variables used in the study.

Proper management of knowledge possibly develops a learning organization (D). As mentioned earlier in the KM definition and its related concepts, learning organization is a concept of continuous learning functioning as a vision. A learning organization refers to an organization where members learn collectively and effectively and transforms itself for better management through the use of knowledge across the organization (Marquardt, 2011).

Learning is a process of creating knowledge. It can take place in an organization at three levels: individual, group, and organizational (E and F). Individual learning includes changes in knowledge, attitudes, and skills acquired through self-study and observation. Group learning refers to an increase in knowledge, attitudes, and skills accomplished by and with groups. Organizational learning represents the enhanced intellectual and productive capacity gained through shared commitment (knowledge, beliefs, or

assumptions of members) to the organization. Learning in an organization is not a single activity. It relies on collaboration and participation in cultural and contextual practices. Knowledge occurs when individuals develop their learning and share their knowledge with others. Then, individual and group knowledge is attained through a shared learning commitment and is transformed into contextual organizational knowledge.

Although individuals and groups are the agents by which organizational learning occurs, their learning processes are influenced by internal and external environments of their organizations. With this interrelated nature, organizational learning involves the sharing of knowledge, beliefs, or assumptions among individuals and groups.

Internal and external environments (G and H) are included in this framework because they influence organizations in multiple ways. The internal environments vary in the forms of managerial assumptions about employees, organizational strategies, and structures. The external environment includes labor markets, availability and cost of capital, competitors, governmental laws and policies, and ecological concerns. Consequently, organizations need to adapt to the demands of their immediate environments (Pugh & Hickson, 2007).

For this study, the KM enablers (B) are performed as forms of internal environments. Other institutionalized aspects are not included in the KM enablers (B), such as university's missions, policies, sizes, and types, exist in the organization's internal environment. The outside organizational aspects, such as contexts of national culture, regulations, communities' requirements, and employers' expectations toward graduates, exist in the organization's external environment. These environmental aspects

provide the context for this study. They impact how the HEIs think and act (Marquardt et al., 2004). The environmental aspects are recognized, but they are not focal points of this investigation.

Knowledge Management Components

The implementation of KM needs to fit within an organizational context in order to optimize the KM advantages (Aujirapongpan et al., 2010; Chen, Yeh, & Huang, 2012; Zheng, Yang, & McLean, 2010). According to the contingency theory by Lawrence and Lorsch (1967), an organization confronts various degrees of uncertainty, complexity, and change. The effectiveness of the organization relies on its internal and external environments. The internal environment represents the forms of an organization's management, including organizational processes, strategies, structures, and mind-sets of employees. The external environment includes aspects from outside the organization that impact the management, such as communities' requirements and expectations, competitors, and changes in technology. The organization must have its internal environments be as complex and dynamic as the external environment in which they operate. Consequently, the achievement of the KM implementation needs an effective operation in line with both.

Some scholars conducting KM research studies in the corporate context (e.g., Choi & Lee, 2003; Gold et al., 2001) and the higher education sector (e.g., Cranfield, 2011; Watcharadamrongkun, 2012) have suggested three major components for implementing KM. The three components, which are KM enablers, processes, and outcomes, engage in an organization's internal environment. KM enablers refer to

organizational factors that influence an organization's ability to manage knowledge in an efficient and effective manner (Gold et al., 2001). KM processes involve an organization's activities or practices that handle knowledge throughout an organization (Heisig, 2009). KM outcomes, also characterized as organizational performance, imply the quality and effectiveness of an organization's overall process. These three components become the environment-organization interfaces that impact the achievement of KM.

Knowledge Management Enablers

Researchers have studied enablers affecting the KM implementation for the past decade. KM enablers refers to *influential factors to manage knowledge efficiency and effectively* (Gold et al., 2001).Various research studies (i.e., Heisig 2009; Lehner & Haas, 2010) were conducted to explore the importance of having the supportive KM factors to underpin KM success.

For example, one of the common perspectives to study KM enablers is resource-based capability (Aujirapongpan et al., 2010). Resource-based capability assumes that organizations with different resources will have different KM capacities. Resource-based capability focuses on organizational resources that infer tangible assets, such as land, buildings, and instruments (Aujirapongpan et al., 2010), and intangible assets, such as organizational structure, culture, and management systems (Gold et al., 2001).

Another most widely cited KM enabler is the study by Gold et al. (2001). They grouped a variety of KM enablers into three components: organizational culture, structure, and technology. They termed these three components as knowledge

infrastructure capability. The cultural infrastructure is the integration of an organizational value and vision. The value and vision should support knowledge-related activities and be clearly communicated through an entire organization. The structural infrastructure refers to the presence of organizational policy and process. Organizational structure should be flexible to encourage knowledge interactions among employees. Last, the technological infrastructure addresses the technology-enabled ties that exist within an organization. The technical systems should determine how knowledge is distributed throughout a firm and how knowledge is accessed.

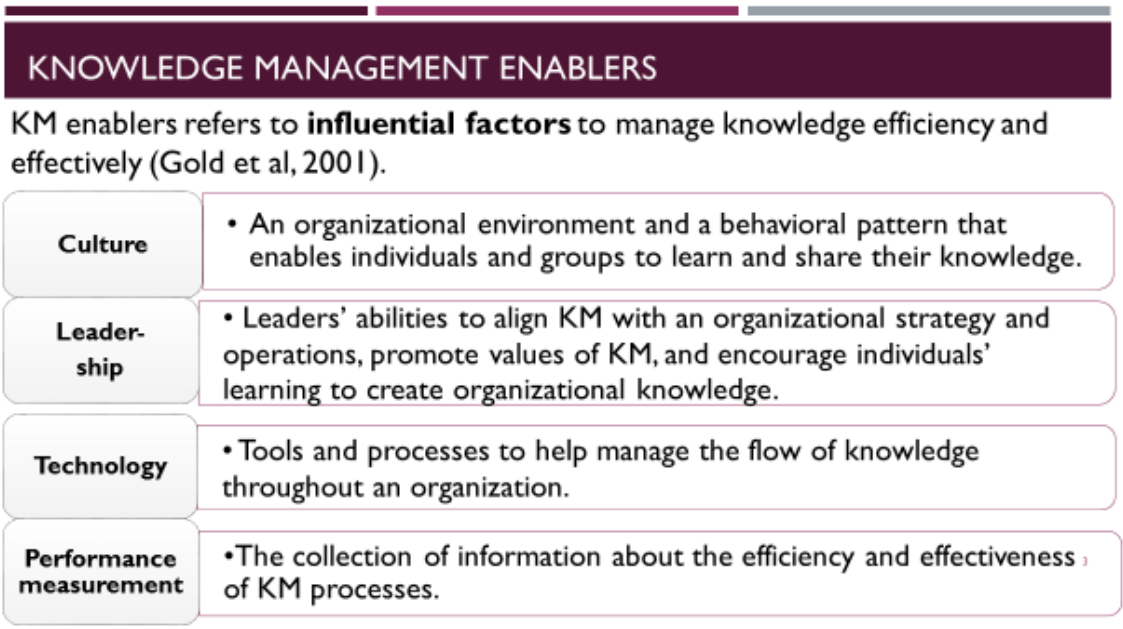
Heisig (2009) did a content analysis study of 160 KM frameworks in a corporate context, regarding the most frequently used terms for the description of KM critical success. He classified KM success factors into four main categories with 10 sub-categories: (a) human-oriented factor: culture, people, and leadership, (b) organization: process and structure, (c) technology: infrastructure and application, and (d) management process: strategy, goal, and measurement. The largest portion is allotted to culture (a sub-category of the human-oriented factor), which is the most frequently mentioned.

Lehner and Haas's study is consistent with Heisig's work. Lehner and Haas (2010) collected over 60 KM studies and then classified KM factors into three dimensions: human being, organization, and technology. They merged the management process factor, which is the fourth dimension of Heisig, with the organization dimension. The dimension of human being involves leadership support and individual attitude facing KM. Organization includes eight components: personnel development, meta-

communication of KM, KM goal, KM responsibility, delegation/ participation, staff member motivation, existing social net, and KM corporate culture. Technology, the last dimension, is composed of an IT system, an organizational system, and a KM content.

This study focuses on intangible assets, including organizational culture, leadership, information technology, and performance management (Figure 5). These four enablers are included in the KMAT tool, a widely recognized KM tool used in industry and higher education sectors across countries. This study uses this set of KM enablers because it denotes two major categories with a focus on human-oriented and organization-oriented factors that are able to lead to an understanding of the entire KM system of any organizations.

Figure 5. **Definition of Knowledge Management Enablers**



Organizational culture. Culture has been long on the agenda of organizational management studies. Schein (1999), a well-recognized scholar of organizational culture, defined organizational culture as

> "a pattern of basic assumptions—invented, discovered, or developed by a given group as it learns to cope with its problems of external adaptation and internal integration—that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think and feel in relation to those problems" (p. 385).

His definition implies that culture is powerfully subjective and reflects how an organization gives meanings to situations and solutions for solving problems.

In the KM literature, culture is a broad term that has multiple characteristics. Ramachandran et al. (2013) defined culture as "a set of beliefs [including] organizational purpose, criteria of performance, the location of authority, legitimate base of power, decision-making orientation, leadership style, compliance, evaluation, and motivation" (p.79). Lee (2007) described culture as "an organizational environment and a behavioral pattern that enables people to share their ideas and knowledge." (p. 13). A study of Coukos-Semmel (2002) referred to culture as "the general knowledge sharing climate of the organization as related to an integrated pattern of human behavior—including thoughts, speech, actions, and artifacts" (p. 14). Tan and Noor (2013) have a specific focus on individuals' willingness to share knowledge. Culture in these studies has diverse characteristics but the same purpose, regarding individuals' values, beliefs, and environments or climates to conduct KM.

A definition of organizational culture can be divided in terms of its process and outcome (Dalkir, 2005). Using the process perspective, culture involves a set of mechanisms, such as values, norms, and practices that control how individuals and groups in an organization interact with each other and people outside an organization. For the outcome perspective, culture includes a manifest pattern of behaviors or the way individuals do things. Culture in the outcome perspective becomes committed ways in which individuals perform their tasks, solve problems, and provide products and services.

Culture is reflected in values, norms, and practices (Lee, 2007). Values, which are tacit in nature, are difficult to articulate. Values inspire members in an organization to do something. Norms are formulated by values but are more visible than values. For example, if members believe that sharing knowledge will benefit them, they are more likely to support an idea of sharing their knowledge. Practices are the most tangible form of culture. These three forms of culture influence behaviors of members in an organization.

Organizational culture is regarded as the most important factor impacting KM (Heisig, 2009). If an organizational culture is willing to accept changes in valuing knowledge, the KM implementation will possibly succeed (Gold et al., 2001). Shaping a culture is an important ability for effectively managing knowledge.

Gold et al. (2001) proposed six characteristics of organizational culture to enhance the KM implementation: (a) an individual attitude toward KM, (b) an individual participation in knowledge-related activities, (c) a recognition of expertise, (d) a

collaboration among organizational members, (e) a clear KM vision and value, and (f) support of top management. An organization needs to establish and create a knowledge-friendly culture to achieve effective knowledge sharing that results in more organizational knowledge (Lee, 2007).

Not only shaping culture, but also maintaining culture is necessary. Culture that encourages KM should be clearly communicated through an entire organization to support knowledge-related activities (Aujirapongpan et al., 2010). Communication is the tool that helps to transmit culture to existing employees and to newcomers. It also enables culture to be maintained and developed in its certain way.

In examining what leverages organizational knowledge capability, two KM studies in higher education examined organizational culture that promotes sharing knowledge and organizational learning. Lee (2007) listed several cultural characteristics: community-orientation, trust or openness, collaboration, entrepreneurship, and responsiveness to training and professional development. Coukos-Semmel (2002) offered examples of cultural strategies to achieve organizational learning, including communities of practice, and staff development opportunities. These cultural characteristics require the support of the organization for learning and sharing knowledge activities.

The management of sharing knowledge and organizational learning leads to a learning organization. Marquardt (2011) suggested that in a learning organization, culture is one factor in which learning is recognized. Learning has become a habitual and integrated part of all organizational functions. Culture enhances learning by encouraging

knowledge values, such as self-learning, learning collaboration or team learning, empowerment, and knowledge sharing. Employees are responsible not only for their own learning, but also for learning of others. They are expected to teach and learn from their colleagues. These values and practices are embedded in organizational culture and help an organization become a learning organization.

A proper organizational culture should be an initial requirement for effective KM. This study defines organizational culture as *an organizational environment and a behavioral pattern (Lee, 2007) that enables individuals and groups to learn and share their knowledge within an organization*.

Leadership. Leaders have exceptional and imperative roles to play in managing knowledge. They establish policies and create an organizational culture that promotes a KM initiative in their organizations (Ramachandran et al., 2013).

Similar to culture, leadership has a complex description with a variety of definitions and components. Leaders act as change agents who send a signal of organizational change adopting KM in their organizations (Coukos-Semmel, 2002; Lee, 2007). Leadership is defined as an ability to align KM behaviors with organizational strategies, identify opportunities to use KM, promote values of KM, communicate best strategies, facilitate the evolution of a learning organization, and provide guidelines for assessing an impact in knowledge. Leaders act as drivers who lead to effective KM (Yusoff et al., 2012).

Golden (2009) viewed leadership with a different perspective. He was interested in leaders with technological skills. KM leaders are expected to have both management

and technological skills. They should possess basic communication skills, good management instincts, abilities to articulate organizational goals and visions, and, importantly, technical skills to be able to communicate with technical staff, comprehend the trend of information technology, and understand the business of an institution.

In the KM literature, some studies examined leadership in terms of top management's attitudes and supportive actions toward KM. One of these studies examined top management's attitudes, it explored top management's understandings of the importance of KM and their engagement in knowledge sharing practices (Tan & Noor, 2013). Other studies explored administrator visions, strategic planning, values of learning, and motivation toward a KM initiative (Arntzen et al., 2009; Lee, 2007). These works illustrate the strategic focus on KM.

Dalkir (2005) suggested appointing a specific leader position in handling KM. A role for a KM executive includes a Chief Knowledge Officer (CKO) or a Chief Learning Officer (CLO). The CKO or CLO position heads KM teams and is primarily responsible for setting KM strategies, handling KM operations, influencing changes in organizations, and managing KM staff teams. KM executives should create an environment that fosters knowledge sharing informally so that they can interact with teams in a work context. Furthermore, they have responsibilities to decide how information and knowledge are created, processed, inventoried, retrieved, and evaluated, so that KM activities are aligned with an organization's goals. This executive KM role also often incorporates change management.

Leaders are required to have abilities to align KM processes with organizational strategies and operations. This study applies the economic perspective as a lens to manage knowledge. It views managing knowledge as managing an organizational asset. Thus, this study defines leadership as *leaders' abilities to align KM with an organizational strategy and operations (Coukos-Semmel, 2002; Golden, 2009; Lee, 2007), promote values of KM (Arntzen et al., 2009; Chumjit, 2012), and encourage individuals' learning to create individual, group, and organizational knowledge (Tan & Noor, 2013).*

Leadership addresses how leaders' actions guide and sustain an organization by setting organizational vision, values, and performance expectations (NIST, 2013). A leader can successfully manage knowledge by following three practices. First, leaders have a vision for managing knowledge. Leaders with KM vision can provide a sense of direction that helps their members to create knowledge (Lee, 2007). Vision for managing knowledge should be communicated clearly and across an entire organization (Gold et al., 2001). Furthermore, leaders should link KM with an organizational strategic plan (Golden, 2009). A strategic plan provides a road map to lead a workplace from where it is now to where it would like to be (McLean, 2006). Strategic planning assists an organization in clearly defining its objectives and assessing internal and external environments to determine a direction of a firm. This planning process provides an overall strategic direction to organizational management, and gives a specific direction (such as, financial strategy, organizational development strategy, and human resources strategy) to achieve an overall organization's success. KM plays a role in this process

and function as a strategy to support the improvement of the organization's knowledge assets.

Second, leaders should promote values of KM through motivation and reward systems. The motivation and reward systems range from monetary, such as bonuses and incentives, to non-monetary incentives, such as recognition and promotion (Chumjit, 2012; Tan & Noor, 2013). By offering motivation, an organization can promote knowledge sharing and encourage people to participate in creating knowledge (Arntzen et al., 2009).

Third, leaders are required to prepare and educate employees in order to be able to understand and implement KM effectively (Chumjit, 2012). KM training programs help assure that individuals obtain needed knowledge for their jobs. Competencies in KM enhance employees' ability to utilize the management of knowledge in their jobs. For example, employees can use technology for searching, codifying, and sharing knowledge (Marquardt, 2011). Collaboration among employees also occurs when applying KM processes, because the essence of KM eases knowledge dissemination and sharing (O' Dell & Hubert, 2011). Networking is important for organizational development since a firm can perform better and create innovations through intra-organizational collaboration of employees from various functions (Chumjit, 2012).

All in all, KM leaders require a multidisciplinary skill set that consists of such competencies as having a vision for managing knowledge, aligning KM with an organization's strategies and operations, recognizing the importance of KM (in particular

an economic benefit), motivating employees to engage in the development of knowledge, and facilitating individuals' learning to enhance their competencies.

Technology. Literature of the developmental stage of KM mainly focused on capturing technology, codifying, storing, and distributing information (Lee, 2007). This overemphasis on technology often creates confusion between information management and knowledge management because most people perceive these two terms as interchangeable. The purpose of KM is to manage the knowledge from individuals' experiences, know-how, and values, rather than the management of data in information processing systems.

Technology in the KM literature focuses on "how knowledge travels throughout an organization and how knowledge is accessed" (Gold et al., 2001, p. 193). With this focus, the definition of technology commonly refers to an infrastructure of devices and systems that enhance the distribution of knowledge across an organization.

Most researchers have addressed the significant impact of technology and its role in effectively managing knowledge. The purpose of technology is to support the development of organizational knowledge by enabling the flow of KM processes (Gold et al., 2001; Marquardt, 2011). Technology, an organizational infrastructure, is composed of integrated hardware, software, technological networks, and information tools with access to and exchange of information and learning, which then are turned into knowledge.

Marquardt (2011) addressed two major components of technology: an application for managing knowledge and an enhancement of learning. Technology for managing

knowledge includes the computer-based technology (such as, web-based networks and electronic databases) that gathers, codes, stores, and transfers information and knowledge across and outside organizations (Marquardt, 2011). Technology facilitates communication between organizational members and increases networking between people within and beyond the workplace (Lee, 2007). The use of technology helps overcome differences in time and distance so organizational isolated members can work together and share their ideas and knowledge (Chumjit, 2012).

Technology for enhancing learning encompasses the utilization of computer-based technology and multi-media for the purpose of the delivering and developing knowledge and skills (Marquardt, 2011). Technology enhances learning opportunities and learning environments for individuals. It offers a collaborative learning environment among organizational members interactively (Gold et al., 2001) through various types of the technological tools, such as blogs, wikis, social tagging, podcasts, social networking, and e-learning (O'Dell & Hubert, 2011).

Measurement of the management in information, knowledge, and information technology examines how an organization ensures the quality and availability of needed data, information, software, and hardware, normally and in the event of an emergency (NIST, 2013). The ultimate goal of this measurement is to improve organizational efficiency and effectiveness and to stimulate innovation through the management of knowledge assets.

Gold et al. (2001) proposed common indicators of the technology capabilities affecting KM effectiveness. These indicators consist of an accessibility of business

intelligence, collaboration and distributed learning technology, knowledge discovery, knowledge mapping, knowledge application, opportunity to generate and store knowledge, and security.

Business intelligence technology supports an organization to generate knowledge, regarding its competition and broader economic environment. Collaboration and distributed learning technology allows individuals to gain interaction and collaboration without the limitations of structural and geographical impediments (such as time and distance). Knowledge discovery technology helps find new knowledge from inside and outside the workplace. An organization can effectively track sources of knowledge from knowledge mapping technology by creating an inventory or a catalog of internal organizational knowledge. Knowledge application technology helps a firm use its existing knowledge, while opportunity generation technologies allow knowledge to be tracked by customers, partners, employees, or suppliers. In addition to creating, storing, and transferring knowledge through the technological infrastructure, an organization must consider that knowledge is secured— it is not stolen or used inappropriately.

Technology is a major facilitator of managing the flow of knowledge. It involves information and communication technologies, technological equipment, and knowledge platforms that facilitate KM processes. Based on the literature review, this study defines technology as *tools and processes that facilitate and sustain individual and collective activities (Marquardt, 2011) to help manage the flow of knowledge throughout an organization (Gold et al., 2001).*

Performance measurement. KM is an iterative process that involves many activities, such as acquisition, creation, storing, sharing, usage, and assessing of knowledge. Once the KM processes are implemented, their effectiveness or achievement needs to be examined. Since an organization faces a massive amount of knowledge, not all knowledge is valuable and applicable to future competitive advantage and to justify for costs of retaining and transferring them (American Productivity and Quality Center, 2003). KM performance measurement assists in identifying what and where knowledge is, and by what means that knowledge can be captured and transmitted.

Based on previous analysis of 17 KM processes models in higher education, measurement is less applied (Sunalai & Beyerlein, in press). Several institutions disregard the measurement of KM processes and rarely use evaluation tools to monitor the management of knowledge flow. It seems that the deficiency of knowledge measurement is one of the impediments to manage the flow of knowledge.

Performance measurement plays a vital role in KM processes, because it focuses on the analysis of the efficiency and effectiveness of the KM implementation. Performance measurement aims to control, evaluate, and improve KM processes to ensure that the implementation stays on track (Ramachandran et al., 2013). This measurement can be conducted at the beginning and ending steps of any KM process. Measurement at the beginning identifies the right knowledge for the right person at the right place. Measurement at the ending step assists in refining knowledge for the long-term use. Measuring KM processes examines their current statuses and provides

justification for modifying their alignment with an organization's strategies and operations (Lee, 2007).

An organization not only measures the efficiency and effectiveness of KM on-going processes, but also assesses relationships between KM impacts and organizational performance (Lee, 2007; Yusoff et al., 2012). From the economic perspective, measurement, as a strategy, serves to identify knowledge assets and capabilities of an organization, and to align the measurement activities with organizational strategies (Lee, 2007). Measuring the outcomes of KM helps justify investments in managing knowledge, and reinforce the support for its implementation.

Three categories of the indicators that an organization can apply to measure KM impacts include: activity, process efficiency, and business performance and output (O'Dell & Hubert, 2011). First, the activity indicator focuses on measures of involvement. The engagement of participants can be represented by the degree of an individual's interest in provided learning activities. Better learning is affected by participants' reactions and motivation to learn (Holton, Bates, Ruona, 2001). Second, the process efficiency indicator assists monitoring and understanding how KM processes help knowledge flow. This indicator helps track learning efforts that involve knowledge capture process, participant satisfaction, and reuse of knowledge. Last, the business performance and output indicator evaluates the performance of business operation.

Commonly in the KM literature, performance measurement consists of as an instrument that collects information with appropriate metrics to assess effective and efficient KM implementation (American Productivity and Quality Center, 2003; Lee,

2007; Ramachandran et al., 2013). This study uses two approaches of measurement (measurement for efficiency and effectiveness of KM processes and measurement for the KM impacts on organizational performance). Thus, the performance measurement of this study refers to *the collection of information about the efficiency and effectiveness of KM processes when managing the flow of knowledge (American Productivity and Quality Center, 2003; Lee, 2007; Ramachandran et al., 2013) and the productivity of individuals and organizations that results from the KM implementation (O'Dell & Hubert, 2011).*

Knowledge Management Processes

KM processes involve *an organization's activities that manage a flow of knowledge throughout an organization* (Heisig, 2009). This study has an underlying assumption that knowledge should flow within institutions through iterations. The management of knowledge activities is iterative in that it involves the refinement of the ongoing knowledge activities by the repetitive application of the activities.

Researchers have studied KM processes for the past decade. The analysis of KM processes increases understandings of how knowledge interacts among individuals and organizations. Various KM processes have been identified in higher education. Sunalai and Beyerlein (in press) conducted an integrative literature review studying KM processes in the higher education context. They systematically searched previous research works from 2001 to 2014 (September 13) in Academic Search Complete (Ebsco), ProQuest, and Google Scholar databases. The KM literature search yielded 15 relevant academic papers published between 2002 and 2013. Five papers are

dissertations and 10 papers are articles in 10 different peer reviewed journals. Based on these 15 publications, 16 KM processes models were found. Fourteen papers used one model and one paper used two models. The development of these models can be divided into two categories: those that adopted a well-known model and those that created a new model.

Of those publications that adopted well-recognized KM process models, the SECI model by Nonaka and Takeuchi was the most used (four publications). The KMAT by Arthur Andersen Consulting Services and the American Productivity and Quality Center (APQC) was the second most cited (two publications). Of the seven publications that developed their own unique model, many found solutions by adopting KM processes found during their extensive literature review.

Based on the analysis of the 16 KM process models, Sunalai and Beyerlein (in press) found 39 different activity terms related to KM processes. They combined similar activity terms within a category and divided them into six categories that consist of Acquire, Create, Store, Share, Use, and Assess knowledge (to avoid a confusion of similar terms that can be placed at the category and construct level, the capital letter for terms represent the category level).

Acquire is a combination of accessibility, collection, and assimilation of acquired knowledge. Similar terms found in the Acquire category include acquire, buy, capture, gain, and get. These terms have a common purpose to obtain necessary knowledge for the use of an organization.

Create refers to the development of new knowledge or the replacement of existing knowledge. The synonymous terms include build, create, generate, improve, and learn. Knowledge creation may occur through reasoning with existing knowledge, innovating by individuals to improve the way they perform their tasks, or buying knowledge from subject matter experts.

Store covers activities of embedding and categorizing knowledge so that organizational knowledge can be easily retrieved. Codify, combine, storage, organize, and sustain knowledge are similar terms in this category. The aim of knowledge storage is to put organizational knowledge into a form that makes knowledge accessible.

Share combines the activities of sharing and distributing knowledge between an organization's members. Knowledge sharing is the most frequent occurrence of KM processes and it is mentioned in all 16 models. The synonyms of Share are comprised of allocate, contribute, disseminate, distribute, integrate, present, share, transfer among organizational members, externalization, and socialization. Share focuses on an interaction of sharing and distributing knowledge between individual, group, and organizational levels.

Use refers to an application of knowledge to individuals' daily work that is embedded in organizational operations. The similar terms consist of apply, use, transfer to job, transform, internalization, and institutionalization. Use aims to apply established knowledge when performing a routine task.

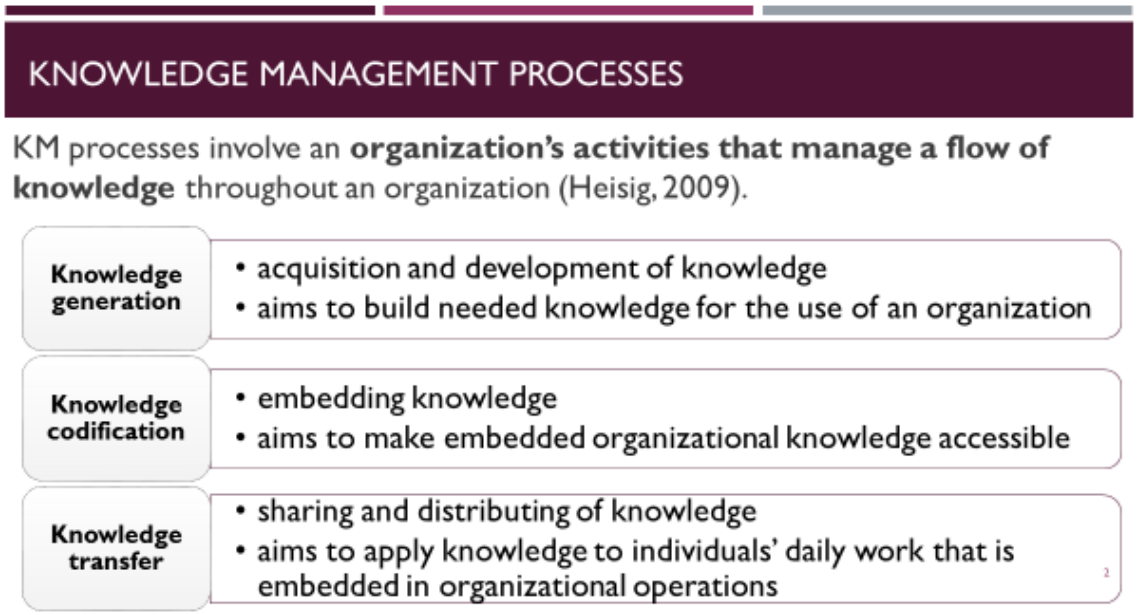
Assess focuses on the analysis of knowledge to assure the usefulness of knowledge and the evaluation of an effectiveness of an overall KM process. This

category is comprised of analyze, assess, define organizational purpose, evaluation, identify, measure, and validation. An assessment of knowledge can be performed before or after KM processes. The purpose of the assessment at the beginning of the process is to identify what knowledge should be possessed or used for an organization. The assessment after KM processes aims to monitor and then refine knowledge being used with existing and future needs.

The six categories of KM processes provide a coherent lens of KM processes used in previous research. They represent a clearer view of how knowledge flows through interactive processes within an institution.

For KM studies, the KMAT tool, initiated by Arthur Andersen Consulting and APQC, is frequently used to study KM processes in both corporate and higher education contexts. The KMAT tool consists of five aspects: process, culture, leadership, technology, and measurement in managing knowledge (American Productivity and Quality Center, 2003). KMAT places all the major KM processes and enablers together in a system. This tool is designed to help organizations make an initial high-level assessment of how well they manage knowledge. The KMAT process operates through three types of activities: generation, codification, and transfer (Figure 6).

Figure 6. **Definition of Knowledge Management Processes**



Knowledge generation. The first KM process starts with knowledge generation. It refers to *the activity of acquisition and development of knowledge* (Ramachandran et al., 2013; Shoham & Perry, 2009). Knowledge generation has a purpose to build needed knowledge for the use of an organization.

For the acquisition of knowledge, this activity starts with finding what essential knowledge should be possessed or used in an organization (Shoham & Perry, 2009). It identifies a detected knowledge gap and needed knowledge (Dalkir, 2005) for the use of making decisions, solving problems, or innovating products and services (Bukowitz & Williams, 2000). A knowledge gap is the difference between what individuals knows and what they need to know in order to accomplish their task (Leonard & Swap, 2005).

The knowledge gap analysis can be conducted through creating a knowledge map that functions as a snapshot to help an organization understand what knowledge it has and lacks (O'Dell & Hubert, 2011). Knowledge maps include three different types of functions. Enterprise knowledge map aims to identify and measure an organization's level of competency and expertise to meet its strategic goals. Cross-functional knowledge map is used to identify specific individuals who are experts and their areas of expertise and to understand the strength and gaps within specific technical or functional knowledge of each area. Process-explicit knowledge map includes the identification of specific knowledge assets and contents that function as resources for an organization, such as knowledge inventories and directories (O'Dell & Hubert, 2011).

When accomplishing the acquisition of essential knowledge in an organization, the next step moves to an activity of developing knowledge. The development of needed knowledge includes the creation of new knowledge (Ramachandran et al., 2013) and the replacement of existing knowledge (Dagli, Silman, & Birol, 2009). This activity develops knowledge, particularly know-how, defined as innovations that have not had a previous existence within an organization. It attempts to access, collect, and assimilate existing internal knowledge within an organization and/or external knowledge from outside (Dalkir, 2005; Watcharadamrongkun, 2012).

The current challenge of building knowledge is not in finding knowledge but in dealing with the massive volume of knowledge that can be obtained (Bukowitz & Williams, 2000). An organization needs to select and match the wide stream of knowledge with the best possible content in an organization's context. Dalkir (2005)

suggested a criterion to develop needed knowledge is to identify a sufficient value to an organization such that it should be added to the store of intellectual capital.

Knowledge generation aims to build needed knowledge, particularly know-how that fits in the context of an organization. This KM process assists an organization in the acquisition and development of the right knowledge in the right people, in the right places, at the right time, and for the right reasons.

Knowledge codification. Knowledge codification is *the activity of embedding knowledge by transforming tacit and explicit knowledge back and forth into an organizational knowledge* (Nonaka, 1991; Wiig, 1993). This embedded organizational knowledge, then, is made accessible so that organizational members can clearly understand and easily retrieve (Coukos-Semmel, 2002; Ramachandran et al., 2013; Wiig, 1993).

According to Nonaka (1991), the transformation of organizational knowledge from tacit into explicit does not occur in a linear fashion that ends at the creation of explicit knowledge. Explicit knowledge can be recreated and then internalized into individuals' tacit knowledge. This explicit knowledge imbeds itself in an organization's members' mind-sets and mental models. Wiig (1993) asserted that codifying knowledge encompasses how individuals represent knowledge in their mind-sets or mental models, how they assemble knowledge into coherent models, how they document knowledge (such as, manuals), and how they encode knowledge in order to post it to a knowledge repository. Consequently, explicit knowledge becomes tacit knowledge that is recognized as part of the organizational norms, routines, and practices.

Another aim of codification is to put organizational knowledge into a form that makes knowledge accessible. Codification gives permanence to knowledge that may exist in forms that can be shared, stored, and combined to retain essential knowledge (Dalkir, 2005). Knowledge, being stored or retrieved, is physical (such as, file folders, printed information) and digital (database). Managing knowledge incorporates not only traditional explicit forms (a physical or digital document), but also tacit knowledge that resides in individuals' mind-sets (Bukowitz & Williams, 2000). This implies that effective knowledge needs to be connected through both visible forms and values added by those individuals who use it. Thus, codification involves major tasks to organize knowledge content, as well as to maintain timeliness, completeness, and accuracy in order to respond to users' needs. Furthermore, an organization needs to offer training programs to enhance users' capabilities with new knowledge repository technologies (information literacy) to ensure that they are able to access and retrieve knowledge that they need.

Individual and group learning represents the first step in organizational learning (Marquardt, 2011). Knowledge is information until it is validated and codified at an organizational level (Dalkir, 2005). Codifying knowledge is an essential step in leveraging knowledge values (Coukos-Semmel, 2002). Codifying knowledge adds value by creating more readily usable knowledge in objective forms and by storing an essential knowledge content more flexibly for future use (Dalkir, 2005).

Knowledge transfer. The last process, knowledge transfer, aims to apply knowledge to individuals' daily work that is embedded in organizational operations.

This process represents *sharing and distributing of knowledge between an organization's members* (Aujirapongpan et al., 2010; Shoham & Perry, 2009). The purpose of knowledge transfer is not only distributing knowledge, but sharing knowledge (Bouthillier & Shearer, 2002). Sharing of knowledge goes beyond the distribution of knowledge because it helps ensure the exchange of knowledge within an organization's communities. Consequently, knowledge transfer deals with combining knowledge in new and interesting ways in order to foster knowledge utilization and encouraging employees to share their own knowledge to a knowledge repository (Bukowitz & Williams, 2000).

Knowledge transfer covers the mechanical, electronic, and interpersonal movement of knowledge (Marquardt, 2011). It can be undertaken formally and informally through various media, meetings, changes in positions or duties, and mentoring (Watcharadamrongkun, 2012). Other interesting knowledge transfer forms involve learning from experiences, including best practices and lessons learned among organizational members (O'Dell & Trees, 2014). Best practices and lessons learned influence knowledge transfer by building organizational memory (Bukowitz & Williams, 2000). An organizational memory is created so that organizational knowledge becomes possible from both successes (best practices) and failures (lessons learned). Individuals, groups, and organizations learn when new knowledge is shared in a socialization process.

Misconception about transferring knowledge is about managing all knowledge made public (Bukowitz & Williams, 2000). The purpose of KM is not to post everything

on an organization's digital platform, such as intranet, but to find out essential knowledge from individuals (their experiences and know-how in relation to their jobs). Knowledge to be shared organization-wide must be organized in an accessible form in order to be widely used.

An outcome of knowledge transfer is to apply knowledge to individuals' works and embed knowledge in organizational operations (Aujirapongpan et al., 2010). The ability to transfer knowledge is significant for the improvement of organizational operations because knowledge transfer aims to apply established knowledge when performing a routine task.

Based on previous KM studies in the higher education setting, two research studies used the KMAT model to represent KM processes (generation, codification, and transfer) in the context of higher education their studies. Both studies examined the gap of KM processes in terms of importance and use in universities in different countries—257 research universities in the United States (Coukos-Semmel, 2002) and four Malaysian universities (Ramachandran et al., 2013). The study of Coukos-Semmel (2002) indicated that the overall use of KM processes was below the moderate level and the importance was above the moderate level. Ramachandran et al. (2013) found that the KM processes were considered to be important. Codification scored the highest mean, followed by transfer and generation. However, for the degree of use, the scores showed the average use of the KM processes. Knowledge transfer scored the highest mean, followed by generation and codification. These two studies provide a clear statement that the implementation (use) does not match the importance.

Organizational Performance

This study assumes that KM enablers affect KM processes that contribute to effective organizational performance. Performance refers "to outputs and their outcomes obtained from processes, products, and customers that permit the organization to evaluate and compare its results relative to performance projections, standards, past results, goals, and the results of other organizations" (NIST, 2012, p. 60). Organizational performance here implies an integrated view of KM outcomes that results from managing organizational knowledge (Yoopetch, 2009). Organizational performance should be more successful if an institution manages knowledge effectively (Keeley, 2004).

This section explains the contribution of KM in organizational performance to provide an insight into how KM impacts an academic institution's effectiveness and efficiency. The measurement of organizational performance has long been argued, in particular, to link an investment in KM with the measurable outcomes (American Productivity and Quality Center, 2003). This study tries to measure KM outcomes by using performance scores in higher education as the representative measurement.

Contribution of knowledge management in organizational performance in higher education. In the academic institution context, the analysis of the previous 18 KM outcome studies suggest that education performance can be divided into three categories: improvement of organization management, achievement of higher education missions, and performance score assessment (Sunalai & Beyerlein, in press).

The improvement of organization management includes two different levels of management perspectives: organizational development and individual performance.

Organizational development involves any practices or interventions aimed at improving an institution's processes through the lens of change at the organizational level (Burke, 2011). KM strengthens an organization's management and supports adaptation to change. Previous higher education research works showed that KM significantly benefits better management processes, such as strategic planning (Chumjit, 2012), decision-making (Keeley, 2004), change management (Mohayidin et al., 2007), creativity (Rahimi, et al., 2011), and quality control (Cranfield, 2011). The effective management of knowledge provides accessible and actionable knowledge to support managerial decisions based on empirical evidence.

The benefits of KM also contribute to performance development. KM supports competency development of an institution's members, in particular faculty members. It directly impacts the quality of teaching and the number of research publications, which lead to faculty growth (Basu & Sengupta, 2007). Furthermore, by using KM, university staff members develop their managerial skills by analyzing and writing their workflow descriptions and workflow procedures (Chumjit, 2012).

Most previous research studies agree that KM contributes to the achievement of higher education missions: teaching, research and publications, and academic services. KM helps improve teaching competencies through the value-added change in teaching (Arntzen et al., 2009; Arsenijević & Arsenijević, 2010; Chumjit, 2012; Cranfield, 2011; McCarthy, 2006; Mohayidin et al., 2007). Better teaching can be enhanced through

knowledge sharing processes among faculty members. Furthermore, KM increases research collaboration across a university, resulting in an increase in the number of research projects and publications (Chumjit, 2012; Cranfield, 2011; Tan & Noor, 2013). Collaboration improves accessibility to scholarly communication, such as conducting research projects and writing publications (McCarthy, 2006). Last but not least, KM positively influences an enterprise's product innovation through a relationship between networks of university–industry collaboration (Chen & Wei, 2008).

During the past decade, only one KM study has used a performance score assessed by an accrediting agency to infer organizational performance. The study of Watcharadamrongkun (2012) integrates three achievement scores including accreditation score, rating score, and North American Pharmacist Licensure Examination (NAPLEX) pass rate to measure academic performance of pharmacy schools in the US. Using a performance assessment from a national agency to represent the KM outcome is not common in higher education studies.

Organizational performance closely relates to KM outcomes aiming to produce knowledge assets in an academic institution. The analysis of the KM outcomes indicates that KM contributes to the improvement of organizational management processes and the achievement of academic institution's missions.

Performance score in higher education. A performance score assessment by an independent agency offers a direct measurement to assess an institution's performance. This measurement involves institutional evaluation (frequently known as programmatic evaluation). Institutional evaluation refers to "the evaluation of the institution's entire

curriculum to determine its effectiveness in meeting its educational outcomes" (Bouldin & Wilkin, 2000, p. 381). It aims to understand how an institution achieves its mission and goals, how it contributes to students and staff members' growth and development, what its strengths and weaknesses are, and how to bring about the organization's change or transformation (Bouldin & Wilkin, 2000; Watcharadamrongkun, 2012). The ultimate emphasis of institutional evaluation addresses the institutional level rather than an individual student level (Bouldin & Wilkin, 2000; Watcharadamrongkun, 2012).

Institutional evaluation affects organizational performance because it reflects and publicly reports on the effectiveness and quality of an institution. Two of the most recognized institutional performance assessments include benchmarking and external accreditation (Mok, 2005; Watcharadamrongkun, 2012).

Benchmarking, as a component of quality management, is a measurement tool in which an academic institution seeks information to analyze its current work processes. The term benchmarks refers to "processes and results that represent best practices and performance for similar activities, inside or outside an organization's industry" (NIST, 2013, p. 56). When doing the process of benchmarking, an institution learns how well other institutions perform. Benchmarking starts by identifying the best institution in an area that HEIs need to compare. Then, HEIs compare their results or outcomes and processes to those studied. Furthermore, HEIs can benchmark not only other institutions, but also themselves with the same process over time to determine how well they are doing. Benchmarking provides information for identifying the directions of institutions

and facilitating activities that efficiently accomplish their missions and goals (Watcharadamrongkun, 2012).

An example of university benchmarking is the university ranking system. Over the past decade, a rise in national and international systems for comparing and ranking universities has come from across the world. The purpose of this system is to measure performance dictating what an institution's performance should be (Taylor & Braddock, 2007). The two best-known international university ranking systems include the Times Higher Education Supplement (THES) World University Rankings and the Shanghai Jiao Tong Academic Ranking of World Universities (Taylor & Braddock, 2007). There have been debates on the criteria being adopted to assess and evaluate university performance. Some academics argue benchmarking systems are counterproductive to university development, while others criticize that benchmarking weakens academic freedom and institutional autonomy (Mok, 2005). A suggestion to use the university ranking systems effectively is to look carefully at their criteria, and then read their rankings as a measurement of achievement according to those criteria in particular (Taylor & Braddock, 2007).

Accreditation is another type of institutional performance assessment. In general terms accreditation can be defined as "a process, based on professional judgment, for evaluating whether or not an educational institution or program meets specified standards of educational quality" (Prados, Peterson, & Lattuca, 2005, p.165). It aims to assure that graduates of accredited programs are prepared for professional practice (Prince, 2004). Two types of accreditation include institutional or specialized.

Institutional accreditation aims to evaluate the overall operation of a university from a broad perspective. Specialized accreditation focuses in detail on programs that prepare graduates for their professions. In some countries, such as the USA, accreditation is a peer-review process conducted by non-governmental organizations associated with educational institutions or professional societies. In other countries, such as Thailand, accreditation is performed by both governmental organizations (Ministry of Education) and professional societies.

The advantages of the university ranking systems and accreditation contribute to three different levels: individual, institutional, and national (Taylor & Braddock, 2007). The published information provides a resource for prospective students to compare institutional performance. HEIs can compare their performances with other universities to analyze and evaluate their university's comparative strengths and weaknesses in particular academic areas. Parent organizations (Ministry of Education), government, and other higher education decision makers can use ranking systems to develop higher education policies.

Organization performance portrays an organization's effectiveness and efficiency through managing knowledge. This study aims to use performance scores as a representative of KM outcome. Performance scores offer a direct measurement to assess an institution's performance. It comes in a form of the institutional evaluation that publicly reflects the effectiveness and quality of higher education.

Relationships of Knowledge Management Enablers, Processes, and Organizational Performance

This study incorporates KM processes into organizational performance of higher education institutions. This section investigates the relationship between KM enablers and processes and the relationship between KM processes and organizational performance to measure the impact of KM on higher education performance. Since previous empirical KM studies in the context of higher education are limited, the literature in the corporate arena is used to support the investigation of the relationship among the studied variables.

Relationship between Organizational Culture and KM Processes

Organizational culture refers to an organizational environment (climate) and a behavioral pattern that enables individuals and groups to learn and share their knowledge within an organization. Most research findings have suggested that organizational culture is critical for managing knowledge. Culture has a greater contribution to KM than other factors (Zheng et al., 2010). Several studies found that culture is positively associated with KM processes (Chuang, 2004; Rašula et al., 2012; Zheng et al., 2010). Zheng et al. (2010) explained that culture influences KM processes through shaping the behaviors of organizational members. The changed behaviors contribute the successful KM implementation.

Many studies found critical characteristics of culture supporting KM. The ability of an organization to learn, develop, and share knowledge is dependent on its values in knowledge and behaviors in collaborative learning. Basu and Sengupta (2007) found that

in some universities, knowledge interactions are restricted to "closed pockets of the individual rooms" (p. 277). This silo hinders the knowledge sharing effort because it is limited to internal peer groups (Basu & Sengupta, 2007). Consequently, communication is low or absent among other external departments.

Yoopetch (2009) found that internal communication and social networking in a firm have a strong influence on KM. Furthermore, Tan and Noor (2013) found that openness in communication has a significant and positive influence on knowledge sharing by faculty members at research universities. Consistent with the study of Basu and Sengupta (2007), their findings revealed that openness in the communication climate increases the awareness of effective communication and the willingness of members to share knowledge with each other. Basu and Sengupta (2007) implied that members are willing to exchange their opinions and knowledge through seminars, workshops, and meetings, even if those ideas and knowledge contradict popular opinions. Open communication among members is an evolving about sharing knowledge across an entire institution.

Trust is also critical to organizational culture. Both studies by Ellingsen (2003) and Tan and Noor (2013) found that trust encourages knowledge sharing by facilitating a more proactive and open relationship among members; this relationship allows knowledge to be exchanged smoothly. Their results indicated that HEIs should build a trustworthy environment where members feel comfortable when sharing knowledge (Tan & Noor, 2013).

Based on previous studies, they showed that the characteristics of culture that support KM include valuing knowledge sharing; supporting collaborative learning; fostering learning value to individual, group, and organizational learning; facilitating open communication; and building trust among members. These cultural characteristics can encourage organizational members to think and behave in managing knowledge. They represent the cultural enablers (or organizational climates and behavioral patterns) that significantly relate to individual and group efforts to learn and share their knowledge within the workplace.

Relationship between Leadership and KM Processes

This study defines leadership as the leaders' abilities to align KM with an organizational strategy and operations; promote values of knowledge; and encourage individuals' learning to create individual, group, and organizational knowledge. Many previous research works have been interested in the relationships of leadership toward KM processes. They used two different terms to portray leadership— one is the term leadership itself, another is the structure term that refers to management styles, such as chains of command, motivation and reward systems, and development of human resources.

Leadership with respect to the top management's attitudes and supportive actions toward KM is one of the most important supporting enablers. Several research papers addressed that leadership relates to KM processes. Gold et al. (2001) found a positive relationship between leadership and the discovery, creation, and sharing of knowledge.

Gold et al. (2001) proposed that a flexible structure (decentralization) facilitates transferring of new knowledge across structural boundaries in corporate sectors. Similarly, Zheng et al. (2010) found that centralization relates negatively to KM processes. Unlike the studies of Gold et al. (2001) and Zheng et al. (2010), Chumjit (2012) indicated that centralization works well for some universities. Chumjit (2012) conducted a qualitative study in four autonomous universities in Thailand. She found that the chains of command in these four institutions are top down. In the case of KM, university administrators have deployed policies, and have allowed schools and departments to implement KM under their supervisions. These universities also have appointed the Chief Knowledge Officer (CKO) and KM teams to facilitate schools and departments to develop their KM strategic plans. The administrators focus on how KM actions of the university staff members impact the university's achievement.

Reward systems encourage sharing knowledge among organizational members (Gold et al., 2001). Results from Tan and Noor's (2013) study demonstrated that organizational rewards have a strong positive influence to predict knowledge sharing. For example, rewards (incentives or recognitions) from leaders to members, who share knowledge and then receive organizational rewards for their contributions, can influence the commitments of other members.

The support of leadership in KM involves individual development. KM training programs enhance individuals to be able to utilize the management of knowledge in their jobs (Chumjit, 2012). Golden (2009) mentioned that an increase in employees' KM understandings and skills influence the success of managing knowledge efforts. Some

examples of the developing activities can be explained by Chumjit's study (2012). She found that university staff members are taught the process of the KM implementation. Universities provide KM training programs, learning spaces or platforms (such as, weblogs, KM days, and community of practices), and incentives for KM best practices.

However, the result of Tan and Noor's (2013) study indicated that the top management support was not a knowledge sharing predictor. Their findings indicated that top management support may be an antecedent of other KM enablers, such as organizational rewards or culture, instead of the KM enabler, because top management plays a crucial role in providing incentives to members and promoting a knowledge culture.

All in all, leadership becomes a vital element to foster KM processes. Leadership can be either a predictor or an antecedent of other KM enablers. The characteristics of leadership consist of the abilities to align KM with the organizational strategies and operations, promote values of managing knowledge, and encourage individual learning and sharing in the workplace.

Relationship between Technology and KM Processes

KM involves the sharing of information and knowledge; therefore, technology becomes a means for searching, storing, retrieving, and accessing needed knowledge (Tan & Noor, 2013). This study views technology as tools and processes that facilitate individual and collective activities to help manage the flow of knowledge throughout an organization. Technology plays a role in academic society of supporting communication and collaboration, and searching for knowledge and information.

Over the past decade, there has been an increase in the study of technology affecting KM. These research findings can be generally divided into three conclusions. First, correlational research confirms that technology is important for KM practices. Rašula et al. (2012) studied the relationship of KM processes and technology in companies in Slovenia and Croatia. Their research revealed that KM heavily relies on technology. Technology has been called the most extensively used KM enabler in newly established public HEIs in Malaysia (Ramachandran et al., 2013). Technology is used in these institutions due to the campus-wide adoption of computers, internet, intranet, and software applications. The use of technology in those universities allows many KM activities to take place, such as knowledge capture, storage, and transfer.

Second, technology influences KM process and outcomes to a lesser degree than other enablers, such as culture (Rašula et al., 2012), internal communication and social networking (Yoopetch, 2009), and an HRM strategy (Chen et al., 2012). When technology is combined with other enablers, it can enhance performance and lead to business advantages (Chuang 2004; Mills & Smith, 2011).

The third conclusion argues that technology has a non-significant relationship with KM. Tan and Noor (2013) found that technology does not influence the achievement of KM in research universities in Malaysia because knowledge is well-embedded in the members and universities' values and work practices.

Based on the literature review, the reported relationship of technology and KM processes is diverse— it performs as a predictor, an antecedent of other KM enablers, or not a predictor. One observation is that the relationship of these two variables depends

on the nature of institutions, such as institutional ages and types (i.e. university with research orientation). However, this study assumes that technology plays the important role in KM processes because technological tools and processes can facilitate individual and collective activities to manage the flow of knowledge throughout the institution.

Relationship between Performance Measurement and KM Processes

Performance measurement refers to the collection of information about the efficiency and effectiveness of KM processes when managing the flow of knowledge and the productivity of individuals and organizations that results from managing knowledge. In practice, performance measurement is the least-developed KM enabler (Ramachandran et al., 2013). This could be due to the difficulty in defining KM which makes it difficult for organizations to understand the performance outcomes resulting from the KM implementation (Ramachandran et al., 2013).

Little research used performance measurement as a KM enabler to investigate its impact on KM processes. To examine a relationship between performance measurement and KM processes, this study reviews the literature in both empirical and conceptual studies. Empirical research was found in a study by Ramachandran et al. (2013). They examined the perception of use and importance of performance measurement in Malaysian universities. The correlational results suggest that performance measurement is important for KM processes (generation, codification, and transfer).

From a conceptual perspective, performance measurement is necessary as a foundation to control, evaluate, and improve knowledge processes or activities to ensure that KM stays on track (Coukos-Semmel, 2002). It is a systematic evaluation mechanism

that proves the KM investment to be worthwhile (Lee, 2007). For example, Lee (2007) found that departments of colleges of education in the United States, where they include the value of KM in their mission statements, are more likely to consider cost-effective strategies in their annual reports. These departments set annual indicators reflecting changes in the KM implementation in the departments.

Although the empirical studies in KM performance measurement are limited, the literature review suggests that performance measurement is expected to relate to KM processes. In other words, KM processes require the presence of performance measurement to manage knowledge successfully.

Relationship between KM Processes and Organizational Performance

Organizational performance implies an integrated view of KM outcomes that result from managing organizational knowledge. Most KM literature reviews associate a success of the KM processes with organizational performance. Some quantitative studies indicate a positive relationship between KM and organizational effectiveness (Gold et al., 2001; Rašula et al., 2012; Watcharadamrongkun, 2012).

Gold et al. (2001) correlated four KM processes (called knowledge process capability in their study) with organizational performance. Organizational performance was measured by perceptions toward abilities of an organization to innovate, improve coordination of efforts, improve rapid commercialization of new products, anticipate surprises, respond to market change, and reduce redundancy of information or knowledge. They found that knowledge acquisition, knowledge application, and knowledge protection positively impact organizational performance.

The study of Rašula et al. (2012) about companies in Slovenia and Croatia indicated that KM processes positively affect organizational performance. Their KM processes include the accumulation, utilization, and sharing and ownership of knowledge. Organizational performance in their study is divided into two perspectives: internal process, and innovation and learning. The internal process perspective focuses on (a) operations management by improving asset utilization and supply chain management, (b) customer management by expanding and deepening relations, (c) innovation by new products and services, and (d) social regulations by establishing good relations with external stakeholders. The innovation and learning perspective focuses on internal skills and capabilities to support the value creating internal processes.

Watcharadamrongkun (2012) addressed that KM processes (knowledge acquisition, knowledge integration, and institutionalization) are related to direct measures of performance (i.e., NAPLEX pass rates and accreditation actions) for colleges and schools of pharmacy in the US. The study of Watcharadamrongkun (2012) is the only study known that used direct measures of performance represented by pass rates and accreditation actions.

The study of Watcharadamrongkun (2012) is the initial KM outcome research using pass rates and accreditation actions to represent the quality of organizational performance. In education, there has been an emerging of using quality scores to represent organizational performance. International accreditation bodies have been established to recognize commitment to quality and continuous improvement in universities, such as the European Quality Improvement System and, for education in the

US, the Malcolm Baldrige Criteria for Performance Excellence. These scores result from criteria (such as, organizational mission, faculty's productivity, and student's achievement) that capture the comprehensive image of the current status of the academic institutions. However, no research investigates the relationship of other types of quality scores (such as, scores from a national accrediting body) and KM. This study will use the quality scores from the Ministry of Education, which is a national accrediting agency, to represent the overall performance of HEIs resulting from the management of knowledge in higher education settings.

In summary, KM processes reflects how HEIs describe how they perform and how to improve their performance through managing the flow of knowledge. However, several enablers can influence the KM processes and lead to varying levels of organizational performance. Organizational performance indicates the efficiency and effectiveness of the overall process of HEIs. The aforementioned literature suggests that organizational performance should improve if an organization has effective KM processes.

Knowledge Management in Higher Education in Thailand

Higher education in Thailand is provided at universities, technical institutes (known collectively as the Rajamangala Institute), and teachers' colleges (known collectively as the Rajabhat Institute). The Thai Higher education system is divided between two types of institutions. Firstly, institutions which fall under the Ministry of Education, including 74 public universities and 81 private institutions for higher education (Bureau of Standards and Evaluation, 2010). Secondly, specialized training

institutions which fall under various ministries (such as nursing colleges, and police and military academies).

In Thailand, the Ministry of Education has developed national policies since 1999 by the use of quality assurance principles to ensure improvement of educational quality and standards (Bureau of Standards and Evaluation, 2010). Chapter VI in the National Education Act of 1999 (2nd amendment in 2002; Office of the National Education Commission, 2003) indicated that there shall be a system of educational quality assurance to ensure improvement of educational quality and standards at all levels. This system shall comprise both internal and external quality assurance. Parent organizations shall establish a quality assurance system in the institutions. Internal quality assurance shall be regarded as a part of educational administration. The Office for National Education Standards and Quality Assessment (ONESQA) shall be responsible for the development of criteria and methods of external evaluation, and for conducting evaluation of educational achievements in order to assess the quality of those institutions. With the focus on quality, all Thai HEIs are assessed regularly. They are internally assessed every year by the Bureau of Standards and Evaluation, whereas they are externally assessed by the ONESQA at least once every five years.

The Thai quality assurance has continually improved its systems and practices since it has been implemented. In 2005, KM has been set as one of the key performance indicators for Thai educational quality assurance because of the influence of the Malcolm Baldrige National Quality Award (MBNQA) approach in Thai organizations (Bureau of Standards and Evaluation, 2010). KM is expected to be the intervention for

transforming institutions into effective learning organizations. The KM indicator focuses on KM processes that are implemented in each HEI. The criteria or requirements to measure the KM application are as follows (Bureau of Standards and Evaluation, 2010):

a) There is a formulation of goals concerning knowledge and knowledge management, and these goals align with the institution's mission of producing graduates and performing research;
b) There is a promotion of human resource development which aims to develop potential faculties and staff's knowledge and skills in order to produce graduates and perform research as clearly defined in requirement 1;
c) There is a process of sharing and exchanging knowledge and skills acquired from faculties and staff's experience (tacit knowledge) to find the best practices and there is a distribution of this tacit knowledge to appropriate persons;
d) There is a process of storing explicit knowledge derived from the tacit knowledge in requirement 3;
e) There is an implementation of the knowledge in requirement 4 and the practices that appear to work the best are identified and implemented in the work of faculties and staff in order to make improvement.

As can be seen, these criteria have an emphasis on the processes of KM that cover knowledge identifying, sharing, storing, and utilizing. Each institution has an opportunity to develop its own KM systems and practices.

Summary

Chapter II reviewed the literature concerning the foundation of KM, including its definitions and relevant concepts from diverse perspectives. It addressed three guiding theories (knowledge creation, organizational epistemology, and contingency) to help develop the conceptual framework of this study. This framework illustrates the relationships of three KM components: KM enablers, processes, and organizational performance.

This study defined KM as an iterative process of handling actionable knowledge that results from individual, group, and organizational learning to improve organizational performance. This definition was influenced by the learning interactions between individual, group, and organization that results in actionable knowledge. Actionable knowledge plays significant roles in the workplace because it is imbedded in an institution's routines and behaviors. This knowledge is considered unique for each organization since it is contextual and has evolved over the years through the individuals' interactions. Then it resided in individuals' and organizations' behaviors, and consequently, it is used and transferred into actual work.

The KM effort is also influenced by internal and external environments through its processes and enablers. The KM processes include activities of generating, codifying, and transferring knowledge. The KM enablers involve culture, leadership, technology, and performance measurement. Then, organizational performance depends on the relationship of KM components among enablers, processes, and outcomes. Organizational performance indicates the efficiency and effectiveness of organizational

management through managing knowledge. This study used performance scores as the representative of institutional performance assessment.

The results of the literature review suggested that the relationship of the three KM components could be explained by two different research models. The first model, Figure 7, showed the conceptual model that encompasses the three KM components at the conceptual level, based on the extensive literature review. The second model, Figure 8, represented the general empirical model resulting from the empirical data from this research study. It aimed to expand HEI KM conceptualization. This general empirical model is further analyzed through the statistical analysis since there has not been any previous research studies that examine the relationship among each KM enabler and process, as well as each KM process and organizational performance score.

Figure 7. **Conceptual Model Summarizing HEI KM Literature**

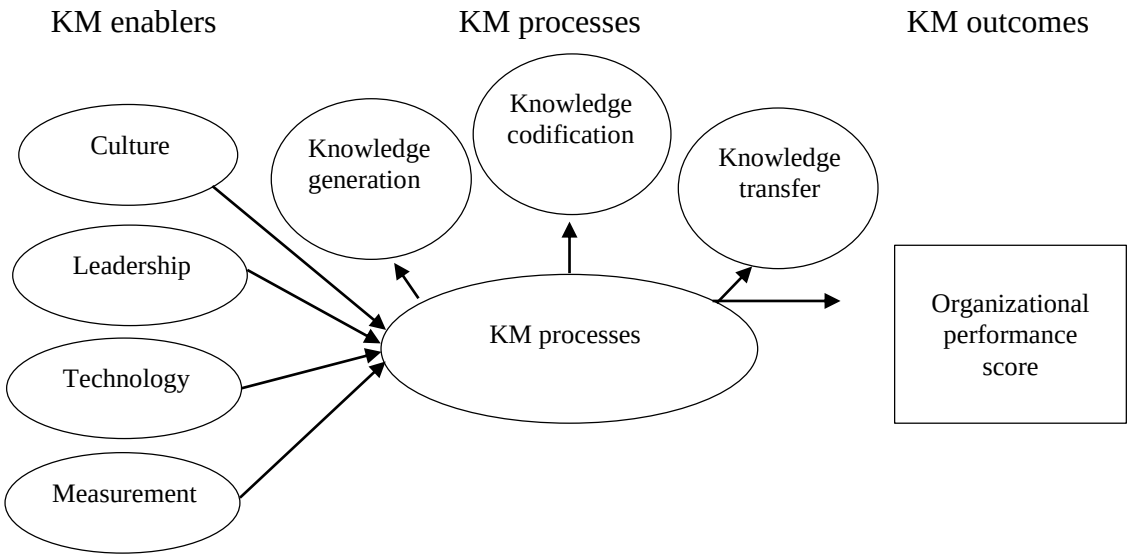
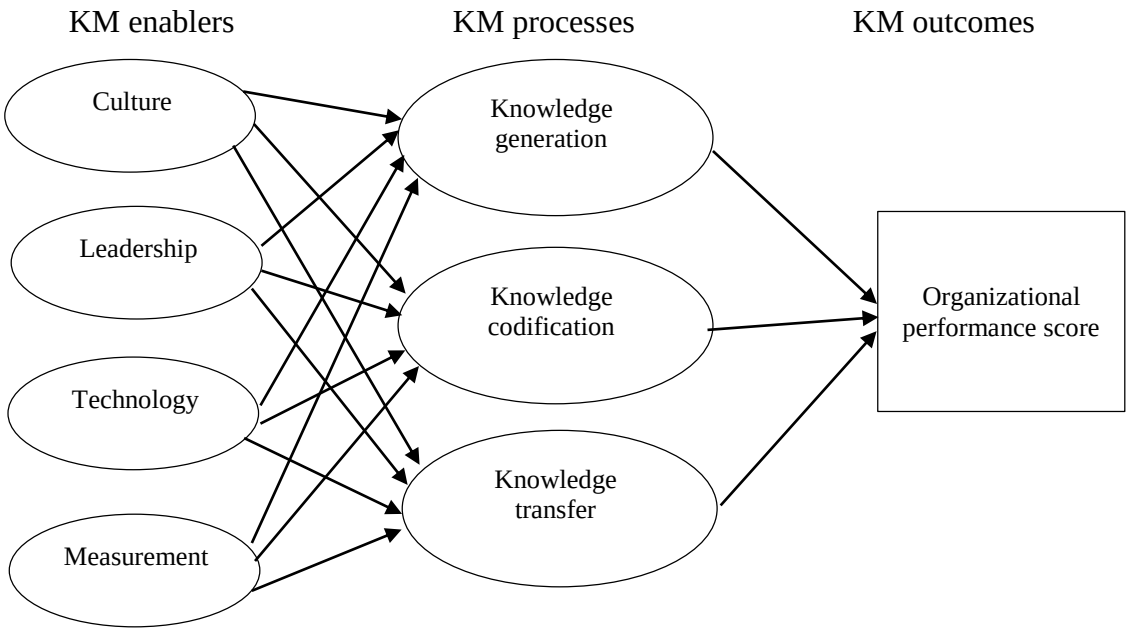


Figure 8. **General Empirical Model to Explain HEI KM Conceptualization**



Chapter III presented a detailed design of the study. It described research methodologies and methods used to answer the study's research questions. It also presented the hypotheses of this study regarding the two research models (Figures 7 and 8).

CHAPTER III

METHODOLOGY

Included in this methodology chapter was a description of the study purpose, research question, and hypothesis followed by an explanation of the research paradigm and methodology. The majority of this chapter presented the method used to conduct this research. Chapter III consisted of the population and sample, instrument, data collection methods, and data analysis methods. Furthermore, the issues of validity and reliability were addressed to ensure the quality of this study. Finally, this chapter identified the limitation of the research design.

Restatement of Study Purpose and Research Question

HEIs need empirical research evidence to explore whether or not and how KM influences HEIs' performance. The purpose of this study was to develop and tested a correlational model in conjunction with KM enablers and processes on organizational performance of HEIs.

This study assumed that KM enablers affect KM processes that contribute to effective organizational performance. The hypothesized conceptual model was designed to represent the relationship between KM enablers and processes and the relationship between KM processes and quality performance scores. Consequently, this hypothesized conceptual model (Figure 9) was guided by one main research question— how do KM enablers and KM processes affect performance of HEIs? The hypotheses were:

H1.1 Organizational culture will correlate positively and significantly with KM processes.

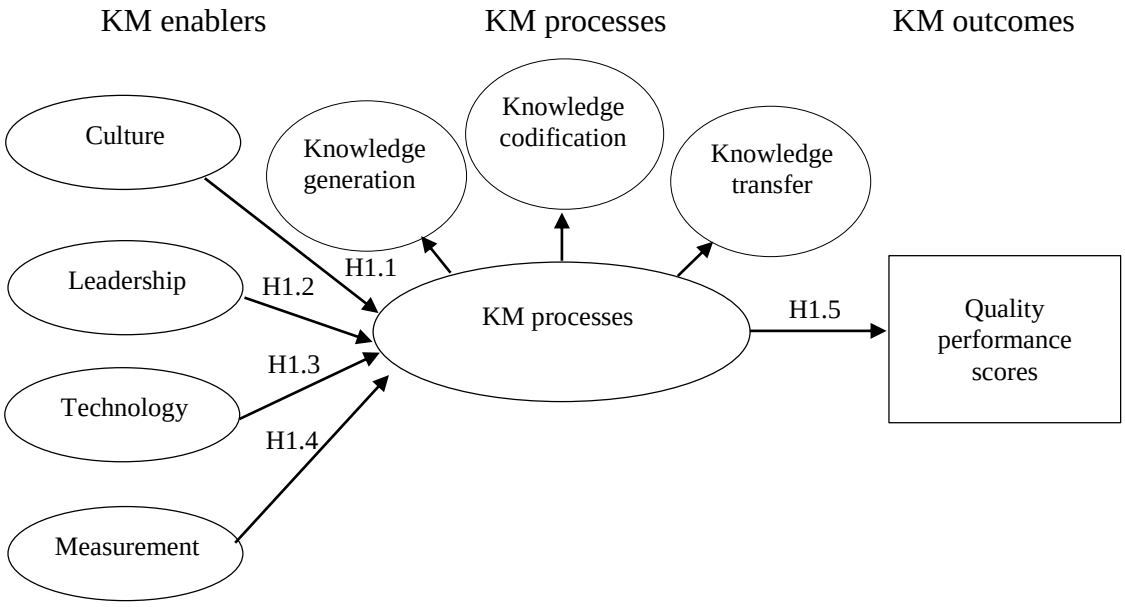
H1.2 Leadership will correlate positively and significantly with KM processes.

H1.3 Technology will correlate positively and significantly with KM processes.

H1.4 Performance measurement will correlate positively and significantly with KM processes.

H1.5 KM processes will correlate positively and significantly with quality performance scores.

Figure 9. **Hypothesized Conceptual Model Summarizing HEI KM Literature**



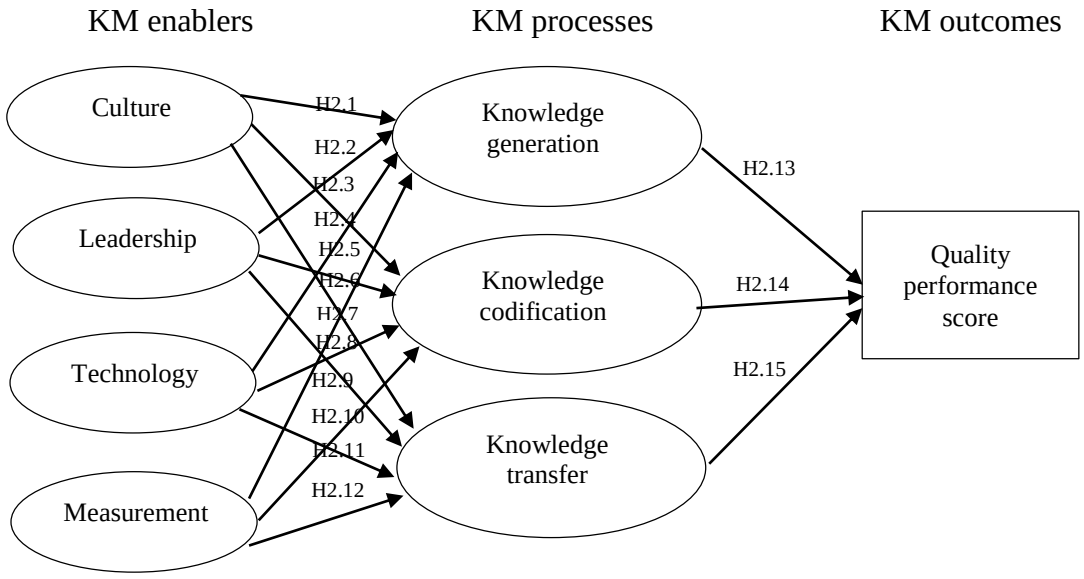
Based on the literature review, Figure 9 showed the hypothesized conceptual model that encompassed the three KM components (KM enablers, processes, and outcomes) at the conceptual level. It was hypothesized that there were relationships between each KM enabler and the KM overall process, and between the KM overall process and quality performance scores.

Currently, no previous research study in the higher education arena examines the relationship between each KM enabler and process, as well as each KM process and quality performance score. The KM processes operate through three types of activities: generation, codification, and transfer. Each activity has its own function and purpose to manage the flow of knowledge. For example, knowledge generation refers to activities of acquisition and development of knowledge (Ramachandran et al., 2013; Shoham & Perry, 2009). Its purpose is to build needed knowledge for the use of an organization. Knowledge codification involves embedding knowledge by transforming tacit and explicit knowledge back and forth into organizational knowledge (Nonaka, 1991; Wiig, 1993), then making organizational knowledge accessible (Coukos-Semmel, 2002; Ramachandran et al., 2013; Wiig, 1993). It aims to give permanence to knowledge that may exist in forms that can be shared, stored, and combined to retain essential knowledge. Each enabler may influence each process to a different degree. The deep investigation provides clearer understandings of the relationship between each enabler and process, as well as each process and organizational performance.

Thus, the second model (Figure 10), called the hypothesized general empirical model, was developed to investigate the relationships of each KM enabler and each KM

process. It aimed to explain HEI KM conceptualization. This hypothesized empirical model resulting from the actual data from this study would be further analyzed, along with the conceptual model.

Figure 10. **Hypothesized General Empirical Model to Explain HEI KM Conceptualization**



H2.1 Organizational culture will correlate positively and significantly with knowledge generation.

H2.2 Organizational culture will correlate positively and significantly with knowledge codification.

H2.3 Organizational culture will correlate positively and significantly with knowledge transfer.

H2.4 Leadership will correlate positively and significantly with knowledge generation.

H2.5 Leadership will correlate positively and significantly with knowledge codification.

H2.6 Leadership will correlate positively and significantly with knowledge transfer.

H2.7 Technology will correlate positively and significantly with knowledge generation.

H2.8 Technology will correlate positively and significantly with knowledge codification.

H2.9 Technology will correlate positively and significantly with knowledge transfer.

H2.10 Performance measurement will correlate positively and significantly with knowledge generation.

H2.11 Performance measurement will correlate positively and significantly with knowledge codification.

H2.12 Performance measurement will correlate positively and significantly with knowledge transfer.

H2.13 Knowledge generation will correlate positively and significantly with quality performance scores.

H2.14 Knowledge codification will correlate positively and significantly with quality performance scores.

H2.15 Knowledge transfer will correlate positively and significantly with quality performance scores.

Research Paradigm and Methodology

This exploratory study was a cross-sectional descriptive research design using a mixed-method methodology. According to Creswell and Creswell (2005), mixed-method research is "a research design or methodology for collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies in order to better understand research problems" (p. 317). They proposed three different aspects of the mixed-method research definition in relation to the combination of data collection, data analysis, and research problem achievement.

The first aspect relates to the form of data collection. A mixed-method researcher collects both quantitative and qualitative data (Creswell, 2014; Creswell & Creswell, 2005). Quantitative data consist of close-ended information in which the researcher sets the response possibilities in advance (e.g., an opinion instrument with responses from strongly disagree to strongly agree). In contrast, qualitative data consist of open-ended information without predetermined response categories (e.g., unstructured observations). Some research studies collect both forms of data. For example, an ethnography researcher gathers quantitative survey data and qualitative observation data (Creswell & Creswell, 2005). A quantitative researcher can use a survey instrument that combines both close-ended and open-ended questions (Gliner & Morgan, 2000).

The second aspect deals with an integration of data analysis. Generally, the forms of quantitative and qualitative approaches are distinct. Quantitative approach are usually

gathered with an instrument that can be scored reliably (e.g., test and questionnaire). Qualitative approach deals with procedures of gathering more subjective details (i.e., text and image) for interpreting the meaning (Gliner & Morgan, 2000). Regardless of the limited boundary, some researchers incorporate both approaches. In a grounded theory design, some quantitative researchers build themes or categories from the numeric data to generate the thematic development (Creswell, 2014). Some qualitative researchers analyze text data and then convert them into frequencies in a quantitative fashion (Creswell, 2014).

The completeness of research problems is the last aspect of the mixed-method definition. The mixing or interrelating of data provide better insights into research problems than only one type of data does. Quantitative data offer generalizable trends or inferences while qualitative data provide in-depth experiences within specific contexts (Creswell & Creswell, 2005). Both data assist each other by capturing both inferences and in-depth perspectives.

With the aforementioned rationales, this study combined both quantitative and qualitative research approaches. It used a mixed-method design called explanatory sequential design to collect both quantitative and qualitative data simultaneously (Creswell & Clark, 2011). Explanatory sequential design uses two methodologies in studying the same phenomenon by using qualitative data to explain quantitative results (Creswell & Clark, 2011). In this study, explanatory sequential design gathered both data to compare between the normative quantitative data and the detailed contextualized qualitative data.

This study used the quantitative approach through statistical analysis to develop a KM correlational model. The quantitative procedures tested the relationships among KM processes, enablers, and outcomes, and develop the KM correlational model. Then this study used the qualitative approach through text analysis from open-ended questionnaire items. These qualitative data provided understandings of the meaning of context surrounding the gathered data. These understandings produced a wider and deeper interpretation. Thus the qualitative approach did not only validate quantitative data but also helped develop the proposed KM model more contextually.

From the utilization standpoint, the mixed-method design aligned well with this research question— to develop the KM model that explains the relationships among KM enablers, processes, and performance of HEIs. This design provided both trends and in-depth perspectives of the KM application in the higher education arena.

Method

This section explained the research procedures covering population and sample, instrument, data collection method, and data analysis method.

Population and Sample

The population of this study consisted of 142 higher education institutions under the responsibility of the Ministry of Education (Bureau of Standards and Evaluation, 2015). The sample was 60 Thai universities which gave the researcher permission to conduct the study. The unit of analysis was a university.

Sampling. This study used the purposive sampling method to select key informants of each university to provide organization-wide data. Key informants were

persons, assigned by universities, who were responsible for managing the KM system at the institutional level. They were asked to report the KM data on behalf of their institutions.

The key informant method is a technique to obtain data from persons who are considered expert sources of information (Hughes & Preski, 1997; Lavrakas, 2008). This method was established in traditional anthropological research aiming at studying collective behaviors in a variety of topics, such as family organization, economic system, and political structure (Hughes & Preski, 1997; Tremblay, 1957). The original purpose was to provide a relatively ethnographical description of the social and cultural patterns of groups.

Although the key informant method emphasizes the qualitative technique through interviewing, it is also possible to get concrete quantitative data (Tremblay, 1957). According to Hughes and Preski (1997), this method has become one of the collecting methods for quantitative studies, particularly in survey research. The key informant method can be applied in organizational survey research through the collection of data from organizational members. Organizational members can function as either respondents or informants. As respondents, participants have a role as singular members to provide data that reflect their own personal perceptions. These data represent the individual unit of analysis because organizational members respond according to their own attitudes or beliefs. In contrast, as informants, organizational members are asked to provide data based on their access to organizational information or specialized knowledge about organizational phenomena. Thus, these data represent a characteristic

of the organization itself. Data from the informant role inherently represent the organizational unit of analysis.

The 60 universities assigned the KM functions differently. Some appointed only a key person to be responsible for KM. Others established a KM committee that included representatives from academic and non-academic units across the institution. Thus, the number of the respondents in each university was various.

Sample size. This study used Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA) with Structural Equation Modeling (SEM) to analyze the gathered data. These analytical methods are sensitive to the sample size and rely on large samples. According to Kline's guideline (2011), a sample size of less than 100 is small, between 100 and 200 is medium, and more than 200 is large.

Instrument

This study used a questionnaire survey to collect data. The questionnaire instrument was adapted from the Knowledge Management Assessment Tool (KMAT) to acquire the data for the KM processes and enablers. This instrument was discussed in terms of its origin, previous related research, its development for this study, its validity and reliability, and translation process.

Origin of the instrument. Arthur Andersen Consulting Services and the American Productivity and Quality Center (APQC) created KMAT in 1997 for use in industry. KMAT has become a widely recognized KM benchmarking tool used in the business sector. This tool was designed to help organizations make an initial high-level assessment of how well they manage knowledge (Jager, 1999). It placed all the major

KM processes (knowledge generation, codification, and transfer) and KM enablers (leadership, culture, technology, and measurement) together in a single system.

Related research. Based on Academic Search Complete (Ebsco) and ProQuest databases with the search terms "Knowledge Management," "Higher Education," and their related expressions, three research studies that used the KMAT instrument were found. These three previous studies used the modified version of KMAT to examine relationships between an organization's perceived use and importance of KM processes, and strategic enablers in different higher education settings.

Coukos-Semmel (2002) conducted a dissertation study to examine the perceptions of university administrators in 161 public and private United States research universities. He used internal consistency reliability and the face validity to measure the quality of his instrument. In terms of the internal consistency reliability, this instrument was greater than the prescribed .70 of the Cronbach alpha values. The reliability values for each of the seven KMAT constructs varied from .72 (codification) to .93 (technology), indicating the instrument was sufficiently reliable for research purposes. For the face validity, all constructs' means, ranging between 3.41-4.21, were above the moderate level (3.0 on a 5-point scale).

The dissertation of Lee (2007) investigated the perceptions of 319 academic department chairs in Colleges of Education in the North Central regional states in the United States. Her instrument (a 5-point scale per item) was acceptably reliable. The reliability values of seven constructs varied from .66 (leadership) to .86 (technology). In addition, she invited three experts to review and validate the content of the instrument.

This method helped ensure that the modified instrument was appropriate for higher education settings.

An updated KMAT application in HEIs was used in the study of Ramachadran et al. (2013) published in *Campus-Wide Information Systems Journal*. They explored the perceptions toward KM importance and use of 191 academic staff in four Malaysia public universities. The reliability of seven constructs ranged between .79 (technology) to .90 (leadership). Furthermore, they applied two types of validity measurements: face validity and construct validity. The face validity was used to check for appropriateness, readability, and comprehensiveness of the instrument. Twenty academics rated the validity of the modified KMAT based on a criterion that the instrument could measure what it was intended to measure in the higher education setting. For the construct validity, they performed factor analysis. With eigenvalues of 1.00 or greater, all items loaded above .40 (the cut-off value of this analysis). The reliability and the validity of this instrument supported the adequacy of the measurement used in their study.

The aforementioned research studies endorsed the applicability and usability of the KMAT instrument in this KM research study. This instrument assisted this study in examining its research question because it measured the KM processes and enablers, and it responded to the nature of the population being studied (academic institutions).

Instrument development for this study. The survey instrument used in this research was the modified version of KMAT. The researcher received permission to use the instrument from APQC who was the original developer and the researcher who modified the latest version used in Malaysia. This instrument primarily measured the

data for the KM processes and enablers. Since the design of this study was based on the mixed-method research approach, this instrument collected both quantitative and qualitative data simultaneously. It combined both close-ended and open-ended questionnaire items aimed at gathering data that provide numeric data and in-depth perspectives of the KM application in each institution. The questionnaire included four sections: institutional demographic information, KM enablers, KM processes, and open-ended questions.

For the measure of KM processes and enablers, all items were adapted from the original version of the KMAT instrument and the latest version of the instrument used in prior KM study (conducted by Ramachadran et al., 2013). The KMAT original version, used in the business sector, consisted of 24 items while the latest instrument, used in four Malaysian public universities, was comprised of 42 item. The Malaysian instrument slightly modified the original items that measured KM enablers and generated more items on KM processes to cover three components of KM processes (knowledge generation, codification, and transfer).

The KM instrument used in this study was somewhat different from the original assessment instrument regarding the clarity of contents, such as (a) separating an original item that combined more than one action in the same question into two items, (b) rewording a statement with technical terms into simple and more understandable terms, (c) changing a passive voice statement into active voice, and (d) adding more items on KM processes to measure three process components. These revised items helped the respondents in HEIs better understand the questions and they also covered the

measurement of processes and enablers that were the variables in the research model. Consequently, KM enablers include 25 items while the KM processes consisted of 17 items. Tables 1 and 2 compared the items between KMAT, the updated version used in Malaysia universities, the modified version used in the subject matter expert (SME) analysis, and the modified version used in this study. The version used in the SME analysis would be explained in the next section. Table 1 shows the number of items and Table 2 illustrates the items in different versions.

Table 1 ***Number of the Survey Items in the Previous Versions and the Modified Version in This Study***

Variables	Original KMAT items (APQC, 1997)	Updated items used in Malaysia universities (Ramachadran et al., 2013)	Modified items used in the SME analysis	Modified items used in this study
KM enablers	19	27	27	25
- *Culture*	*5*	*6*	*7*	*7*
- *Leadership*	*4*	*8*	*9*	*7*
- *Technology*	*6*	*8*	*6*	*6*
- *Measurement*	*4*	*5*	*5*	*5*
KM processes	5	15	15	17
- *knowledge generation*	-	*6*	*6*	*6*
- *knowledge codification*	-	*5*	*5*	*5*
- *knowledge transfer*	-	*4*	*4*	*6*
Total	24	42	40	42

Table 2 ***Comparison of the Previous Survey Items and the Modified Items Used in This Study***

	Original KMAT items	Items used in Malaysia universities	Modified items used in the SME analysis	Modified items used in this study (based on the SME comment)
	KM Enablers			
	Culture			
1.	The organization encourages and facilitates knowledge sharing.	The university encourages and facilitates knowledge sharing.	The university facilitates knowledge building and sharing.	The university culture facilitates knowledge building and sharing.
2.	A climate of openness and trust permeates the organization.	A climate of openness is present in the university. A climate of trust is present in the university.	The university has a climate of openness in sharing knowledge. The university has a climate of trust in sharing knowledge.	The university has a culture of 1. openness in sharing knowledge. 2. trust in sharing knowledge.
3.	Customer value creation is acknowledged as a major objective of knowledge management.	Student value creation is acknowledged as a major objective of knowledge management.	The university acknowledges student value creation as a major objective of knowledge management.	The university's KM system creates a knowledge value for the university's achievement of its missions.
4.	Flexibility and a desire to innovate drive the learning process.	Flexibility and a desire to innovate drive the learning process.	The university has flexibility that facilitates the employees' learning process.	The university's KM system facilitates the employees' learning process.
			The university has a desire to innovate that drives the employees' learning process.	The university's desire to innovate drives employees' learning processes.
5.	Employees take responsibility for their own learning.	Individuals take responsibility for their own learning.	The university's employees take responsibility for their own learning.	The university has a culture of accountability for individual learning.

Table 2 ***(continued)***

	Original KMAT items	Items used in Malaysia universities	Modified items used in the SME analysis	Modified items used in this study (based on the SME comment)
	Leadership			
6.	Managing organizational knowledge is central to the organization's strategy.	Managing organizational knowledge is important in the university's strategic plan.	The university includes the management of organizational knowledge in the university's strategic plan.	The university administrators include the management of organizational knowledge in the university's strategic plan.
7.	The organization understands the revenue-generating potential of its knowledge assets and develops strategies for marketing and selling them.	The university understands the income generating potential of its knowledge assets (product of R&D, books, and consultation).	The university acknowledges that managing organizational knowledge helps increase the incomes from products of R&D, books, and consultations.	The university administrators acknowledge that managing organizational knowledge helps increase income (e.g., from products of R&D, books, and consultations).
8.		The university develops strategies for selling its knowledge assets.	The university develops strategies for selling its knowledge assets.	The university administrators develop strategies for selling its knowledge assets.
9.	The organization uses learning to support existing core competencies and create new ones.		The university uses learning to support existing core competencies and create new ones.	The university administrators deliberately use learning to develop core competencies.

Table 2 ***(continued)***

	Original KMAT items	Items used in Malaysia universities	Modified items used in the SME analysis	Modified items used in this study (based on the SME comment)
10.	Individuals are hired, evaluated, and compensated for their contributions to the development of organizational knowledge.	Individuals are hired for their contributions to the development of organizational knowledge.		The university administrators reward employees for their contributions to the development of organizational knowledge.
11.		Individuals are evaluated for their contributions to the development of organizational knowledge.	The university evaluates employees for their contributions to the development of organizational knowledge.	
12.		Individuals are rewarded for their contributions to the development of organizational knowledge.	The university rewards employees for their contributions to the development of organizational knowledge.	
13.		A position (e.g. chief knowledge officer) has been created in the university to promote development of knowledge relating to the university's core competencies.	The university creates a position (e.g. chief knowledge officer) to promote the development of organizational knowledge.	The university administrators need a specific person to oversee the development of organizational knowledge.
14.		The university has a vision for managing knowledge.	The university has a vision for managing knowledge.	The university administrators have a vision for managing organizational knowledge.

Table 2 ***(continued)***

	Original KMAT items	Items used in Malaysia universities	Modified items used in the SME analysis	Modified items used in this study (based on the SME comment)
	Technology			
15.	Technology links all members of the enterprise to one another and to all relevant external publics.	IT links all members of the university to one another.	The university uses technology to enhance the flow of knowledge (such as acquiring, sharing, and using) among employees.	The university uses technology to enhance the flow of knowledge (such as acquiring, sharing, retrieving, and using) among employees.
16.	Technology creates an institutional memory that is accessible to the entire enterprise.	IT creates a database that is accessible to the entire university.	The university uses technology to create an institutional knowledge database that is accessible to the entire university.	The university uses technology to 1. create an institutional knowledge database. 2. make an institutional knowledge database accessible to the entire university.
17.	Technology brings the organization closer to its customers.	IT brings the university closer to its students.	The university uses technology to allow students to participate in university's products and services.	The university uses technology to allow students to provide feedback to the university's performance.
18.	Technology that supports collaboration is rapidly placed in the hands of employees.	The university continuously upgrades and replaces collaborative hardware and software.	The university provides technology to enhance collaborative learning effort among employees.	The university provides technology to enhance collaborative learning efforts among employees.
19.	The organization fosters development of "human-centered" information technology.	IT is designed to help employees work more efficiently.	The university supports technology to help employees work more efficiently.	

Table 2 ***(continued)***

	Original KMAT items	Items used in Malaysia universities	Modified items used in the SME analysis	Modified items used in this study (based on the SME comment)
20.	Information systems are real-time, integrated, and "smart."	Information reaches appropriate decision makers in a timely fashion.	The university facilitates information system to help employees make better decisions in a timely fashion.	The university's information system is designed to help employees make better decisions in a timely fashion.
	Performance measurement			
21.	The organization has invented ways to link knowledge management to financial results.	The university has ways to link knowledge management to the budget allocated.	The university has ways to link knowledge management to the budget allocated.	The university's assessment process has ways to link KM to the budget allocated.
22.	The organization has developed a specific set of indicators to manage knowledge.	The university has developed a specific set of indicators to manage knowledge.	The university develops a specific set of indicators to manage knowledge.	The university has a specific set of indicators to measure KM outcomes.
23.	The organization's set of measures balances hard and soft as well as financial and non-financial indicators.	The measurement system measures intangible assets (e.g. intellectual capital).	The university develops the measurement system that incorporates measures of intangible assets (e.g. intellectual capital).	The university has a measurement system that incorporates measures of intangible assets (e.g., intellectual capital)
24.	The organization allocates resources toward efforts that measurably increase its knowledge base.	The university allocates resources toward efforts that measurably increase its knowledge base.	The university allocates resources toward efforts that measurably increase its knowledge base.	The university allocates resources for efforts that measurably increase its knowledge.
25.		The university's annual report includes an assessment of how knowledge capital has contributed to bottom line use.	The university's annual report includes an assessment of how knowledge has contributed to organizational performance.	The university's annual report includes an assessment of how knowledge has contributed to organizational performance.

Table 2 ***(continued)***

	Original KMAT items	Items used in Malaysia universities	Modified items used in the SME analysis	Modified items used in this study (based on the SME comment)
	KM Processes			
	Knowledge generation			
26.	Knowledge gaps are systematically identified, and well-defined work processes are used to close them.	Knowledge gaps are systematically identified.	The university identifies organizational knowledge gaps systematically.	The university identifies organizational knowledge needs systematically.
27.		Well-defined work practices are used to close knowledge gaps.	The university uses well-defined work practices to close knowledge gaps.	The university uses well-defined work practices to address knowledge needs.
28.		The university creates a map of its organizational knowledge, indicating where information is located and how to access it.	The university create a map or diagram of its organizational knowledge, indicatin where information is located and how to access it.	The university creates its organizational knowledge directories that list employees' skills, knowledge, and location.
29.		Knowledge directories that list employees' skills, knowledge, location, and how to reach them exist.	The university creates knowledge directories that list employees' skills, knowledge, location, and how to reach them.	
30.		Knowledge directories of other groups aligned with the university are also disseminated.	The university disseminates knowledge directories of other groups (outside the university) aligned with the university.	The university creates directories with specialized knowledge of other groups (outside the university) aligned with the university.
31.	Sophisticated and ethical intelligence-gathering mechanism has been developed.	The university excels at scanning the environment for information.	The university develops mechanisms to gather intellect knowledge systematically and ethically.	The university develops mechanisms to 1. gather knowledge systematically. 2. gather knowledge ethically.

Table 2 ***(continued)***

	Original KMAT items	Items used in Malaysia universities	Modified items used in the SME analysis	Modified items used in this study (based on the SME comment)
	Knowledge codification			
32.	"Tacit" knowledge (what employees know how to do but cannot express) is valued and transferred across the university.	"Tacit" knowledge (what employees know how to do but cannot express) is valued across the university.	The university values "tacit" knowledge (what employees know how to do but cannot express) across the university.	The university transfers its tacit knowledge (what employees know how to do but cannot express) across the university through 1. supporting knowledge platforms to share tacit knowledge, such as a KM sharing day, a story telling activity, or mentoring. 2. supporting technology to make tacit knowledge accessible and retrievable.
33.		"Tacit" knowledge (what employees know how to do but cannot express) is transferred across the university.	The university transfers "tacit" knowledge (what employees know how to do but cannot express) across the university.	
34.		The university has systems for identifying and passing on the internal knowledge of individual employees (e.g. rotation of divisional personnel, apprenticeship, site visits, sabbaticals, and mentoring).	The university has systems for identifying and passing on the internal knowledge of individual employees.	The university has mechanisms in place to make employees' past know-how 1. explicit. 2. accessible. 3. remain within the university when they leave the university.
35.		Past know-how is made explicit and accessible.	The university makes employees' past know-how explicit and accessible.	

Table 2 ***(continued)***

	Original KMAT items	Items used in Malaysia universities	Modified items used in the SME analysis	Modified items used in this study (based on the SME comment)
36.		Most of the employees' knowledge remains within the university when they leave the university.	The university makes sure employees' know-how remains within the university when they leave the university.	
	Knowledge transfer			
37.	All members of the organization are involved in looking for ideas in traditional and nontraditional places.	The university provides locations and occasions for employees to talk and to listen to one another and interact informally.	The university provides locations and occasions for employees to meet, talk and listen to one another and interact informally.	The university provides opportunities for employees to 1. meet informally to share knowledge. 2. build their knowledge networks.
38.	The organization has formalized the practice of transferring best practice, including documentation and lessons.	The university has formalized the practice of transferring best practice, such as documentation and lessons learned.	The university shares the best practices and lessons learned to improve work performance in the university.	The university widely communicates 1. the best practices to improve work performance. 2. lessons learned to improve work performance. 3. success stories to improve work performance
39.		Success stories involving new approaches are widely communicated in the university.	The university widely communicates success stories in improving organization performance.	
40.		Knowledge practices are rapidly communicated through the university, making it easy to transfer best practices.	The university invests in transferring an individual's knowledge to others more effectively.	The university strategically invests resources in applying organizational knowledge into job.

All in all, the final questionnaire included 48 items. In the first section of the instrument, the respondents were asked to provide four institutional demographic information that would support further analysis regarding other contextual factors that comprised an institution's type and mission orientation. Furthermore, 42 items of the KM processes and enablers were measured on a Likert-type scale ranging from 1 (Almost Never) to 5 (Almost Always). Finally, this instrument incorporated two open-ended questions to ask the respondents to describe the three internal factors that significantly support or block successful KM. These data for open-ended questions provided the unique and contextual understandings of the state of KM in each university, including its KM processes and enablers.

Validity and reliability of instrument. The instrument of this study was used in the academic sector and in Thai language. The use of this modified instrument differed from the original English version that was commonly used in business. Thus, the validity and reliability analysis was performed to ensure the study's quality. Validity is widely known as accuracy that the instrument is measuring what it intends to measure (Gliner & Morgan, 2000). A valid measure is a measure that can be used to answer a research question accurately (Russ-Eft & Hoover, 2005). The nature of reliability relates to replication. If a reliable measurement is repeated, it will produce similar results. In the instrument measurement context, reliability is the degree to which a test consistently measures whatever it measures (Gliner & Morgan, 2000; Russ-Eft & Hoover, 2005).

Validity. This study conducted two pre-pilot tests by using the SME analysis technique to measure the content validity. The first pre-pilot test involves a panel of

three KM experts who know the English language. Commonly, a minimum of three experts is an appropriate number for the content validity measurement (Lynn, 1986). These three experts were selected from (a) practitioners who work in the KM field or have a responsibility for KM implementation in their organizations, and (b) professors who teach KM courses or have KM publications. This panel was formed to review the contents of the survey questionnaires. It aimed to verify that the content of the instrument matches the contents of what this study intends to measure (Gliner & Morgan, 2000). The researcher translated instrument into Thai language because this study was conducted in Thailand. Thus, the second pre-pilot test, a panel of the three Thai KM experts was also assigned to review the survey contents to match the Thai language and cultural context. These three Thai experts were conveniently selected from either KM managers or KM committee members from Thai universities. The translation process would be explained more in the next section.

This study had two purposes to measure content validity (Devriendt, Van den Heede, Coussement, Dejaeger, Surmont, Heylen, Schwendimann, Sexton, Wellens, Boonen, & Milisen, 2012). The first purpose involved the relevance of each questionnaire item to its construct. The experts were asked to rate each item on its relevance to its construct using a 4-point scale, ranging from not relevance (score 1), somewhat relevant (score 2), quite relevant (score 3), and highly relevant (score 4). The second purpose involved the clarity of the items. The experts were asked to comment whether the item should be revised and propose a better statement if the item is not

understandable. The items that were rated 1 or 2 were carefully considered to remain or delete from the list.

Reliability. The pilot test was done to develop an appropriate measure for the targeted samples and to examine the reliability of the revised instrument. For this research, reliability analysis was conducted to determine if the results of using the selected instruments are consistent and replicable. Reliability is estimated by internal consistency. The internal consistency reliability helps determine if an instrument is consistent among its items— an instrument measures a single construct or concept (Gliner & Morgan, 2000). One of the most common internal consistency reliability measurements is Cronbach's alpha. Cronbach's alpha is an index of reliability associated with the variation accounted for by a true score of a hypothetical variable that is being measured (Santos, 1999). Cronbach's alpha values greater than .70 (> .70) is considered reliable for the internal consistency of the instruments (Kline, 2011).

The sample size of the pilot test was 30 participants (Isaac & Michael, 1995). A web-based survey instrument for the pilot study was randomly sent to quality assurance assessors of 30 universities. Twenty five participants completed the survey. Cronbach's alpha values of seven constructs were as the followings: culture (.90), leadership (.83), technology (.92), measurement (.81), knowledge generation (.84), knowledge codification (.90), and knowledge transfer (.96).

Translation of instrument. The original research instrument was developed in a Western context, whereas this study was conducted in an Eastern culture which differs in language and culture. Thus this study used the forward-backward translation to translate

instruments into the language of the culture being studied. This translation conducted both from the original language of the instruments (English) to the language of participants (Thai) and in the reverse direction, called forward and backward translation (Degroot, Dannenburg, & Vanhell, 1994). This instrument was originally developed by the English language, then the researcher translated it into Thai. Finally, the IRB cultural evaluators, a Thai professor who understands both Thai and English languages, translated back into English. Backward translation helped the researcher verify whether the translation covers all aspects of the original language (Degroot et al., 1994). Equivalence of meaning was checked after each translation.

Data Collection

Data collection included two components, including the data source and the data collection procedure.

Source of data. Data came from two resources: the questionnaire survey and the archival source. The online questionnaire survey was provided for key informants in each institution. Archival data consisted of quality assurance performance scores from the Ministry's published database.

The 48-item questionnaire survey provided the data in relation to institutional demographic information, KM enablers, KM processes, and factors for supporting and blocking successful KM (Appendix 1). The explanation of the development of this survey instrument was discussed previously.

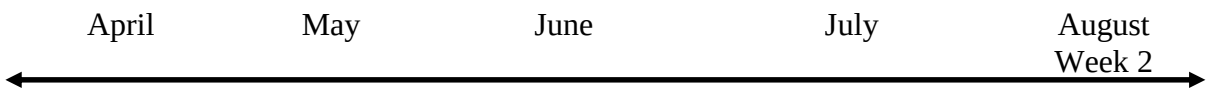
The archival data were any sort of data previously collected by others and amenable to systematic study (Jones, 2010). Normally various archival sources included

public documents and official records, private documents, mass media, physical or nonverbal materials, and social science data archives. This study derived the archived QA scores from the 2014 academic year from the Commission of Higher Education in Thailand. The researcher examined the archival data because these data were publicly available on the Commission's website and they were expected to have better accuracy than the survey responses for QA data. Moreover, the archival data method could reduce the respondents' burden to provide the QA scores (Russ-Eft & Preskill, 2009).

The QA scores portrayed overall organizational performance scores that were assessed by appointed QA teams from the Commission. This study retrieved the QA scores from the Commission's database, called the CHE QA online system. This system was the single integrated database that combined the universities' self-assessment reports and the assessors' reports based on the QA performance criteria. Under the QA scoring system, the QA criteria were classified into nine groups that represented multiple institutional achievements: philosophy, mission, objectives and identities; production and quality of graduates; student development activity; research; academic services and social responsibility; preservation of art and culture; administrative management; finance and budgeting; and quality assurance system and mechanism. This study used the total score of all nine criteria used by the Ministry, since it represented the institution-wide performance.

Data collection procedure. The data collection followed these procedures (Figure 11).

Figure 11. **Timeline for Data Collection**



April	May	June	July	August Week 2
a) IRB approval for a pilot study b) Pre-pilot study c) Pilot study d) Instrument revision based on the pilot study	IRB approval for this study	a) Letter of introduction from the Office of Association of Higher Education Institutions of Thailand b) Recruitment process - Letter to each university asking for permission to conduct the study and assign a contact person - Reminder letter to not-yet-responded universities	a) Online survey administration - Email to an assigned contact person of each university to forward an email with a survey link to participants - Reminder email and call to contact persons to forward the email - Thank you email to contact persons b) Archived QA scores from the CHE QA online system	Close the survey

The first step involved a logistics pilot study starting at April 2015. It started with obtaining the Texas A&M University Institutional Review Board (IRB) approval for the pilot study. The survey instrument used in this study was tested during the pre-pilot test and the pilot test to examine its reliability and validity as mentioned in the instrument development section. Then the researcher revised the instrument to improve the

effectiveness of the survey administration. In May, the researcher submitted the IRB application for the regular study to obtain the IRB approval.

The next step was to ask for a letter of introduction from the Office of Association of Higher Education Institutions of Thailand. This letter was sent to universities to request their participation in the study. This strategy was expected to lead to greater cooperation and response from institutions. Then the recruitment was processed in the middle of June. The researcher sent an official letter to 142 universities to ask permission to include the institution in the study and collect data from the institution's staff members. This letter introduced the study, the researcher, and the benefits and potential harm to participants and institutions (Appendix 2). The universities that granted the permission returned the permission form, including a name and an email address of the contact person at the institution (Appendix 3). The contact person had a role in distributing the e-survey to persons who were responsible for KM, such as KM committee members. After one month, the researcher followed up by sending a reminder letter to not-yet-responded institutions.

The administration of questionnaire surveys was performed beginning in July. Sixty institutions (42 percent) agreed to take part in this study. Upon agreement of the decision maker of each institution, the researcher emailed a letter to the contact persons of the 60 universities to forward the researcher's email with the Qualtrics online survey link. After two weeks (Nulty, 2008), a reminder email was sent to contact persons who did not forward the survey email to participants. One week after sending the reminder email, the researcher called to persons who did not forward the email. Then, the

researcher sent a thank you email to the contact persons to thank them for their assistance.

During July, the researcher also accessed the CHE QA online system to retrieve the QA scores of the 60 universities. Then the researcher entered the scores in the data spreadsheet for further analysis.

Finally, the process of questionnaire survey administration was completed in the middle of August. The researcher downloaded the data from the Qualtrics system for data analysis. The 181 respondents from 60 universities voluntarily participated in completing the e-survey. Then the researcher identified true response cases. This step aimed to delete inadmissible cases when respondents partially complete the survey questions. The true response cases were the case that at least 77% of survey questions were answered (Cohen & Cohen, 1983). Thirty-one of the 181 cases in the raw data had missing values on 13 or more items out of the 42 quantitative items. Finally, the 150 cases were used for data analysis. The target for the sample size was greater than 100 to reach the acceptable analysis.

Data Analysis

This study used the mixed-method research approach to guide the research protocol. Two distinct approaches were used to analyze data.

Quantitative analysis. The quantitative analysis was performed to test a correlational model linking KM enablers and KM processes on organizational performance. The data from the questionnaire survey and archival sources was entered and coded.

The data analysis included descriptive statistics, EFA, and CFA with SEM. The IBM Statistical Package for Social Sciences (SPSS) version 22 was used for descriptive statistics, EFA, and reliability Cronbach's alpha. Mplus version 7.3 was used for CFA and SEM analysis. SEM was utilized to investigate the hypothesized theoretical model and structural relationships.

Descriptive statistics. To describe the main features of a sample, this study calculated descriptive statistics for key variables, including institutions' profiles, KM enablers, processes, and QA scores. Continuous variables (KM enablers, processes, and QA scores) was presented in terms of means and standard deviations. Categorical variables (institutions' profiles) was presented in terms of percentages and counts. Then, a correlation matrix and alpha coefficients were provided for the statistical analysis.

Exploratory Factor Analysis (EFA). EFA is one of the two types of factor analysis. The fundamental idea of factor analysis is that some variables cannot be directly observed (Kline, 2011). These unobserved variables are referred to as latent factors. Latent factors can be generated by observing their influences on measured or observed variables (Meyers et al., 2013). Factor analysis examines covariation among a set of measured variables, trying to identify structure with the minimum latent factors.

EFA is often used in scale construction to explore the dimensionality of a measurement instrument (Muthén & Muthén, 2008). This analysis finds the smallest number of factors needed to explain the correlations among a set of variables (Muthén & Muthén, 2008). At the conclusion of the analysis, the interpretation of the factor is based on measured variables that are most strongly associated with it (Meyers et al., 2013).

Confirmatory factor analysis (CFA). This study also used CFA because the factor analysis is driven by the theoretical relationships among the measured variables and the latent factors (Schreiber, Stage, King, Nora, Barlow, 2006). The objective of CFA is to determine if the relationships between the variables in the hypothesized model capture the relationships between the variables in the actual or observed data set (Meyers et al., 2013). In other word, CFA is widely used to study how well a hypothesized factor model fits a new sample from the same population or a sample from a different population (Muthén & Muthén, 2008).

Technically, when CFA is conducted, a hypothesized model will be used to estimate a population covariance matrix that is compared with the observed covariance matrix (Schreiber, et al., 2006). The goodness of fit index comparing the two matrices provides support for the model.

CFA models are usually presented in the form of diagrams as graphic representations of theoretical models or conceptual structures (Meyers et al., 2013). CFA models contain three components (as shown by Figures 9 and 10): (a) measured (observed) variables, represented in the diagrams by rectangles or squares; (b) latent (not directly observed) factors or constructs, represented in the diagrams by ovals or circles; and (c) paths (direction of hypothesized cause or influence) represented in the diagram by lines with arrows pointing in a given direction or directions (Meyers et al., 2013).

CFA can be either a stand-alone analysis or an embedded analysis in a study of a larger structural model (Meyers et al., 2013). The stand-alone analysis (a relatively simple structural model) aims to test the viability of a hypothesized factor structure.

When CFA is included in a larger structural model, it aims to relate the latent factors to other variables or constructs.

In the SEM analysis, the confirmatory portion is a measurement model because it assesses the statistical quality of the latent factors based on the measured variables that represent them (Schreiber, et al., 2006). A poor fit of the measurement (CFA) model to the data can cause the entire structural model to perform poorly (Meyers et al., 2013). However, a good fit of the measurement model does not ensure that the larger structural model will work well but only that its analysis is justified.

Structural equation modeling. This study aimed to develop and test a relationship model linking KM enablers and KM processes to organizational quality performance. SEM helps suggest how the variables (KM processes, enablers, and QA scores) affect each other in the theorized or hypothesized model. Then SEM analyzes the overall model with the actual data set collected from the survey and the archival data to identify how well the model fits with these data. If the hypothesized model captures the data, this model can indicate the relationship of variables (Meyers et al., 2013).

Causality in SEM should be discussed. Some scholars use the causal terminology in SEM because they believe that SEM can establish a causal relationship with their studied models so it implies causation between variables (Bollen & Pearl, 2013). If a model is estimated and shows a significant coefficient, then the researcher feels justified to conclude that a significant causal influence exists between the two variables. However, this belief is incorrect because SEM does not establish causality from models of partial associations alone. For example, a father's occupation leads to his

child's performance on an intelligence test, and these two variables (father's occupation and child's intelligence score) are correlated. This does not mean that the father's occupation directly causes the child's intelligence (Anderson & Gerbing, 1988).

SEM is a statistical inference technique that "takes in two inputs, qualitative causal assumptions and empirical data, and derives two logical consequences of these inputs: quantitative causal conclusions and statistical measures of fit for the testable implications of the assumption" (Bollen & Pearl, 2013, p. 13). Fitting the data does not prove the causal assumptions, but it makes them tentatively more plausible. Failure to fit the data shows weak causal assumptions of zero coefficients or zero covariances, and guides a researcher to further diagnose the models. With the aforementioned discussion, this study avoids use of the causal terminology in SEM.

SEM is the combination of the measurement model and the structural model. The measurement model represents the degree to which the indicator variables capture the essence of the latent factors (Anderson & Gerbing, 1988; Meyers et al., 2013). This model is the CFA portion of the SEM model (Holbert & Stephenson, 2002; Kline, 2011; Schreiber, et al., 2006). Another model called the structural model tests a set of hypothesized relations among two or more latent variables (Holbert & Stephenson, 2002). It looks at the relationships between the latent variables of interest in the theory (Meyers et al., 2013). This model is the path analysis portion of the SEM model (Kline, 2011). The path model is a structural model for observed variables and it is represented by a single arrowhead (→) that points from X to Y representing a direct effect (Kline, 2011).

When a SEM model is proposed (relationships between variables are hypothesized), a correlation or covariance matrix is created (Kline, 2011). Then the estimates of the relationships between the variables in the model are calculated using the maximum likelihood estimation procedure. Finally, the overall SEM model is compared with the actual or observed data set. If the two matrices (the one based on the hypothesized model and the one derived from the actual or observed data) are consistent with one another, the model can be considered a credible explanation for the hypothesized relationships. The structure emerging from analysis of the actual or observed data matches the hypothesized structure in the theoretical model.

The SEM analysis can be performed through four steps, the first of which is model specification. Model specification refers to setting hypotheses in the form of the structural equation model (Kline, 2011) or setting the metric (variances) of the factors (Anderson & Gerbing, 1988). The structural equation model can be specified by two types of variables (Meyers et al., 2013): (a) an exogenous variable is a variable that has not presumed to be explained by other variables in the model; and (b) an endogenous variable, in contrast, is a variable that is explained by other variables in the model. In this study, the exogenous latent variables includes KM enablers (leadership, culture, technology, and measurement). The endogenous latent variables consist of KM processes and QA scores.

Second, model identification involves the step when the SEM software (Mplus) generates a set of model parameter estimates (Kline, 2011). The requirements for identifying any structural equation model involve: (a) the model degrees of freedom (the

number of observations minus some values that limit the observations' freedom to vary) must be at least zero, and (b) every latent factor must be assigned a scale (metric) that leads to a number of parameters and observations (Kline, 2011).

There are three scenarios for model identification (Holbert & Stephenson, 2002). Over-identification occurs when there are more known parameters (or known values) for the model than unknown parameters (or estimated parameters). The number of known parameters is the number of covariances or $r(r + 1)/2$; where r is the number of variables in the model. Unknown parameters are those for which the SEM process will generate numerical values. If a model has one or more degrees of freedom, then it is over-identified. If a model has zero degrees of freedom, then it is just-identified. If a model is under-identified, most SEM programs will not perform the analysis. Thus, the hypothesized model should be over-identified—the model has more numbers of known parameters than unknown parameters.

Third, estimation of the model aims to find a set of parameter estimates that can minimize the Maximum Likelihood (ML) estimate. The ML estimate is one of the most common methods for estimations of structural path coefficients and model-fitting (Anderson & Gerbing, 1988; Kline, 2011). ML describes the statistical principle that underlies the derivation of parameter estimates. The estimates are the ones that maximize the likelihood (the continuous generalization) that the data (the observed covariances) were drawn from (Kline, 2011).

The fourth step is model evaluation. This step involves testing the hypothesized model through ML estimation. Model fit will be tested to determine if the hypothesized

model should be accepted or rejected. Two methods of overall model evaluations include: (a) chi-square test and (b) goodness-of-fit index.

Chi-square ($\chi 2$) aims to test the fit of the hypothesized model by comparing with the actual or observed data set (Meyers et al., 2013). If the two matrices (the one based on the hypothesized model and the one derived from the actual data) are consistent with one another, then the model is acceptable for explaining the hypothesized relationships as shown by a chi-square value that is nonsignificant meaning there is minimal difference between the observed and computed matrices. Chi-square ($\chi 2$) is the product (N-1) F_{ML} where F_{ML} is the value of the statistical criterion (fit function) minimized in ML estimation and (N-1) is one less than the sample size (Kline, 2011). The hypothesized model with an acceptable fit should yield a p value that is ≥ 0.05. A non-significant chi-square ($\chi 2$) score ($p > .05$) leads to the acceptance of the hypothesized model (Holbert & Stephenson, 2002). It implies that the hypothesized model can capture the data of the actual or observed data model. If the hypothesized model fits, the pattern coefficients of the observed variables and the structural path coefficients of the latent factors will be examined (Holbert & Stephenson, 2002). If the model does not fit, adjustments can be made to improve the match between the two matrices.

Goodness-of-fit index explains the size of misfit (Kline, 2011). Two types of goodness-of-fit indices include Root Mean Square Error of Approximation (RMSEA) and Comparative Fit Index (CFI).

RMSEA is scaled as a badness-of-fit index where a value of zero indicates the best fit (Kline, 2011). It represents the difference between each cell in the observed

matrix and the computed matrix where a zero would mean perfect match. The cut-off values of RMSEA are 0.05 or less (≤ .05) indicating good fit, and 0.08 or less (≤ .08) indicates fair fit of the hypothesized model to the actual data (Hu & Bentler, 1999).

CFI measures the relative improvement in the fit of a hypothesized model over that of a baseline or null model (Kline, 2011). The CFI index ranges between 0 and 1, with values near 1 indicating a better fit. CFI with a good fit is greater than .90 (> .90; Hu & Bentler, 1999).

In sum, SEM helps verify the hypothesized interrelationships model. SEM primarily tests a relationship model that suggests how the variables might affect each other. Then it assesses how well the hypothesized model reproduces the relationships found in the data. (Meyers et al., 2013).

Qualitative analysis. Qualitative data of this study were drawn from the open-ended questions asking internal factors for supporting and blocking successful KM. Qualitative analysis involved a variety of processes of coding, categorizing, identifying themes, and assigning meaning to the collected text data. The identification of themes requires coding and sorting that are necessary for qualitative research (Cardona, Jain, & Canfield-Davis, 2012).

The analysis process started with looking for patterns within the data and sorting them into general themes. Then, the data were identified in specific thematic categories and coded using colored markers. The qualitative analysis followed four guidelines of Guba and Lincoln (1981) to develop the categories: (a) the frequent occurrence of an activity or mention of an issue, (b) the comments and activities that participants

considered realistic and credible, (c) the unique concerns and issues, and (d) the items facilitating inquiry pertinent to the study. Finally, the meaning of the organized data were interpreted so that it answers the research question. These qualitative data led to a context of KM process and enablers in each Thai university.

Summary

Chapter III elaborated on how to conduct this study. It started with restating the study's purpose and research question— to develop an inclusive KM model that can be generalized in higher education. The mixed-method methodology guided the research protocols. The population of this study was 142 higher education institutions in Thailand.

Data came from the revised 48-item questionnaire survey and the online archival data. The survey instrument for the KM processes and enablers was the modified version of KMAT, originated by APQC. This instrument was tested validity and reliability through three steps: (a) the panel of the three KM experts verified the match of the instrument contents and the construct's contents that this study intended to measure; (b) the panel of the three Thai KM experts reviewed the instrument contents to match the Thai language and cultural context; and (c) the 25 respondents were asked to complete the pilot-test survey to examine the reliability of the instrument. Consequently, the instrument included 42 items (5-scale) of the KM processes and enablers, four measurements of institutional demographic information, and two open-ended questions.

Data collection started in June 2014 after the approval of the TAMU IRB. The electronic questionnaire survey administration was completed in the middle of August.

The 181 respondents from 60 universities voluntarily participated in the e-survey. Then the researcher identified true response cases, which were 150 cases from 60 universities, for data analysis.

Data analysis combined quantitative and qualitative approaches. Quantitative analysis using descriptive statistics, EFA, CFA, and SEM tested a correlational model linking KM enablers and KM processes on quality assurance scores. The use of qualitative analysis led to the contextual understandings of KM processes and enablers in each university.

CHAPTER IV

FINDINGS

Chapter IV reported the results of the study from the quantitative and qualitative data. This chapter included the quantitative analyses from descriptive statistics, EFA, CFA, reliability analysis, and SEM. The thematic analysis was also reported for the qualitative data.

Before analyzing the quantitative data, the researcher checked the original raw data set for accuracy, missing data, multivariate normality, and univariate normality. For accuracy, the researcher examined the frequency tables of the 42 quantitative variables to identify the existence of out-of-range values (Meyers et al., 2013). The accurate values should range from 1 to 5. Missing data can affect the accuracy of data analyses. Therefore, the researcher identified true response cases by deleting inadmissible cases when respondents partially completed the survey questions, as previously mentioned in Chapter III. Since this study provided the choice of not applicable (NA) in the rating scale, the raw data were carefully checked to identify the case that at least 77% of survey questions were answered. Therefore, the researcher used 150 cases as the final sample size for this study.

The issue of sample size is critical in SEM. However, there is no absolute standard with regard to an appropriate sample size to all situations in SEM (Muthen and Muthen, 2002). Some researchers (Boomsma & Hoogland, 2001; Kline, 2011) considered that a sample size greater than 200 is adequate for SEM. Inversely, SEM

models can be meaningfully tested even if sample size is less than 200 (Wang & Wang, 2012). Muthen and Muthen (2002) suggested that an appropriate sample size for a simple SEM model with normally distributed indicator variables is 150. The recent study, by Sideridis, Simos, Papanicolaou, and Fletcher (2014), assessed the impact of sample size on the power and fit of SEM using chi-square Type I errors, model convergence, RMSEA, and confidence intervals of the RMSEA. The results showed that a sample size between 50 and 70 is acceptable to conduct SEM since it can maintain low Type-I error rates and ensure RMSEA values between .05 and .08. Based on the previous studies, 150 is acceptable for conducting this study.

Not only the determination of appropriate sample size needs to be considered, but also the assumption of multivariate normality is required to achieve. The underlying procedure in SEM is based on the assumption of multivariate normality that expects to see the variables that are normally distributed (Kline, 2011). The instance of multivariate normality can be examined by the inspection of univariate distributions (Kline, 2011). Therefore, univariate normality was utilized for the multivariate normality inspection in the study. Univariate normality in the study that has more than 40 cases could be examined by skew and kurtosis (Kline, 2011). Skew implies that the shape of a unimodal distribution is asymmetrical about the mean of a variable. Positive skew indicates that most of the scores are below the mean, and negative skew indicates that most of the scores are above the mean. Kurtosis represents the peakedness of the distribution. The results of this study indicated no extreme skewness or kurtosis or of any variables (the criteria of normality is ± 1). The skewness measures ranged from -0.09 (TR37) and 0.95 (CU3), with the exception of

these three items: -1.03 (CU1), -1.06 (CU7), and -1.20 (ME22). The kurtosis measures ranged from -0.06 (CU22) and -0.97 (TE17); except six items: -1.01 (CU7), -1.08 (LE19), 1.13 (ME22), 1.03 (CO32), -1.12 (TR37), and -1.01 (TR38). The researcher did not perform transformation of data because the departures from the normal distribution were not extreme and a sample size that was more than 40 cases could affect a possible threat of non-normality in multivariate analyses (Meyers et al., 2013).

Descriptive Statistics

The researcher used SPSS version 22 for computing descriptive statistics. The 150 respondents completed 4 demographic questions and 42 quantitative items.

Demographic Characteristics

Table 3 reports the respondents' demographic variables: type, mission orientation, and location of the universities. Most respondents (n = 101, 67.3%) were from public universities while others (n = 49, 32.7%) were form private universities. The majority of the respondents worked at teaching universities (n = 135, 90.0%) and 10% worked at research universities (n = 15, 10.0%). One third of the respondents working at the universities that located in Bangkok and metropolitan areas (n = 54, 36.0%). Overall, the sample of this study can represent the characteristic of the Thai universities by covering their different types, missions, and locations.

Table 3 ***Demographic Characteristics: Type, Mission, and Location of Universities***

Variable	Characteristic	Frequency	%	Cumulative %
Type of university	Public	101	67.3	67.3
	Private	49	32.7	100.0
Mission orientation of university	Research	15	10.0	10.0
	Teaching	135	90.0	100.0
Location of main campus	Bangkok and metropolitan	54	36.0	36.0
	Other provinces	96	64.0	100.0
	Total	150	100.0	

Table 4 illustrates the units in which the respondents worked. More than half of the respondents came from supporting units (n = 86, 57.3%). The majority of this group worked at quality assurance offices (n = 33, 22.0%), followed by other types of the supporting units, including library and academic affairs (n = 14, 9.3%). Almost half of the respondents worked at academic units (n = 64, 42.7%). Half of them had the affiliation with the humanities or sociology fields (n = 33, 22.0%).

Table 4 ***Demographic Characteristics: Unit of Respondents***

Characteristic	Frequency	%
Academic unit	*64*	*42.7*
- Health science	4	2.7
- Physical or biological science	19	12.7
- Humanity or sociology	33	22.0
- Technology	7	4.7
- Others	1	.6
Supporting unit	*86*	*57.3*
- Policy, planning, and budget	13	8.6
- Human resource	6	4.0
- Quality assurance	33	22.0
- Technology	5	3.3
- Research	13	8.7
- Others (i.e., library, academic affairs, community service center)	14	9.3
- KM institution	2	1.1
Total	150	100.0

The number of the respondents in each university was summarized in Table 5. Thirty-three universities (55.0%) had one representative who responded to the survey. Multiple respondents were the representatives of the 27 other universities (45.0%). The highest number of respondents who represented in one university was 12.

Table 5 ***Demographic Characteristics: Number Respondents of Each University***

Number of the respondents of each university	Frequency	%	Cumulative %
1	33	55.0	55.0
2	8	13.3	68.3
3	2	3.3	71.7
4	7	11.7	83.3
5	5	8.3	91.7
6	1	1.7	93.3
7	2	3.3	96.7
10	1	1.7	98.3
12	1	1.7	100.0
Total	60	100.0	

Descriptive Statistics for the Quality Performance Scores

The quality performance scores are summarized in to three groups in Table 6. Among the 150 respondents from the 60 universities, two respondents (1.3%) were in the universities that had scores between 2.00 to 3.50. The majority of the respondents (62.7%) were in the range of 3.51 - 4.50 on a 5-scale. Fifty-four respondents were in the range of 4.51 and higher.

Table 6 ***Descriptive Statistics for the Quality Performance Scores***

Score range	Frequency	%	Cumulative %
2.00 – 3.50	2	1.3	1.3
3.51 – 4.50	94	62.7	64.0
4.51 – 5.00	54	36.0	100.0
Total	150	100.0	

Descriptive Statistics for the Quantitative Items

Descriptive statistics for the 42 quantitative items were analyzed separately into each construct in two tables: KM enablers (4 factors and 25 items) in Table 7 and KM processes (3 factors and 17 items) in Table 8. The statistics were calculated by using SPSS 22 that showed the means and the standard deviations (SD) along with the minimum (Min) and maximum (Max) scores for each item. The means for KM enablers ranged between 3.33 - 4.38 and the means for KM processes varied between 3.12 - 3.96.

Table 7 ***Descriptive Statistics for the KM Enablers***

Factor	Item	N	Min	Max	Mean	SD
Culture	CU1	150	2	5	4.31	0.86
	CU2	150	2	5	4.23	0.86
	CU3	145	1	5	4.16	0.87
	CU4	150	1	5	3.84	0.94
	CU5	148	1	5	4.21	0.92
	CU6	150	1	5	3.88	0.94
	CU7	147	2	5	3.78	0.98
Leader	LE8	149	1	5	4.38	0.96
	LE9	146	1	5	3.75	1.08
	LE10	147	1	5	3.44	1.14
	LE11	147	1	5	3.99	0.97
	LE12	148	1	5	3.52	1.21
	LE13	145	1	5	4.16	1.08
	LE14	146	1	5	3.96	1.05

Table 7 ***(continued)***

Factor	Item	N	Min	Max	Mean	SD
Technology	TE15	149	1	5	3.81	1.12
	TE16	145	1	5	3.79	1.06
	TE17	145	1	5	3.79	1.07
	TE18	146	1	5	3.87	1.07
	TE19	148	2	5	3.86	1.00
	TE20	148	1	5	3.59	1.09
Measurement	ME21	146	1	5	3.89	1.07
	ME22	148	1	5	4.17	0.97
	ME23	144	1	5	3.33	1.13
	ME24	141	1	5	3.62	1.09
	ME25	144	1	5	3.65	1.28

Table 8 ***Descriptive Statistics for the KM Processes***

Factor	Item	N	Min	Max	Mean	SD
Knowledge	GE26	148	1	5	3.87	1.08
generation	GE27	149	1	5	3.96	1.02
	GE28	144	1	5	3.12	1.17
	GE29	145	1	5	3.20	1.19
	GE30	146	1	5	3.60	1.06
	GE31	145	1	5	3.88	1.09
Knowledge	CO32	149	1	5	3.63	1.10
codification	CO33	148	1	5	3.47	1.12
	CO34	148	1	5	3.57	1.07
	CO35	148	1	5	3.57	1.07
	CO36	144	1	5	3.29	1.17
Knowledge	TR37	150	1	5	3.60	1.07
transfer	TR38	149	1	5	3.68	1.05
	TR39	149	1	5	3.62	1.11
	TR40	149	1	5	3.69	1.14
	TR41	148	1	5	3.59	1.10
	TR42	150	1	5	3.61	1.02

Results of Factor Analysis

This section reports the results of EFA and CFA for the two constructs: KM enablers and KM processes. Due to the limited sample size, the total 150 cases were used for EFA and CFA, respectively.

Results of Exploratory Factor Analysis

As prerequisites for factor analysis, two tests, the Kaiser-Meyer-Olkin (KMO) of sampling adequacy and the Bartlett's Sphericity test, were conducted to determine if the sample has met the requirements for factor analysis (Hair, Black, Babin, & Anderson, 2010; Meyers et al., 2013).

The KMO index can be interpreted as follows: KMO $\geq .80$ is meritorious; $.70 \leq$ MSA $< .80$ is middling; $.60 \leq$ MSA $< .70$ is mediocre; $.50 \leq$ MSA $< .60$ is miserable; and MSA $< .50$ is unacceptable (Hair et al., 2010). Bartlett's Sphericity tests the null hypothesis that the correlation matrix is an identity matrix. An identity matrix represents a matrix in which all of the diagonal elements are 1 and all of diagonal elements are 0. In short, a significant Sphericity value indicates that the correlation matrix of variables in a scale has significant correlations among at least some of the variables. Consequently, the variables can be factor analyzed.

To determine the factor structures of the scales, EFA requires two criteria: percentage of variance and factor loadings (Costello & Osborne, 2005; Meyers et al., 2013). The percentage of variance criterion refers to a requirement that usually 60% or larger amount of the total variance can be explained by the extracted factors. Factor loadings equal to or greater than .40 can be retained in EFA (Meyers et al., 2013).

For a factor rotation method, Costello and Osborne (2005) explained that factors can be extracted by unweighted least squares, generalized least squares, maximum likelihood, principal axis factoring, alpha factoring, and image factoring. They suggested that if data are relatively normally distributed, maximum likelihood (ML) will provide the best results because ML allows for "the computation of a wide range of indexes of the goodness of fit of the model [and] permits statistical significance testing of factor loadings and correlations among factors and the computation of confidence intervals." (Costello & Osborne, 2005, p. 2). Inversely, if multivariate normality is severely violated, the principal axis factors is the practical option. As mentioned earlier, the normal distribution of some variables in this study were not perfect, thus the principal axis factors was used to extract for this EFA.

Since the results of factor extraction were usually difficult to interpret, the rotation method assists in simplifying and clarifying the data structure (Costello & Osborne, 2005). Two representative approaches to factor rotation are orthogonal rotation and oblique rotation. Conventionally, researchers have used orthogonal rotation because it produces more easily interpretable results. However, in the social science studies, behaviors are rarely partitioned into complete units. Social science researchers expect some correlation among factors. Orthogonal rotation results in a loss of valuable information if the factors are correlated, while oblique rotation assumes rotated factors are correlated. Thus, this study used the oblique factor rotation because oblique rotation allows the factors to correlate.

Direct oblimin, quartimin, and promax are available oblique methods of rotation. The study of Costello and Osborne (2005) found that these methods produce similar results. This study used the direct oblimin technique because it simplifies factors by minimizing the sum of cross-products of squared loadings in the pattern matrix. Then pattern coefficients in the pattern matrix are used in determining which items meaningfully correlate with the rotated factor. Finally, a pattern coefficient of .40 was used in this study because it provides strong loaders (.32 is acceptable and .50 or higher is strong, Costello & Osborne, 2005). In addition, this study expected to see a factor that included more than three items because a factor with fewer than three items is weak and unstable (Costello & Osborne, 2005).

Exploratory factor analysis of the KM enablers. To analyze the 25 items in this construct, the researcher chose not to set the number of factors in order to see how many meaningful factors might be extracted in the data set. The KMO index was .928, indicating that the present data were suitable for EFA. Bartlett's Sphericity test was significant ($\chi^2 = 2383.749$, df = 300, p = .000), indicating sufficient correlation between the variables to proceed with the analysis. For the first factor structure requirement, percentage of variance, Table 9 shows four factors with an eigenvalue larger than 1. A total of the initial eigenvalues of the four factors cumulatively accounted for 68.264% of the total variance, indicating the requirement of the 60% of variance criterion for factor extraction. Factor 1 accounted for the most variance (51.651%). Furthermore, the eigenvalues of the four factors after rotation ranged from 1.088 to 12.913.

Table 9 ***Total Variance Explained of KM Enablers***

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	12.913	51.651	51.651	12.552	50.206	50.206
2	1.608	6.434	58.085	1.279	5.114	55.320
3	1.456	5.826	63.911	1.132	4.528	59.848
4	1.088	4.353	68.264	.750	3.001	62.849
5	.858	3.432	71.696			
6	.780	3.121	74.817			
7	.699	2.794	77.611			
8	.632	2.527	80.137			
9	.582	2.329	82.467			
10	.530	2.121	84.588			
11	.482	1.927	86.515			
12	.425	1.702	88.217			
13	.407	1.627	89.844			
14	.355	1.419	91.262			
15	.344	1.376	92.639			
16	.288	1.152	93.790			
17	.286	1.143	94.933			
18	.234	.938	95.871			
19	.213	.854	96.725			
20	.197	.786	97.511			
21	.169	.678	98.189			
22	.152	.609	98.798			
23	.129	.516	99.313			
24	.111	.444	99.758			
25	.061	.242	100.000			

Factor loadings is another requirement of factor structure. As shown in Table 10, the factor loadings of 23 out of the 25 variables ranged from .403 to .913, meeting the factor loading criterion for extraction. Empirically, some of these 25 items were not loaded onto the theoretical factors. Table 11 shows the correlation matrix of KM Enablers ranged from .397 to .537, indicating a moderate positive relationship.

Table 10 ***Pattern Matrix of KM Enablers***

	Factor			
	1	2	3	4
CU1			.591	
CU2			.843	
CU3			.759	
CU4		.403		
CU5			.404	
CU6		.509		
CU7		.512		
LE8				.410
LE9		.770		
LE10		.821		
LE11		.579		
LE12				.475
LE13				.810
LE14				.466
TE15	.680			
TE16	.783			
TE17	.913			
TE18	.538			
TE19	.685			
TE 20	.506			
ME21				
ME22				.452
ME23		.424		
ME24		.546		
ME25				

Table 11 ***Correlation Matrix of KM Enablers***

Factor	1	2	3	4
TEC	1.000			
STC	.537	1.000		
CUL	.485	.490	1.000	
LDR	.519	.397	.453	1.000

Note: Technology (TEC), Strategic Context (STC), Culture (CUL), Leadership with the Directive Role (LDR)

Based on the content of item TE15 - TE20 in Factor 1, this factor was named Technology (TEC). Factor 1 accounted for the maximum part (51.651%) of the variance

of all items. It also provided the clear extraction and matched the theoretical factor. Factor 1 included the use of technology to enhance the flow of knowledge (TE15), to create an institutional knowledge database (TE16), to make an institutional knowledge database accessible (TE17), to allow students to provide feedback (TE18), to enhance collaborative learning effort among employees (TE19), and to help employees make better decision in a timely fashion (TE20).

Factor 2, accounted for 6.434% of variance, was titled Strategic Context (STC). Interestingly, this factor included 8 items that covered some aspects of the theoretical culture, leadership, and performance measurement factors. The eight items of Factor 2 were interrelated and reflected multi-aspects of culture, leadership, and performance measurement at the strategic viewpoint. This factor reflected the strategic context that involved the creation of knowledge value to achieve an institution's mission (CU4), the desire to innovate (CU6), the accountability for individual learning (CU7), the increase in income (LE9), the strategy for selling knowledge (LE10), the development of core competency (LE11), the measure of intangible assets (ME23), and the allocation of resources (ME24).

In addition, due to the extracted results, the researcher further analyzed these eight items with the same EFA procedure in order to determine how many subfactors were under Factor 2. The results showed that all eight items were not extracted; they were under the single factor. The results of this additional extraction were as follows: the KMO index was .905; Bartlett's Sphericity test was significant (χ^2 = 548.002, df = 28, p = .000); a total of the initial eigenvalues of the factor cumulatively accounted for

59.877%; the loadings of each items ranged between .658 - .792. Consequently, this study retained these eight extracted items to represent Factor 2 called Strategic Context.

Factor 3, accounted for 5.826% of variance, was named Culture (CUL). This factor retained four out of the seven theoretical items. Among four items in Factor 3, three items, which were the university culture facilitates knowledge building and sharing (CU1), the university has a culture of openness in sharing knowledge (CU2) and trust in sharing knowledge (CU3), included the term *culture* in their statements. Only one item, the university's KM system facilitates the employees' learning process (CU5) did not obviously mention the term *culture*. The term *culture* might lead to bias because it was a guiding word in the statements. Thus the items that included the term *culture* were extracted to the same factor.

Leadership with the Directive Role (LDR) was named for Factor 4 that accounted for the minimum part (4.353%) of variance. This factor maintained four (LE8, LE12, LE13, and LE14) out of the seven theoretical leadership items and added one item from the theoretical measurement factor (ME22). This factor reflected the obvious roles of the leaders that related to plan setting (LE8), rewarding (LE12), KM positioning (LE13), setting the KM vision (LE14), and setting the KM performance indicator (ME22). These roles were recognized as the aspects of directive leaders.

Exploratory factor analysis of the KM processes. The researcher used the same EFA procedure to analyze the 17 KM process items. The KMO index was .934, indicating that the present data were suitable for EFA. Bartlett's Sphericity test was significant ($\chi^2 = 2489.072$, df = 136, p = .000), indicating sufficient correlation between

the variables to proceed with the analysis. Table 12 shows two factors with an eigenvalue larger than 1. A total of the initial eigenvalues of the two factors cumulatively accounted for 72.810% of the total variance, indicating the requirement of the 60% of variance criterion for factor extraction. Factor 1 accounted for the most variance (66.419%). Furthermore, the eigenvalues of the two factors after rotation were 1.087 and 11.291.

Table 12 ***Total Variance Explained of KM Processes***

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	11.291	66.419	66.419	11.001	64.710	64.710
2	1.087	6.391	72.810	.858	5.048	69.758
3	.919	5.406	78.217			
4	.670	3.939	82.155			
5	.540	3.175	85.330			
6	.464	2.728	88.058			
7	.404	2.374	90.432			
8	.324	1.909	92.340			
9	.247	1.455	93.795			
10	.222	1.306	95.101			
11	.195	1.146	96.247			
12	.166	.979	97.226			
13	.148	.873	98.100			
14	.105	.616	98.715			
15	.086	.505	99.220			
16	.082	.483	99.703			
17	.051	.297	100.000			

As shown in Table 13, the factor loadings of 17 variables ranged from .403 to .974, meeting the factor loading criterion for extraction. Empirically, without a priori criteria for determining the number of factors, the extraction produced only two factors

that did not match the number of the theoretical factors. Furthermore, as shown in Table 14, it represents the correlation matrix of KM enablers ranged from .397 to .537, indicating a moderate positive relationship.

Table 13 ***Pattern Matrix of KM Processes***

	Factor	
	1	2
GE26		.509
GE27		.550
GE28		.747
GE29		.833
GE30		.620
GE31		.633
CO32	.866	
CO33	.794	
CO34	.760	
CO35	.706	
CO36	.453	.403
TR37	.733	
TR38	.787	
TR39	.960	
TR40	.974	
TR41	.972	
TR42	.647	

Table 14 ***Correlation Matrix of KM Processes***

Factor	1	2
KTR	1.000	
KGE	.638	1.000

Note: Knowledge Transfer (KTR), Knowledge Generation (KGE)

Based on the extraction, Factor 1, which accounted for the maximum part (66.419%) of the variance, was named Knowledge Transfer (KTR). This factor combined the two theoretical factors: knowledge codification (CO32 - CO36) and

knowledge transfer (TR37 - TR42). The theoretical knowledge codification factor aimed to make organizational knowledge accessible by transforming tacit and explicit knowledge. It involved the activities of supporting knowledge platforms to share tacit knowledge (CO32), supporting technology to make tacit knowledge accessible (CO33), making past know-how explicit (CO34) and accessible (CO35), and making past know-how remain within the university when employees' leave the university (CO36). The theoretical knowledge transfer factor aimed to apply knowledge to individuals' daily work through knowledge sharing and distributing activities. It involved the activities of providing opportunities for employees to meet informally to share knowledge (TR37) and build knowledge networks (TR38), communicating the best practices (TR39), lessons learned (TR40), and success stories in improving organization's performance (TR41), and strategically investing resource in applying knowledge into job (TR42).

From the contents of the 11 items, they merged the two theoretical factors and had a common theme to make tacit knowledge into explicit knowledge through the process of sharing knowledge. The activities of sharing and distributing knowledge were the core element of this extracted factor, consequently Knowledge Transfer was named to cover the aspects of this factor.

Another finding, which needed to be carefully interpreted, was a cross-loading item (CO36). CO36 loaded higher than .32 on two factors (.453 and .403). Conventionally, if a cross-loading item has a strong loading (.50 or better) on each factor, this item should be dropped from the analysis (Costello & Osborne, 2005). This study retained CO36 because its loadings were lower than .50.

Factor 2, accounted for the minimum part (6.391%) of variance, was named Knowledge Generation (KGE). This factor still included all six theoretical knowledge generation items (GE26 - GE31) that focused on the activity of acquisition and development of knowledge. These six items related to the activities of identifying knowledge needs (GE26), using well-defined work practices to address knowledge needs (GE27), creating organizational knowledge directories (GE28), creating directories with specialized knowledge of other groups aligned with the organizational knowledge (GE29), developing mechanisms to gather knowledge systematically (GE30), and gathering knowledge ethically (GE31).

Results of Confirmatory Factor Analysis

The researcher used Mplus 7.3 to analyze CFA for the two constructs: KM enablers and KM processes. CFA aims to evaluate how well the measurement models established in EFA fits the data.

Confirmatory factor analysis of the KM enablers. The CFA results showed that the hypothesized 4-factor KM enabler model provided an unsatisfactory fit for the data. The χ^2 (2430.256) was statistically significant (df = 271, $p < .001$) due to its sensitivity. Many researchers addressed that chi-square values can be affected by the following situations: (a) the failure to meet the assumption of multivariate normality can lead to an overestimation of the chi-square statistic, even when the model is properly specified (Jackson, Gillaspy, & Purc-Stephenson, 2009); (b) complex models with many variables and degrees of freedom are likely to make chi-squares significant (Marsh, Hau, & Wen, 2004); (c) large samples are likely to produce large chi-squares that are more

likely to be significant (Type I error) (Bentler & Bonnet, 1980), whereas small samples tend to accept poor models (Type II error) because they cannot discriminate between good fitting models and poor fitting models (Kenny & McCoach, 2003). Due to the restrictiveness of chi-square, this study has sought alternative indices, such as CFI and RMSEA, to assess model fit. The CFI (.689) was below the standard .95 cutoff (Hu & Bentler, 1999). The RMSEA was .230 with a 90% confidence interval (CI) of .222 to .239, indicating an unacceptable fit. All in all, this model did not fit the data.

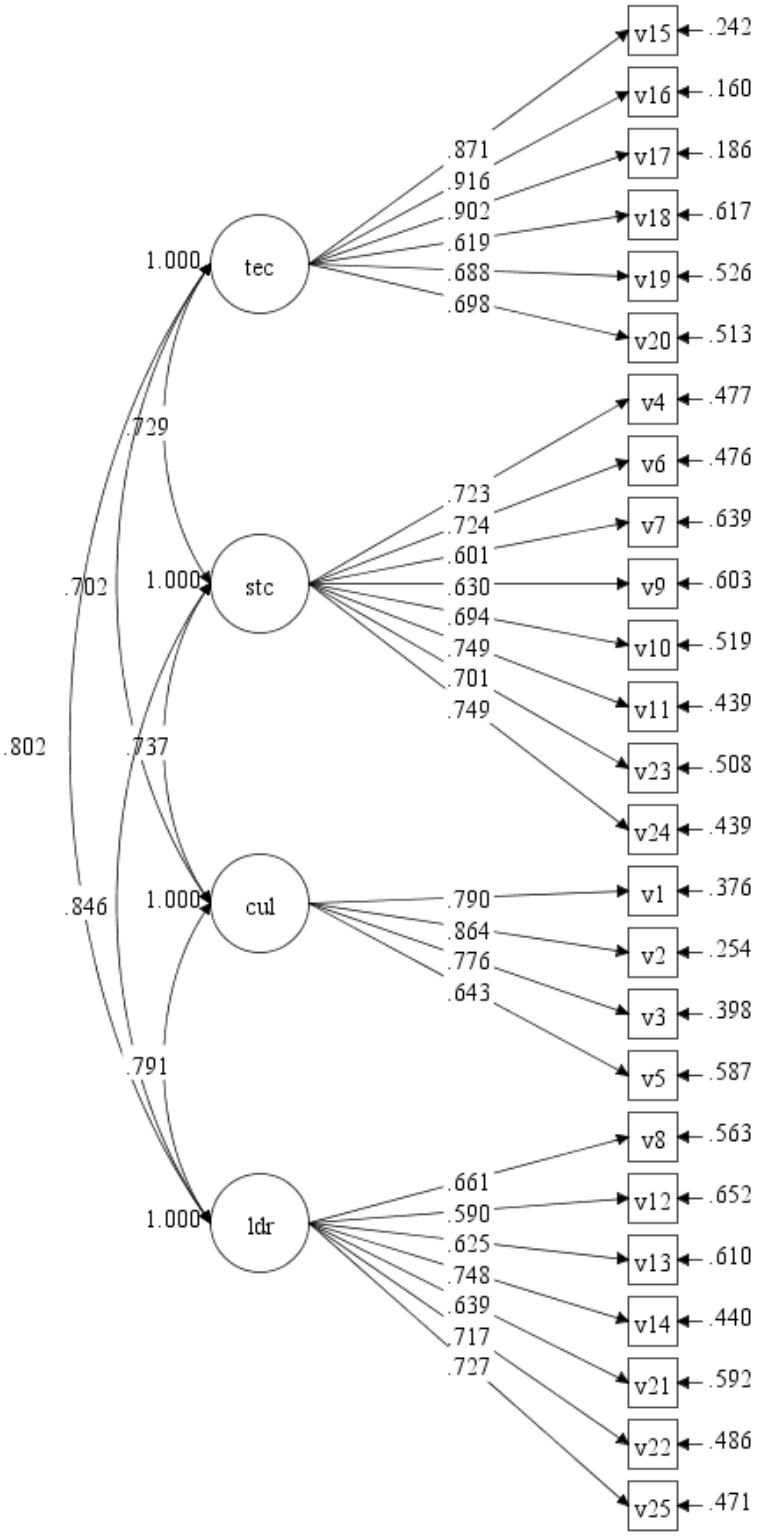
Since the CFA model did not fit data satisfactorily, modification was applied to determine what was specifically wrong with this initial model. Generally, modification examines fixed parameters in the initial model to capture model misspecfication and then re-test the model using the same data set (Wang & Wang, 2012). With the guideline from the modification indices, CFA modification of this model suggested adding ME21 and ME25 in the extracted EFA factors. The researcher added these two items into the three factors: Technology, Strategic Context, and Leadership with the Directive Role. Table 15 shows all modified CFA models provided satisfactory fits (good CFI and fair RMSEA). The researcher decided to keep these two items in the Leader with the Directive Role because ME21 and ME25 were the characteristics of directive leadership that include setting clear objectives, clarifying of the criteria for success, and providing psychological support. ME21 related to the managerial task of allocating budget regarding the achievement of the performance assessment, while ME25 described the task of reporting the performance achievement.

Table 15 ***Fit Indices of the Four Enabler CFA models***

Fit indices	Initial CFA model	Modified TEC CFA model	Modified STC CFA model	Modified LDR CFA model
Chi-square test	χ^2 = 2430.256 (df = 271, p < .001)	χ^2 = 510.815 (df = 269, p < .001)	χ^2 = 498.651 (df = 269, p < .001)	χ^2 = 481.185 (df = 269, p < .001)
CFI (>.90)	.689	.965	.967	.969
RMSEA (<.05)	.230 (90% CI of .222 to .239)	.077 (90% CI of .067 to .088)	.075 (90% CI of .065 to .086)	.073 (90% CI of .062 to .083)

The modified LDR model revealed a good fit for the data. Although the χ^2 (481.185) was statistically significant (df = 269, p < .001) due to its restrictiveness, CFI (.969) was good. RMSEA was .073 with a 90% confidence interval (CI) of .062 to .083, indicating a fair fit. These fit indices provided a support for the model fit. Furthermore, Figure 12 shows the standardized factor loadings (regression weights, p < .001) ranged from .590 (V12) to .916 (V16), exceeding the minimum standard of .5 for convergent validity of each factor (Hair et al., 2010; Hu & Bentler, 1999).

Figure 12. **CFA Model of KM Enablers**



Based on the EFA and CFA results, Table 16 shows the KM Enabler measurement model with 4 factors and 25 items.

Table 16 ***Items of the KM Enabler Model***

Technology	
TE15	The university uses technology to enhance the flow of knowledge (such as acquiring, sharing, retrieving, and using) among employees.
TE16	The university uses technology to 1) create an institutional knowledge database.
TE17	2) make an institutional knowledge database accessible to the entire university.
TE18	The university uses technology to allow students to provide feedback to the university's performance.
TE19	The university provides technology to enhance collaborative learning efforts among employees.
TE20	The university's information system is designed to help employees make better decisions in a timely fashion.
Strategic Context	
CU4	The university's KM system creates a knowledge value for the university's achievement of its missions.
CU6	The university's desire to innovate drives employees' learning processes.
CU7	The university has a culture of accountability for individual learning.
LE9	The university administrators acknowledge that managing organizational knowledge helps increase income (e.g., from products of R&D, books, and consultations).
LE10	The university administrators develop strategies for selling its knowledge assets.
LE11	The university administrators deliberately use learning to develop core competencies.
ME23	The university has a measurement system that incorporates measures of intangible assets.
ME24	The university allocates resources for efforts that measurably increase its knowledge.

Table 16 ***(continued)***

Culture	
CU1	The university culture facilitates knowledge building and sharing.
	The university has a culture of
CU2	1) openness in sharing knowledge.
CU3	2) trust in sharing knowledge.
CU5	The university's KM system facilitates the employees' learning process.
Leadership with the Directive Role	
LE8	The university administrators include the management of organizational knowledge in the university's strategic plan.
LE12	The university administrators reward employees for their contributions to the development of organizational knowledge.
LE13	The university administrators need a specific person to oversee the development of organizational knowledge.
LE14	The university administrators have a vision for managing organizational knowledge.
ME21	The university's assessment process has ways to link KM to the budget allocated.
ME22	The university has a specific set of indicators to measure KM outcomes.
ME25	The university's annual report includes an assessment of how knowledge has contributed to organizational performance.

Confirmatory factor analysis of the KM processes. According to the hypothesized models, this study examined two research models: the general empirical model to explain HEI KM conceptualization and the conceptual model summarizing HEI KM literature. The general empirical model was focused on the relationship among each KM enabler and process, as well as each KM process and outcome. Thus the factors used in this analysis included four KM enabler factors (Technology, Strategic Context, Culture, and Leadership with the Directive Role), two KM process factors (Knowledge Generation and Knowledge Transfer), and one performance score. With this model's

requirement, the CFA of the KM processes were analyzed at the factor level from the first-order factor.

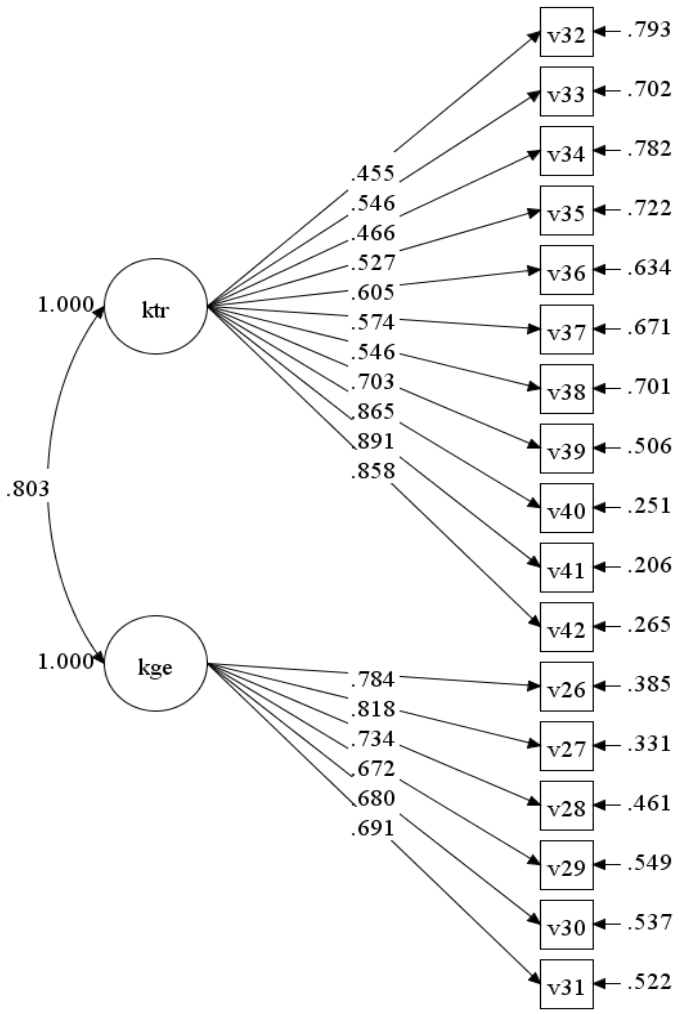
The conceptual model encompassed the three KM constructs: enablers, processes, and outcomes at the conceptual level. It examined the construct of the KM processes. Unexpectedly, the result from EFA dropped KM processes from three into two factors so the number of the factor did not meet the requirement of higher-order factor analysis. The rule for identification of higher-order factor is that a second-order factor must have a minimum of three first-order factors to be identified (Kwok, 2014). With only three-first order factors, the second-order factor model is equivalent to the first-order model with correlated factors. Thus, the researcher did not analyze the hypothesized conceptual model (Figure 9 in Chapter III).

The CFA result from the general empirical model showed the acceptable fit for the data. Although the χ^2 (597.462) was statistically significant ($df = 120$, $p < .001$), the other indices were within a range that would be associated with good fit. The CFI (.913) was greater than .90 cutoff. The RMSEA was .163 with a 90% confidence interval (CI) of .150 to .176, indicating an unacceptable fit.

To further identify the fitness of the model with the data, the researcher examined another two indices: Tucker-Lewis Index (TLI) and Weighted Root Mean Square Residual (WRMR). TLI is computed by comparing the normed χ^2 values for the null and specified measurement model (Muthen & Muthen, 2008). TLI equal to or greater than .90 exceeding the cut-off value. The WRMR, a variance-weighted approach, is recommended for models that variables are measured on different scales or have

widely unequal variances (Muthen & Muthen, 2008). It is also appropriate for data that are not distributed normally (Muthen & Muthen, 2008). The acceptable WRMR value is 1. The results of this model reported the two fit indices yielded at .901 and 1.019, indicating that goodness of fit was satisfied. The standardized factor loadings ($p < .001$) ranged from .455 (V32) to .891 (V41), meeting the requirement for convergent validity (Figure 13).

Figure 13. **CFA Model of KM processes**



Based on the EFA and CFA results, Table 17 shows the KM Process measurement model with 2 factors and 17 items.

Table 17 ***Items of the KM Process Model***

Knowledge Transfer	
	The university transfers its tacit knowledge (what employees know how to do but cannot express) across the university through
CO32	1) supporting knowledge platforms to share tacit knowledge, such as a KM sharing day, a story telling activity, or mentoring.
CO33	2) supporting technology to make tacit knowledge accessible.
	The university has mechanisms in place to make employees' past know-how
CO34	1) explicit.
CO35	2) accessible.
CO36	3) remain within the university when they leave the university.
	The university provides opportunities for employees to
TR37	1) meet informally to share knowledge.
TR38	2) build their knowledge networks.
	The university widely communicates
TR39	1) the best practices in improving organization performance.
TR40	2) lessons learned in improving organization performance.
TR41	3) success stories in improving organization performance.
TR42	The university strategically invests resources in applying organizational knowledge into job.
Knowledge Generation	
GE26	The university identifies organizational knowledge needs systematically.
GE27	The university uses well-defined work practices to address knowledge needs.
GE28	The university creates its organizational knowledge directories that list employees' skills, knowledge, and location.
GE29	The university creates directories with specialized knowledge of other groups (outside the university) aligned with the university.
	The university develops mechanisms to
GE30	1) gather knowledge systematically.
GE31	2) gather knowledge ethically.

Results of Reliability Analysis

Reliability estimation using the Cronbach's alpha technique was conducted for the six factors that were established from the series of EFA and CFA procedures. As indicated in Table 18, all of the factors in this study had very good reliabilities, ranging from .861 to .965 (> .85, Meyers et al., 2013).

Table 18 ***Estimates of Reliability***

Constructs	Factors	N of Items	Cronbach's α
KM enabler	Technology (TEC)	6	.919
	Strategic Context (STC)	8	.903
	Culture (CUL)	4	.861
	Leadership with the Directive Role (LDR)	7	.862
KM processes	Knowledge Transfer (KTR)	6	.905
	Knowledge Generation (KGE)	11	.965

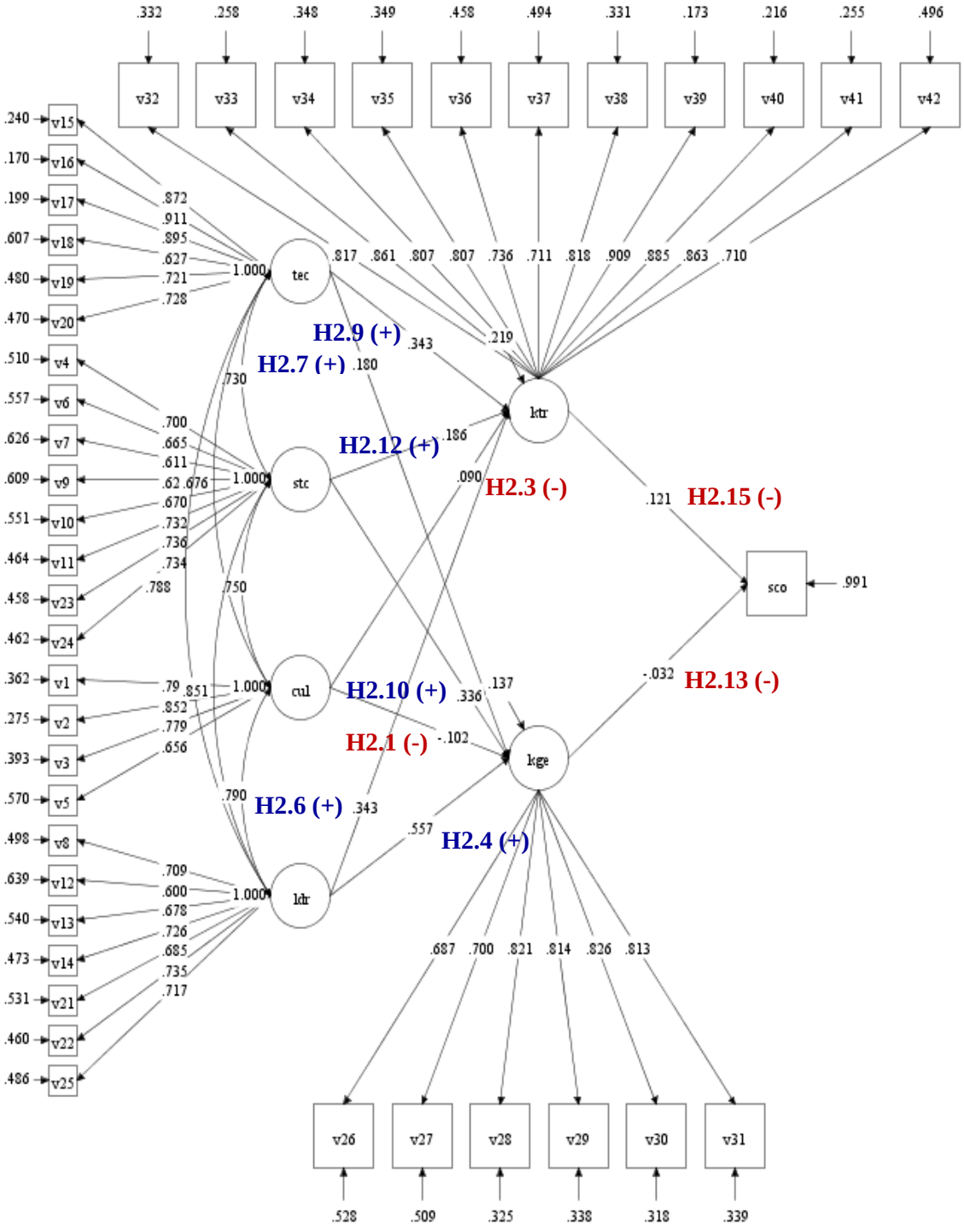
Results of Structural Equation Modeling

Based on the measurement model from CFA, the researcher further analyzed the SEM model to investigate the hypothesized models and the structural relationships. Prior to performing SEM using Mplus 7.3, the researcher revised the hypothesized general empirical model (Figure 10 in Chapter III) based on the results from the EFA. The revisions involved renaming the two factors for KM enablers (Strategic Context and Leadership with the Directive Role) and dropping KM processes from three into two factors. The researcher did not analyze the hypothesized conceptual model (Figure 9 in

Chapter III), because this model did not meet the requirement of higher order factor analysis, as previously mentioned in the CFA section.

The results of the SEM analysis showed that although the χ^2 test was statistically significant ($\chi^2 = 1581.515$, df = 845, $p < .001$), indicating not a good fit, the other indices were within a range that would be associated with acceptable fit: CFI = .809; TLI = .795; RMSEA = .083 (90% CI: .077 – .089); SRMR = .065. As shown in Figure 14, the path coefficients ranged from .032 (between KGE and SCO) to .557 (between LTR and KGE). Furthermore, six of the standardized (STDYX) parameters were statistically significant ($p < .01$). Four parameters (CUL to KTR, CUL to KGE, KTR to SCO, and KGE to SCO) were not statistically significant. The variance of SCO was high. The measure of SCO, that was a single latent variable, may be faulty rather than the model. In this model, six hypotheses (H2.4, H2.6, H2.7, H2.9, H2.10, and H2.12) were accepted, and five (H2.1, H2.3, H2.13, and H2.15) were rejected.

Figure 14. **Results of Structural Equation Modeling with the Hypothesized General Empirical Model**



Results of Thematic Analysis

This study incorporated two open-ended questions, which asked the respondents to describe the three internal factors that significantly support or block successful KM. The qualitative findings resulted from various processes of coding, categorizing, identifying themes, and assigning meaning to the text data. The researcher looked for patterns within the data and sorted them into general themes based on the four guidelines of Guba and Lincoln (1981), as mentioned in Chapter III. Then, the researcher identified data in specific thematic categories and codes. Microsoft Excel was a facilitating tool for coding and categorizing these qualitative data. Tables 19 and 20 report the main themes and subthemes of factors for supporting and blocking successful KM that were tabulated in a frequency order. For this data analysis, 129 of the 150 respondents completed the two qualitative questions.

Supporting Factors for Successful KM

The researcher generated 301 initial codes from the 129 respondents who identified the supporting factors for successful KM. Table 19 represents qualitative data for 13 main themes and 24 subthemes: the KM process with four subthemes (53 codes); leadership with three subthemes (45 codes); the KM unit or person with two subthemes (31 codes); the individual engagement with two subthemes (29 codes); the KM policy and strategic planning with two subthemes (28 codes); technology with two subthemes (26 codes); budget allocation with one subtheme (23 codes); the corporate culture with two subthemes (22 codes); the individual's KM understanding with two subthemes (18 codes); motivation with one subtheme (16 codes); the influence of the quality assurance

system with one subtheme (5 codes); the external KM network with one subtheme (4 codes); and the organization's structure with one subtheme (1 code).

Table 19 ***Supporting Factors for Successful KM***

Main theme	Subtheme	Frequency of codes
KM process	- Integrative and continuous KM process	20
	- Effective knowledge sharing	16
	- Clear knowledge identification	9
	- Use of knowledge into practice	8
	Subtotal	*53*
Leadership	- Good supportive management	32
	- Positive attitude of the leaders' toward KM significance	11
	- Good governance in KM implementation	2
	Subtotal	*45*
KM unit or person	- Assigned KM unit, team, or key person	24
	- Effective KM unit or team	7
	Subtotal	*31*
Individual engagement	- High engagement in KM practices	18
	- Positive attitude toward KM	11
	Subtotal	*29*
KM policy and strategic planning	- Clear KM policy	24
	- Integrative KM strategic planning	4
	Subtotal	*28*
Technology	- Efficient and effective KMIS	14
	- Efficient and effective IS for decision making	12
	Subtotal	*26*
Budget allocation	- Adequate budgeting	23
	Subtotal	*23*
Corporate culture	- Supportive organizational culture	13
	- Supportive KM culture	9
	Subtotal	*22*

Table 19 ***(continued)***

Main theme	Subtheme	Frequency of codes
Individual's KM understanding	- Correct KM understanding	13
	- Having knowledgeable staff's members	5
	Subtotal	*18*
Motivation	- Strong motivation system	16
	Subtotal	*16*
Influence of the quality assurance system	- Positive influence of the quality assurance system	5
	Subtotal	*5*
External KM network	- Established external KM network	4
	Subtotal	*4*
Organization's structure	- Small sized campus	1
	Subtotal	*1*
	Total	301

The largest portion of the supporting KM factors' main theme was the KM process with four subthemes of 53 codes. This KM process's main theme focused on the integration and continuousness of the KM process and related to three core KM process components (knowledge identification, knowledge sharing, and use of knowledge into practices). The second portion was allotted to leadership with three subthemes of 45 codes. The last frequently mentioned main theme included the organization's structure (1 code). Among the 24 subthemes, good supportive management in leadership was the most mentioned main theme (32 codes). The assigned KM unit, team, or key person and the clear KM policy, which included 24 codes equally, were the second frequently mentioned subthemes.

Blocking Factors for Successful KM

The researcher extracted 283 initial codes of the blocking factors for successful KM. Both blocking and supporting factors had 12 main themes in common. Inversely,

the external KM network was indicated in the supporting factors, while workload and time were categorized in the blocking factors. Table 20 reported the blocking factors with 13 main themes and 29 subthemes: the KM process with five subthemes (52 codes); the individual engagement with three subthemes (46 codes); workload and time with two subtheme (37 codes); the individual's KM understanding with two subthemes (29 codes); corporate culture with two subthemes (24 codes); leadership with three subthemes (20 codes); the KM unit or person with three subthemes (18 codes); budget allocation with one subtheme (14 codes); technology with two subthemes (14 codes); influence of the quality assurance system with one subtheme (11 codes); the KM policy and strategic planning with two subthemes (8 codes); motivation with one subtheme (5 codes); and the organization's structure with two subtheme (4 code).

Table 20 ***Blocking Factors for Successful KM***

Main theme	Subtheme	Frequency of codes
KM process	- No integrative and continuous KM process	21
	- Ineffective knowledge sharing	11
	- Lack of transfer of knowledge into practice	11
	- Unclear knowledge identification	5
	- Ineffective knowledge storage	4
	Subtotal	*52*
Individual engagement	- Negative attitude toward KM	30
	- Low engagement in KM practices	13
	- High turn-over rate	3
	Subtotal	*46*
Workload and time	- Over workload	20
	- Insufficient time to participate in KM practices	17
	Subtotal	*37*

Table 20 ***(continued)***

Main theme	Subtheme	Frequency of codes
Individual's KM understanding	- Incorrect KM understanding	28
	- Lack of knowledgeable staff's members	1
	Subtotal	*29*
Corporate culture	- Lack of supportive KM culture	14
	- Lack of supportive organizational culture	10
	Subtotal	*24*
Leadership	- Negative attitude of leaders' toward KM significance	13
	- Unsupportive management	5
	- Bad governance in KM implementation	2
	Subtotal	*20*
KM unit or person	- Ineffective KM unit or team	8
	- Ineffective KM key person	6
	- No assigned KM unit or key person	4
	Subtotal	*18*
Budget allocation	- Inadequate budgeting	14
	Subtotal	*14*
Technology	- Inefficient and ineffective IS for decision making	9
	- Inefficient and ineffective KMIS	5
	Subtotal	*14*
Influence of the quality assurance System	- Negative influence of the quality assurance system	11
	Subtotal	*11*
KM policy and strategic planning	- Lack of the KM policy	6
	- Lack of the KM strategic planning	2
	Subtotal	*8*
Motivation	- No motivation system	5
	Subtotal	*5*
Organization's Structure	- No interaction between units	3
	- Frequent change of the organization's structure	1
	- Big sized campus	1
	Subtotal	*5*
	Total	283

The largest portion of the blocking KM factors' main theme was the KM process with five subthemes of 52 codes. The second portion was allotted to individual engagement with three subthemes of 46 codes. Similar to the supporting factors, the last frequently mentioned main theme included the organization's structure (5 codes). Among the 29 subthemes, the negative attitude toward KM in the individual engagement main theme was the most frequent mention (30 codes), followed by the individual's incorrect KM understanding (28 codes).

Emerging KM Factors from Thematic Analysis

The qualitative data from the open-ended questions provided unique findings regarding the institutional contexts of each university. This section reflects the emerging themes of the factors supporting and blocking successful KM that differ from the quantitative findings. It aims to provide missing pieces that the quantitative procedure failed to capture.

Leadership. Consistent with the quantitative results, leadership relates to an ability to align KM behaviors with organizational strategies, promote values of KM, and provide guidelines for assessing an impact in knowledge. Furthermore, many respondents expected to see their leaders play various roles to facilitate the KM practice as follows: (a) having a vision of learning organization; (b) supporting learning environment; (c) having skills to apply KM into actual practices or to integrate KM into routine work; (d) participating in KM activities; (e) allocating KM budget; and (f) planning and monitoring KM implementation regularly.

The qualitative data portray the qualifications of the KM leaders and teams as follows: have a positive attitude toward KM, understand the KM concept and implementation correctly, act as a KM specialist (be able to guide and provide a consultation to the school and supporting units that conduct KM at the unit level), and keep maintaining the KM leader and staff (do not change the core KM persons often).

Interestingly, one unique finding from qualitative data showed the issue of good governance. Some respondents expect the equitable KM implementation. They stated that all their organization's members should have opportunities to participate in the KM activities. The KM activities should be provided and communicated equally across the entire institution, not only the group who takes the administrator's side.

Assigned KM unit and person. The results of this study showed that the current agency bodies in charge of KM are diverse. KM managed by quality assurance offices, planning departments, research and development centers, human resource departments, libraries, and KM institutions, along with the KM committee at the institutional level. The qualitative findings suggest that the universities that officially assigned the specific units or persons to oversee KM are more likely to manage their organizational knowledge effectively.

KM policy and strategic planning. Aligning with the quantitative results, respondents widely mentioned the establishment of the KM policy and strategy. The quantitative data provide the specific elements of KM policy and strategy. The KM policy should identify clear objectives, procedures, activities, resources, and individual

roles. The KM strategy needs to include performance indicators that are explicit and measurable.

Inversely, the universities can use KM as the institutional strategy to achieving HEIs' goals. KM can function as the strategy to support the improvement of the organization's knowledge assets. Several respondents stated that the universities should allign KM practices with the individual development plan that support competency improvement.

Budget allocation. KM budget allocation needs to be considered when HEIs manage knowledge. The financial aspect is necessary to drive the KM mechanism in relation to an IT infrastructure and necessary for learning and sharing activities (i.e., workshop, seminar, and incentive). Budget should be distributed across the institutional functions (both teaching and supporting units).

Organizational structure. The qualitative data reveal that the size of the institution can be a predictor of KM implementation. A university with multiple campuses is likely to have a difficulty in conducting KM activities due to the chain of command. In contrast, smaller institutions can deploy the KM activities smoothly.

Organizational culture and KM culture. The qualitative data assists in clarifying the characteristics of culture. Interestingly, this thematic analysis differentiates the terms corporate culture and KM culture. The characteristics of corporate culture that support KM implementation include the value of unity, generosity, and helpfulness; the value of continuous learning and self-development; the acceptance of change; and a working environment that enhances the learning and sharing knowledge. It should be

noted that change acceptance was not mentioned in the quantitative instrument. For KM culture, the higher education institutions should hold the KM culture that values learning and knowledge sharing; aims to become learning organization or learning society; supports collaborative learning; and has trust in individuals' knowledge.

Staff members' engagement. The qualitative data reveal that universities should motivate their employees to participate in KM activities. In particular, the individuals should engage in KM activities at all levels and all functions. Many respondents expressed that academic staff engage in KM activities less than supporting staff.

Additionally in findings related to a high turn-over rate, three respondents raised the issue that their universities have difficulty in conducting KM due to employee turn-over. These universities invest significant effort to make new employees understand the KM approach and shape them into their corporate and KM culture. This expression is not a frequent occurrence in the qualitative results but it is considered realistic and unique.

Motivation and reward system. Aligning with previous studies, reward systems encourage the creation and distribution of knowledge among organizational members (Gold et al., 2001). Rewards (incentives or recognitions) from leaders to members can influence the commitments of other members. Practices to motivate values of KM can come in various forms, such as counting the KM participation as a workload and rewarding or recognizing a person or a unit that has a good KM practice (i.e., good KM websites, good KM activities, and KM role models).

Technology. Similar to the quantitative finding, the use of technology in KM can be classified into two aspects: KM information system (KMIS) and information system (IS). It seems that the respondents differentiate IS from KMIS. They use IS for making decisions about university administration. KMIS is viewed as the technological tool that supports processes of acquiring, storing, sharing, and using explicit knowledge. Many KM activities can be developed and performed through an electronic network, such as Google Plus, Facebook, Web Blog, and Knowledge bank/system. KMIS becomes a source that brings individuals together to participate and exchange more knowledge based on their interests.

Workload and time constraint. The obstacles to conduct KM involve a heavy workload and time conflict. A heavy workload is claimed to be an impeding factor of KM engagement. Time conflict reduces the effort to participate in KM activities.

KM process. The effectiveness and efficiency of the KM process can influence the management of organizational knowledge. A strong KM effort should occur through dynamic, continuous, and interrelated KM activities. The identification of knowledge should serve individuals' interests and job relevancy. The environment of knowledge sharing should be friendly and collaborative. The university should set a strong mechanism to apply knowledge in the actual work of employees. Heavy investment in KM will not be worthwhile if individuals do not apply what they learn in their real-life work. The measurement of the use of knowledge was missed by the quantitative instrument.

The management of knowledge also involves the refinement of the ongoing knowledge activities by the repetitive application of activities. This finding showed that many respondents require systematic measurement, such as KM indicators, to assess the outcome of KM investment. The assessment assists in refining knowledge for the institution's long-term use.

External KM network. The external KM network is the big missing piece in the quantitative instrument. Some universities develop KM networks that have the same context, such as the University of Technology. One university in the rural area mentioned that it has developed the KM network by incorporating surrounding communities in order to learn local knowledge and wisdom. This kind of knowledge assists in improving the direction of the university to better serve the need of its society and community.

Influence of the quality assurance system. Since KM is set as one of the QA criteria, the influence of QA becomes two sides of the same coin. Positively, the QA system has driven the universities to conduct KM to achieve the QA standard, so many universities set strategic and action plans to conduct KM. With the obvious direction, KM keeps on track through a well-planned mechanism (such as, clear goals, clear procedures, adequate resources, and proper measurement).

On the other hand, QA can hinder the value of KM. Some faculties expressed that they are forced to implement KM, while they have already managed their knowledge in their day-to-day jobs. Some universities implement KM to meet the QA requirement that is not embedded in their organizational culture. The KM indicator, set

by the Commission of Higher Education, is problematic. It is not flexible since it assesses all universities with the same measurement that cannot capture the uniqueness of each institution.

The findings from the thematic analysis fill the gap of KM factors that the quantitative measurement cannot capture. Table 21 summarizes the compatible themes, which are measured by both quantitative and qualitative approaches, and the emerging themes of the influential KM factors, resulting from the thematic analysis. These themes are classified into the five factors, corresponding to the hypothesized factors.

Table 21 ***Emerging Themes for KM Influential Factors***

KM Enablers	Compatible themes	Emerging themes
Technology	- Efficiency and effectiveness of KMIS - Efficiency and effectiveness IS for decision making	
Strategic Context	- Attitude of the leaders' toward KM significance - KM strategic planning	
Culture	- KM culture	- Organizational culture
Leadership with the Directive Role	- Supportive management - Clear KM policy - Assigned KM unit, team, or key person - Budget allocation - Motivation system	- Good governance in KM implementation - Effectiveness of KM unit or team
KM Process	- Integrative and continuous KM process - Effectiveness of knowledge sharing - Clarification of knowledge identification - Effectiveness of knowledge storage	- Use of knowledge into practice

Table 21 ***(continued)***

KM Enablers	Compatible themes	Emerging themes
Others		- Employee engagement in KM practices - KM understanding of employees - Influence of the quality assurance system - External KM network - Time conflict - Employee turnover rate - Size of campus

Summary

Chapter IV reported the quantitative analyses from descriptive statistics, EFA, CFA, reliability analysis, and SEM. It also presented qualitative data from the thematic analysis. 150 responses from 60 different universities formed the sample of this study. Prior to running the factor analyses, data were screened to examine accuracy, missing data, and multivariate and univariate normality. Two statistical software programs in this study included SPSS version 22, for computing descriptive statistics, and EFA and Mplus 7.3, for CFA and SEM.

The results from EFA generated KM Enablers included 4 factors and 25 items, while KM Processes included 2 factors and 17 items. Based on their characteristics, the six factors were named Technology (TEC), Strategic Context (STC), Culture (CUL), Leadership with the Directive Role (LDR), Knowledge Transfer (KTR), and Knowledge Generation (KGE). These EFA extractions did not closely match the theoretical factors that indicated 4 factors for KM enablers and 3 factors for KM processes and some items were misclassified on the theoretical factors.

According to this EFA analysis, the limited two-factor model of KM Processes (KTR and KGE) did not meet the requirement for higher-order factor analysis in CFA and SEM. Consequently, this study could not further analyze the hypothesized conceptual research model, which encompassed the three KM constructs (KM enablers, processes, and outcome) at the conceptual level. Another model, the general empirical model examining the relationships among each KM enabler and process as well as each KM process and organizational performance score, was used to investigate the structural relationships from the SEM approach. The SEM analysis showed that the hypothesized general empirical model with seven factors indicated an acceptable fit by the four fit indices. This hypothesized model captured the actual data set fairly well.

The qualitative data from two open-ended questions, asking about the three internal factors that significantly support or block successful KM, were coded and categorized into specific themes. The thematic analysis resulted in 13 main themes with 24 subthemes for the supporting KM factors and 13 main themes with 29 subthemes for the blocking KM factors.

These quantitative and qualitative findings will lead to the discussion, with regard to the research question and hypotheses, in Chapter V.

CHAPTER V

SUMMARY

This chapter included three major sections. It started with the discussion of the research questions and hypotheses. Then it described the implications for HRD research, practice, and theory. Last, the limitations and recommendations of the study were provided.

Discussions

This study explored the use of KM in HEIs by developing and testing a correlational model linking KM enablers and processes on organizational performance of HEIs. It was framed by a single research question that will be presented first, along with the answers drawn from the results of the study. The research question was as follows: *"How do KM enablers and KM processes affect performance of HEIs?"* This question was supported by the quantitative and qualitative results. The quantitative results supported several research hypotheses testing the relationships of the hypothesized factors (presented with the capital letter), while the qualitative results assisted in understanding the meaning of context and filling the gap that the quantitative data did not capture. Findings in this study offered mixed answers to the research question.

Hypothesized Research Models

As mentioned in Chapters II and III, the results of the literature review suggested that the relationships of the three KM components (KM enablers, processes, and

outcome) could be explained by two different research models. The first model (Figure 9 in Chapter III) showed the conceptual model that encompasses the three KM components at the conceptual level. The second model (Figure 10 in Chapter III) illustrated the general empirical model to examine the relationships among each KM enabler and process, along with KM process and quality performance scores.

Unexpectedly, EFA's quantitative procedures did not generate results that completely matched the hypothesized research models. This caused two major revisions for further CFA and SEM analyses. First, the researcher needed to rename the two factors of the KM enablers (Strategic Context and Leadership with the Directive Role) related to their contents. The hypothesized conceptual model (Figure 9) and its hypotheses (H1.1 - H1.5) were dismissed, because this model did not meet the requirement of the insufficient number of factors for higher order factor analysis.

The researcher tested the hypothesized general empirical model (Figure 10) and its structural relationships using the empirical data of the study sample. The SEM analysis indicated that the hypothesized model with seven factors was acceptable based on the following fit indices (χ^2 = 1581.515, df = 845, $p < .001$; CFI = .809; TLI = .795; RMSEA = .083, 90% CI: .077 – .089; SRMR = .065). This hypothesized model adequately represents the actual data set. Overall, the data match the model of the KM system, implying that KM enablers and KM processes affect performance of HEIs. This study is the first attempt to test the relationships of the entire KM system through KM enablers, processes, and outcomes. The findings of this study contribute to further KM research in the higher education setting.

Hypothesis 2.1 culture and knowledge generation. Hypothesis 2.1 was not supported by the empirical data of the study sample. The path coefficient from Culture to Knowledge Generation ($\gamma = .102$) was not significant ($p > .05$), indicating that Culture is not a predictor of Knowledge Transfer.

The results from Hypothesis 2.1 revealed that Culture in this study does not have an influence on Knowledge Generation. Knowledge Generation, in this study, refers to the activity of acquisition and development of knowledge (Ramachandran et al., 2013; Shoham & Perry, 2009) and aims to build needed knowledge, particularly know-how that fits in the context of an institution. The aspects of Culture are comprised of facilitation of knowledge building and sharing, trust in the source of knowledge, and openness in communication.

The non-significant result may occur due to two possibilities. First, the three aspects of Culture cannot completely capture Knowledge Generation. Second, the limited understanding of the term Culture of the study sample can deter the results since it is the abstract term with less consensus.

Hypothesis 2.2 culture and knowledge codification. Hypothesis 2.2 was not analyzed because the EFA results dropped the Knowledge Codification factor.

Hypothesis 2.3 culture and knowledge transfer. Hypothesis 2.3 was not supported by the empirical data of the study sample. The path coefficient from Culture to Knowledge Transfer ($\gamma = .090$) was not significant ($p > .05$), indicating that Culture is not a predictor of Knowledge Transfer.

The results from Hypothesis 2.3 contradicts previous studies that found a significant relationship between Culture and Knowledge Transfer. Earlier studies indicated that trust encourages knowledge sharing by facilitating a more proactive and open relationship among members (Ellingsen, 2003; Tan & Noor; 2013). Furthermore, openness in communication has a significant and positive influence on knowledge sharing (Tan & Noor, 2013) and increases the willingness of members to share knowledge with each other (Basu & Sengupta, 2007).

Similar to the results of Hypothesis 2.1, the contradictory result in this study may occur due to the limited understanding of the term Culture. This study opens the avenue to conduct further research that investigates the influence of trust in knowledge and openness in communication in the Thai context.

Hypothesis 2.4 leadership (leadership with the directive role) and knowledge generation. Hypothesis 2.4 was supported by the empirical data of the study sample. Leadership (the term used in the original model) or Leadership with the Directive Role (the renamed term resulting from the EFA) had a significant and positive relationship with Knowledge Generation. The path coefficient from Leadership with the Directive Role to Knowledge Generation ($\gamma = .557$) was significant ($p < .01$), indicating that Leadership with the Directive Role is a predictor of Knowledge Generation.

The results from Hypothesis 2.4 is aligned with earlier studies. Although EFA resulted in the factor renamed of Leadership with the Directive Role, this factor captures several aspects of directive leadership in relation to the supportive management styles toward KM processes. These aspects include the establishment of clear KM visions and

policies, the formation of the KM team, the clarification of the KM performance criteria, and psychological support.

Previous studies suggest that the clarification of KM visions and policies is a primary visible symbol of Thai structure that calls for obvious rules (Sarawanawong et al., 2009). Thai employees expect to see clear and explicit vision and policies. Leaders should identify objectives, activities, IT support, measurement, and individual roles related to managing knowledge in their institutions (Sarawanawong et al., 2009). Furthermore, the correlational results showed that KM measurement is important for KM processes in Malaysian universities (generation, codification, and transfer, Ramachandran et al., 2013). Leaders can measure the KM performance to ensure that KM stays on track (Coukos-Semmel, 2002). Departments of colleges of education in the United States set annual indicators that reflect changes in KM implementation, considering the cost-effective strategy (Lee, 2007). In conclusion, this study supports that Leadership with the Directive Role impacts Knowledge Generation.

Hypothesis 2.5 leadership (leadership with the directive role) and knowledge codification. Hypothesis 2.5 was not analyzed because the EFA results dropped the Knowledge Codification factor.

Hypothesis 2.6 leadership (leadership with the directive role) and knowledge transfer. Hypothesis 2.6 was supported by the empirical data of the study sample. Leadership (the term used in the original model) or Leadership with the Directive Role (the renamed term resulting from the EFA) had a significant and positive relationship with Knowledge Transfer. The path coefficient from Leadership with the Directive Role

to Knowledge Transfer ($\gamma = .343$) was significant ($p < .01$), indicating that Leadership with the Directive Role is a predictor of Knowledge Transfer.

Knowledge Transfer in this study represents sharing and distributing of knowledge between an organization's members (Aujirapongpan et al., 2010; Shoham & Perry, 2009). Sharing of knowledge goes beyond the distribution of knowledge because it helps ensure the exchange of knowledge within an organization's communities. Similar to Hypothesis 2.4, Leadership with the Directive Role impacts Knowledge Transfer. Earlier study in relation to knowledge sharing found that organizational rewards have a strong positive influence on knowledge sharing (Tan & Noor, 2013). Rewards, both incentives and recognitions, from leaders to employees, who share knowledge and then receive organizational rewards for their contributions, can influence the commitments of other members.

Hypothesis 2.7 technology and knowledge generation. Hypothesis 2.7 was supported by the empirical data of the study sample. Technology had a significant and positive relationship with Knowledge Generation. The path coefficient from Technology to Knowledge Generation ($\gamma = .180$) was significant ($p < .01$), indicating that Technology is a predictor of Knowledge Generation.

Generally, previous studies examined the influence of technology on the entire KM process. The use of technology in public HEIs in Malaysia allows many KM activities, such as knowledge capture, storage, and transfer, to take place (Ramachandran et al., 2013). No research has investigated the relationship of Technology and Knowledge Generation in the higher education context. This study provides the initial

result that Technology impacts Knowledge Generation in Thai HEIs. Thai people usually use technology to search for information rather than to share discussion forum (Sarawanawong et al., 2009). Technology allows employees to access, collect, and assimilate existing internal knowledge within an organization and/or external knowledge from outside (Dalkir, 2005; Watcharadamrongkun, 2012). The technological system provides a knowledge database and repository to provide accessible organizational knowledge.

Hypothesis 2.8 technology and knowledge codification. Hypothesis 2.8 was not analyzed because the EFA results dropped the Knowledge Codification factor.

Hypothesis 2.9 technology and knowledge transfer. Hypothesis 2.9 was supported by the empirical data of the study sample. Technology had a significant and positive relationship with Knowledge Transfer. The path coefficient from Technology to Knowledge Transfer ($\gamma = .343$) was significant ($p < .01$), indicating that Technology is a predictor of Knowledge Transfer.

The results from Hypothesis 2.9 supports the study of Ramachandran et al. (2013), stating that technology becomes the most extensively used KM enabler in public HEIs in Malaysia. Furthermore, these results seem to contrast the study of Tan and Noor (2013) that claims that technology does not influence the achievement of KM in research universities in Malaysia. They explained that knowledge is well-embedded in the values and work practices of the well-established research universities. Since most of the respondents (90%) in this study worked at teaching universities, the context of the respondents differ from the study of Tan and Noor (2013) which focuses on research

universities. Based on the study sample, this study demonstrates that Technology impacts Knowledge Transfer at least in some HEI contexts.

Hypothesis 2.10 performance measurement (strategic context) and knowledge generation. Hypothesis 2.10 was supported by the empirical data of the study sample. Performance measurement (the term used in the original model) or Strategic Context (the renamed term resulting from the EFA) had a significant and positive relationship with Knowledge Generation. The path coefficient from Strategic Context to Knowledge Generation ($\gamma = .336$) was significant ($p < .01$), indicating that Strategic Context is a predictor of Knowledge Generation.

The results from Hypothesis 2.10 is consistent with earlier studies. Strategic Context, renamed KM enabler factor, reflects several aspects of the strategic role of leadership in promoting values for managing knowledge. Previous studies addressed that HEIs need a synchronized strategy of KM that aligns with institutional missions and goals (Ramachandran et al., 2013). The strategic support of leadership can show in a form of the understanding of leadership toward the value of knowledge. This strategic support influences individual learning, because it extensively increases an individual commitment to collaborative learning within the workplace (Arntzen et al., 2009) and encourages strong knowledge sharing activities (Sarawanawong, Tuamsuk, Vongprasert, & Khiewyoo, 2009). Not only does the positive perception toward KM increase the commitment in engaging the KM processes, but also the KM budget allocation is needed to be considered to support the activities of acquiring, creating, storing, and sharing knowledge (Arntzen et al., 2009).

Interestingly, this study also shows that leaders with a positive attitude toward the benefit of KM, especially in increasing organizational incomes and knowledge assets, becomes the influential KM indicator. However, no research study has deeply investigated the cause and effect of this strategic aspect, showing the research gap in relation to the cost-effective strategy for future studies.

Hypothesis 2.11 performance measurement (strategic context) and knowledge codification. Hypothesis 2.11 was not analyzed because the EFA results dropped the Knowledge Codification factor.

Hypothesis 2.12 performance measurement (strategic context) and knowledge transfer. Hypothesis 2.12 was supported by the empirical data of the study sample. Strategic Context had a significant and positive relationship with Knowledge Transfer. The path coefficient from Strategic Context to Knowledge Transfer ($\gamma = .186$) was significant ($p < .01$), indicating that Strategic Context is a predictor of Knowledge Transfer.

As mentioned in Hypothesis 2.10, Strategic Context influences KM processes, not only on Knowledge Generation, but also on Knowledge Transfer. From the economic perspective, measurement, one aspect of the strategic context, assists in identifying knowledge assets and capabilities of an organization and aligning the measurement activities with organizational strategies (Lee, 2007). Commonly, measuring the outcomes of KM helps justify investments in managing knowledge, and reinforce the support for its implementation.

All in all, this study demonstrates that Strategic Context impacts Knowledge Generation and Knowledge Transfer. It becomes a strategic element to foster KM processes through the mechanisms of encouraging individual learning and promoting KM values in the workplace.

Hypothesis 2.13 knowledge generation and quality performance scores. Hypothesis 2.13 was not supported by the empirical data of the study sample. The path coefficient from Knowledge Generation to Quality Performance Scores (γ = -.032) was not significant ($p > .05$), indicating that Knowledge Generation is not a predictor of Quality Performance Scores.

The results from Hypothesis 2.13 do not show significant relationships between Knowledge Generation and Quality Performance Scores. However, no research has specially investigated the relationship of Knowledge Generation and Quality Performance Scores. It is unclear why the presence of Knowledge Generation does not influence on Quality Performance Scores as found in this study. Further research concerning this question is needed.

Hypothesis 2.14 knowledge codification and quality performance scores. Hypothesis 2.14 was not analyzed because the EFA results dropped the Knowledge Codification factor.

Hypothesis 2.15 knowledge transfer and quality performance scores. Hypothesis 2.15 was not supported by the empirical data of the study sample. The path coefficient from Knowledge Transfer to Quality Performance Scores (γ = .121) was not

significant ($p > .05$), indicating that Knowledge Transfer is not a predictor of Quality Performance Scores.

More notably, the results from Hypotheses 2.13 and 2.15 do not show the significant relationships between KM processes (Knowledge Generation and Knowledge Transfer) and Quality Performance Scores. These results contradict most previous qualitative research studies that endorse the idea that KM contributes to the achievement of higher education missions. For example, teaching can be enhanced through knowledge sharing processes among faculty members (Chumjit, 2012; Cranfield, 2011; McCarthy, 2006; Mohayidin et al., 2007). KM enhances research collaboration across a university, resulting in an increase in the number of research projects and publications (Chumjit, 2012; Cranfield, 2011; Tan & Noor, 2013). KM brings practical benefits to the higher education achievement.

According to the scale of the quality performance score, the majority of Thai universities get scores in the range of 3.51 – 4.50 (62.7%) and 4.51 and higher (36%). These results lead to an error called a restriction of range that refers to the clustering of ratings around a particular portion of the rating scale (Saal, Downey, & Lahey, 1980). A restriction of range arbitrarily affects the rating to one particular polarity of the scale (either lenient or severe ratings). This error fails to use ratings in other portions of the scale, so it leads to a restriction in the range of variables. In correlational studies, this type of statistical error can inflate or deflate the results.

Given the lack of empirical studies that have applied the direct performance (such as accreditation scores) to measure the HEI performance outcome, this study is the

first attempt to apply Quality Performance Scores, accredited by the national education agency, to represent alternative KM measurement. Although the specific findings with regard to Hypotheses 2.13 and 2.15 were not anticipated, these findings were reported at the model level that the hypothesized general model with seven factors was acceptable based on the fit indices. The specific findings of Hypotheses 2.13 and 2.15 bring up ideas that need to be verified regarding the use of the direct measurement to assess the investment in KM.

In summary, the quantitative analysis supports that the hypothesized model can capture the actual data set. The KM system model implies that KM enablers and KM processes affect performance of HEIs. Considering the specific hypotheses, inversely, the results seem not to be clear for two clear relationships (Culture and KM processes as well as KM processes with Quality Performance Score). Culture is not always the significant predictor of KM processes and KM processes may not necessarily result in improved quality performance. Since empirical KM studies in higher education are limited, more investigations are necessary to solve the puzzle.

Contextualized KM Factors of Thai Higher Education Institutions

The thematic analysis provided emerging themes of the supporting and blocking factors based on the context of the universities in Thailand. The three following themes have a people-focus that includes leadership, staff members' attitudes toward KM, and KM understandings.

Leadership. Consistent with previous studies, the qualitative data endorse that the HEIs need strong KM support from top management (Coukos-Semmel, 2002; Lee,

2007; Ramachandran et al., 2013; Yusoff et al., 2012). Since the Thai people respect a distant hierarchy, top management has strong influence in leading organizational members in the required direction. University administrators can motivate a strong commitment to KM initiatives by setting and communicating the KM vision, policies, strategies, and goals.

An organization needs to consider whether to appoint a KM position (such as, a chief knowledge officer) to develop and drive KM processes. When a leader is made up of top management, an institution is likely to encourage its members to the KM implementation more progressively and proactively (Yusoff et al., 2012). The assigned KM leader is extensively mentioned by respondents as a supportive mechanism to conduct successful KM. Thai universities reflect the national culture that calls for clarification, structure, and rules. An assigned KM unit or team can be designed to meet Thai social culture.

The KM leaders and teams should perform two major roles: to support top management and to support academic and supporting units. These assigned KM leaders and teams are primarily responsible for setting and monitoring the KM plan at the institutional level and reporting KM performance to top management. At the same time, they should facilitate KM resources and monitor the KM implementation of the school and supporting units. Especially, the fundamental role is to communicate the significance of KM and how to implement KM across the institution.

Staff members' attitudes toward KM. Positive attitudes toward KM significantly influence higher engagement in KM practices. Attitudes toward KM refers

to a level of individual perceptions (Arsenijević et al., 2010) and participation in knowledge-related activities (Cranfield, 2011; Yusoff et al., 2012). The finding of this study is consistent with previous empirical studies, claiming that the ability of an organization to learn, develop, and share knowledge is dependent on individuals' attitudes toward learning and knowledge sharing (Basu & Sengupta, 2007; Rašula et al., 2012). Positive KM attitudes drive individuals' commitments to participate in KM activities that create a collaborative learning process. The collaborative learning provides a social interaction through dialogue with others to see different perspectives and experiences. When the organization's members perceive the contribution of KM, they tend to interact with others through good practices and lessons shared within groups that can directly help increase productivity of their institutions.

Furthermore, the commitment to the job and loyalty to the workplace become influential factors that change individuals' behaviors to contribute to the successful KM implementation. The passion for job and organization is an unspoken promise in the Thai society (Sunalai, 2014). When the institution acknowledges employees' contributions and employees receive fair treatment in return, they potentially engage more in the organization's achievement.

Interestingly, this study reflects the major unique finding, mentioned by respondents, in the Thai context that "KM should be treated as a regular work; not an occasional event." This phenomenon occurs because KM has been set as the indicator in the quality assurance assessment by the Ministry of Education. Many respondents express that their universities should implement KM, aiming at leveraging the

organizational knowledge to achieving their university's missions. With this intention, the KM system is likely to be built in the regular work operations, so organizational knowledge will reside in individuals' and organizations' behaviors where it can be expressed as actionable knowledge. In contrast, some respondents point out that their universities conduct KM assessment only occasionally in order to meet the requirement of the QA criteria, rather than the purpose of using KM to leverage their knowledge. This misled purpose creates unpleasant KM attitudes in the institution's staff members. The negative attitude toward KM, "to implement KM to get higher QA scores," hinders the effort in managing knowledge.

KM understandings of staff members. The most interesting finding from the thematic analysis involves the variety of levels of KM understanding of the staff members. The majority of respondents are not sure that their colleagues understand the KM concept and practice correctly. Several comments express the concern that some KM key persons and KM staff teams perceive KM as equivalent to training and workshops. Consequently, these KM units and teams invest heavily in professional training programs, seminars, and workshops to improve individuals' competency levels. They do not view KM as the activity of creating and sharing knowledge across the whole KM system that aims to enhance self-developed, informal, and collaborative learning within the workplace. The essence of KM is to enable members to participate in the flow of knowledge. Surprisingly, some QA assessors, who evaluate the KM indicators, misunderstand the KM concept. They measure the KM performance with the wrong assumption. This is the most critical issue in managing knowledge since it leads the KM

effort in the wrong direction. This study draws attention to the way that the level of KM understandings influences the KM implementation across the whole system. KM activities and resources rely on the understandings that KM key persons hold.

Implications

The findings, which emerged from the current study, have several implications. These following implications reinforce the existing HRD theory, research, and practice.

Implications for Theory

From a theoretical perspective, the implications are double. First, this study offers a holistic model on the KM system by showing the linkage of continuity and dynamism between three KM elements (enablers, processes, and outcomes). The model develops an intention based theoretical model using the lens of three theories: knowledge creation, organizational epistemology, and contingency theory.

The knowledge creation theory relies on the assumption that knowledge is created through transformation of tacit knowledge into explicit knowledge. This study endorses the importance of building the learning platform (known as “ba” in the knowledge creation theory, Nonaka & Takeuchi, 2004). The learning platform helps employees shape new experiences into knowledge, not just information. Several KM activities in the Knowledge Transfer factor (such as, supporting knowledge platforms to share tacit knowledge and providing opportunities for employees to build their knowledge networks) assist in creating a community for dissemination and sharing within the institution. Organizational performance depends on establishing a learning

environment in which individuals are encouraged to create, share, and use knowledge for the benefit of the institution.

This study extends the organizational epistemology and contingency theories—how the environment-organization interface impacts organization's systems. The results of the study provide the inclusive model for managing organizational knowledge due to the comprehensiveness of hypothesized factors. The model identifies a variety of factors that predict KM processes and outcomes. The coefficient paths from Figure 10 in Chapter IV showed the multiple relationships affecting the interactions among organizational elements within the institution. For example, the paths explained about 56 percent of the variance in Leader with the Direct Role to Knowledge Generation and 34 percent of the variance in the Technology to Knowledge Transfer relationship. These results give a clearer view that HEIs need to put KM enablers in place that will stimulate the development of individual knowledge, group sharing of knowledge, and organizational knowledge retention.

The second implication proposes the values of KM to extend the boundary of HRD, in particular the theory of learning. Chapter II identified the characteristics of learning (Sun, 2003) and primarily focuses on three of these characteristics: learning is active, constructive, and collaborative. The empirical result shows that the management of organizational knowledge assists in leveraging individual and organizational learning. KM activities help individuals actively construct their knowledge through interactions with their knowledge sharing environment. Since learning involves situated and collaborative processes, individuals can learn from informal knowledge, such as best

practices, lessons learned, and success stories. This learning occurs in an interaction through processes of communication and collaboration. In other words, when environment is not supportive, potential of individual to learn or share knowledge is unused. Consequently, new knowledge is not generated and the opportunity to increase the institution's capital asset is lost.

Implications for Research

The current study reveals research implications in relation to the measurement of KM enablers and processes in the academic institutions. The measurement in this study corporates part of the modified KMAT questionnaire, designed from the western business context. It is the first attempt to apply this instrument in Asian academic institutions with the sophisticated statistical analyses (EFA, CFA, and SEM). Multiple test construction steps were used to ensure the quality of the instrument in the specific context—higher education institutions in Thailand. Although the results from EFA generates the misclassified factors, the SEM proved that the entire instrument can capture the general aspects of KM enablers and processes in the higher education setting. This instrument contributes to establishing a more practical and accessible instrument for researchers in the academic arena. It provides measurable constructs that researcher may use to further investigate the organizational KM mechanisms of higher education, in particular roles of leadership, levels of culture (institutional and national levels), and individuals' KM understandings and attitudes.

Likewise, this modified instrument provides an important starting point for study of reliability and validity of KM measurement by developing the corresponding

theoretical dimensions (or factors). The understanding of the KM dimensions will allow researchers to explore new insights into the field of KM enablers and processes. This instrument can be applicable via the quantitative survey method, allowing scholars to explore the relationship between KM enablers and processes along with other organizational parameters, such as creativity (Rahimi et al., 2011) and planning and decision-making (Keeley, 2004).

Implications for Practice

From a pragmatic perspective, this study has multiple implications that can be classified into micro and macro levels. The micro level focuses on the institutions in initiating or striving to promote the management of knowledge. The macro perspective focuses on the KM system of higher education at the national level.

The micro level incorporates the four theoretical enablers of KM. First, prior to launching KM initiatives, organizations should create an organizational culture that is conducive to the creation and distribution of knowledge. The characteristics of culture that support KM include fostering learning values, facilitating open communication, and building trust among members. Organizations should develop and nurture KM culture and practices that build trust, collective cooperation, and positive social interactions among organizations' members. Work context exemplified by high levels of trust, collective cooperation, formal and informal networks facilitate knowledge exchanges among individuals (Ellingsen, 2003; Tan & Noor, 2013).

The results of this study also showed that Thai universities need an incremental change to manage their KM by embedding the KM values in their routine jobs. This

incremental change impacts an operation of each institution gradually, so does not significantly threaten existing institution's norms and practices (Burke, 2011). The institution that values knowledge always motivates staff to learn and encourage a strong knowledge culture.

The effect of culture is unclear from the quantitative findings in this study. Though expected to have a positive and significant effect, it was found to have non-significant relationships with KM processes. This might be due to the quantitative questions not capturing the actual impact of culture on KM processes. Further research is needed to determine the aspects of culture (e.g., national culture, corporate culture, and knowledge culture) that influence the managing of knowledge.

Second, organizations should employ technology to increase the accessibility of knowledge. Technology represents a set of important tools that facilitate individual and collective activities to help manage the flow of knowledge throughout an organization. Technology plays a significant role by supporting communication and collaboration and searching for knowledge and information.

Third, the results of the study suggest that the managerial roles of leadership have a positive influence on KM processes. Leaders are required to prepare and educate employees in order to be able to understand and implement KM effectively. Leaders should promote the values of KM through motivation and reward systems. By offering motivation, an organization can promote knowledge sharing and encourage people to participate in creating knowledge (Arntzen et al., 2009). Furthermore, the qualitative study strongly suggests appointing a specific leader position or a unit in handling KM.

The role for a KM executive should involve acting as supervisor of heads of KM teams, setting strategies, handling operations, and influencing changes in organizations. When a leader is made up of top management, an institution is likely to encourage its members to participate in KM implementation more progressively and proactively (Yusoff et al., 2012). All in all, these directive roles affect intention and further the actual behavior of an organization's members in Thai institutions.

Last, the strategic context of the institution significantly influences the KM initiative. The strategic context becomes the mechanism in which leaders use to facilitate the flow of knowledge within their institutions. The HE institutions need to set clear KM objectives, clarify of the criteria and indicator for measuring KM success, build learning supportive environment, and consider cost-effective strategies in KM investment.

This KM study reflects the national KM system in higher education in Thailand. First, KM provides components that HEIs can apply for performance improvement. KM assists the universities in performing better management of knowledge for its continual improvement. University administrators can measure KM enablers and processes and then use this information as part of a performance benchmarking (Mok, 2005) or a SWOT analysis (Watcharadamrongkun, 2012) to maintain quality of education. These analyses provide information for identifying the directions of institutions and facilitating activities that efficiently accomplish their missions and goals.

The qualitative results suggest that the key informants of each university have different KM perspectives. These key informants have diverse backgrounds, such as fields of education and functions. KM activities and resources will vary by definition of

KM that leaders hold. They have invested substantial time and resources based on their KM definitions. This study reveals that some key informants misunderstand the essence of KM. They view KM merely as professional training and workshops. Consequently, these key KM persons provide learning interventions that cannot serve the purpose of KM that aims to leverage knowledge posed in an organization to become actionable knowledge applied into routine work. Since, the key informants have a role of change agents, who send a signal of organizational change adopting KM in their organizations (Coukos-Semmel, 2002; Lee, 2007), the correct understanding by the key persons is vital to leading the KM direction.

Limitations

Several limitations to this study are important for discussion: (a) sample size, (b) self-reported measures, and (c) validity of KM measure.

The first potential study limitation is a relatively small sample (150 respondents from 60 universities) was used to develop scales and to examine the relationships in the hypothesized model. This limitation is inescapable, given the size of the sample (n = 150). If a larger sample had been studied, the results of the statistical analyses may have changed, such as better fit CFA and SEM models and additional significant paths (Muthen & Muthen, 2002). Although this study was limited to quantitative methods of data collection, the sample size was adequate to allow qualitative approaches for examining KM enablers and processes.

The second potential limitation relates to self-reported measures. This study used the survey instrument that relied on self-reported measures. It had distinct sample

groups. The findings depended on the diverse perceptions of key informants, regarding their understandings, attitudes, and experiences, rather than on observable organizational practices. Key informants may reflect their individual perceptions and have limited understandings about the KM mechanisms occurring in their universities. Self-reports are often criticized in terms of response bias and inaccuracy to make findings less robust (Watcharadamrongkun, 2012).

The last potential limitation is the validity of KM measures. This study constructed KM measures only in universities in Thailand that may have varying relevancy and accuracy. Universities are considered as being in the academic services, making them different from other types of organizations. The uniqueness of the respondents means the findings cannot be generalized to other types of organizations or other settings.

Recommendations for Future Research

Future research can extend the findings of this study in the following areas. First, this study is based on the modest sample size of 150 respondents. A larger sample will permit more statistical power for SEM (Muthen & Muthen, 2002) and allow the conducting of the analysis with different demographic subgroups, such as university type, size, age, location, and mission orientation. A multi-group analysis can be conducted to analyze whether there are differences between the combined group model and the multi-group model, and also whether there were differences between the groups.

Second, the KM enablers used in this study were limited to four organizational interfaces that influence KM systems: culture, technology, strategic context, and

leadership. As such, these antecedents explain only a portion of the variance in the dependent variable (knowledge generation and knowledge transfer). There may be other factors which are not part of this study but may have significant influence on the KM implementation. Future research should examine additional constructs that influence the completeness of the KM system. The possible constructs include attitude toward KM, KM understanding, role of KM key person or unit, organizational culture, external network, and external environment (e.g., national policy, culture).

Last, the data in this study were drawn from a single method (survey and a single set of respondents). Conclusions came from self-reported measures based on individual perception. As such, the study may suffer from common method bias, a statistical measurement error referring to "variance that is attributable to the measurement method rather than to the constructs the measures represent" (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003, p.897). Future research can use case studies to provide richer understanding of supportive factors and barriers of KM implementation. A further study can examine universities that are recognized for having KM best practices by investigating their accomplishments— what strategies and practices they use and what organizational factors are significantly important.

Conclusion

The results of this study reveal that KM enablers and KM processes affect the performance of higher education institutions in Thailand. The statistical analysis generated four KM enablers (Technology, Strategic Context, Culture, and Leadership with the Directive Role) and two KM processes (Knowledge Transfer and Knowledge

Generation) to explore the key relationships in KM systems. The thematic analysis provides unique enablers for successful KM in the Thai context in relation to roles and qualifications of KM leaders, impacts of corporate and national culture, individual understandings and attitudes toward KM.

This study showed that successful KM is created depends on social interaction that consists of collaborating participants and the way they participate in the flow of knowledge. This social interaction is influenced by an organizational environment to transform tacit knowledge into explicit knowledge through knowledge sharing.

Participants become the focal point of managing knowledge because they engage in the flow of knowledge. Knowledge is a cognitive process of individuals' insights, experiences, know-how, and values that are to be justified through social interactions among participants to make knowledge actionable and embedded in institutions' repositories and routines. Participants need to have positive attitudes toward KM and correct KM understandings that lead to higher engagement in KM practices. If participants are not willing to share their knowledge among groups, there will be no generation of organizational knowledge.

Knowledge should flow within institutions through dynamic and continuous KM activities. The flow of knowledge arises from the process of creating, sharing, and using knowledge on the job. Organizational knowledge is a direct result of the continuous dialogue between tacit and explicit knowledge of the participants. Higher education institutions need to find a way to improve participants' interaction processes that make knowledge flow fluently throughout their institutions.

The organization's environment relies on KM enablers that vary in each university based on their contextualized aspects, such as their missions, values, norms, preference, and resources. These aspects vary in the forms of managerial assumptions about employees, organizational strategies, structures, and technologies used.

These three mentioned elements (participants, flow of knowledge, and organizational environment) reflect how the environment-organization interface impacts the KM system. HEIs need to put KM enablers and processes in place that will stimulate the development of individual knowledge, group sharing of knowledge, and organizational knowledge retention.

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APPENDIX A

QUESTIONNAIRE

Knowledge Management Systems in Higher Education Institutions in Thailand: A Holistic Model of Enablers, Processes, and Outcomes

Knowledge management (KM) plays an important role in higher education institutions because it provides a holistic view with which to measure, analyze, improve, and manage organizational knowledge that enhances organizational achievement. This research study defines KM as a process of handling knowledge that results from individual, group, and organizational learning to improve organizational performance related to teaching, research, community service, and university management. The objective of this study is to develop a model linking KM enablers and processes to quality performance of higher education institutions.

Your participation in this research study is very much appreciated. The completion of this questionnaire is very important to the overall design of the study. Please allow 15-20 minutes to complete this questionnaire that contains 48 items. While answering the questionnaire, please rate the KM system for the entire university. The design of this dissertation study concentrates on the organizational level of analysis. In other words, your responses will be used as a proxy for the university's overall status.

Please be open and candid with your responses. All information you provide will be strictly confidential in accordance with the protocol of Texas A&M University Institutional Review Board (IRB). The records of this study will be kept private. No identifiers linking you to this study will be included in any sort of report that might be published. Research records will be stored securely and only Principal Investigator, Protocol Director, and IRB Protocol will have access to the records. Furthermore, your responses will only be presented in aggregate, and no single individual's results will be highlighted.

Thank you for participating in this survey. If you would like a summary copy of this study and the result of your university benchmarking with the overall universities, please fill in the request form at the last page of the questionnaire.

If you have any questions or concerns, please do not hesitate to contact me directly at ssuravee@tamu.edu or Professor Michael Beyerlein, Principal Investigator at beyerlein@tamu.edu. For questions about your rights as a research participant, to provide input regarding research, or if you have questions, complaints, or concerns about the research, you may call the Texas A&M University Human Subjects Protection Program office by phone at 1-979-458-4067, toll free at 1-855-795-8636, or by email at irb@tamu.edu.

This research is voluntary and you have the choice whether or not to be in this research study. You may decide to not begin or to stop participating at any time. You do not need to answer any questions that make you uncomfortable. The following statement is a consent from required by Texas A&M University. By choosing "I Accept" below, you agree that you have had the opportunity to read this consent from and understand it or have contacted me and had your questions answered. Now you are prepared to participate in the research project described above. If you wish, you can print this form for your records before continuing.

Consent statement

I voluntarily agree to participate in the research survey of "Knowledge Management Systems in Higher Education Institutions in Thailand: A Holistic Model of Enablers, Processes, and Outcomes" being conducted by Suravee Sunalai, of the Department of Educational Administration & Human Resource Development at Texas A&M University.

The procedures have been explained to me, and my questions have been answered. I understand that any identifiable information in regard to my university name will remain confidential, that is, this information will not be listed in the dissertation of any future publication (s).

- ❍ I accept
- ❍ I do not accept

Knowledge Management Systems in Higher Education Institutions in Thailand: A Holistic Model of Enablers, Processes, and Outcomes

Please allow 15-20 minutes to complete this questionnaire that contains 39 items and includes 4 sections.

1) Institutional demographic information
2) KM enablers
3) KM processes
4) Internal factors for supporting or blocking successful KM

Section 1 Institutional Demographic Information

For a research purpose, please indicate your institutional demographic information. Your responses will only be presented in aggregate, and no single individual's results will be highlighted.

1. Type of university

   ❍ Public ❍ Private

2. Mission orientation of university

   ❍ Research-oriented university

   ❍ Teaching-oriented university

   ❍ Community service-oriented university

3. University name…….

4. Your unit (Please choose only one choice)

College or School	Supporting unit
❍ Health science	❍ Policy, planning, and budgeting
❍ Physical or biological science	❍ Human resource
❍ Humanity or sociology	❍ Quality assurance
❍ Technology	❍ Technology
❍ Others……	❍ Others……

Section 2 KM Enablers

Please indicate your level of agreement with each statement regarding KM enablers within your university. Mark one number on the scale (1-5) with 1 being "almost never" and 5 being "almost always".

No.	KM Enablers	1 almost never	2 seldom	3 some-times	4 often	5 almost always	N/A
5.	The university culture facilitates knowledge building and sharing.						
6.	The university has a culture of						
	6.1 openness in sharing knowledge.						
	6.2 trust in sharing knowledge.						
7.	The university's KM system creates a knowledge value for the university's achievement of its missions.						
8.	The university's KM system facilitates the employees' learning process.						
9.	The university's desire to innovate drives employees' learning processes.						
10.	The university has a culture of accountability for individual learning.						
11.	The university administrators include the management of organizational knowledge in the university's strategic plan.						
12.	The university administrators acknowledge that managing organizational knowledge helps increase income (e.g., from products of R&D, books, and consultations).						

No.	KM Enablers	1 almost never	2 seldom	3 some-times	4 often	5 almost always	N/A
13.	The university administrators develop strategies for selling its knowledge assets.						
14.	The university administrators deliberately use learning to develop core competencies.						
15.	The university administrators reward employees for their contributions to the development of organizational knowledge.						
16.	The university administrators need a specific person to oversee the development of organizational knowledge.						
17.	The university administrators have a vision for managing organizational knowledge.						
18.	The university uses technology to enhance the flow of knowledge (such as acquiring, sharing, retrieving, and using) among employees.						
19.	The university uses technology to						
	19.1 create an institutional knowledge database.						
	19.2 make an institutional knowledge database accessible to the entire university.						

No.	KM Enablers	1 almost never	2 seldom	3 some-times	4 often	5 almost always	N/A
20.	The university uses technology to allow students to provide feedback to the university's performance.						
21.	The university provides technology to enhance collaborative learning efforts among employees.						
22.	The university's information system is designed to help employees make better decisions in a timely fashion.						
23.	The university's assessment process has ways to link KM to the budget allocated.						
24.	The university has a specific set of indicators to measure KM outcomes.						
25.	The university has a measurement system that incorporates measures of intangible assets.						
26.	The university allocates resources for efforts that measurably increase its knowledge.						
27.	The university's annual report includes an assessment of how knowledge has contributed to organizational performance.						

Section 3 KM Processes

Please indicate your level of agreement with each statement regarding usual KM practices and approaches within your university. Mark one number on the scale (1-5) with 1 being "almost never" and 5 being "almost always".

No.	KM Processes	1 almost never	2 seldom	3 some-times	4 often	5 almost always	N/A
28.	The university identifies organizational knowledge needs systematically.						
29.	The university uses well-defined work practices to address knowledge needs.						
30.	The university creates its organizational knowledge directories that list employees' skills, knowledge, and location.						
31.	The university creates directories with specialized knowledge of other groups (outside the university) aligned with the university.						
32.	The university develops mechanisms to						
	32.1 gather knowledge systematically.						
	32.2 gather knowledge ethically.						
33.	The university transfers its tacit knowledge (what employees know how to do but cannot express) across the university through						
	33.1 supporting knowledge platforms to share tacit knowledge, such as a						

No.	KM Processes	1 almost never	2 seldom	3 some-times	4 often	5 almost always	N/A
	KM sharing day, a story telling activity, or mentoring.						
	33.2 supporting technology to make tacit knowledge accessible.						
34.	The university has mechanisms in place to make employees' past know-how						
	34.1 explicit.						
	34.2 accessible.						
	34.3 remain within the university when they leave the university.						
35.	The university provides opportunities for employees to						
	35.1 meet informally to share knowledge.						
	35.2 build their knowledge networks.						
36.	The university widely communicates						
	36.1 the best practices in improving organization performance.						
	36.2 lessons learned in improving organization performance.						
	36.3 success stories in improving organization performance.						
37.	The university strategically invests resources in applying organizational knowledge into job.						

We are almost finished. Just one more step.

Please complete the short open-ended items.

Section 4 Internal Factors for Supporting or Blocking Successful KM

KM refers to a process of handling knowledge that results from individual, group, and organizational learning to improve organizational performance related to teaching, research, community services, and university management.

38. Please describe at least three internal factors that significantly support successful KM in your university and give an example.

_____

_____

_____

_____

39. Please describe at least three internal factors that significantly block successful KM in your university and give an example.

_____

_____

_____

_____

Thank you so much for filling out this questionnaire. Please fill in the request if you would like to receive a summary copy of this study.

❍ I request a summary copy of this study.

Email address ……

University name……..

❍ I do not request a summary copy of this study.

APPENDIX B

PERMISSION LETTER TO CONDUCT THE STUDY

June 15, 2015

Dear President

I am Suravee Sunalai, a PhD student at Human Resource Development, Texas A&M University. I am conducting a study entitled "Knowledge Management Systems in Higher Education Institutions in Thailand: A Holistic Model of Enablers, Processes, and Outcomes" that is supervised by Professor Michael Beyerlein, PhD. The purpose of this study is to examine how higher education institutions link KM enablers and processes to quality performance of institutions. The variables used in this study include KM enablers (i.e., organizational culture, leadership, technology, and performance measurement), processes, and outcomes represented by internal quality assurance scores. The unit of analysis is 142 Thai universities. The sources of data come from electronic questionnaire surveys and archival data from the CHE QA system.

I am writing you to request permission to include your institution in my study. Please grant me permission to collect data from the knowledge management committee (or quality assurance committee) of your institution. If you give your permission, please return the enclosed form to ssuravee@tamu.edu. I will also need a contact person at your institution (preferably a secretary of the committee) in order to assist in distributing my invitation email to the committee members. The survey will be conducted in July 2015. Upon completion of the study, I will send you a summary of the research findings and a brief report comparing your institution with other universities in the aggregate.

Thank you in advance for your consideration and assistance to this study. Please let me know if you have any questions or concerns. I look forward to hearing from you soon.

Sincerely yours,

Suravee Sunalai
PhD candidate, Texas A&M University

APPENDIX C

FORM OF PERMISSION TO CONDUCT THE RESEARCH STUDY

Knowledge Management Systems in Higher Education Institutions in Thailand: A Holistic Model of Enablers, Processes, and Outcomes

I give permission to Ms. Suravee Sunalai, a PhD student at Texas A&M University to include the institution in her study and collect data from the institution's staff members.

I understand that this research is voluntary and all information obtained in this study is confidential regarding the protocol of Texas A&M University Institutional Review Board (IRB2015-265D). This study incorporates several procedures to protect the privacy of the institution and respondents. First, the responses will be confidential and no effort will be made to link individuals with responses. Second, no record of the participants' involvement in the study will be kept indicating their participation by name. Third, all responses received will be stored in a secured area with access limited to the researcher.

The contact person at the institution assisting in distributing the e-survey to the institutional knowledge management (KM) committee members (preferable a person who is a secretary of the committee) is

Name (in English)…….…….……...….

Name (in Thai)……...……....…

Email…….…….…….……..……

Phone number……... Fax number…….……

Signature ……..…..……..…….…….

Name …...……..…...……..……..……...

Position …...……...…..……..……...…….

University …...……..……...…….

Please scan this form and return it to ssuravee@tamu.edu

APPENDIX D

INVITATION EMAIL TO PARTICIPATE IN THE STUDY

July 1, 2015

Dear Knowledge Management Committee

I am Suravee Sunalai, a PhD student at Human Resource Development, Texas A&M University. I am conducting a study entitled "Knowledge Management Systems in Higher Education Institutions in Thailand: A Holistic Model of Enablers, Processes, and Outcomes." The purpose of this study is to examine how higher education institutions link Knowledge Management (KM) enablers and processes to quality performance of institutions.

This research study received permission from your university to collect data from the KM committee members. Please allow 15-20 minutes to complete this online questionnaire that contains 48 items by following the link https://tamucehd.qualtrics.com//SE/?SID=SV_4Jl6cOyMRnQ9nnf (if you complete the survey through a smart phone or a tablet, please touch your preferable choice of each item and then touch a >> mark to continue to the next page). If you cannot open the link, please fill in the MS word file attached below and return it to ssuravee@tamu.edu by July 31, 2015.

Since the design of this study concentrates on the organizational level of analysis, while answering the questionnaire, please rate the KM system for the entire university. Your participation in this research study is very much appreciated. Your information will reflect the KM implementation in Thai universities that may help institutions better plan and implement the KM system in Thai academic institutions. Furthermore, your information will assist in validating the KM instrument in the Thai context. The instrument used in this study was modified from the Knowledge Management Assessment Tool (KMAT), initiated by Arthur Andersen Consulting Services and the American Productivity and Quality Center (APQC). The original KMAT has been used widely in industries across countries.

Thank you for participating in this survey. Please let me know if you have any questions or concerns. If you would like a summary copy of this study and the result of your university benchmarking across universities, please fill in the request form on the last page of the questionnaire.

Sincerely yours,
Suravee Sunalai

APPENDIX E

CORRELATION AND COVARIANCE MATRICES OF THE KNOWLEDGE MANAGEMENT SYSTEM FACTORS

Table 22 Correlation Matrix for Knowledge Management System Analysis

	TEC	STC	CUL	LDR	KTR	KGE	SCO
TEC	1.000						
STC	0.730*	1.000					
CUL	0.676*	0.750*	1.000				
LDR	0.788*	0.851*	0.790*	1.000			
KTR	0.810*	0.796*	0.732*	0.843*	1.000		
KGE	0.795*	0.864*	0.711*	0.903*	0.807*	1.000	
SCO	0.072	0.068	0.066	0.073	0.095	0.065	1.000

* p < .01 (Two-tailed)

Table 23 Covariance Matrix for Knowledge Management System Analysis

	TEC	STC	CUL	LDR	KTR	KGE	SCO
TEC	0.896*						
STC	0.453*	0.430*					
CUL	0.433*	0.333*	0.456*				
LDR	0.509*	0.381*	0.364*	0.465*			
KTR	0.678*	0.461*	0.437*	0.508*	0.782*		
KGE	0.586*	0.441*	0.374*	0.480*	0.556*	0.607*	
SCO	0.038	0.025	0.025	0.028	0.047	0.029	0.317

* p < .01 (Two-tailed)