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ABSTRACT

The capability to manage knowledge is built, practiced and improved by many organizations. The study of Knowledge Management Capability (KMC) in single organizations is needed to further the understanding of how improvements can be made with effective Knowledge Management. Specifically, educational organizations can benefit from KMC improvement due to the strategic value of knowledge identified across various institutes of learning. This research exploits a prior KMC investigation in a manufacturing organization to investigate potential benefits in an educational setting. Educational settings, viewed as organic organizations, can realize benefits through KMC improvement that include: identified improvements to the management of knowledge in an organic (educational) vs. mechanistic (manufacturing) organization, understanding of how different knowledge types are viewed in the different settings, and greater understanding of how KMC is formed in organic organizations. We hypothesize that KMC factors and areas exist in educational organizations, and that organizational culture affects the knowledge management process. We expect the research to provide industry specific insight into the unique structure and process requirements for effective knowledge management in education.

KEYWORDS: organizational knowledge, knowledge management capability, knowledge process, organizational culture

INTRODUCTION

Among the subjects of organizational management, a recent focus on Knowledge Management Capability (KMC) has emerged (Holsapple and Wu, 2008). A principal reason for this emergence is the need for managers at all levels, in all industries, to unlock the potential of their organizational members by reducing barriers to knowledge acquisition, storage, presentation, and application (Freeze and Kulkarni, 2008). In an age of high speed information exchange, it is essential for managers to understand the factors related to knowledge management capability within their industry and particularly in their organization (Oltra, 2005).

Causal links between KMC and individual organizational functions have been difficult for researchers to solidify. Tanriverdi (2005) discussed the synergistic effects of knowledge resource exploitation as an extension of applying the resource-based view (RBV) of the firm. This suggests that proper delineation across KMC areas will extend benefits across constructs. Focusing on the development of multi-business firms, Tanriverdi (2005) approached operationalizing KMC as the degree of creating, transferring, integrating, and leveraging resources. This application was asserted to find the linkage among IT relatedness, KMC, and firm performance across product, customer, and managerial knowledge sources. Viewing KMC from a RBV suggests that it affects the ability of an organization to effectively deploy and build resources (Makadok, 2001).

The interest in KMC has led to a call to study knowledge management in an educational organization by Milam (2001). Applications of innovative business practices, including those employing codified processes for managing *soft* assets, such as knowledge management, are lacking in the education industry (Kidwell, Vander Linde, and Johnson, 2000). To effectively prepare students for the fast pace of information sharing, education practitioners need to be able to effectively acquire, store, present, and apply accurate and time-specific information for students.

Efficient knowledge management in education can provide a large impact on society. Educational organizations, according to the United States Bureau of Labor Statistics (USBLS) (2008), employ over 3,100,000 people in the United States in over 150,000 schools, colleges, universities, professional and technical training organizations, and educational support service companies. This industry needs managers who can harness and apply their organization's knowledge management assets. While these numbers are a driver representing the overall scope of need for effective and efficient knowledge management, a more direct educational requirement has been identified by the United States Air Force.

In January 2008, in the forward of "On Learning: The Future of Air Force Education and Training", USAF commander of Air Education and Training Command General William Looney stated that it was necessary to develop an enterprise-wide infrastructure to capture the most critical asset: Knowledge (On Learning, 2008). This initiative underpins the importance of understanding and applying knowledge management principles, recognizing that there is a direct need in the educational industry. Evaluation of KMC in educational organizations, such as those in Air Education and Training Command, can provide the first steps toward the development of an enterprise-wide knowledge infrastructure.

From 2002-2004, Kulkarni and Freeze (2008) developed, validated, and refined a Knowledge Management Capability Assessment (KMCA) administered to three large business units within a Fortune-50 manufacturing company. This assessment successfully identified scale items, factors, and areas associated with KMC formulation. Their instrument validation highlighted knowledge process capability and provided significant insight into KMC for this mechanistic organization. The Knowledge Processes (KPs) studied in the KMC relationship were *acquisition, storage, presentation,* and *application.* Application of the KMCA to an educational setting will answer the call to study knowledge management in an educational organization generally and the Air Force specifically. First, knowledge management within education can be viably assessed with the results used to target knowledge management improvement. Second, the unique aspects of how knowledge capability is formed and improved in a more organic setting can be studied. Finally, the dynamics of knowledge management as related to the preponderance of knowledge types and organizational types can be understood.

The investigation of generic KPs in an educational organization to date has not concluded any practical steps for developing specific capabilities. The building of knowledge processes must be addressed through modeling of specific KMC areas, to show where exact areas of improvement can be pursued for an educational organization. The multi-dimensional nature of these formative knowledge processes indicates the existence of areas that can be significant in the building of an organizationally complete KMC. The extension of the KMCA will be used to facilitate the investigation of KMC, knowledge capabilities and knowledge processes in a formative manner and will be guided by Jarvis, Mackenzie, and Podsakoff (2003).

The primary research focus will be to address the knowledge management needs for educational organizations. The remainder of this paper will consist of the following sections. A literature review addressing the motivation for studying knowledge management in an educational organizational setting. Assessment modifications necessary for: a) application to an educational organizational setting, b) knowledge process refinement and c) contribution to assess the building of the knowledge capabilities. The proposed methodology will address the research design for subject selection, instrument distribution, data collection and analysis of the results. The final section will indicate the anticipated results and potential implications of this research.

EDUCATIONAL KNOWLEDGE MANAGEMENT

Effective organizational management requires managers to coordinate processes that unlock the knowledge of organizational members (Rico, Manzanares, Gil, and Gibson, 2008). Schulz-Hardt, Brodbeck, Mojzisch, Kerschreiter, and Frey (2006) found that group decision making is vulnerable to bias, group dynamics, and communication barriers that prohibit groups from making decisions as effectively as individual members with the group's total knowledge. Therefore, assessing, cataloging, and allowing for easy access of the group's correct information for decision making is critical to an organization's success. Collaboration and coordination of knowledge is increasingly critical in education, where faculty have practical application needs in handling students, creating new course material, and analyzing processes for improvement. These statements support the claim that organizational knowledge is connected to organizational capability (Turner and Makhija, 2006).

Because of the importance of education and training, having the capability to manage knowledge is essential to achieving organizational objectives at all levels of operation. The ongoing problem to be examined is how to improve the capability to manage knowledge within educational organizations. This includes identifying associated knowledge management factors and areas within the education industry, in order to appropriately acquire, store, present, and apply. There are various aspects of this problem that will be evaluated including knowledge, knowledge management processes, and organizational culture. Turner and Makhija (2006) recommended that to further understand relationships among organizational knowledge flows, qualitative methods supported by quantitative data should be used. This supports the use of the KMCA in a new organization type to better understand this subject area. Understanding the unique educational organization's knowledge processes and how they form knowledge capabilities within a knowledge management capability setting would improve understanding of knowledge flows within their organizations. The investigation of KMC in an educational setting can therefore be guided by the following research questions.

> *RQ1*: Can the knowledge processes and capabilities of an educational organization be identified and measured for targeted continuous improvement?

> *RQ2*: Does the organic culture of an educational organization contribute to the knowledge management capability?

Significance of Research

This research is targeted to improve the understanding of how KMC is built and maintained in an educational organization. Understanding how KMC is structured within an educational organization provides department heads and deans with a way to target improvements into weak areas of KM. With a theoretical foundation, knowing what KPs are associated with the different KM areas and knowledge types enables specific infrastructure development of IT solutions to speed up knowledge

transfer that meets the educator's needs. This will in turn infuse the culture with an attitude of sharing knowledge inside the structure of the KMC model.

Results from this study will provide invaluable insight into differences in knowledge processes between organic vs. mechanistic organizational settings. Validation of the KMCA in an organic organization will provide perspective into the KPs and KMC area differences when compared to a manufacturing organization. Finally, updating and organizing the knowledge, knowledge management process, and organizational culture literature will help to orient the educational organization manager towards the subject of KMC.

Defining Knowledge

Knowledge is widely defined and described in the literature related to organizational management. For the purpose of this study, we apply the definition provided by Tsoukas (2005) as "the capability members of an organization have developed to draw distinctions in carrying out their work, in particular concrete contexts, by enacting a set of generalizations whose application depends on historically evolved collective understanding". Knowledge is found to be socially constructed, within the shared experiential context of those who have created it. The social construction of knowledge is even greater in organic organizations such as that represented in educational settings. This knowledge development is accomplished with implicit and explicit knowledge types.

Implicit or tacit knowledge has been defined by a wide array of scholar-practitioners as hard-to-describe, unobservable, and experience-based (Polanyi, 1966; Nonaka and Takeuchi, 1995; Forsythe et al., 1998). In most references, implicit knowledge is considered immeasurable unless it can be inferred from actions and statements (Ceci and Liker, 1986; Forsythe et al., 1998). Knowledge of this type is plainly described throughout the literature as learned through experience (Armstrong and Mahmud, 2008).

Explicit knowledge can be formally articulated, communicated, repeated, and taught through cognitive and psychomotor exercises (Alavi and Leidner, 2001). Polanyi (1966) expressed that this type of knowledge could be codified and understood by members of a community through common language. This is knowledge that is observable, present, readily demonstrable, and measurable. Polanyi suggested that all knowledge is on a continuum between these two types, never fully tacit or explicit.

Knowledge Processes

Knowledge management is primarily broken into at least four processes throughout the literature. The primary process is *acquisition*; which is recognition of value and the decision to transfer of a knowledge worker. Once the knowledge is acquired, it must be *stored* in a manner consistent with organizational standards for cataloging. When the knowledge is needed it must be *presented* through a straightforward system. Finally, the knowledge must be *applied* towards attainment of an outcome (Drucker, 1993). Other similar processes exist in the literature. For example *generation, codification, and transfer* is a process for knowledge management developed by Davenport and Prusak (1998). Additionally the *creation, storage, retrieval, transfer,* and *application* process is viewed as the framework for developing information technology solutions for knowledge management (Alavi and Leidner, 2001). Another prominent process is *creation, transfer, interpretation, and application* (Turner and Makhija, 2006). This process is mostly applied to interpreting ways of controlling organizational knowledge. The KPs studied in the KMCA and used for this investigation are *acquire*, *store*, *present* and *use*.

An application of this process in education is the generation and collection of knowledge. When developing a new course at a university an assessment is made of the course material's needs. *Acquisition* of subject matter leads to **knowledge documents** that contain the known scholarly literature and framework for *presenting* the material to students according to university standards. A survey of the faculty yields which members have **expertise** in the area based on prior experience and education. After the faculty concludes an iteration of the course with a live cohort of students, **lessons learned** are *stored* and shared to *apply* in the course during later sessions. This process crosses a variety of knowledge types, and requires specific assessment to improve the KP of each capability area: **Lessons Learned**, **Expertise**, and **Knowledge Documents**.

Knowledge Management Assessment

Because of the inherent tacit component of knowledge, metrics that contribute to knowledge management capability needed to be identified in order to better understand how to effectively manage knowledge. Previous efforts to assess KMC resulted in consolidation of knowledge and development of knowledge management processes (Gold, Malhotra, and Segars, 2001). A specific instrument needed to be developed to assess an organization's knowledge management capability. Working with a Forture-50 company, Freeze and Kulkarni (2005) developed and validated a Knowledge Management Capability Assessment. Their KMCA linked scale items to factors, and factors to areas most attributable to KMC. During instrument validation, structural equation modeling employed exploratory factor analysis followed by confirmatory factor analysis to

identify loading of scale items and factors to areas of KMC. This validation process established reliability of the instrument by assessing the variance in an item as attributable to the variance in a capability.

Knowledge Management Capability Constructs

We hypothesize that KMC factors and areas exist in educational organizations, and that organizational culture affects the knowledge management process. The KMC construct for this study has three areas: Lessons Learned, Expertise, and Knowledge Documents. These areas and the associated KPs are further defined as follows:

Lessons Learned are specific and useful knowledge gained in the process of completing a project or a task, learned from past successes and failures and can be generated during sessions designed to discuss results from previous organizational tasks. The Lessons Learned KPs are *capture*, *repository*, *taxonomy*, and *usage*. The knowledge type is predominantly tacit, because it is developed through the shared experiences of members who comprise the organization. Lessons Learned are gained from experience and case studies of previously applied concepts and courses of action. In an educational setting this may be in the form of a course, an exercise, testing method, etc.

Expertise is knowledge available within the minds of organizational members, and hence, experts are individuals who have expertise to share. This area is also mostly implicit, as it is not necessarily easy to capture and express. One way is to profile the education and experience of faculty members within a database that will show who may be most qualified for new tasks. The expertise KPs are *expert profiling and registration*, *repository*, *taxonomy*, and *access*. Expertise is found among the faculty of the educational organization, in varying degrees, and is based on experience and education.

Knowledge Documents are those documents which contain codified, explicit, support material, generated or gathered for the use of application to organizational tasks. The Knowledge Documents KPs are *categorization*, *repository*, *search and retrieval*, *reference* and *use*. These specific documents are among the organization's internal library; reference material, shared files, databases, etc. External to the organization, publisher's textbooks, journals, and conference proceedings can also be identified for use. They are used for codifying policy and process as well as resources for instruction.

Conceptual Construct Model

Previous work by Freeze and Kulkarni validated the KMCA using structural equation modeling, which utilized second-order and general-specific models. These models provided a conceptual framework of the overall KMC construct. The research model, in Figure 1, represents the conceptual relationship to be investigated between the scale items, processes, capabilities and KMC. Note that the processes are reflective to scale items, and formative of knowledge capabilities. This is because we propose that changes in the extent of an existing KP would result in reflected changes in the scale item measurements. The scale items do not comprise the totality of each factor, but are a measurement which denotes the existence of the process and the extent to which it exists. As surmised by Jarvis, Mackenzie, and Podsakoff (2003), reflective scale items should be internally consistent, and because they are assumed to be equally valid they are each reliable and interchangeable. The construct validity is therefore unchanged if a single scale item is not found to be present.

The knowledge capabilities are formed by the KPs. Each of the knowledge capabilities subsequently forms the total KMC. In this relationship, changes in the factors or areas are individually translated into a change in the KMC of an organization. This relationship, being depicted by this research, will further validate that direct improvement on organizational KMC can be made by targeting specific weak factors or areas. Specific factors are identified for the generic KP stages due to the different nature of knowledge types. For example, the KMC area of Expertise has a relatively tacit knowledge type which must be treated differently than Knowledge Documents which are generally more explicit. These differences drive the use of specific KP names in place of their generic KP stages. The relationship of knowledge capabilities and the KP stages are shown in Table 1.

KMCA Modifications

A review of the KMCA identified some adaptations and modifications that were necessary in order to apply it in an educational setting. It is important to note that a certain level of knowledge about the organization under study is necessary to orient the respondent with a basic understanding of KMC, knowledge capability and KM process concepts. Specifically, examples need to be included for each of the KMC areas that identify to the respondent where these areas *may* be found in his/her organization.

The KMCA followed prior literature in its representation of KMC as a construct which is reflective of the KPs comprising each area. However, if capabilities are built by organizations, this would imply that a formative construct would be a more appropriate representation, including within an educational organization, where we assert that Lessons Learned, Expertise, and Knowledge Documents comprise overall KMC. To test this question, additional scale items have been constructed to

measure the overall knowledge capabilities in order to construct a formative 2nd order model as specified in Jarvis et al. (2003).

Also, items related to the influence of the organization's culture on its KMC were included for preliminary insight on this theoretical relationship. This is important because educational organizations are inherently characterized as *organic,* while the previous manufacturing setting can be classified as *mechanistic* (Boje, 1999). Organic organizations fundamentally allow for the free flow of information, application of creativity and innovation in job performance, and autonomy of decision making at lower levels. Mechanistic organizations, on the other hand, have a predominantly rigid structure, retain centralized decision making, and often do not require the flow of information at the task level. It could be argued that a healthy organic organization could be identified by strong and robust knowledge management capability.

METHODOLOGY

The National Security Space Institute (NSSI) is a premier education and training organization for space professionals in the Department of Defense and the setting for the administration of the KMCA. The purpose of this field study will be to test the theory of organizational KMC that links the areas of Lessons Learned, Expertise, and Knowledge Documents to KMC for faculty members at the NSSI in Colorado Springs, Colorado. The NSSI employs a faculty of approximately 100 active duty military members, United States Air Force (USAF) Reservists, government civilians, and contractors who educate approximately 2,000 students annually in 16 space professional development education and training courses. Within this study, KMC is defined as the ability of an organization to acquire, store, present, and apply knowledge (Kulkarni and Freeze, 2005). A counterpart of this organization type in the civilian sector would be a technical or trade school, designed for the advancement of a student who has chosen a particular career field. The problem to be examined is that managers of educational organizations do not have adequate understanding of KMC because associated factors and areas have not been verified within the education industry (Turner and Makhija, 2006; Wilson, Goodman, and Cronin, 2007).

Data Collection

The selection of our respondents was guided by the call for research presented in the white paper "On Learning" (2008). This field study will survey approximately 100 faculty and administration members of the NSSI and utilize a KMCA instrument that examines the KMC areas of Lessons Learned, Expertise, and Knowledge Documents adapted to an educational setting. The KMCA will be administered either through email using Inquisite Software, or by paper copies through local distribution. Once all participating members have responded, the data will be analyzed using SPSS v15.0 to find loading factors for scales items, factors and areas associated with KMC for this organization.

Analysis

Confirmatory Factor Analysis (CFA) will be used to validate the similarity of knowledge capabilities of the organizational KMC within the educational organization under study. The two common approaches to CFA are traditional methods and the Structural Equation Modeling (SEM) method (Garson, 2008). The SEM method applied to this study will initially follow the prior validation methods with the use of two types of measurement models: the Second-Order Model and General-Specific Model. Factor loadings were classified by thresholds previously determined by Comrey and Lee (1992) as excellent, very good, good, and fair. This analysis will include the additional knowledge process unable to be tested by prior KMCAs. As with prior applications of the KMCA, goodness of fit of the model will be assessed using Non-Normed Fit Index (NNFI), Comparative Fit Index (CFI), and Standardized Root Mean Squared Residual (SRMR). The model is said to be a good fit when at least two of these three indicate adequate model estimation. Results of this KMCA in a new setting will show the strength of the model and its transferability across industries.

Each knowledge capability area will have an additional measurement model constructed to investigate these constructs as formative indicators. As indicated in Figure 1, the KM processes will be assessed as formative indicators of the knowledge capability of the organization. Similar fit indices will be evaluated in order to test the transportability of each knowledge capability. Successful completion of these measurement models will allow the examination of a structural model in which the knowledge capabilities can be tested as to their impact on performance measures in the presence of different aspects of the organizational culture.

Within the educational organization, Lessons Learned, Expertise, and Knowledge Documents exist in a variety of processes and activities. Aligning KMC to provide for the best education and training will join the organization's resources with its primary task. This will also infuse a culture of applying knowledge processes among the faculty in order to retain and retrieve information more quickly and accurately.
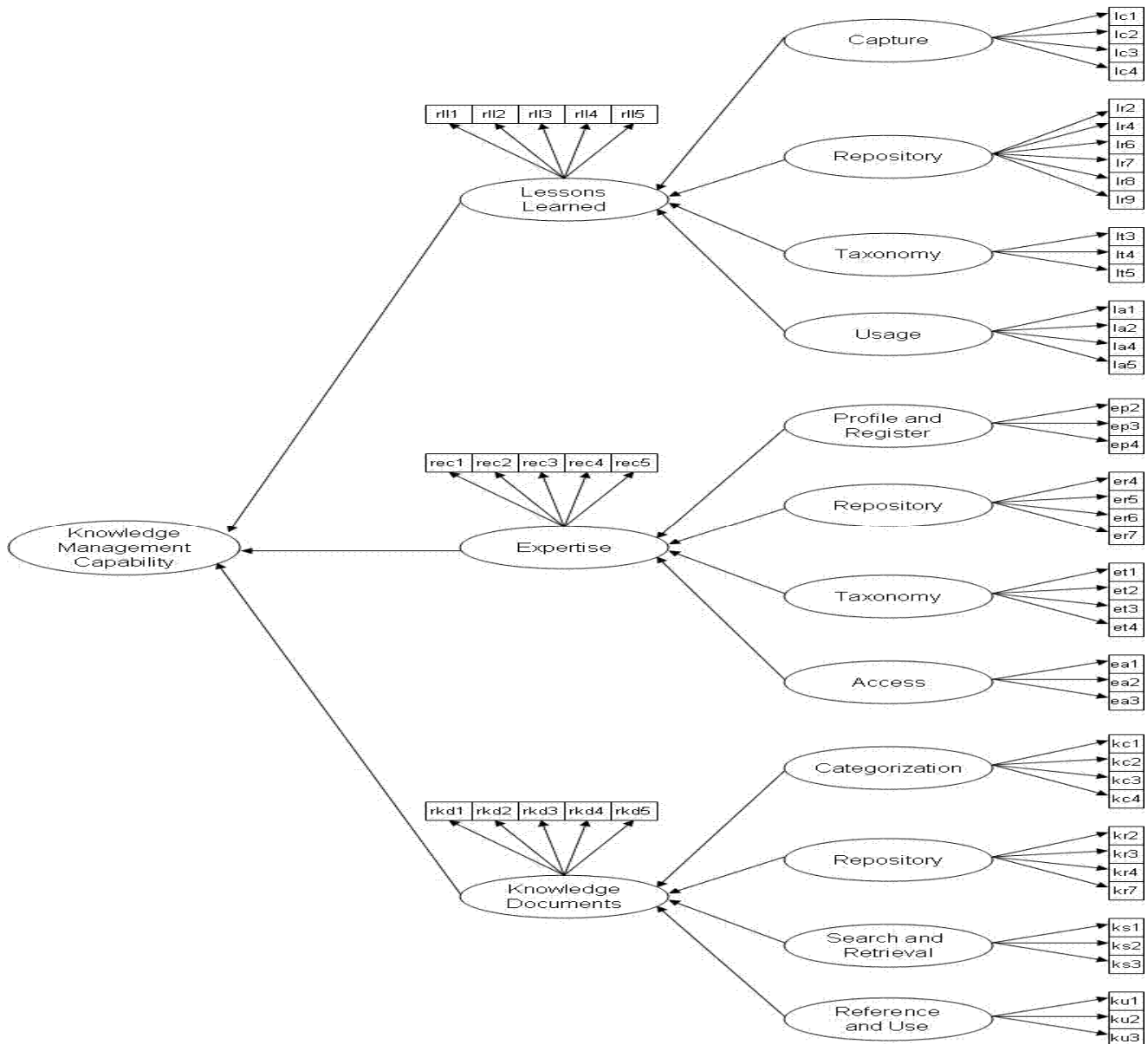
Figure 1 - Knowledge Management Capability Conceptual Model

IMPLICATIONS

The immediate benefits of this research will be to managers of educational organizations by showing a way to assess and target improvement areas for knowledge management. Better understanding of KMC for managers of educational organizations will allow them to direct changes at tactical and operational levels. This fine tuning of the organization's KMC will enable resources to be calculably used as efficiently as possible. Additionally, future research can be vectored to assign specific focus to the organic nature of educational organizations, and how this structure and philosophy impacts KMC. Further research into organizational culture, structure, use of teams, and teaching methods may also be necessary to encompass the scope of the implications.

The validation of the KMCA and knowledge capabilities within a new organizational setting advances the external validity of the instrument and provides an indication that similar knowledge capabilities exist across multiple organizations. Further validation of the knowledge capabilities can be achieved through having analyzed all four KM processes for the three areas. Other knowledge capabilities may exist and can be tested in the future to increase an organization's understanding of their strategic assets. Possible future research then could include multi-organization testing, across universities and technical education and training centers. This application will further the base of research of KMC in the education industry with additional insight into specific organization types.

The confirmation of KMC as a formative construct has substantial implications for organizations. With KMC as a formative construct, each KM process, as well as each knowledge capability, can be targeted for improvement in an organization. The initiatives will not need the larger funding of a general KM improvement project but can target smaller projects that would produce larger gains on the overall strategic assets of the organization. This can be realized by targeting improvements in specific processes like Expertise - Access.

Finally, managers throughout personnel and organizational management can see the far reaching effects of a better understanding of this important asset. KMC touches on multiple areas of organizational management, to include resources, processes, and structures. Understanding KMC from a business unit perspective and coupling that with an organizational maturity model, may lead to future research about team composition for the best long term KMC. Managers may be able to glean efficiencies in processes of production, training, and staffing due to a better application of KMC. Also, senior executives can incorporate KMC philosophy when creating new organizations, to decide on the appropriate structure for the optimal KMC. Applying KMC theories in this multi-tiered approach to management will pay dividends in the effective and efficient management and use of the organization's collective knowledge.

Table 1. KMC Factor and KMP Stage Relationship

KMC Area	KMP Stage (Generic)	Specific Factor
Lessons Learned	Acquire	Capture
	Store	Repository
	Present	Taxonomy
	Apply	Usage
Expertise	Acquire	Profile and Register
	Store	Repository
	Present	Taxonomy
	Apply	Access
Knowledge Documents	Acquire	Categorization
	Store	Repository
	Present	Search and Retrieval
	Apply	Reference and Use

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