REVISTA INNOVAR JOURNAL

Design, Measurement and Analysis of a Knowledge Management Model in the Context of a Mexican University[1]

Gibrán Rivera
Ph.D. en Estudios de la Información
Instituto Politécnico Nacional
Distrito Federal, México
Correo electrónico: griverag@ipn.mx
Enlace ORCID: http://orcid.org/0000-0003-2805-5524

Igor Rivera
Ph.D. en Ingeniería Industrial
Instituto Politécnico Nacional
Distrito Federal, México
Correo electrónico: iariverag@ipn.mx
Enlace ORCID: http://orcid.org/0000-0003-0768-3740

ABSTRACT: The paper aims to design and apply a Knowledge Management (KM) model within the context of a Higher Education (HE) institution in Mexico. The model is composed of six enablers: leadership, culture, structure, human resources, information technologies and measurement, which facilitate the processes of knowledge creation, storage, transfer and application. A 53-question survey applied to thirty-six (36) people allowed to evaluate the degree of development and implementation of knowledge enablers and processes. Objectivity, reliability and overall model fit were assessed.

The application of the Model serves to highlight the core role that cultural, human and structural aspects play in Knowledge Management processes. Whereas Information Technologies are the least influential to Knowledge Management processes.

This paper was limited to examine the perceptions of the Board of Directors of a single university. It is yet to be tested in other institutions. Moreover, the resulting model can be used as an assessment tool in Higher Education Institutions to identify the key elements during a KM initiative as well as to define actions to obtain the greatest benefits from these initiatives.

KEYWORDS: Knowledge Management, Mexican University, culture, information technologies.

Introduction

In recent times, knowledge has become the main asset of production as opposed to the tangible assets that previously droved manufacturing-based markets (Kemp *et al*., 2002). As such, knowledge must be recognized as a resource that needs to be managed. According to Carrillo (2001), in the nature of the new global environment, sooner or later, we will distinguish two great blocks of species in the world of organizations: those that manage their knowledge and those that are extinct.

[1] Part of this paper is based on the Master degree thesis project by Gibrán Rivera González, and is a result of the project SIP-IPN 20152105.

DISEÑO, MEDICIÓN Y ANÁLISIS DE UN MODELO PARA LA GESTIÓN DEL CONOCIMIENTO EN EL CONTEXTO DE UNA UNIVERSIDAD MEXICANA

RESUMEN: Este trabajo tiene como objetivo el diseño y la aplicación de un modelo para la Gestión del Conocimiento (GC) en el contexto de una Institución de Educación Superior (IES) en México. El modelo se compone de seis facilitadores: liderazgo, cultura, estructura, recursos humanos, tecnologías de la información y la comunicación, y medición, los cuales propician los procesos de creación de conocimiento, su almacenamiento, transferencia y posterior aplicación. Una encuesta de 53 preguntas, aplicada a treinta y seis (36) personas permitió evaluar el grado de desarrollo e implementación de los facilitadores y los procesos relacionados con el conocimiento. La objetividad, fiabilidad y ajuste general del modelo fueron también evaluados. La aplicación del modelo sirve para destacar el papel fundamental que los aspectos culturales, humanos y estructurales desempeñan dentro de los procesos para la gestión del conocimiento. Asimismo, se señala que las Tecnologías de la Información y la Comunicación son el factor con menor influencia dentro de estos procesos. Este trabajo se limitó a analizar las percepciones de la Junta Directiva de una sola universidad, por lo tanto está sujeto a comprobación en otras instituciones. El modelo resultante puede ser empleado como una herramienta de evaluación en Instituciones de Educación Superior para identificar los elementos clave de las iniciativas para la GC, así como en la definición de planes de acción para la obtención de mayores beneficios a partir de dichas iniciativas.

PALABRAS CLAVE: Gestión del conocimiento, universidad mexicana, cultura, tecnologías de la información y la comunicación.

DESENHO, MEDIÇÃO E ANÁLISE DE UM MODELO PARA A GESTÃO DO CONHECIMENTO NO CONTEXTO DE UMA UNIVERSIDADE MEXICANA

RESUMO: Este trabalho tem como objetivo o desenho e a aplicação de um modelo para a Gestão do Conhecimento (GC) no contexto de uma Instituição de Educação Superior (IES) no México. O modelo se compõe de seis facilitadores: liderança, cultura, estrutura, recursos humanos, tecnologias da informação e comunicação, e medição. Esses facilitadores propiciam os processos de criação de conhecimento, seu armazenamento, transferência e posterior aplicação. Mediante uma pesquisa de 53 perguntas aplicada a 36 pessoas, avaliou-se o grau de desenvolvimento e implementação dos facilitadores e dos processos relacionados com o conhecimento. A objetividade, fiabilidade e ajuste geral do modelo foram também avaliados. A aplicação do modelo serve para destacar o papel fundamental que os aspectos culturais, humanos e estruturais desempenham dentro dos processos para a GC. Além disso, indica-se que as Tecnologias da Informação e Comunicação são o fator com menor influência dentro desses processos. Este trabalho se limitou a analisar as percepções da diretoria de uma única universidade; portanto, está sujeito à comprovação em outras instituições. O modelo resultante pode ser empregado como uma ferramenta de avaliação em IES para identificar os elementos-chave das iniciativas para a GC, bem como na definição de planos de ação para a obtenção de maiores benefícios a partir dessas iniciativas.

PALAVRAS-CHAVE: Gestão do Conhecimento, universidade mexicana, cultura, tecnologias da informação e comunicação.

CONCEPTION, MESURAGE ET ANALYSE D'UN MODÈLE POUR LA GESTION DES CONNAISSANCES DANS LE CONTEXTE D'UNE UNIVERSITÉ MEXICAINE

RÉSUMÉ : Ce document vise à concevoir et mettre en œuvre un modèle de gestion des connaissances (GC) dans le cadre d'un établissement d'enseignement supérieur (EES) au Mexique. Le modèle se compose de six facilitateurs: leadership, culture, structure, ressources humaines, technologies de l'information et la communication, et mesurage. Ces facilitateurs favorisent les processus de création de connaissances, leur stockage, leur transfert et leur mise en œuvre ultérieure. Une enquête de 53 questions, appliquée à trente-six (36) personnes, a permis d'évaluer le degré de développement et de mise en œuvre de facilitateurs et les processus liés à la connaissance. L'objectivité, la fiabilité et l'ajustement global du modèle ont également été évalués.L'application du modèle sert à mettre en évidence le rôle crucial que les aspects culturels, humains et structurels jouent dans les processus de gestion des connaissances. Aussi, il est à noter que les technologies de l'information et la communication sont le facteur moins influent dans ces processus. Cette étude s'est bornée à analyser les perceptions du Conseil d'une seule université; par conséquent, elle est assujettie à une vérification dans d'autres institutions. Le modèle qui en résulte peut être utilisé comme un outil d'évaluation dans les établissements d'enseignement supérieur pour identifier les éléments-clé des initiatives d'assurance qualité et dans la définition des plans d'action pour obtenir de plus grands avantages à partir de ces initiatives.

MOTS-CLÉ : Gestion des connaissances, université mexicaine, culture, technologies de l'information et la communication.

CORRESPONDENCIA: Av. Té 950, Delegación Iztacalco, Colonia Granjas México, C.P. 08400 Ciudad de México, D. F. México. UPIICSA-SEPI, Cubículo 20.

CITACIÓN: Rivera, G., & Rivera, I. (2016). Design, Measurement and Analysis of a Knowledge Management Model in the Context of a Mexican University. *Innovar, 26*(59), 21-34. doi: 10.15446/innovar.v26n59.54320.

ENLACE DOI: http://dx.doi.org/10.15446/innovar.v26n59.54320.

CLASIFICACIÓN JEL: D83, M10, M15.

RECIBIDO: Abril 2013, **APROBADO:** Diciembre 2014.

The increasing importance of knowledge lies in how its application is adding value to services. That is the case of Higher Education (HE) institutions in which education is a knowledge-based activity. The relevance of knowledge in the new economy has led organizations to re-examine and renovate their strategies, processes and technologies based on a Knowledge Management perspective (Luo & Lee, 2013; Zhang & Zhao, 2006). Facing this situation, institutions (*e.g.,* Universities) require of strategies and models that allow them to manage their knowledge (Fullwood, Rowley & Delbridge, 2013). A starting point, from which Universities can learn to do so, would be to look at previous research (*e.g.,* Skyrme & Amindon, 1998; Davenport, De Long & Beers, 1998; Holsapple & Joshi, 2000; Liebowitz, 1999; Chong & Choi, 2005; Wong, 2005; Pentland *et al*., 2011), in which a series of KM critical success factors have been identified. A second source of learning for Universities to implement KM initiatives would be to analyze the existing KM models (*e.g.*, Nonaka & Takeuchi, 1995; Snowden, 1998; Bukowitz & Williams, 1999; Wiig, 1997; Eppler & Sukowski, 2000; Heisig, 2002) and determine how these models can contribute to their own KM initiatives.

However, despite the identification of critical success factors for KM and the availability of different KM models, there is still a persistent discussion about the role of information technologies in KM initiatives, on the one hand, and on the role played by social and cultural aspects, on the other. Davenport *et al*. (1998), comment that the field of KM has been traditionally dominated by information technologies. Nevertheless, today the roll of people in KM processes is being recognized, increasing the interest from a perspective focused on people (Earl, 2001). Organizations begin to realize that technology is not the solution for all KM problems, reason why the focus is going towards people (Grundstein, 2013; Poole, 2000). The theory of Nonaka and Takeuchi (1995) agrees with this idea. They focus their attention on the conversion of individual tacit knowledge to collective explicit knowledge, through individual and organizational processes of learning and perceived KM as a set of structural administrative initiatives that support learning of employees in the organization. This theory is based on cultural, organizational, human and social aspects of knowledge (Ackerman *et al*., 2003).

In contrast to the perspectives that consider information systems are the solution to KM problems, others have suggested that people, their interrelations and attitudes are fundamental aspects to succeed. It seems then that both perspectives should be fore-grounded when analyzing KM initiatives. Consistent with this idea, the study by Scholl *et al*. (2004), argues that the future of KM focuses on a better integration of KM activities to business processes, as well as a greater concentration in the interface man-organization and a better adjustment between technological aspects and human factors.

This study agrees with the view expressed by Scholl *et al*. (2004), and proposes a holistic KM model that integrates organizational, cultural, structural and technological elements. These elements are required in organizations in order to support and facilitate the processes of creation, storage, transference and application of knowledge.

The remaining part of this paper is organized as follows: Section two discusses the theoretical background of the study; it starts by establishing a KM definition to further discuss a series of KM enablers and KM processes that are located at the core of the concept. Drawing on this body of literature a KM model is introduced in section three. Section four introduces the research methodology and includes the methods used for data collection, the sample characteristics and the operationalization of variables. Section five presents the data analysis and suggests a series of hypotheses that emerge from the study. A final section discusses the conclusions, implications and limitations of the study.

Theoretical Background

Knowledge Management

Different authors (*e.g.*, Grundstein, 2013; Prusak, 2002; Lehaney *et al.*, 2004; Hinds & Pffefer, 2003; Huysman & Wit, 2002; De Long & Fahey, 2000; Karlsen & Gottshalk, 2004; Satayadas *et al*., 2001; Horwitch & Armacost, 2002; Mertins *et al.*, 2003; Friedman & Prusak, 2008; Horwitch & Stohr, 2008; Chan *et al*., 2013; Trusson, 2014) have defined KM from complementary perspectives. Most of these definitions agree in the following points:

- KM requires a set of organizational practices related to strategy, technology, environment and people (KM enablers).
- KM tries to improve the knowledge processes of creation, storage, sharing and use (KM processes).
- KM tries to improve organization productivity and the quality of decision making (KM benefits).

In a previous work by one of the authors of this paper, KM was defined as "*the set of methods, tools, structures, and necessary initiatives that organizations need to create, store, transfer and apply knowledge in the organization-value-adding processes, in order to gain a competitive advantage over their competitors*" (Rivera, 2007, p. 17). Taking this definition as the point of departure, what

follows reviews existing research on KM enablers and processes, and how the relations among them have been hypothesized in previous studies. This review is further used to develop a KM Model to be applied within the context of a HE institution in Mexico.

KM Processes

For the purpose of this paper KM processes are defined as the necessary activities that need to be performed so that knowledge can be created, stored, shared and applied by the members of the organization in order to reach a better organizational performance.

Different classifications have been suggested for the necessary KM processes to managing organizational knowledge. Generally, these classifications may vary in the number of activities within a rank of three to eight. Davenport and Prusak (1998), propose as KM processes the generation, codification, coordination and transference of knowledge. The model proposed by Probst *et al*. (1998), considers eight KM processes: identification, acquisition, development, transference, use, retention, evaluation and knowledge goals. A study conducted in 1,000 German companies and 200 European companies, concluded that four knowledge activities are the most relevant for organizations: apply, distribute, generate and store (Mertins *et al*., 2003). These processes coincide with the classification by Alavi and Leidner (2001), of creating, storage/retrieval, transferring and application, which has been widely accepted in the field of KM (Handzic & Zhou, 2005). These processes as proposed by Mertins *et al*. (2003), and Alavi and Leidner (2001), are taken as the starting point and discussed below.

Knowledge creation. Refers to the process through which new knowledge is developed within existing knowledge. This process has been widely studied by Nonaka and Takeuchi (1995). In their work, they analyzed how knowledge is created and shared, and the conditions that support knowledge creation. In their knowledge creation model, they present four ways of knowledge conversion: socialization, exteriorization, combination and internalization; by means of these, knowledge expands from the individual to the organizational level. This was further complemented by Nonaka and

Konno (1998), who studied the fundamental conditions that must exist in organizations so that knowledge can be created. They introduced the concept of "*ba*", and defined it as the shared context of those who take action and interaction in the process of knowledge creation (Nonaka & Teece, 2001). In this context, an environment in which tolerance and freedom allow to continuously learn is strongly recommended (Handzic & Zhou, 2005).

Knowledge storage. This process implies that knowledge has to be organized and deposited in different forms, such as documentation of best practices, written documents, structured information, codified knowledge, documented procedures and tacit knowledge (Alavi & Leidner, 2001). Storing knowledge by constructing knowledge repositories allows organizations to develop an organizational memory. Many of the KM practices initiate constructing knowledge repositories with the objective of capturing and storing knowledge for its later access and use (Grover & Davenport, 2001). Markus (2001) mentions three factors that must be considered when developing effective knowledge repositories: i) to provide time and suitable resources to document knowledge, ii) to count on appropriate incentives for motivating employee participation and contribution (formal and informal incentives as well as an open culture that allows knowledge sharing), and iii) to have intermediaries to organize, synthesize and translate the information in effective knowledge that can be used.

Knowledge transfer. Implies to distribute knowledge where it is needed to be applied (Pentland, 1995). The objective of knowledge transfer is to distribute the correct knowledge to the correct people at the correct time. Several technological applications have been developed to facilitate knowledge transfer; some of the most outstanding are the email, discussion forums, videoconferencing, intranet systems and the internet. Channels to knowledge transfer can be formal and informal, personal or impersonal (Alavi & Leidner, 2001) and their application will depend on the type of knowledge to be transferred. In order to enable knowledge transfer, organizations must generate a suitable organizational environment as well as provide an infrastructure that facilitates knowledge sharing. This implies that: i) knowledge has to be accessible through the use of expert directories that can be used to identify specialists in certain areas, ii) technological infrastructure has to be promoted to facilitate knowledge distribution using intranets, email and virtual working, and iii) KM initiatives need management support through the creation of an environment of trust and a friendly knowledge culture.

Knowledge application. Refers to the use of knowledge in order to reach a competent performance (Pentland, 1995). The final objective of KM is to use knowledge to benefit the organization. Only the productive use of knowledge will translate intangible assets in tangible results (Handzic & Zhou, 2005). Without an effective use of knowledge, all the efforts in the development, storage and transference of knowledge are in vain. Although, the possession of knowledge does not guarantee automatically its successful application in daily work; there is a wide variety of factors that inhibit the effective use of knowledge, reason why it is necessary to take into consideration some aspects to assure that knowledge is used effectively, such as knowing users necessities, promoting a supportive work environment and designing physical facilities to promote an effective communication, among others.

KM Enablers

KM enablers are defined as the set of organizational, cultural, structural and technological elements existing in the organization that support and facilitate the KM processes of creation, storage, transference and application of knowledge. Previous literature has identified a number of KM enablers that might be relevant to support KM processes when implementing KM initiatives. Among other studies, the work by Wong (2005) becomes relevant for the purposes of the current study. In his work, Wong made a comparison of KM enablers proposed by different authors that are required to succeed in KM initiatives (Table 1).

A similar exercise was conducted by Rivera (2007), who identified different KM models and the KM enablers suggested in these models (Table 2).

From the contributions by Wong (2005) and Rivera (2007), a set of KM enablers persistently appear as critical to support the processes discussed above. These are: leadership, culture, human resources, information technologies, structure and control.

Leadership plays a critical role to succeed in KM (Garavan, Carbery & Murphy, 2007; Holsapple & Joshi, 2000) because it is a decisive factor during the implementation of cultural, organizational and technical changes in organizations (Handzic & Zhou, 2005). Eppler and Sukowski (2000) place leadership as the main element in the pyramid of necessary platforms, norms, processes and tools to have an effective KM. In the same way with the continuous improvement programs, management support and commitment is a key element to succeed in KM initiatives (Davenport *et al.,* 1998). A study conducted in 431 American and European companies confirms that 67% of the executives interviewed admit that the greatest obstacle to manage knowledge —culture— can be attacked with a

TABLE 1. Comparison of KM enablers

KM enablers	Skyrme & Amidon (1998)	Holsapple & Joshi (2000)	Davenport *et al.* (1998)	Liebowitz (1999)	Hasanali (2002)	Wong (2005)	Chong & Choi (2006)
Management leadership and support	Knowledge leadership	Leadership	Senior management support	Support and leadership	Leadership	Management leadership and support	Management commitment and support
Culture	A knowledge creating and sharing culture		Knowledge-friendly culture	Knowledge-supporting culture	Culture	Culture	Knowledge-friendly culture
Technology	A well-developed technology infrastructure		Technical infrastructure Standard and flexible knowledge structure	Knowledge ontologies and repositories KM systems and tools	IT infrastructure	IT	Infrastructure to information systems
Strategy	Strong link to a business imperative A compiling vision and architecture		Clear purpose and language	A KM strategy		Strategy and purpose	
Measurement		Measurement	Link to economic performance or industry value		Measurement	Measurement	Performance measurement
Roles and responsibilities			Organization infrastructure	A CKO or equivalent and a KM infrastructure	Structure roles and responsibilities	Organizational infrastructure	Teamwork and empowerment
Processes	Systematic organizational knowledge processes Continuous learning	Control and coordination	Multiples channel for knowledge transfer			Processes and activities	Knowledge structure
Rewards and recognition			Chance in motivation practices	Incentives to encourage knowledge sharing		Motivational aids	
Other		Resources				Resources Training and education Human resource management	Training Benchmarking Employee involvement

Source: Adapted from Wong (2005).

TABLE 2. KM enablers identified in previous KM models

KM enablers	Knowledge Management Reference Fraunhofer Model (Heisig, 2002)	Knowledge Management Assessment Tool (APQC, 1999)	Knowledge Creation Model (Nonaka & Takeuchi, 1995)	Knowledge Management Maturity Model (KMMM, 2001)	Intellectual Capital Model of IBM (Vorbeck *et al.*, 2003)	Knowledge Management Diagnostic (Bukowitz & Williams, 1999)
Leadership	✓	✓	✓	✓	✓	
Culture	✓	✓	✓	✓		✓
Information technologies	✓	✓		✓	✓	✓
Control	✓	✓			✓	
Roles and organization	✓		✓	✓		✓
Human Resources	✓		✓	✓	✓	✓

Source: Adapted from Rivera (2007).

greater sense of leadership (Holsapple & Joshi, 2000). Different authors comment about the function of leadership within KM initiatives. Eppler and Sukowski (2000), and Beckham (1999), make emphasis on the role of leaders in providing motivational aids and the necessary time and space in order to share knowledge, given that KM initiatives sometimes fail due to the lack of resources such as time, human and financial resources (Wong, 2005).

Organizational culture has been recognized as one of the most important enablers or inhibitors of KM (Handzic & Zhou, 2005; Holsapple & Joshi, 2000; Lin, 2006) and as the greatest challenge in the practices of KM (Zhou & Fink, 2003). It is in the culture where non-spoken norms are about how knowledge is distributed in the organization and between individuals. A study made by the *Journal of Knowledge Management* (Lin, 2006) revealed that culture is one of the greatest obstacles faced by the people responsible for managing knowledge. Of the 431 executives interviewed in this study, 80% stated that culture prevents the development and introduction of KM strategies and programs in their organizations. Only through the creation of a culture of trust and collaboration, can knowledge sharing and organizational effectiveness be improved (Sveiby & Simons, 2002). Moreover, trust also requires tolerance to mistakes and failures, which must be seen as part of the learning process of KM implementations (Kannan, Aulbur & Haas, 2011).

In addition to leadership and culture supporting KM activities, human resource initiatives become critical to support those of KM. On the one hand, organizations need to provide training and development to their employees so that they can understand the purpose of a KM initiative and have the competencies required to participate in the KM activities (Liebowitz, 1999); on this regard, special attention should be given to the development of competencies required to use information technologies. On the other hand, there is a need to use incentives in order to motivate employees so that they share their knowledge with other members of the organization (Wong, 2005). When giving incentives for participating in KM processes, organizations must provide the correct incentives according to the raised objectives. According to Chase (1997), unproductive incentive programs are one of the greatest obstacles for implementing KM initiatives. As in the case of technological solutions, incentive programs must be customized, since different interests in the organization and its employees are present.

The critical role of Information Technologies (IT) has been acknowledged in many studies (Tambe & Hitt, 2012; Woodman & Zade, 2012; Heisig, 2009; Mertins *et al*., 2003; Wong, 2005; Lin, 2006; Trusson *et al*., 2014). Handzic and Zhou (2005), comment that there are two types of enablers: first, the organizational environment, integrated by organizational culture, leadership, organizational structure and measurement; and second, the technological infrastructure, which includes a great variety of information and communication technologies. Whereas the organizational environment contributes to create a knowledge friendly climate, the technological infrastructure facilitates the processes for KM. This technological infrastructure can help managing the stored explicit knowledge in internal or external databases, as well as maintaining employees in contact for sharing the knowledge they own, which is not documented (Mertins *et al*., 2003). In general, ITs have been reported to support several processes to store, transfer and apply organizational knowledge (Lin, 2006). Among the ITs most commonly used by organizations we can mention the intranet, email, forums of discussion, tools for managing documents, video-conferences, and other tools to support communities and electronic learning (Spek & Carter, 2003).

Recent KM research has revealed that organizational structure plays a more important role than organizational culture and information technologies in the processes of knowledge sharing (Zhou & Fink, 2003). Different studies have tackled the subject of organizational structure as a fundamental element to succeed in KM initiatives. Some of the elements that emphasize these studies are those related to Communities of Practice (CoPs), social networks, formal and informal hierarchies inside organizations and the creation of spaces to promote interactions between employees. Handzic and Zhou (2005), argue that companies can use a wide variety of organizational forms such as teamwork, social networks and CoPs, to create an atmosphere that supports collaboration and knowledge sharing (Lave & Wenger, 1991). Facilitating the creation of informal groups of collaboration between employees is one of the more effective means to promote knowledge sharing (Snowden, 2000).

Similarly, it has been found that the elimination of hierarchies of status in order to promote knowledge sharing can contribute to the success of KM initiatives (Karlsen & Gottschalk, 2004). This elimination of hierarchies also entails changing the organization facilities in order to ease collaborative work. The creation of special spaces to facilitate employee interaction (coffee rooms, dining rooms for employees, etc.), has been identified as highly useful to promote the flow of ideas and knowledge between employees in an informal but very effective way (De Long & Fahey, 2000).

Measurement and control continue being one of the greatest challenges in KM initiatives and one of the least developed aspects in KM. This might be due to the difficulty of measuring something that cannot be seen, as it is knowledge (Bose, 2004). In spite of the difficulty of companies for measuring the benefits of KM, Skyrme (2003),

comments that not only a measurement system has been developed, but in addition to this, he argues that today there is a great variety of new methods that combine different indicators to measure the intangible assets of an organization. Supporting this point of view, the APQC (2001) affirms that measurement is possible, although it is not a simple task.

Generally, when organizations have tried to measure the impact of KM initiatives on the general performance of the organization, they have used three different approaches: financial measurements, non-financial measurements and a combination of the two (Chang, Hsu & Yen, 2012). Mertins *et al*. (2003), remark that one of each three companies uses soft and hard indicators to evaluate the results of KM initiatives. What is clear is that before defining a method to measure the impact of KM initiatives, organizations must clearly define the objectives of this measurement (Skyrme & Amidon, 1998).

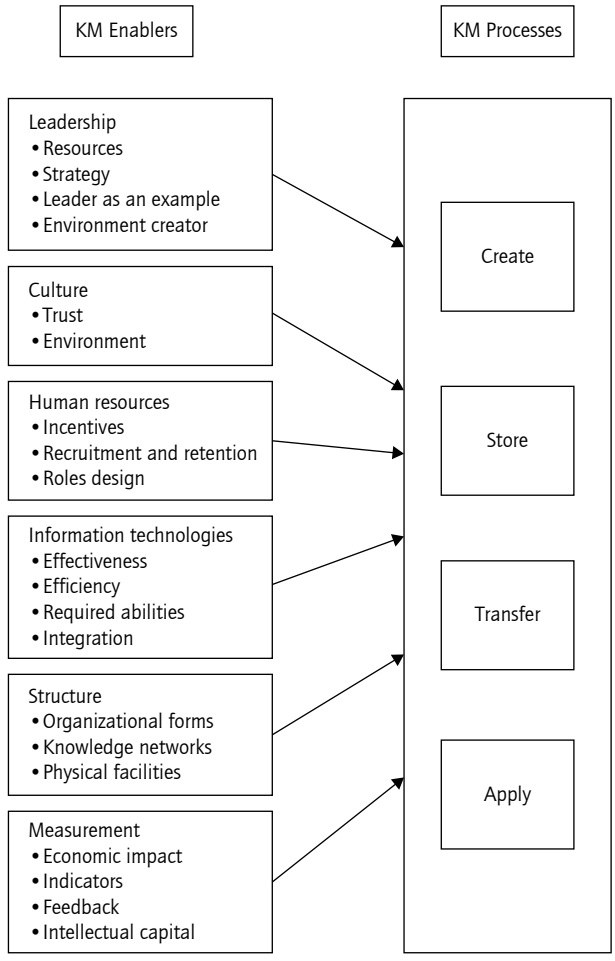
Theoretical Model

Drawing on the literature reviewed in the previous section, this part of the paper introduces the Knowledge Management Model developed in the current study, as shown in Figure 1. The model is composed by six enablers: leadership, culture, structure, human resources, information technologies and measurement. Altogether, these six enabling conditions are expected to facilitate the processes of knowledge creation, storage, transference and application. It is important to clarify that these four processes and six enablers are not discrete, independent and isolated, but they are rather dynamic and interdependent. Thus for KM initiatives to succeed it is not required of an excellent performance in a single activity, but rather to support the four activities as an integrated process.

This study asserts that the proposed model holds the potential for explaining how KM enablers relate to KM processes. Three main objectives of the proposed model are set up:

1. to evaluate the degree of development of KM processes: creation, storage, transference and application;
2. to evaluate the degree of implementation of KM enablers: leadership, culture, structure, human resources, information technologies and measurement;
3. to establish the relations among the elements of the model within the context of the case study.

FIGURE 1. Proposed KM model



Source: Own elaboration.

Research Methodology

Sample and Data Collection

Data was collected through the application of a 65 question paper-based survey to the whole board of directors of a Mexican University. For each item, the survey requested the participant to evaluate in a five-point Likert-type scale (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree and 5 = strongly agree) the way they perceive each one of the exposed statements. In total, 36 employees were surveyed. Despite the fact these employees represents only 15% of the total population of the University, research subjects were selected for several reasons: they were familiar with the multiple aspects related

to a KM implementation; according to a group of research informants, they showed an authentic interests in KM; and their perceptions provided insights about an influential group critical for the success of the KM initiative.

A meeting session was carried out in order to apply the survey to all research participants. A cover letter explained the goal of the study and ensured participants that their opinions were kept anonymous and confidential. Additionally, a glossary of terms was included at the end of the survey to ensure that research participants had a consistent and clear view of the concepts included. Prior to the application of the survey, a pilot test was carried out to improve the final version of the instrument. This pilot test was also applied to 15 Master degree and four Ph.D. students who provided feedback to improve the instrument design. In this pilot test, the clarity of each statement as well as the suitable operation of each item was carefully revised.

Table 3 shows research participants' demographic information, including gender, age, positions held at the University and number of years working for the institution.

TABLE 3. Demographic characteristics of research participants

Demographic characteristics	Frequency	%
Gender		
Female	10	27.8
Male	26	72.2
Age		
Under 35	1	2.7
35-45	16	44.4
45-55	14	38.8
Over 55	5	13.8
Position held at the University		
Director	1	2.78
Assistant director	3	8.33
Head of department	32	88.8
Years in the institution		
From 5 to10	7	19.4
From 10 to 15	9	2
From 15 to 20	4	11.1
More than 20	16	44.4
Academic degree		
Ph.D.	3	8.3
Master degree	21	58.3
Bachelor degree	12	33.3
TOTAL	36	100

Source: Own elaboration.

Operationalization of Variables

All constructs were measured using different items. The operationalization of these constructs was primarily adapted from previous studies but modified to be applied in the context of HE institutions. The items used to measure each construct are summarized as follows (Table 4):

TABLE 4. List of items of each construct

Enablers	Item No.
I. Leadership	
1.1 Resources	
1.1.1 Financial resources	19
1.1.2 Human resources	29
1.1.3 Time	35
1.2 Strategy	
1.2.1 Use of information technologies	12
1.2.2 Clear and spread KM strategy	24
1.2.3 Awareness of tools, activities and benefits of KM	42
1.3 Leader by example	
1.3.1 Leader by example	6
1.4 Creating an appropriate work environment	
1.4.1 Appropriate work environment	32
II. Culture	
2.1 Trust	
2.1.1 Freedom and trust to new possibilities	10
2.1.2 Knowledge credit	21
2.1.3 Trust to resolve doubts	38
2.2 Environment	
2.2.1 Knowledge is power	2
2.2.2 Job security	15
2.2.3 Attitude toward mistakes	33
2.2.4 Employees collaboration	44
III. Human Resources	
3.1 Incentive systems	
3.1.1 Establishment of incentive systems	31
3.1.2 Non-financial incentives	43
3.1.3 Financial incentives	4
3.2 Recruitment and retention	
3.2.1 Knowledge positive attitude	36
3.2.2 Valuable employees retention	23
3.3 Role design	
3.3.1 Personal development opportunities	16
3.3.2 KM integration to daily activities	25
3.3.3 Role required skills	11

(Continue)

TABLE 4. List of items of each construct (*continued*)

Enablers	Item No.
IV. Information Technologies	
4.1 Effectiveness	
4.1.1 Existence of Information technologies	27
4.1.2 Applications and databases	14
4.1.3 Benefits of information technologies	5
4.2 Efficiency	
4.2.1 Use, maintenance and support	45
4.3 Required knowledge and skills	
4.3.1 Required knowledge and skills	22
4.4 Integration	
4.4.1 Integration to role activities	39
V. Structure	
5.1 Organizational forms	
5.1.1 Informal activities	13
5.1.2 Formal activities	41
5.1.3 Hierarchical levels	20
5.1.4 Departments interaction	30
5.2 Knowledge networks	
5.2.1 Teamwork and empowerment	1
5.2.2 Communities of practice	46
5.3 Physical facilities	
5.3.1 Buildings, offices and work spaces	8
VI. Measurement	
6.1 Economic impact	
6.1.1 Financial incentives	48
6.2 Indicators	
6.2.1 Financial indicators	49
6.2.2 Non-financial indicators	50
6.3 Feedback	
6.3.1 Feedback for improvement	51
6.4 Intellectual capital	
6.4.1 Metrics to measure intellectual capital	52

Processes	Item No.
P.1 Create	
P.1.1 Creation of new ideas and knowledge	26
P.1.2 Learning between employees	7
P.1.3 Sharing knowledge with clients and suppliers	18
P.1.4 Freedom and trust to new possibilities	10
P.1.5 Attitude toward mistakes	33
P.1.6 Personal development opportunities	16
P.2 Store	
P.2.1 Documenting key knowledge and lessons learned	9
P.2.2 Efficient processes to classify and store knowledge	40
P.2.3 Documented procedures	3
P.2.4 Applications and databases	14
P.2.5 Maintenance to physical facilities and electronic means	34
P.2.6 Time	35
P.3 Transfer	
P.3.1 Learning between employees	7
P.3.2 Sharing knowledge with internal clients and suppliers	18
P.3.3 Personal development opportunities	16
P.3.4 Buildings, offices and work spaces	8
P.3.5 Job security	15
P.3.6 Hierarchical levels	20
P.3.7 Knowledge is power	2
P.4 Apply	
P.4.1 Applying the appropriate knowledge	47
P.4.2 Applying the acquired knowledge	17
P.4.3 Context of the problem	28
P.4.4 Support to apply new ideas	37
P.4.5 Required skills and knowledge	22

(Continue)

TABLE 4. List of items of each construct (*continued*)

Source: Own elaboration.

Data Analysis, Hypothesis Definition and Discussion

Data Analysis

In order to carry out the statistical analysis of the data, different software was used: SPSS version 15.0, *Eviews* version 5, *Masters* version 5 and *Minitab* version 15. Data analysis proceeded in two complementary stages. An initial stage assessed the overall fit of the model (Table 5) and its convergent validity (Table 6).

The overall model fit was assessed in terms of the Root Mean Square Error of Approximation (RMSEA). In practice it has been found that a value near 0.05 or less indicates a good fit to the model; a value of 0.08 or less indicates an acceptable fit to the model (Steiger & Lind, 1980). As shown in Table 5, indices of Culture, Human Resources, Structure, Creation, Store and Apply exhibited a good fit with the data collected, whereas indices of Leadership, Information Technology, Measurement and Transfer showed an acceptable fit to the model. This in turn showed that the defined variables modeled the data well.

Convergent validity was assessed through reliability of question items. Reliability of a scale is used to examine internal consistency by calculating Cronbach's alpha value (Nunnally, 1979). Two Likert-type scales were analyzed, the first scale evaluated the level of implementation of KM enablers integrated by 41 items and the second evaluated the degree of development of KM processes integrated by 24 items. Table 6 shows the factor loadings of

the measurement items. For all items, these factors exceeded the recommended level of 0.5; indeed, the value of all items ranged from 0.71 (ITs, store and apply) to 0.89 (leadership). Based on these results it can be concluded that the instrument has a high reliability (0.96), indicating that the obtained results are consistent and coherent.

TABLE 5. Results of the overall model fit

		Root Mean Square Error of Approximation (RMSEA)	Not Acceptable	Acceptable	Good
Enablers	Leadership	0.059		✓	
	Culture	0.036			✓
	Human resources	0.048			✓
	Information technologies	0.071		✓	
	Structure	0.044			✓
	Measurement	0.080	✓		
Processes	Create	0			✓
	Store	0.04			✓
	Transfer	0.051		✓	
	Apply	0.027			✓

Source: Own elaboration.

TABLE 6. Results of reliability analysis

	Reliability	Items No.
Enablers	0.95	41
Leadership	0.89	8
Culture	0.72	7
Human resources	0.73	8
Information technologies	0.71	6
Structure	0.85	7
Measurement	0.86	5
Processes	0.91	24
Create	0.73	6
Store	0.71	6
Transfer	0.78	7
Apply	0.71	5
Total reliability	0.96	65

Source: Own elaboration.

In the second stage, once the overall fit of data to the model and the convergent validity were assessed, two Spearman correlations analysis for non-parametric data were run in order to evaluate the existing relations between KM processes and KM enablers. The levels of correlations found are shown in Table 7 with a confidence level of 99%.

In addition to the correlations found between KM processes and KM enablers, research participants were asked to assign a number from 1 to 6 to the KM enablers that they perceived to be the most important in supporting KM processes. Results are presented in Table 8, which shows how culture is perceived to be the most influential enablers to support KM processes. In contrast, IT is one of the least relevant enablers to support KM processes.

TABLE 7. Results of correlation analysis between enablers and processes

	Create	Store	Transfer	Apply
Leadership	0.675	0.615	0.707	0.73
Culture	0.74	0.565	0.677	0.681
Human resources	0.622	0.437	0.711	0.625
Information technologies	0.423	0.656	0.364	0.471
Structure	0.634	0.674	0.777	0.699
Measurement	0.513	0.621	0.476	0.573

Source: Own elaboration.

TABLE 8. Relevance of KM enablers as perceived by research participants

Enabler	Mean
Leadership	4.11
Culture	4.77
Human resources	3.47
Information technologies	2.97
Structure	3.5
Measurement	2.16

Source: Own elaboration.

Hypotheses Definition

According to the results introduced in Tables 7 (secondary hypothesis) and 8 (core hypothesis), the following hypotheses are suggested to be explored in further studies:

- ***Hypothesis 1***. Culture is perceived as the most influential enabler to knowledge management processes.
- ***Hypothesis 2***. Information technologies are perceived as the least influential enabler to knowledge management processes.
- ***Hypothesis 3***. Leadership has the greatest positive impact in the process of knowledge application.
- ***Hypothesis 4***. Culture has the greatest positive impact in the process of knowledge creation.
- ***Hypothesis 5***. Structure has the greatest positive impact in the process of knowledge storage.
- ***Hypothesis 6***. Structure has the greatest positive impact in the process of knowledge transfer.

As shown by previous research, culture has been regarded as the most critical feature in supporting knowledge management processes (Heisig, 2009; Richter & Pawlowski, 2008; Bick & Pawlowski, 2009). As measured in this study,

aspects such as trust (Muneer, Iqbal & Long, 2014), collaboration among co-workers (Liebowitz, 2012) and tolerance toward mistakes (Vera & Crossan, 2005), have been found to be influential in supporting knowledge sharing.

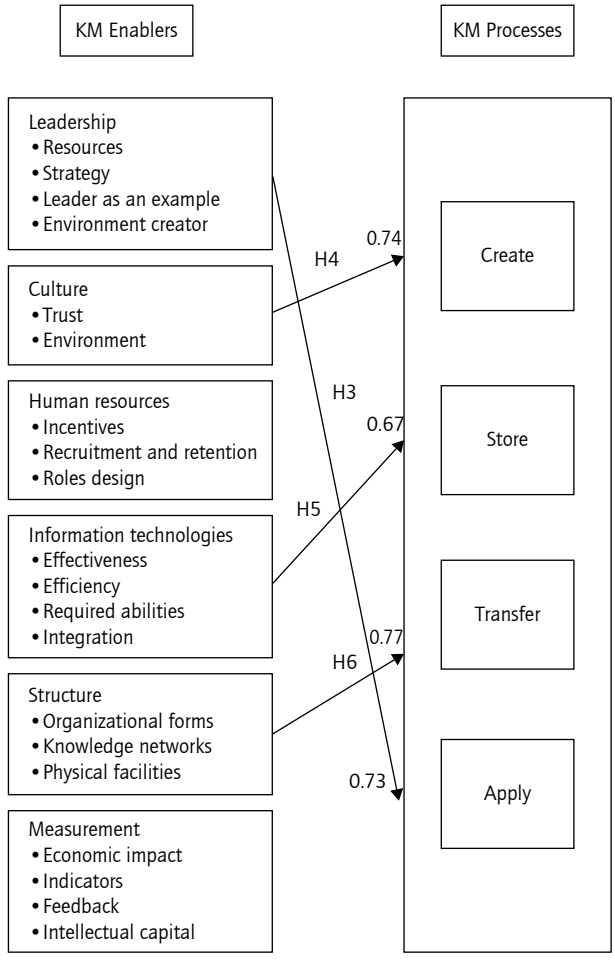
In relation to the hypothesis about IT as the least influential enabler to knowledge management processes, other studies are also in line to this finding showing that the enabler Information Technology has been overrated several times (Krzakiewicz & Cyfert, 2012). Similarly, authors such as Andreeva and Kianto (2012), and Davison, Ou and Martinsons (2013), have also found that this enabler (ITs) has no impact on KM initiatives unless cultural and social aspects are also considered.

Similarly, previous research (Rašula *et al*., 2012; Fullwood *et al*., 2013; Mas-Machuca & Martínez-Costa, 2012; Singh & Kant, 2008) has concluded that organizational structure is also critical in processes of knowledge storage and transfer as suggested by the finding of our study presented in Hypotheses 5 and 6. Sáenz *et al.* (2012), for example, found that an environment where interactive dialogue is promoted —dimension of organizational structure— facilitates the generation and transfer of new ideas. In contrast, Miller *et al*. (2007), found that creating knowledge-oriented practices can be designed to create a supporting environment for knowledge flows. Finally, our study found a positive relation among the enabler leadership and the process of knowledge application. These findings are highly consistent with previous studies on KM research (Garavelli *et al*., 2004; Von Krogh *et al*., 2012).

Figure 2 shows the structural model in which the correlations related to hypotheses three, four, five and six are represented; this to avoid that the model creates confusion. It is necessary to take into account that this is an exploratory study, what means that the six hypotheses suggested are tentative assertions about the relations between KM enablers and KM processes. Further research needs to be conducted in order to test the hypothesis.

A second concern for discussion points to the empirical findings of the study. According to the perception of the Board of Directors surveyed, culture was perceived as the most influential KM enabler to KM processes, while information technologies were perceived as the least influential. When KM enablers were correlated in an independent way, structure, culture and leadership were found to have the greatest positive impact in KM processes. In that way, the current study argues for the critical role that the social, human and cultural aspects play in KM initiatives (Heisig, 2002; Lehaney *et al.*, 2004; Huysman & Wit, 2002; Nonaka & Takeuchi, 1995).

FIGURE 2. Results of the correlation model



Source: Own elaboration.

Organizations and institutions can thus create an environment where continuous participation and learning opportunities are promoted; open communication is the rule rather than the exception; barriers between departments and hierarchies are to be eliminated; and trust among all employees is developed to explore new possibilities. It has also become clearer that information technologies play an important role in KM initiatives but not sufficient to succeed. Focusing only on information technologies when KM initiatives are implemented might overcome the relevance of other critical aspects to be considered.

Implications and Conclusions

This study has developed and applied a KM model to the context of a HE institution in Mexico. The proposed model, which is an initial contribution of the current study, shows that KM processes can be facilitated through a set of KM enablers. As shown in our research, this model emerged from the review of a series of studies and KM models.

Additionally, we argue that the proposed model is holistic, since it considers the cultural, social, human and technological aspects of an organization as well as an integral knowledge cycle for creating value (Ruggles, 1997; Alavi & Leidner, 2001; Mertins *et al*., 2003; Handzic & Zhou, 2005; Gairín & Rodríguez-Gómez, 2011). The validity and reliability of the model also suggest that it can be used as an instrument to evaluate KM initiatives in HE institutions. Furthermore, when evaluating KM initiatives through the proposed model, measurable results can be obtained to identify areas that require of improvement.

The study has practical implications for Mexican Universities in particular and for HE Institutions in general, which can be categorized into four dimensions. First, Universities can benefit from the use of a KM such as the developed in this paper, to identify, develop and evaluate their knowledge assets, in order to improve the knowledge sharing process that impacts core activities such as teaching, researching and consulting. Second, the findings suggest that for KM initiatives to succeed, Universities need to deploy not only financial resources but also non-financial schemes; whereas resources such as investment in facilities, economic rewards and information technologies seem to be relevant, other aspects such as development of trust, embracement of a friendly work environment and leadership by example are also needed. Third, although the use of Information Technologies is important to support KM initiatives, Universities must not undermine the social, human and cultural character of knowledge processes; aspects such as power, informal relations, status and rules of thumb must be brought to the fore. Fourth, the model proposed in this paper is to be seen by Universities as a dynamic model in which enablers and processes are interconnected and in continuous change, thus requiring flexibility in its application and continuous monitoring.

This study is not without limitations that require caution and further research. Since the study was conducted within the context of a Mexican University, what has been found may not hold true in other contexts. For that reason, it is recommended to test the model in different organizations, considering that culture differences can influence employee perception about how they perceive KM processes and KM enablers. A second limitation relates to the data collection method used. In order to improve reliability and validity of findings, the use of different measuring instruments such as participant observation, semi-structured interviews and analysis of physical artifacts is recommended. A final limitation points to the cross-sectional approach taken in the study. It might be desirable to conduct a longitudinal research to identify how KM processes and KM enablers develop over time.

References

Ackerman, M., Pipek, V., & Wulf, V. (Eds.) (2003). *Sharing Expertise: Beyond knowledge management*. Cambridge, MA: MIT Press.

Alavi, M., & Leidner, D. (2001). Knowledge Management and Knowledge Management Systems: conceptual foundations and research issues. *MIS Quarterly*, *25*(1), 107-136.

American Productivity and Quality Center - APQC (1999). *Knowledge management: executive summary.* Consortium Benchmarking Study Best-Practice Report, APQC. Houston, TX. Avaliable at: www.apqc.org [accessed on April 2007].

Andreeva, T., & Kianto, A. (2012). Does knowledge management really matter? Linking Knowledge Management practices, competitiveness and economic performance. *Journal of Knowledge Management*, *16*(4), 617-636.

Beckham, T. (1999). The current state of knowledge management. In: Liebowitz, J. (Ed.) (1999). *Knowledge Management Handbook.* 1-22. Boca Raton: CRC Press LLC.

Bick, M., & Pawlowski, J. M. (2009). Applying Context Metadata in Ambient Knowledge and Learning Environments. A process-oriented Perspective. In: Hinkelmann, K., Wache, H. (Eds.) (2009). *5th Conference on Professional Knowledge Management. Experiences and Visions*, 52-61. Bonn: Köllen Druck+Verlag GmbH.

Bose, R. (2004). Knowledge management metrics. *Industrial Management and Data Systems*, *104*(6), 457-468.

Bukowitz, W., & Williams, R. (1999). *The Knowledge Management Fieldbook*. London: Prentice-Hall.

Carrillo, J. (2001). *La Evolución de las Especies de Gestión del Conocimiento: Un reporte expedicionario de los nuevos territorios.* Intervención a distancia en el evento Entorno empresarial del siglo XXI. Cinco años del Clúster del Conocimiento. Bilbao, España, 21 de junio de 2001.

Chan, Y. Y., & Chan, C. K. (2013). *A Multiple-Case Study in a Stochastic Demand Industry to Sustain Autopoietic Property of Knowledge Agent*. Proceedings of the KIM2013 Conference. Avaliable at: http://www.theorsociety.com/Media/DocRepository/1344/KIM2013%20Conference%20Proceedings%20%2015.05.2013_13082013103357.pdf#page=7.

Chang, C. M., Hsu, M. H., & Yen, C. H. (2012). Factors affecting knowledge management success: the fit perspective. *Journal of Knowledge Management, 16*(6), 847-861.

Chase, R. (1997). The knowledge-based organization: an international survey. *Journal of Knowledge Management*, *1*(1), 38-49.

Chong, S., & Choi, Y. (2005). Critical factors in the successful implementation of knowledge management. *Journal of Knowledge Management Practice*, *June*. Avaliable at: http://www.tlainc.com/articl90.htm.

Davenport, T., De Long, D., & Beers, M. (1998). Successful knowledge management projects. *Sloan Management Review*, *39*(2), 43-57.

Davenport, T., & Prusak, L. (1998). *Working Knowledge: How organizations manage what they know?* Boston, MA: Harvard Business School Press.

Davison, R. M., Ou, C. X., & Martinsons, M. G. (2013). Information technology to support informal knowledge sharing. *Information Systems Journal*, *23*(1), 89-109.

De Long, D., & Fahey, L. (2000). Diagnosing cultural barriers to knowledge management. *The Academy of Management Executive*, *14*(4), 113-127.

Earl, M. (2001). Knowledge management strategies: Toward a taxonomy. *Journal of Management Information Systems*, *18*(1), 215-233.

Eppler, M. J., & Sukowski, O. (2000). Managing team knowledge: Core processes, tools and enabling factors. *European Management Journal*, *18*(3), 334-341.

Friedman, R. S., & Prusak, L. (2008). On heuristics, narrative and knowledge management. *Technovation*, *28*(12), 812-817.

Fullwood, R., Rowley, J., & Delbridge, R. (2013). Knowledge sharing amongst academics in UK universities. *Journal of Knowledge Management*, *17*(1), 123-136.

Gairín, J., & Rodríguez-Gómez, D. (2011). Cambio y mejora en las organizaciones educativas. *Educar*, *47*(1), 31-50.

Garavan, T. N., Carbery, R., & Murphy, E. (2007). Managing intentionally created communities of practice for knowledge sourcing across organisational boundaries: Insights on the role of the CoP manager. *The Learning Organization*, *14*(1), 34-49.

Grover, V., & Davenport, T. (2001), General perspectives on knowledge management: fostering a research agenda. *Journal of Management Information System*, *18*(1), 5-21.

Grundstein, M. (2013). Towards a technological, organizational, and socio-technical well-balanced KM initiative strategy: a pragmatic approach to knowledge management. *Knowledge Management Research & Practice*, *11*(1), 41-52.

Handzic, M., & Zhou, A. (2005). *Knowledge Management. An integrative approach*. Oxford, England: Chandos Publishing.

Hasanali, F. (2002). *Critical success factors of knowledge management*. Available at: www.kmadvantage.com/docs/km_articles/Critical_Success_Factors_of_KM.pdf (accessed 20 November 2012).

Heisig, P. (2002). *European Guide to Good Practice in Knowledge Management. Frameworks on Knowledge Management*. Berlin: Fraunhofer IPK.

Heisig, P. (2009). Harmonisation of knowledge management– comparing 160 KM frameworks around the globe. *Journal of Knowledge Management*, *13*(4), 4-31.

Hinds, P. J., & Pfeffer, J. (2003). Why organizations don't know what they know: Cognitive and motivational factors affecting the transfer of expertise. In: Huysman, M., & De Wit, D. (2002). *Knowledge sharing in practice*. Kluwer: Dordrecht.

Holsapple, C. W., & Joshi, K. D. (2000). An investigation of factors that influence the management of knowledge in organization. *Journal of Strategic Information Systems, 9*(2/3), 235-261.

Horwitch, M., & Armacost, R. (2002). Helping knowledge management be all it can be. *Journal of Business Strategy*, *23*(3), 26-31.

Horwitch, M., & Stohr, E. A. (2008). Transforming technology management education: Value creation-learning in the early twenty-first century. In: Management of Engineering & Technology, 2008 (pp. 2015-2026). PICMET 2008. *Portland International Conference-IEEE*. Cape Town, South Africa, 27-31 July 2008.

Kannan, G., Aulbur, W., & Haas, R. (2011). *Management in Practice: Making Technology Work at DaimlerChrysler*. In: Rao, M. (Ed.) *Knowledge Management Tools and Techniques*. London: Routledge.

Karlsen, J., & Gottschalk, P. (2004). Factors affecting knowledge transfer in IT Projects. *Engineering Management Journal*, *16*(1), 3-11.

Kemp, J., Putladz, M., Pérez, P., & Muñoz-Ortega, A. (2002). *KM Framework*. Research paper of the European KM Forum (IST Project No 2000-26393).

Knowledge Management Maturity Model- KMMM (2001). *Methodology for assessing and developing maturity in Knowledge Management*. Available at: http://www.kmmm.org/objects/KMMM_Flyer.pdf [accessed on June 2007].

Krzakiewicz, K., & Cyfert, S. (2012). The role of leaders in managing organisation boundaries. *Management*, *16*(1), 7-22.

Lave, J., & Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press.

Lehaney, B., Clarke, S., Coakes, E., & Jack, G. (2004). *Beyond Knowledge Management*. Hershey, PA: Idea Group Publishing.

Liebowitz, J. (1999). Key ingredients to the success of an organization's knowledge management strategy. *Knowledge and Process Management*, *6*(1), 37-40.

Liebowitz, J. (Ed) (2012). *Knowledge Management Handbook*. Boca Raton: CRC Press LLC.

Lin, H. (2006). Impact of organizational support on organizational intention to facilitate knowledge sharing. *Knowledge Management Research and Practice*, *4*, 26-35.

Luo, S. H., & Lee, G. G. (2013). Key factors for knowledge management implementation. *Social Behavior and Personality*, *41*(3), 463-476.

Markus, A. (2001). Toward a theory of knowledge reuse: types of knowledge reuse situations and factors in reuse success. *Journal of Management Information Systems*, *18*(1), 57-93.

Mas-Machuca, M., & Martínez-Costa, C. (2012). Exploring critical success factors of knowledge management projects in the consulting sector. *Total Quality Management & Business Excellence*, *23*(11-12), 1297-1313.

Mertins, K., Heisig, P., & Vorbeck, J., (2003). *Knowledge Management. Concepts and Best Practices*. Berlin: Springer Verlag.

Miller, B., Bierly, P., & Daly, P. (2007). The knowledge strategy orientation scale: individual perceptions of firm-level phenomena. *Journal of Managerial Issues*, *19*(3), 414-435.

Muneer, S., Iqbal, J., & Long, C. S. (2014). An Incorporated Structure of Perceived Organizational Support, Knowledge-Sharing Behavior, Organizational Trust and Organizational Commitment: A Strategic Knowledge Management Approach. *Pakistan Journal of Commerce and Social Sciences*, *8*(1), 42-57.

Nonaka, I., & Konno, N. (1998). The concept of Ba: building a foundation for knowledge creation. *California Management Review*, *40*(3), 40-44.

Nonaka, I., & Takeuchi, H. (1995). *The Knowledge-creating Company*. New York: Oxford University Press.

Nonaka, I., & Teece, D. (2001). *Managing industrial knowledge*. London: Thousand Oaks SAGE.

Nunnally, J. (1979). *Psychometric Theory*. New York: McGraw-Hill.

Pentland, B. (1995). Information systems and organizational learning: the social epistemology of organizational knowledge systems. *Accounting, Management and Information Technologies*, *5*(1), 1-21.

Pentland, D., Forsyth, K., Maciver, D., Walsh, M., Murray, R., Irvine, L., & Sikora, S. (2011). Key characteristics of knowledge transfer and exchange in healthcare: integrative literature review. *Journal of Advanced Nursing*, *67*(7), 1408-1425.

Poole, A. (2000). The view from the floor. What KM looks like through the employee's lens. *Knowledge Management Review*, *3*, 8-10.

Probst, G., Buchel, B., & Raub, S. (1998). Knowledge as a Strategic Resource. In: G. Krogh, J. Ross y D. Kleine (Eds.), *Knowing in firms. Understanding, Managing and Measuring Knowledge*, 240-252. London, New Delhi: SAGE Publications.

Prusak, L. (2002). "The death and transfiguration of knowledge management". *First International Conference on the Future of Knowledge Management*, Septiembre, Berlin.

Rašula, J., Bosilj-Vukšić, V., & Indihar Štemberger, M. (2012). The impact of knowledge management on organisational performance. *Economic and Business Review*, *14*(2), 147-168.

Richter, A., Stocker, A., Müller, S., & Avram, G. (2013). Knowledge management goals revisited: A cross-sectional analysis of social software adoption in corporate environments. *VINE, 43*(2), 132-148.

Richter, T., & Pawlowski, J. M. (2008). Adaptation of E-Learning Environments: Determining National Differences through Context Metadata. TRANS - *Internet Journal for Cultural Studies*, *17*.

Rivera, G. (2007). *Diseño, medición y análisis de un Modelo de Administración del Conocimiento*. Master Dissertation. Instituto Tecnológico de Monterrey, Monterrey, NL, México.

Ruggles, R. (1997). *Knowledge Management Tools*. Boston, Oxford: Butterworth-Heinemann.

Sáenz, J., Aramburu, N., & Blanco, C. (2012). Knowledge Sharing and Innovation in Spanish and Colombian High-Tech Firms. *Journal of Knowledge Management*, *16*(6), 919-933.

Satayadas, A., Harigopal, U., & Cassaigne, N. (2001). Knowledge management tutorial: An editorial overview. *IEEE Transactions on Systems, Man and Cybernetics* (Part C), *31*(4), 429-437.

Scholl, W., Konig, C., Meyer, B., & Heisig, P. (2004). The future of knowledge management: an international delphi study. *Journal of Knowledge Management. 8*(2), 19-35.

Singh, M. D., & Kant, R. (2008). Knowledge management barriers: An interpretive structural modeling approach. *International Journal of Management Science and Engineering Management*, *3*(2), 141-150.

Skyrme, D. (2003) Measuring the value of knowledge. Metrics for the Knowledge-Based Business. Available at: http://www.skyrme.com/pubs/measures.htm [accessed on April 2007].

Skyrme, D., & Amidon, M. (1998). New measures of success. *The Journal of Business Strategy*, *19*(1), 20-24.

Snowden, D. (1998). A framework for Creating a Sustainable Programme. In: Rock, S. (Ed.) (1998). *Knowledge Management. A real business Guide*. London: Caspian Publishing Ltd.

Snowden, D. (2000). The social ecology of knowledge management. In: Despres, C., & Chauvel, D. (Eds.) (2000). *Knowledge Horizon*. Woburn: Butterworth-Heinemann.

Spek, R. Van der, & Carter, G. (2003). A survey on Good Practices in Knowledge Management in European Companies. In: Mertins, K., Heisig, P., & Vorbeck, J. (Eds.) (2003). *Knowledge Management. Concepts and Best Practices*. Berlin: Springer Verlag.

Steiger, J. H., & Lind, J. C. (1980). *Statistically-based tests for the number of common factors.* Annual Spring Meeting of the Psychometric Society, Iowa City, Iowa, US.

Sveiby, K., & Simons, R. (2002). Collaborative climate and effectiveness of knowledge work- an empirical study. *Journal of Knowledge Management*, *6*(5), 420-433.

Tambe, P., & Hitt, L. M. (2012). The Productivity of Information Technology Investments: New Evidence from IT Labor Data. *Information Systems Research*, *23*(3), 599-617.

Trusson, C. R., Doherty, N. F., & Hislop, D. (2014). Knowledge sharing using IT service management tools: conflicting discourses and incompatible practices. *Information Systems Journal*, *24*(4), 347-371.

Vera, D., & Crossan, M. (2005). Improvisation and innovative performance in teams. *Organization Science*, *16*(3), 203-224.

Von-Krogh, G., Nonaka, I., & Rechsteiner, L. (2012). Leadership in organizational knowledge creation: a review and framework. *Journal of Management Studies*, *49*(1), 240-277.

Vorbeck, J., Heisig, P., Martin, A., & Schutt, P. (2003). Knowledge Management in a Global Company. In: Mertins, K., Heisig, P., & Vorbeck, J. (Eds.) (2003). *Knowledge Management. Concepts and Best Practices*. Berlin: Springer Verlag.

Wiig, K. M. (1997), Knowledge management: and introduction and perspective. *Journal of Knowledge Management*, *1*(1), 6-14.

Wong, K. Y. (2005). Critical success factors for implementing knowledge management in small and medium enterprises. *Industrial Management + Data Systems*, *105*(3/4), 261-279.

Woodman, M., & Zade, A. (2012). Five Grounded Principles for Developing Knowledge Management Systems. *Electronic Journal of Knowledge Management*, *10*(2), 183-194.

Zhang, D., & Zhao, L. (2006). Knowledge Management in Organizations. *Journal of Database Management*, *17*(1), 1-8.

Zhou, A., & Fink, D. (2003). Knowledge management and intellectual capital: an empirical examination of current practice in Australia. *Knowledge Management Research and Practice*, *1*(2), 86-94.