



MARMARA UNIVERSITY
INSTITUTE FOR GRADUATE STUDIES
IN PURE AND APPLIED SCIENCES



ASSESSING THE KNOWLEDGE MANAGEMENT
CAPABILITIES OF ENTERPRISES:
DEVELOPING ENTERPRISE INTELLIGENCE INDEX AND A
CASE STUDY

EVREN SATICI

Ph.D. THESIS

Department of Engineering Management

Thesis Supervisor

Assoc. Prof. Dr. Özalp VAYVAY

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Evren SATICI, a Doctor of Philosophy student of Marmara University Institute for Graduate Studies in Pure and Applied Sciences, defended his thesis entitled “**Assessing The Knowledge Management Capabilities of Enterprises: Developing Enterprise Intelligence Index and A Case Study**”, on 09/12/2014 and has been found to be satisfactory by the jury members.

Jury Members

Assoc. Prof. Dr. Özalp VAYVAY (Advisor)

Marmara University

Prof. Dr. Yasemin Claire ERENSAL (Jury Member)

Okan University

Prof. Dr. Murat DİNÇMEN (Jury Member)

Istanbul Technical University

Prof. Dr. Gülruh GÜRBÜZ (Jury Member)

Marmara University

Assoc. Prof. Dr. Hakan TOZAN (Jury Member)

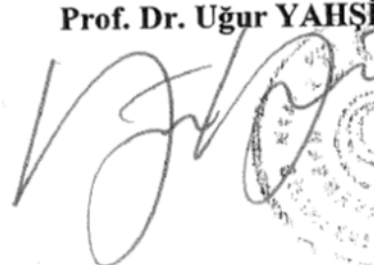

Naval Academy

APPROVAL

Marmara University Institute for Graduate Studies in Pure and Applied Sciences Executive Committee approves that Evren Satıcı be granted the degree of Doctor of Philosophy in Engineering Management Department, Engineering Management Program on 22/12/2014 (Resolution no: 2014/27-83.....).

Director of the Institute

Prof. Dr. Uğur YAHSİ

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ÖZET

KURUMLARIN BİLGİ YÖNETİMİ KABİLİYETLERİNİN DEĞERLENDİRİLMESİ: KURUMSAL ZEKA ENDEKSİNİN GELİŞTİRİLMESİ VE BİR VAKA ÇALIŞMASI

Her gün şirketler binlerce değer biçilemez bilgi üretmekte fakat birçoğu arkalarında iz bırakmadan uçup gitmektedir. Bu arzu edilmeyen bilgi kaybını önlemek ve bilgiyi şirketin bilgi hafızasında tutmak için şirketler bilgi yönetim sistemleri kurmaktadır. Bilgi yönetimi uygulamalarına yapılan yatırımların artması ile bilgi yönetimi uygulamalarının ölçümüne olan ilgi de artmaktadır. Bilgi yönetimi ile ilgili ölçümler strateji ve aksiyonlar arasındaki bağın kurulmasını ve mevcut performansın gözden geçirilerek gelişmesini sağlar. Söz konusu bu çalışma şirketlerin bilgiyi elde etme ve kullanabilme olarak tanımlanabilecek zekalarının olduğunu önermektedir. Şirketler veriden bilgi üretirler, bu bilgiyi analiz ederek süreçlerine değer katacak yeni bilgiler elde ederler ve yeni elde ettikleri bilgiyi süreçlerinde kullanırlar. Tüm bunlar şirketlerin bilgiyi kullanabilme yeteneklerini daha iyi anlayabilmek için Kurumsal Zeka Endeksi oluşturma ihtiyacı doğurmuştur. Kurumsal Zeka Endeksinin oluşturmak için 42 ölçekli bir model geliştirildi. Türkiye’de finans, bilişim, telekomunikasyon, hızlı tüketim sektörlerinin önde gelen şirketlerinin bilişim, insan kaynakları, satış, pazarlama, müşteri ilişkileri yönetimi departmanlarından 144 orta ve üst düzey yöneticisi anketi yanıtladı. Endeksin bileşik yapısı nedeniyle açıklayıcı ve doğrulayıcı faktör analizleri gerçekleştirildi. Sonuçlar Kurumsal Zeka Endeksinin anlamlı faktör yüklemeleri neticesinde 8 ana faktör olduğunu ortaya koymuştur: Organizasyon ve Yapı, Kültür, İş birlikleri, Süreçler, Ölçümler, Yetkinlikler ve Teknoloji ve Altyapı. Bu faktörler Kurumsal Zeka Endeksinin yüzde 53’ünü kabul edilir ölçek içi tutarlılıkla açıklayabilmiştir. Bu çalışma şirketlerin Kurumsal Zeka alanında mevcutta yaptıkları çalışma ile performanslarını geliştirmek için yapmaları gerekenler arasındaki farkı anlamalarını sağlama yolunda atılan ilk adımdır. Makro seviyede endeks şirketlerin birbirileri arasında karşılaştırma yapabilmelerini sağladığı gibi mikro seviyede kurum içi gelişime açık alanların tespitini sağlamaktadır. Her iki seviyede de endeks karar verme ve organizasyonel gelişim alanlarında önemli ve güvenilir bir gösterge olarak kullanılabilir. Kurumsal Zeka Endeksi ile şirketler yıllar

boyunca gelişimlerini takip edebilecekleri gibi rakipleri ile de herhangi bir anda karşılaştırma yapabileceklerdir.

ABSTRACT

ASSESSING THE KNOWLEDGE MANAGEMENT CAPABILITIES OF ENTERPRISES: DEVELOPING ENTERPRISE INTELLIGENCE INDEX AND A CASE STUDY

Every day, organizations create thousands of invaluable information but many of them just fly away with leaving no mark behind. To avoid this undesirable loss, organizations build knowledge management (KM) systems to keep the information recorded in the organization's knowledge base. With increasing investments in KM implementations, measuring organizational benefits of KM initiatives has become an important agenda among KM practitioners. Measuring knowledge provides a mechanism to evaluate, control, and improve on existing performance and forms essential linkages between strategy and actions. The current study proposes that organizations have intelligence which is defined as ability to acquire and apply knowledge skills. They create information from data, identify new information adding value to its processes through analyzing the information gathered and use the information in its processes. All these indicate a need for a scale to measure Enterprise Intelligence Index (EII) in order for better understanding of an organization's ability to keep and manage information. To develop EII, total 42 item scale was constructed. 143 mid- or senior-level IT, HR, CRM, sales, marketing managers of leading finance, IT, telecommunications, FMCG companies in Turkey responded to the survey. Due to the composite structure of the index, the factorial structure was analyzed with explanatory and confirmatory methods. The results indicated that there were 8 broad factors of EII - *Leadership and Vision, Organization and Structure, Culture, Partnerships, Processes, Measures, Competencies, Technology and Infrastructure* with significant level of item loadings. These factors explained the total 53% of overall EII with acceptable levels of inter-item consistency. The study was one of the first steps in understanding the difference between what organizations is currently doing and what it needs to do in order to maintain and improve its performance level regarding with EII. At the macro level the index will enable organizations to compare themselves with each other. At the micro level, it calls attention to areas needing improvement in current and future initiatives. In

either case, the index provides robust indicator and basis for decision making and organizational support and development. By the help of EII, organizations will be able to monitor their own progress among years as well as they can benchmark their status compared to the competition at any given time.

CLAIM OF ORIGINALITY

Enterprise Intelligence is defined as the ability of an enterprise to create information from data it has, to identify new information adding value to its processes through analyzing the information gathered and to use the information in its processes. Measuring knowledge provides mechanism to evaluate, control and improve performance and forms essential linkages between strategy and actions. Having a standardized but comprehensive measurement allows enterprises grow to

- determine what needs to be improved
- provide a scoreboard for self-monitoring
- give an indication of the cost of poor implementation
- provide a standard for comparisons
- align efforts with business objectives

This study aims to create an index for companies which can be used as a practical tool in order to

- identify the needs before initiating a KM project
- monitor KM success of the enterprise along the years and make necessary improvements based on action plans
- measure how well the company is doing regarding KM area
- identify the improvement areas to improve
- benchmark the different companies regarding their KM capabilities
- associate their KM success with business results (customer satisfaction and financial results)

Having this practical tool in place, companies will have the opportunity to assess their enterprise intelligence by addressing key factors at any given time.

ABBREVIATIONS

APQC	:	American Productivity & Quality Center
CEO	:	Chief Executive Officer
CFA	:	Confirmatory Factor Analysis
CMM	:	Capability Maturity Model
CSF	:	Critical Success Factors
DSS	:	Decision Support System
EFA	:	Exploratory Factor Analysis
EFQM	:	European Foundation for Quality Management
EII	:	Enterprise Intelligence Index
IT	:	Information Technologies
KA	:	Knowledge Accumulation
KC	:	Knowledge Creation
KCP	:	Knowledge Creation Process
KI	:	Knowledge Internalization
KS	:	Knowledge Sharing
KU	:	Knowledge Utilization
KM	:	Knowledge Management
KMAT	:	Knowledge Management Assessment Tool
KMPs	:	Knowledge Management Practices
KMPI	:	Knowledge Management Performance Index
KMS	:	Knowledge Management
KMMM	:	Knowledge Management Maturity Model System
NPV	:	Net Present Value
P/E	:	Price Earnings Ratio
R&D	:	Research and Development
ROI	:	Return on Investment
SECI	:	Socialization, Externalization, Combination, Internalization
XML	:	Extensible Markup Language

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1. : INTRODUCTION

1.1. Aim

Every day, organizations create thousands of invaluable information but many just fly away with leaving no sign behind. Likewise, organizations face challenges due to the costly mistakes which are duplicated as earlier ones were not recorded or analyzed, work often re-done as people are not aware of former activities and their outcomes, damaged customer relationships due to lack of knowledge unavailable at the point of action and limited number of employees holding crucial knowledge, risen overall costs as a result of hidden good ideas and best practices, and frustrated employees, all leading to slow learning organizations which result in delayed product development and/or several missed opportunities.

Contemporary business management attaches great importance to knowledge since it is as critical as tangible assets and it is a source of sustainable competitiveness for companies. Therefore, numerous researches discuss knowledge management process and several knowledge management process models are developed.

“Knowledge Management” (KM), described as all of the necessary activities to organize an environment in which people are facilitated to apply, develop, share, combine, and consolidate knowledge in order to achieve their individual and collective ambitions, systems to keep the information recorded in the organization’s knowledge base, has emerged in recent years as a means to improve business performance and can help to address all of these issues.

According to the definition of American Productivity & Quality Center (APQC), KM is a kind of strategy that delivers the right knowledge to the right people at the right time, helping members share information, and turning this sharing into actions that improve organizational effectiveness (Ho, 2009).

With increasing investments in KM implementations, measuring organizational benefits of KM initiatives has become an important agenda among KM practitioners as it provides a mechanism to evaluate, control and improve

existing performance and forms essential linkages between strategy and actions Barragán-Ocaña and Zubieta-García (2013) address the importance of knowledge utilization in R&D organizations and identify the critical factors. To maintain continued support of decision makers, practitioners need to both ensure and demonstrate that KM strategies have contributed to business activities. Lai et al. (2014) state that knowledge management can improve corporate innovation performance. Azma and Mostafapour (2012) conclude that the organizations can use business intelligence and information technology to collect information and analyze it managers make good decisions and additional cost savings and also improve performance and increase productivity. The greater the need to have a structured and systematic approach to what is being properly known as KM has begun to gain attention in recent years, the more relevant it become in this fast changing business world.

Markus (2001) developed a theory of organizational knowledge reuse stating that the corporate memory has an effect on present decisions playing an important role in the success of an organization's operations and response to changes and challenges. Liebeskind (1996), on the other hand, stated that in order to use knowledge management, firms develop a firm-specific knowledge management system and firms are able to develop a sustainable competitive advantage in KM by developing a mix of KM methods that complement and enable their core strategies (Hansen, 2002). However, despite large investments in KM technology, many of the performance outcomes are not clear and the causal relationship between what works and what does not work has not been established empirically (Liebeskind, 1996).

Another research indicates that since knowledge management activities are an integral component of other management activities and processes, assessing knowledge management concerns how and when knowledge management is integrated into organizational activities, which can be measured (Anantatmula and Kanungo, 2005). Thus, it is important to identify these activities and determine the contributions knowledge management makes to these activities. The study suggests that organizations should require less precision as well as more interest

in trends than exact figures using a balance scorecard approach such as customer and employee satisfaction and intellectual capital (Anantatmula and Kanungo, 2005).

All those studies are just one of the first steps in understanding the difference between what organizations is currently doing and how can and what it needs to do in order to maintain and improve its performance level.

Most organizations today recognize that knowledge is the currency of the 21st century (Crnkovic et al., 2005). This recognition motivates organizations to pursue a range of activities that fall under the canopy of knowledge management. Unfortunately because the field of knowledge management is still in its infancy and still evolving, there are as yet no time-tested or standard methodologies that organizations can employ to successful knowledge management (Crnkovic et al., 2005). Although there is general agreement that managing knowledge is beneficial, firms have had a hard time deciding what must be done in order to reap the maximum benefits of knowledge management (Crnkovic et al., 2005).

Every year, a further knowledge-based economy is emerging, and KM is being disseminated more in the business world (Chen and Chen, 2006). However, while an increasing number of companies have launched knowledge management initiatives, a large proportion of these initiatives retain unfortunately a technical perspective. The problem with this type of focus is the exclusion and neglect of potential benefits that may be derived from knowledge management. Thus, in the recent years the following types of question started proliferating whether it is really worthwhile to invest in KM, whether the implementation of KM has been a success and whether the KM systems of the companies are productive and effective (Chen and Chen, 2006).

In today's fast changing and non-linear business environment gaining competitive advantage is by managing intellectual capital, by leveraging the organization's knowledge; creating new knowledge or promoting innovation; and increasing collaboration while enhancing the skill level of employees (Arora,

2002). Many organizations are embracing KM but unfortunately few are able to implement it successfully to reap the benefits.

Current studies propose that organizations have intelligence which is defined as ability to acquire and apply knowledge skills. They create information from data, identify new information adding value to its processes through analyzing the information gathered and use the information in its processes. These studies also indicate a potential as well as a need for a scale to measure KM in order for a better understanding of an organization's ability to keep and manage information. However implementation of KM is a strategic process and needs careful target setting and review. Organizations that use balanced scorecard for strategy deployment can effectively implement KM in their organization by developing and deploying a KM index.

Study findings reveal that knowledge management efforts result in soft measures, which are not directly tied to end results. These results also imply that knowledge management outcomes are difficult to measure. However, efforts focused on improving these soft measures lead to gains in efficiency, effectiveness, and innovation, which in turn have a significant effect on what organizations seek.

Many companies have embarked on programs of knowledge management. Unfortunately after investing huge amounts of money and time they have started to wonder whether the effort has been worthwhile. The reason for the disenchantment is that they have little or no understanding of the value being derived from their efforts (Pervaiz et al, 1999). The vacuum has arisen because they have failed to put in place a tracking system to measure progress. This enforces the case for measurement. To reiterate, measurement is important: as you cannot manage what you cannot measure; to determine what to pay attention to and improve; to provide a scoreboard for people to monitor their own performance levels; to give an indication of the cost of poor implementation; to give a standard for making comparisons; to help efforts comply with business objectives. Generally organizational environments are committed to continuous

improvement but traditional summary measures of performance are generally harmful and incompatible with improvement measures (Pervaiz et al., 1999).

Performance measures need to promote and encourage the right behaviors within an organization, i.e. those behaviors that assist the organization in achieving its goals (Zairi, 1992). They need to reflect a positive image that encourages involvement and ownership within a non-threatening environment if it is to succeed in the development of a continuous improvement efforts. Accordingly, a fundamental characteristic of a good knowledge measurement system is performance reflected at various levels of organizational systems. It is measured at the strategic, tactical and operational levels; performance measurement is a distributed activity reflecting various levels of ownership and control; performance measurement reflects a blend of measures for individual tasks/activities to manage processes; performance measurement highlights opportunities for improvement in all areas with leverage points (Zairi, 1992).

Traditional performance measures focus on outputs, whereas there is a need to look towards the enablers that lead to the production of results. Enablers can be multifaceted and include elements such as leadership, people, systems, strategy, communication, etc. It is from these enablers that improvement benefits flow. Unfortunately whilst managers understand the concepts and the need for measurement many organizations fail to develop performance measurement systems to support their development due to failure to operationally define performance; failure to relate performance to the process; failure to define the boundaries of the process; misunderstanding or misusing measures; failure to distinguish between controlling and improving measures; measuring the wrong things; misunderstanding/misuse of information by managers; fear of distorting performance priorities; fear of exposing poor performance; perceived reduction in autonomy (Zairi, 1992).

Clearly the purpose for measuring is to help monitor the value of KM initiatives and to provide a link to the key performance indicators. This, however, is largely dependent on the purpose of the measurements. If the results are for

policing reasons, then they work against the principles of capturing, sharing and learning within the organization (Zairi, 1992).

The current study proposes that organizations have intelligence which is defined as ability to acquire and apply knowledge skills. They create information from data, identify new information adding value to its processes through analyzing the information gathered and use the information in its processes. All these indicate a need for a scale to measure Enterprise Intelligence Index (EII) in order for better understanding of an organization's ability to keep and manage information.

The study also aims at investigating relationship of enterprise intelligence index with financial performance and customer satisfaction results of companies. Hence, the study comprises three chapters. First chapter gives a broad perspective on conceptual discussion on knowledge management and other related concepts such as knowledge management systems, knowledge management processes, knowledge management performance indicators, knowledge management factors.

Next chapter further details knowledge management models. Having a detailed literature review on knowledge management, chapter identifies studies on modeling knowledge management systems.

Material and method are discussed in the following chapter. Confirmatory factor analysis as well as exploratory factor analysis is employed in the study to get dimensions of proposed model. Findings are also elaborated in the chapter. Study concludes with results and recommendations for future research.

1.2. Conceptual Discussion

Knowledge management is becoming increasingly important as organizations realize that sustainable competitive advantage hinges on effective management of their vast and varied knowledge assets (Kulkarni and Freeze, 2004). In order to be able to get "better" at managing knowledge, one needs to know how well one is managing it in the first place, having in mind Redman's "That which doesn't get measured, doesn't get managed" (1998). Hence, the first

step in any large scale KM initiative or project should be that of assessment or benchmarking. A scientific methodology concerning KM projects would allow an organization to gauge progress against assessment goals and can serve to guide the overall KM strategy.

There are two significantly challenging tasks that need to be addressed by a KM assessment methodology. One is defining knowledge and the other is constructing the metrics to assess how effectively an organization is managing its knowledge assets. Thus, we go further with describing what knowledge is and follow how to construct the metrics.

Although a conceptual understanding of knowledge can be approached from various perspectives, such as philosophical, religious, cognitive, practical, etc., the KM literature has focused on the practical perspective, discussing it, for example, in the data-information-knowledge continuum. In general, data may be accepted as a set of discrete facts about an event, information as data in a context, and knowledge as information combined with experience, context, interpretation, and reflection (Davenport et al., 1998).

Knowledge is a multidimensional concept that shows itself in the form of individuals with domain expertise, lessons learned from past similar experiences, documents, routines, methods, etc.

Nonaka and Konno (1998) think that knowledge is a “shared space for emerging relationships that can be either a physical space, virtual, mental or any combination of the above.” This concept is known as “ba” – place – and originally was proposed by Japanese philosophers Kitaro Nishida and refined by Shimizu. “Ba” provides a shared place that provides meaning. This intangible idea of knowledge differs markedly from tangible information that once separated from “Ba” can be communicated via media or networks. What is important to recognize from this definition is what knowledge is not. Knowledge is not information nor is it tangible.

Knowledge may be created and shared using “ba” but knowledge is constantly undergoing change and transformation to new levels of knowledge.

This change is presented in the SECI (socialization, externalization, combination, internalization) model of spiral evolution of knowledge creation and the self-transcending process (Nonaka and Konno, 1998) that uses the concept of an ever changing spiral evolution of knowledge from tacit to tacit through internalization and socialization and from tacit to explicit through externalization and combination. This is the definition used in this research because it succinctly presents that knowledge exists as a continuum and the interplay of tacit and explicit knowledge creates ever more knowledge.

Putting in other way, knowledge is such constantly changing and action-oriented individual rules, which are tacit (Sveiby, 1997). Nonaka et al. (1995) add dynamism to knowledge process to justify one's belief towards truth. They iterate the distinction between tacit knowledge, one in peoples' minds, and explicit knowledge, one in documents. Tacit knowledge is internal in nature and is relatively hard to code and extract. Not only does tacit knowledge need to be discovered, extracted, and captured; it has to be creatively disseminated so that this shared knowledge can be efficiently used to extend the KM base (Davis, 2002).

While Sveiby (1997) stresses individual level analysis, he contends that explicit knowledge is codified and transmittal communication measures that are formalized and systematized. On the other side, tacit knowledge needs to be formalized and systematized once it is personal and context-specific (Nonaka et al., 1995).

Furthermore, Nonaka et al. (1995) advocate that tacit knowledge has two dimensions; technical and cognitive. Wagner and Sternberg (1985) defined tacit knowledge as "that work-related practical knowledge learned informally on the job". This definition defines only one part of tacit knowledge, that is, the part that encompasses know-how. While technical dimension of tacit knowledge encompasses craft and skills mentioned in 'know-how' frame, the cognitive dimension encompasses 'mental models' such as schemata, paradigms, perspectives, beliefs, images of reality and vision of the future, which shape the individual's perception of the world (Kakabadse et al, 2001). The cognitive

dimension is related to the cultural shaping of the individual and the group. This cognitive dimension of tacit knowledge is a most important, yet most difficult, part of enabling knowledge creation and dissemination (Harlow, 2008).

It seems that a clear definition of knowledge has proven to be elusive over the years. Many authors confuse the concepts of knowledge and information and many a time the term knowledge is simply used in place of information (Nonaka et al., 1995). One's knowledge must be communicated to be available for use elsewhere; information hoards bring no value. Albert Einstein is quoted to have said that, "knowledge is experience, and everything else is information".

Nonaka et al. (1995) make three observations to describe how knowledge is similar to and different from information. First, knowledge unlike information is about beliefs and commitment. Knowledge is a function of a particular stance, perspective, or intention. Second knowledge, unlike information, is about action. It is always knowledge "to some end". And third knowledge, like information, is about meaning. It is context-specific and relational.

More relevant in this is for the following reason that everyone is facing the problem of information overload – so called info glut (Arora, 2002). The focus on documenting everything, creating and capturing all types of data and making them available to all and sundry in the organizations have created this problem. It is a common tendency in the organization that everyone wants all data that are generated even if they are not relevant. "Information is power" is still the knowledge paradigm in some of the organizations. So far we had all sorts of IT technologies that facilitate generation and dissemination of data. It is now that the executives have realized that they need IT to facilitate culling out of the right knowledge to help them in taking quick and correct decisions. The advent of IT tools has challenged the old inefficient methods of managing knowledge. Technology is now available to combat corporate amnesia and facilitate knowledge creation, capture, organization and transmission from the right people to the right people at the right time for the job (Arora, 2002).

Organizations and their executives are grappling with several concerns relating to the management and institutionalization of knowledge (Arora, 2002). The notion of how knowledge is acquired and how it is assembled and restructured can provide a competitive advantage for a company (Lee, 2005). The greater need to have a structured and systematic approach to what is being properly known as knowledge management has begun to gain attention in recent years and has become more relevant in this fast changing business world.

According to the definition of American Productivity & Quality Center (APQC), KM is a kind of strategy that delivers the right knowledge to the right persons at the right time. It can also help members share information, and turn this sharing into actions that improve organizational effectiveness which then can bring the collective intelligence influence ability into full play using knowledge sharing, and further increase the response and innovation abilities of an organization.

A great trap in knowledge management is using information management tools and concepts to design knowledge management systems (McDermott, 1999). KM is a systematic and organizationally specified process for acquiring, organizing and communicating both tacit and explicit knowledge to make use of it to be more effective and productive in a workplace.

Andrew et al. (2001) identify a strong relationship between organizational effectiveness and KM capability. Lingle and Schiemann (1996) survey the measurement-management of American enterprises, and statistic results show that organizations that implement measurement-management show better performances than others, whether or not it is in respect to financial performance or industry ranking.

1.3. Evolution of Knowledge Management

Knowledge Management is the ability of creation, identification, collection, classification, storing, sharing, dissemination, accessibility, re-usage

and updating of knowledge (Polat, 2003). Knowledge Management is related with tacit and explicit knowledge.

Explicit knowledge can be expressed in words and numbers, and easily communicated and shared in the form of hard data, scientific formulae, codified procedures, or universal principles. On the other hand, tacit knowledge is highly personal and hard to formalize, making it difficult to codify and communicate or to share with others. Tacit knowledge can be segmented into two dimensions: The first is the technical dimension, which encompasses the kind of informal and hard-to-pin-down skills or crafts captured in the term 'know-how'. At the same time, tacit knowledge contains an important cognitive dimension. It consists of schemata, mental models, beliefs, and perceptions so ingrained that we take them for granted. In fact, tacit knowledge and explicit knowledge are not totally separate, but mutually complementary entities.

Human knowledge is created and expanded through social interaction between tacit knowledge and explicit knowledge. This interaction is knowledge conversion which is a 'social' process between individuals and not confined within an individual. Nonaka and Takeuchi defined four generic processes for converting between tacit and explicit knowledge that they describe as fundamental to creating value:

- ***Tacit-to tacit (socialization)***: where individuals acquire new knowledge directly from others, through observation and dialogue. Socialization is a process of sharing experience and thereby creating tacit knowledge such as shared mental models and technical skills.
- ***Tacit-to-explicit (externalization)***: articulation of knowledge into tangible form through discussion and documentation.
- ***Explicit-to-explicit (combination)***: combining different forms of explicit knowledge, such that in documents or databases.
- ***Explicit-to-tacit (internalization)***: learning by doing, where individuals internalize knowledge from documents into their own body of experience.

This cycle is knowledge spiral, with interaction between tacit and explicit knowledge and where individual knowledge becomes organizational knowledge and vice versa.

Converting tacit knowledge into explicit knowledge makes it easier to store, replicate, and transmit through computer repositories and networks. When retrieved, it then needs assimilating into another person's tacit knowledge for their specific situation.

A company should systematically manage not only explicit knowledge but also tacit knowledge and their conversions, in order to increase creativity and innovativeness to the company and short and long term success. Both hard elements like databases, infrastructure, workflow management, document management systems and soft elements like cultural and behavioral aspects should be handled in a company to manage tacit and explicit knowledge effectively. Most of the companies are focused on hard elements like Information Technology tools. As these studies do not cover soft elements, their impact on is limited. Similar problems, i.e. how to start Knowledge Management projects, how to organize these projects, avoid the duplication of efforts for these projects, the impact of it on the company processes, how it is related with creativity and innovativeness.

Perhaps tacit knowledge is the most important component of KM, to the extent that the collaboration that it encourages leads to quantum shifts in knowledge rather than the incremental linear enhancements that are typically associated with explicit KM. However, tacit knowledge extraction, dissemination, and collaboration are difficult to effect (Markus, 2001). Tacit knowledge may be best understood by the assertion that "we know more than we can tell" (Polanyi, 1966). This observation is quickly supported if people are asked to write out a certain process or workflow. Persons asked to explain how to drive a car cannot fully describe how to accomplish this common task of everyday life. Much of the process and workflow is contained in a mutual understanding of the work or process and it is not easily documented nor can it be easily communicated.

The identification of what is explicit knowledge is relatively straightforward. Drawings, e-mails, policy manuals, product manuals, and other forms of explicit knowledge lend themselves to the application of metrics. While tacit knowledge and explicit knowledge coexist in a continuum (or as a knowledge spiral) complementing each other, the explicit knowledge forms are more easily extracted and measured (Nonaka and Konno, 1998). The measurement of tacit knowledge is less clear. Tacit knowledge can be part of the group collective knowledge (Spender, 1994). This socio-cultural knowledge drives the organization (Castillio, 2002), but it is difficult to measure.

Quantifying tacit knowledge by proxy measurements such as financial and human resources data on the penetration of new markets by Japanese and American firms was completed by Hennert (1992) and Kim and Hwang (1992). Nonaka and Takeuchi's (1995) theory of knowledge creation depends on the idea that implicit (tacit) knowledge can be transferred.

As examples of the successful transfer of tacit knowledge, they pointed to the success of Japanese multinationals NEC, Honda, and Matsushita. These theories of knowledge creation support this research and its measurement of tacit knowledge since they also point out that in order to transfer tacit knowledge successfully the firms must plan for that transfer by using tacit methods (people-centered) appropriate to tacit knowledge transfer.

It is not sufficient to have knowledge assets, patents, or other marketable intellectual property. The firm must also be capable of translating that knowledge into value for customers. In this research, customer value is measured through the analysis of the performance outcomes where the results of the firm, in both innovation and financial outcomes, are equated to customer value. That value-creating capability resides in the know-how or tacit knowledge of the engineers, managers and marketing staff and this dynamic tacit knowledge capability creates sustainable competitive advantage (Teece, 2001). These subject matter experts must be able to fit into an automated system that allows tacit knowledge dispersal and tacit knowledge use by both the experts and the rest of the firm's staff and

depends to a large degree on the KM systems that are employed (Maybury et al., 2000).

There are two apparently divergent tracks within the field that can have major implications for both an understanding and the implementation of Knowledge Management. The two perspectives are: (1) information technology-centric and (2) people-centric.

The information technology perspective focuses on the construction of information systems and tends to involve researchers and practitioners with a background in computer and information sciences. The approach implies that knowledge is an object or product, to be identified, classified, stored and distributed independently of its source. From this perspective, there are many ways in which products and artifacts can represent knowledge. These may often be documents, yet can be symbols, maps, images, or icons.

Alternatively, people perspective focuses on the assessment and development of a “complex set of dynamic skills and know-how that is changing”. Researchers and practitioners within this track tend to have a background in management or the social sciences. These backgrounds support an emphasis on knowledge as a process. This focus seeks ways to motivate, broker and animate the exchange of knowledge through an emphasis on communications and collaboration tools and sees knowledge as dependent upon its source – people.

What has emerged from the experience and the best practice studies is that it is not a choice between two perspectives. Leading practitioners seem to manage an effective of the two seemingly divergent views. In this instance both the product and process-based approaches can support the maximum leverage of knowledge in any organization. The former will help to codify knowledge and make it accessible, whilst the latter helps to make a connection between items of knowledge, their sources and others who may find value in the application of that knowledge (Dinçmen, 2004).

In some cases, the main focus of KM has been the implementation of systems; for an organization investing in a ‘KM system’, the evaluation may be

very important (Yates-Mercer and Bawden, 2001). One of the most common 'KM systems' is an intranet. The value gained from an intranet and its measurement can be assessed in various ways, including: metrics on usage and users, traffic analysis, time spent online, contributors and non-contributors. Business benefits include efficient internal communication, knowledge capture and distribution. Intranet benchmarking and an intranet maturity model have been developed by Cranfield and Cap Gemini (1999) and suggested that two-thirds of company intranets are underachieving.

This was based on a survey of organizations, which scored the intranet features and consolidated them to a single numeric value for comparison purposes. The maturity model provided a benchmarking tool for expressing intranets in 'generations' over time. The Knowledge Management Assessment Tool (KMAT), developed by Arthur Andersen and APQC (American Productivity and Quality Center) (1996), is also a high-level benchmarking approach, which compares practices in four categories (leadership, culture, technology and measurement) and helps organizations develop their KM initiatives.

A post-implementation audit of an intranet sought to capture both tangible and intangible benefits. They used a wide range of methods, assessing reductions in operating costs, improved staff productivity/time saving, and cost avoidance. On the soft benefits' side, they documented a shift in culture by volume of contributions and accesses, analyzed web logs, captured system utilization statistics and surveyed customers and employees, in various ways.

KM systems can enhance the effectiveness of teams by improving the way the team composition evolves, reducing the cost of searching for specialized knowledge sources; also increases in team knowledge variety lead to more effective solutions, which in turn enhance the organization's adaptive ability – a series of benefits. The factors that affect an organizational KM program have been identified as managerial, resource and environmental, and built into a descriptive framework, using a Delphi process.

The goal of KM is to deliver the right knowledge to the right members at the right time, which can help members take the right actions and further improve the performance of circulation processes in an organization (O'Dell and Grayson, 1999; Milton et al., 1999). Drucker (1993) states that KM is different from general management activities since it focuses on the perspective of knowledge, and is eventually aimed at applying this knowledge in a systematic and organized manner to further create knowledge. Arthur Anderson Business Consulting (1999) notes the KM also improves the quality and quantity of innovative knowledge in an organization.

Broadly speaking, all the activities that improve the value of knowledge assets are included in the content of KM. From the literature reviews, we can conclude that KM is a kind of dynamic circulation process (Ho, 2008). It is a behavior model of efficient knowledge recording, sharing and diffusing, and aside from this, its ultimate goal is to apply knowledge to improve organizational competitiveness.

Several researchers have developed models of tacit knowledge transfer and effect on performance that support observations (Harlow, 2008). Somech and Bogler (1999) details how tacit knowledge is quantified in college freshmen and can be measured as the students gain more tacit knowledge as they progress to seniors. The term practical intelligence has been used as a proxy for tacit knowledge (Sternberg, 1997). Others have developed tools for measuring tacit knowledge as part of their work on quantifying managerial intelligence (Wagner and Sternberg, 1992). Measuring tacit knowledge is also seen as ‘‘risky business’’ (Nonaka and Takeuchi, 1995). O'Dell and Grayson (1998) detail ways that internal knowledge can be transferred using ‘‘best practices’’ that supports this study’s measurement of both activities and outcomes.

KM is the formal process of determining what internally held information could be used to benefit a company and ensuring that this information is easily made available to those who need it (Roy, 2002). KM has also been defined as the effective use of systems to collect, use, and reuse knowledge within the firm (Davis, 2002).

The use of KM systems (Castillo, 2002) has grown substantially in the past ten years (Teece, 2001). A firm's overall economic, strategic, and innovation performance is dependent on the degree to which the firm can use all of the knowledge created by the firm and turn this knowledge into value-creating activities (Krogh, 1998).

KM is a strategic process, the desired goal of which is to harness the value of information by integrating it with processes that govern the manipulation of intellectual assets (Loshin, 2001). The use of KM enables firms to have more effective decision-making processes and enables firms both to create new knowledge and to apply this knowledge to generate more innovation in products, strategy, and processes (Probir and Tacit, 2002). Greater levels of innovation and improved processes in turn lead to enhanced market and financial performance.

KM also enables better strategic moves that enable the firm to have greater-than-average long-term returns. Just as more knowledge in the stock market enables investors to gain greater-than-average returns, our argument is that knowledge that is shared widely within the firm and made available in a timely manner enables better strategic decision making.

A knowledge management system (KMS) is one that allows both tacit un-codified and explicit codified knowledge to be created, stored and shared using technology or other methods. A KMS is not simply an information technology system since codified knowledge (explicit knowledge) is just one component of knowledge.

Because explicit-based KMSs are easy to imitate, it is not clear that they form the basis for a core competitive advantage (Barney, 1991). A KMS includes the following eight major knowledge processes (Ruggles, 1998):

1. generation of new knowledge;
2. accessing valuable knowledge from outside sources;
3. using accessible knowledge in decision making;
4. embedding knowledge in processes, products and/or services;

5. representing knowledge in documents, databases, and software;
6. facilitating knowledge growth through culture and incentives;
7. transferring existing knowledge into other parts of the organization;
8. measuring the value of knowledge assets and/or impact of knowledge management.

Arora (2002) advocates that redundancy of knowledge-based activities may be reduced by handling existing knowledge assets. This is also referred to one of the objectives of a KM program. The second objective of KM program is related to new knowledge innovation. Innovation is a mean for creating value in an organization. In case KM motivates organizations to promote innovation on a continuum basis, new knowledge may be exploited to add value and contribute to organization. The third objective of KM program focuses on competencies framework in the organization. Human-based approach improves productivity and creativity while participation increases ownership and contribution decision-making process resulting in reduction of wrong decisions.

Skyrme (1999) lists a range of 'proven benefits' achieved from a good knowledge initiative, including:

- . avoidance of costly mistakes;
- . sharing of best practices;
- . faster problem-solving;
- . faster development times;
- . better customer solutions;
- . gaining new business;
- . improved customer service;
- . reduction of risk

For years, the evaluation of KM performance has become increasingly important since it directly provides the reference for directing the strategic

organization learning and, by which the capabilities are generated to match the requirement to enhance enterprise competitiveness. It implies that company has strived to manage knowledge more effectively and efficiently to improve its performance. Nevertheless, it does not yet fully understand how enterprise can successfully implement KM. In addition, despite the growing body of theory, there are relatively few KM studies which make an explicit connection between knowledge management system (KMS) and KMS itself performance. By partitioned the activities of KMS into three processes: KM strategic, the plan of KM, and implementation of KM plan, the study explores the KMS performance indicators which are useful to assess the KMS performance for firms.

The features of knowledge assets are difficult to measure due to their inherently intangible characteristics. Unlike materials or equipment, core competencies and distinct employee abilities cannot be effectively listed in balance sheets (Austin and Larkey, 2002). As a result, many factors that contribute substantially to a firm's success tend to elude traditional means of quantification. This presents significant challenges to the performance measurement of knowledge management.

A KMS is a specialized IS for KM using modern technologies (e.g., the Internet, intranets, browsers, data warehouses, and software agents) to systematize, facilitate, and expedite firm-wide KM. KMS research consists primarily of general and conceptual principles and case studies of such systems in a few organizations. In particular, Gray (2000) describes how KMS can enhance the effectiveness of teams that analyze complex, non-recurring problems by improving the way that their team composition evolves. Knowledge mining is similar to data mining. However, Rouse et al., (1998) have used mining to extract knowledge from several data sources and apply it to more complicated and value-added problems: Decision Support System (DSS) could be used to provide the right knowledge in the right form to the right persons at the right time.

1.4. Knowledge Management Process

Lee et al (2005) define steps of knowledge circulation as: knowledge creation (KC), knowledge accumulation (KA), knowledge sharing (KS), knowledge utilization (KU), and knowledge internalization (KI).

Knowledge creation deals with a variety of knowledge, whether tacit or explicit and is accelerated by encouraging synergistic interrelations of individuals from diverse backgrounds. It is a continuous, self-transcending process through which one transcends the boundary of the old self into a new self by acquiring a new context and new knowledge. The key to knowledge creation lies in the way it is mobilized and converted through technology. To measure knowledge creation, two constructs are needed: task understanding and information understanding.

Knowledge accumulation is the second component. All individuals in the firm must have access to the base to obtain the relevant knowledge to aid in their work and decision making. The knowledge accumulated in firms can play an important role in eliminating obstacles and inefficiencies and, at the same time, in improving management performance. However, if knowledge created through management activities for years is not accumulated systematically, it cannot be beneficial for future decision-making needs. An instrument to assess knowledge accumulation uses three constructs: database utilization, systematic management of task knowledge, and individual capacity for accumulation.

The third component of knowledge management process (KMP) is knowledge sharing, which promotes diffusion of knowledge and also contributes to making the work process astute and knowledge-intensive: workers consider themselves to be knowledge workers. If they can find the knowledge from the knowledge source administered by the firms, they are able to apply it to complete their works successfully. This requires integration of knowledge from multiple sources to obtain improved performance. An attempt at knowledge sharing is only valuable if one's views differ from that of the other parties, since one learns nothing from total homogeneity of view. The degree of sharing knowledge depends on constructs such as core knowledge sharing and knowledge sharing.

Knowledge utilization, the fourth component of KMP, can occur at all levels of management activities in firms: one of the popular forms of knowledge utilization is to adopt the best practice from other leading organizations, uncover relevant knowledge, and apply it. Knowledge utilization depends on two constructs: degree of knowledge utilization in the organization and the knowledge utilization culture. Knowledge internalization is the process of embodying explicit knowledge into tacit knowledge.

The fifth component is knowledge internalization, which may occur when individual workers discover relevant knowledge, obtain it and then apply it. Therefore, internalization may give rise to new knowledge this way, it provides a basis for active knowledge creation. Knowledge internalization can be measured by three constructs: capability to internalize task-related knowledge, education opportunity, and level of organizational learning.

Han (2009) details knowledge management process steps and gives increments in the processes. Process constructs, dimensions and related literature are displayed on the table below.

Table 1.1. Process Constructs, Dimensions, and Main Literature

Process	Dimension	Main Literature
Knowledge Creation	Socialization Externalization Combination Internalization	Nonaka, 1991 & 1994
Knowledge Organization	Storage Retrieval Maintenance Protection	Stein, 1995 Tyndale, 2001
Knowledge Transfer	Acquisition Diffusion Absorption	Darroch, 2003 Wang, 2000
Knowledge Application	Integration Leverage	Grant, 1996 Gold, Mahotra and Segars, 2001

Source: Han, 2009

On the other hand, Allee (1997) classified organizational KM activities as: (i) knowledge creation; (ii) knowledge retention; (iii) knowledge sharing; and

(iv) knowledge innovation. This classification can be further extended as organizational KM activity measures. Allee only focused on the organizational KM activities without considering the “effectiveness” of organizational activity.

In this way, it provides a basis for active knowledge creation. Organizations need to support the combination of various components of the KMS, such as developing its infrastructure, securing new and existing knowledge, distributing it, and combining it. Nonaka and Takeuchi (1995) proposed that knowledge conversion, from tacit to explicit knowledge and vice-versa, occurs through a life ‘knowledge flow’ cycle: socialization, internalization, externalization, and combination.

Hsieh (2004) show all knowledge management process models and give their main ideas in the Table 1.2 below.

Table 1.2. Knowledge Management Process Models

Researcher	Definition of KMP
Alavi & Leidner, 2001	Creating Storing/retrieving Transfer applying
Arthur Andersen, 1995	Create Identify Collect Adapt Organize Apply Share
Beckman, 1997	Identify Capture Select Store Share Apply Create Sell
Davenport & Prusak, 1998	Generate Codify Transfer

Table 1.2.: Continued.	
Researcher	Definition of KMP
Despres & Chauvel, 1999	Create Map/buddle Store Share/transfer Reuse
DiBella & Nevis, 1998	Acquire Disseminate Utilize
Gartner group, 1998	Create Organize Capture Access Use
Holner & Mars, 1979	Construction Organization Storage Distribution Application
Marquardt, 1996	Acquisition Creation Transfer and utilization Storage
Nissen, 1999	Capture Organize Formalize Distribute Apply
O'Dell, 1996	Identify Collect Adapt Organize Apply Share
Varun grover & Davenport, 2001	Generate Codification Transfer Realization
Wiig, 1993	Creating and sourcing Codification and transformation

Source: Hsieh, Hun and Chou, 2004

1.5. Knowledge Management Factors

Davenport and Grover (2001) looked at successful KM projects to determine eight key factors to help a company create, share, and use knowledge efficiently. Success factors include compensation of the knowledge provider, incentive systems, organization culture, etc.

The primary focus of knowledge management is to utilize information technology and tools, business processes, best practices, and culture to develop and share knowledge within an organization and to connect those who possess knowledge to those who do not (Anantatmula and Kanungo, 2005).

Research made by Anantatmula and Kanungo (2005) identified that enhanced collaboration within organization, improved communication, and improved employee skills to be the top three most favored criteria. The other two criteria, improved productivity and better decision-making are the results of first three. These criteria could be implemented for general management as well. Some of the knowledge management definitions in literature have primary focus on business results such as competitiveness and return from knowledge assets. However, the research respondents considered that knowledge management's primary focus is on internal performance of communication and collaboration to improve employee skills (Anantatmula and Kanungo, 2005).

Specifically, knowledge management has no direct relation to market performance, although its efforts can ultimately translate into improving efficiency and effectiveness (faster, better, and cheaper).

Equally important are the findings that enhanced collaboration, sharing of best practices and effective KM *co-influence* and *co-determine* each other. This has important managerial implications. The main implication can be derived from the complementarity perspective. According to the complementarity perspective co-investing in two or more inputs that jointly determine the desired output is more beneficial than investing in one or fewer of those inputs. In some cases, the improvement of employee skills can be maximally leveraged by ensuring that

investments in and managerial attention to KM activities, collaborative frameworks and sharing best practices are evenly distributed and synchronized.

Improved employee skills in the context of KM do not directly lead to improved productivity or enhanced product or service quality. Good employee skills that are partly determined by good KM practices need to be leveraged by improved managerial decision-making to result in high product or service quality, higher productivity, or both (Anantatmula and Kanungo, 2005). Knowledge plays a significant role as a source for a sustainable competition for companies (Hsieh, Hun and Chou, 2004). In other words, KM has been considered to be an important resource in competitive advantage (Ginsburg and Kambil, 1999; Nahapiet and Ghoshal, 1998). In the current competitive environment, the factors leading to enterprise success are no longer simply in the investment of capital, labor and raw material, but in the ability of knowledge innovation from all the members of an organization. Knowledge has now become a kind of strategic resource in enterprises (Ho, 2008). Therefore, the management of this strategic resource shows its explicit importance.

Intellectual capital is now accepted as a type of capital and is as critical as traditional tangible capital. The Intellectual Capital Services' IC-Index – originally developed in Scandinavia and Australia by Johan Roos and Goran Roos (1997) the index identifies four categories of intellectual capital: relationship, human, infrastructure and innovation; it then looks at the relative importance of each, and also at the impact of changes in intellectual capital.

There are a number of varying descriptions and definitions of intellectual capital such as: knowledge that can be converted into value (Edvinsson and Sullivan, 1996); it is about knowledge and knowing capability of a social collectivity (Nahapiet and Ghoshal, 1998); packaged useful knowledge (Stewart, 1997); and Intellectual capital = competence x commitment (Ulrich, 1998). This research includes specific inclusion of the use of knowledge to create customer value which in turn drives firm outcomes.

KMPG's survey reveals that three-fourth of respondents confess that available knowledge is not successfully exploited. According to survey results, KM is being applied in all business and functional areas such as service delivery, marketing and sales, operations, human resources, R&D, strategy, distribution channels and procurement. Another point is noteworthy that shift from internal to external knowledge sharing and customer and supplier communities is expected (Hsieh et al., 2004).

Table 1.3. Levels and Perspectives in KMMM

KMMM	Knowledge journey	KM and Maturity Model	KMMM	KMMM
	KPMG (1999)	Gabor Klimko (2001)	Ehms & Langen (2002)	Infosys (Kochikar 2000)
Levels	1. Knowledge-chaotic 2. Knowledge-aware 3. Knowledge-enabled 4. Knowledge-managed 5. Knowledge-centric	1. initial 2. Knowledge discoverer 3. Knowledge creator 4. Knowledge manager 5. Knowledge renewer	1.initial 2.repeated 3.defined 4.managed 5.optimized	1. default 2. reactive 3. aware 4. convinced 5. sharing
Perspectives	<ul style="list-style-type: none"> • culture • people • processes and content • technology 	...	<ul style="list-style-type: none"> • Strategy, Knowledge goals • Environment, partnerships, • People, competencies • Collaboration, culture • Leadership, support • Knowledge structures, knowledge forms • Technology, infrastructure • Processes, role, organization 	Key result areas by capabilities <ul style="list-style-type: none"> • people • processes • technology organizational characterization • knowledge acquisition/update • knowledge sharing/dissemination • knowledge reuse • virtual teamwork

Source: Hsieh, Hun and Chou, 2004.

Gold et al., (2001) discuss essential organization capabilities for effective knowledge management and suggest a knowledge infrastructure composed of technology, structure, and culture. In terms of organizational capabilities, important factors such as culture, technology and organizational structure are key elements in establishing the capabilities of an organization.

Bixler (2002) identifies seven critical success factors to be considered in implementing KM, as set out in Table 1.4. Bixler (2002) also states that customer focus is very important.

Table 1.4. Bixler's Critical Success Factors for KM

No	Critical Success Factor
1.	Vision and leadership: KM strategic plan
2.	Organizational and communication training
3.	Business performance measurements
4.	KM mission interface alignment
5.	KM architectures and infrastructure
6.	KM integration and resourcing
7.	Governance: Policies and Procedures

Skyrme and Amidon (1997) talks about seven recurrent characteristics in successful knowledge innovation best practices, as set out in Table 1.5. Other authors indicate that cultural and technological barriers as key factors for ensuring successful KM implementation have to be overcome successfully.

Table 1.5. Skyrme's Critical Success Factors for KM

No	Critical Success Factor
1.	Clear and explicit links to business strategy
2.	Knowledgeable about knowledge
3.	A compelling vision and architecture
4.	Knowledge leadership and champions
5.	Systematic knowledge processes
6.	A well-developed knowledge infrastructure
7.	Appropriate bottom-line measures

KM projects have been judged by success indicators similar to those used for assessing other business initiatives (Crnkovic et al., 2005). Such indicators include visible growth in resources attached to the project, growth in the volume of knowledge content and usage, likelihood of survival, etc.

Evidently, the success of KM in organizations depends on several factors. Based on an exploratory study, eight such factors were hypothesized: link to economic performance or industry value, technical and organizational infrastructure, standard, flexible knowledge structure, knowledge-friendly culture, clear purpose and language, change in motivational practices, multiple channels for knowledge transfer and senior management support. These factors have been encapsulated into four general critical success factors (CSF) – technology, leadership, culture and measure.

Based on the literature, eight factors are defined for this study: Leadership and Vision; Organization and Structure; Culture; Partnerships; Processes; Measures; Competencies; Technology and Infrastructure

1.5.1. Leadership and Vision

Pieris, David and William (2003) point out that the prerequisite of KM is strategy, wherein the members of an organization are ready to plan and give their contributions to KM. Zack (1999) suggests that the most important factor that promotes KM is organizational strategy. It is very important to understand organizational strategy and KM strategy once knowledge strategy relates to organizational strategy.

A knowledge-based view of a company has emerged as an important topic in strategic management (Lee, 2004). It provides a theoretical basis on why knowledge-based resources play an important role in increasing the sustainable competitiveness of the firm. A resource-based view of a company promotes a knowledge-based perspective, which postulates that competitive advantage builds upon those privately developed resources, tacit and explicit, inside the firm. Similarly, the knowledge-based view of the firm assumes that the knowledge

assets existing at any given time provide an opportunity for sustainable competitive advantage.

Davenport et al., (1998) conclude that among the critical factors that determined the success of KM projects from 31 KM cases, one of the most important enablers was the support given by the senior managers.

KM as a conscious practice is so young that executives lack successful models and strategies that they could use as guides. Codification (coding and storing knowledge in databases, used for example by Accenture) and personalization (helping people communicate knowledge, not store it, used for example by McKinsey) are two such strategies (Crnkovic et al., 2005).

They generally reflect the competitive advantage of the organization. Both strategies are geared towards creating customer value, determining not only how that value supports an economic model but also how the company's people deliver on the value and the economics. Three key questions to answer when considering these strategies (Crnkovic et al, 2005): Does the organization offer standardized or customized product? Is the product mature or innovative? Do people rely on explicit or tacit knowledge to solve problems?

Earl (2001) indicates that the strategy adopted for KM in an organization depends on the school of thought: systems, cartographic, engineering, commercial, organizational, spatial, and strategic. Each of these schools can be distinguished by attributes including: focus, aim, unit, CSF, principal IT contribution and philosophy. Earl suggests that knowledge should be considered as a determinant of, or variable in, organizations' business strategy.

Botha's (2000) study underlines how direction in an organization is provided by knowledge management. It is of great significant that knowledge potential is to focus on production of specific market offerings with new solutions. Researcher stresses the role of knowledge management in alignment of organizational goals and those of individuals.

Botha (2000) cites that Nonaka et al. (1995) focus on the concept of strategy as a knowledge creation tool and also highlight that strategy develops organizational capacity to acquire, create, accumulate, and exploit knowledge.

Vision is a dream awaiting organization to get achieved. However, organizations get equipped with required assets. Arora (2002) proposes that the difference between the current knowledge assets and the required knowledge assets represents the amount of effort organization commits to create new knowledge in the organization.

Means to stimulate innovation leading to new knowledge creation may differ within and among organizations. Arora (2002) states that there exist mainly two different groups in organizations and adds that challenging job is to identify individuals with high potential to generate and disseminate knowledge via a cohesive group study in a learning culture and infrastructure given appropriate incentive.

Organizations may employ knowledge exploitation, learning, and innovation on a continual basis to close the gap with the competitors who are leading the sector while increasing that with the ones who are behind. Since continuity is of paramount significance, some review system in top-down approach to ensure operational continuum should be in place. Tone-at-top is critical that perceived organizational support and commitment is on hand because KM takes a long time and the returns are not instant. It is really hard to find such top management behavior since all oriented towards tough competition in the environment (Arora, 2002).

KM may have priority with regard to competitive strategy, restructuring or growth plans; however, few top management put KM on their agenda while others do not take into account. In order to employ KM program, one is required to influence and convince top management. Aftermath, some key performance indicators may be put in place to evaluate the level of given continuous attention in the review system. Balance score card is a good sample for implementing and reviewing KM strategy. In such situation, KM can be a part of balance score card.

of CEO rather it is put in place in that of down level. On the other side, KM may necessarily be a common part of balance score card of all employees (Arora, 2002). A general view of balance score card is given in the figure below.

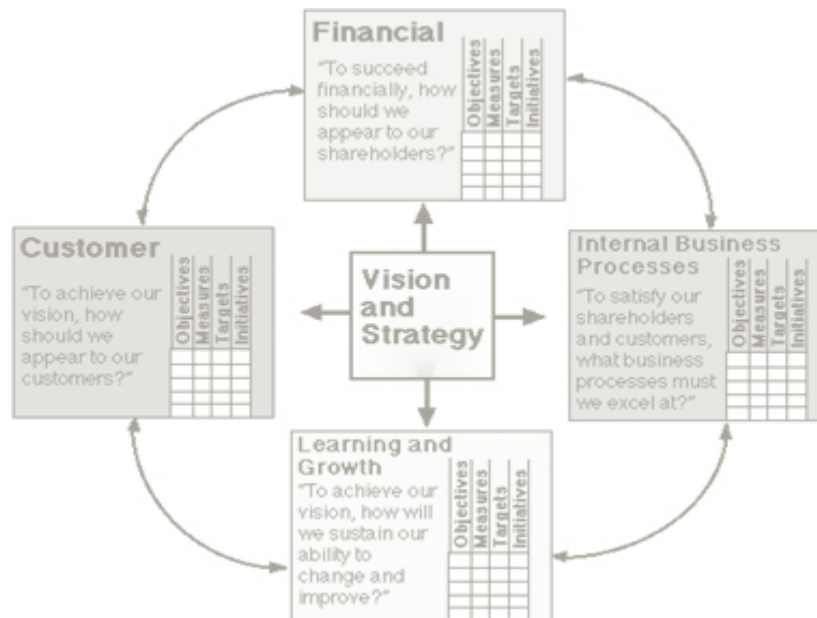


Figure 1.1. Balanced score card

1.5.2. Organization and Structure

KM imposes organizations to have a team-base structure to exercise KM processes. However, organizations face with organizational inertia because of not sharing knowledge. Teams are not aware what other teams do. Each team concentrates on only team goals whilst not taking organizational goals into account (Arora, 2002). It is not wrong to put forward that teams repeat the same mistakes of their predecessors due to organizational blindness and not sharing lessons-learned.

In addition to organic organizational structure, organizations are split into different forms such as profit centers, divisions, and departments. As far as knowledge sharing is concerned, the units work independently and there are sem-permeable boundaries between them. Organizational culture and collaboration need are determinants of level of sharing. Several reasons affect efficient knowledge transfer among the units (Arora, 2002).

1.5.3. Culture

Organizational culture is a complex entity of values, beliefs, behavior models, and symbols. It represents a company's value, and this value can turn into a model for activities and behaviors of staff (Ho, 2008). Many literatures and researches indicate that organizational culture is a critical factor that influences KM or the effectiveness of knowledge sharing (Gold et al., 2001). The effectiveness of KMP is influenced by the organizational culture: human relationships, harmony between decision-making entities, quality of the work process, strategic alliances with vendors, customer trust, effectiveness of strategic management, and the CEO's character and vision, etc (Lee, 2005).

Long (1997) suggests that organizational culture defines the value of knowledge, and also explains the existence of the advantage of knowledge innovation in an organization. This kind of advantage further affects the willingness of employees to share and be involved. Therefore, building a knowledge accessible-friendly culture in a process that embraces KM is very important (Ho, 2008).

Research findings on KM implementations by Alavi and Leidner (1999) show that knowledge sharing experience in an organization is mostly related to organizational culture. Therefore, a successful KM must depend on the cooperation of domains of culture, management, and organization (Ho, 2008). Davenport and Prusak (1998) also introduce eight factors of successful KM projects, and most of them are influenced by organizational culture.

Aside from this, Davenport and Prusak (1998) indicate that in addition to the characteristics of knowledge, the components of an organizational culture are also the key for successful knowledge control and transference. Skyrme and Amindon (1997), Davenport et al., (1998) and Hauschild et al. (2001) all mention that the culture of knowledge sharing in an organization is a criterion for successful KM.

Employees exchange their experiences by means of experimentation, failures, successes and proposals in the database (Arora, 2002). Assessment is

generally made by experts who may add tacit knowledge to some extent what employees contributed (Arora, 2002). Experts need to have such characteristics that as a member of some communities of practice they are supposed to keep their part of database updated. Furthermore, they would produce knowledge like FAQ, best practices, lessons-learned cases, white papers, and update database (Arora, 2002). Experts may enrich databases by contributions taken from external sources like Internet and knowledge vendors (Arora, 2002). Collaboration between beneficiaries such as employees, authors of contributions made to the database, or experts is a must for effective KM process (Arora, 2002). In order to capture tacit knowledge, i.e. know-how of the experts, collaboration may be done via electronic media (Arora, 2002).

On the other hand, codification of know-how is very challenging since this job needs to take it out from an expert (Arora, 2002). In other words, making tacit knowledge explicit one requires efforts to draw it out from an expert. Another issue related to this challenging job is transformation knowledge from the context in which it is generated into the one in which it will be used (Arora, 2002). Following codification, explicit knowledge becomes an invaluable source.

Human resources policy should be in compliance with overall strategy and accordingly knowledge management strategy. The policy, therefore, requires knowledge sharing culture, teamwork focus, and collaborative approach (Arora, 2002).

Making tacit knowledge explicit is of great significance for companies that knowledge is the only material residing in the minds of employees who have potential to add value to the company (Arora, 2002). Hence, companies should provide forums to employees to exchange ideas and learn from each other. Otherwise, good practices will not have the chance to be shared by the others and a closed-loop on re-inventing the wheel will go on (Arora, 2002).

Liu (2012) identifies that the psychological ownership of knowledge can encourage individual knowledge creation behaviour. This is only possibly within an enabling organization culture. According to Sánchez et. al (2013) Knowledge

Creating and Sharing Corporate Culture Framework aims to share the knowledge with others, create new knowledge and get to build teams more multidisciplinary and collaborative, to establish synergies within the team and build highly productive environments which ultimately will boost the efficiency within the project management field and within the whole company

Another cultural issue is related to performance evaluation. When companies employ individual performance assessment instead of promoting team work, employees would rather hoard knowledge than share it (Arora, 2002).

Coordination and communication among the units are also cultural problems faced by the companies. The problem is more visible if there is a tough competition and rivalry among the units (Arora, 2002). Moreover, it is sometimes obvious that units rendering similar type services or producing similar type products conceal knowledge to outperform each other (Arora, 2002).

Arora (2002) highlights that communities of practices are attaching great importance and becoming more popular to make interaction between individuals and units more formal and organized. By means of communities of practices, socialization process amongst employees and exploitation of knowledge are becoming more possible and feasible.

1.5.4. Partnerships

External partnerships are managed to add value to the knowledge assets of the organization. According to the European Foundation for Quality Management (EFQM) Knowledge Management Framework, this may include:

- Identifying and leveraging core competencies of partners and supporting mutual development
- Collecting, leveraging and maintaining knowledge of the organization's partners and suppliers to create competitive advantage
- Encouraging partners and suppliers to contribute to the organization's knowledge development processes.

Research on complexity has revealed a phenomenon that is interesting in relationship to this conversation and is important in strategic thinking for corporations. Numerous studies and simulations have produced the same result. That is, when a system is stable there is a significant degree of predictability. And when one of the agents, part of the system, fails, or alters in any significant way, or the environment changes, the whole system becomes unstable and completely unpredictable. The reliable qualities of stability turn into chaos.

This principle also applies in industry and corporations. In an industry where one of the major players goes bankrupt, or makes a major change in its operations and/or relative competitive position, an entire network, including suppliers, competitors and customers will be disrupted. The previous leaders may even be losers in the order that eventually emerges. A company's previous competitive position will no longer be valid and the relative effectiveness of its competitive qualities may change dramatically over a short space of time.

What will have maximum survival value will be competence in communication ability, availability of information, and computational ability. What will have minimum survival value, maybe even negative value, is a design which pursues prediction and/or specific visions of a future.

The search for excellence involves mutually beneficial collaboration and cooperative relations (Martin-Castilla and Rodrigues-Ruiz, 2006). This sort of relationship is based on confidence. Knowledge socialization is essential for creating value in customer service.

Changes in the corporate environment and information from partnerships are often the catalyst for changes to the strategy and the knowledge goals (Ehms and Langen, 2002). The topics of this structural field relate to important participants from *outside* the "system boundary" of the organization. Aspects covered are customers and other stakeholders, the comparison with other enterprises, and the problems of using external knowledge.

Customer KM is the critical factor that determines success in customer relationship management, and it also beneficial for creating customer values

(Wayland and Cole, 1997; Swift, 2001). Efficient customer relationship management can improve customer satisfaction and loyalty (Fickel, 1999). Furthermore, understanding customer needs is also a good effect generated by efficient customer KM (Fickel, 1999), and this is one of the driving forces for gaining more intimate customer relationships (Ho, 2008). Customer KM is mainly used to support consultant services (Wayland and Cole, 1997).

Suppliers are often mistreated in current working environments. It is of late that supplier partnerships have come into light and been acknowledged to be an integral part of the success of an organization (Pervaiz et al., 1999). The suppliers' knowledge is of vital importance to an organization. For example, a supplier's knowledge of raw materials can be passed on to the customer to allow for a more informed decision to be made. This is evident in the workings of Japanese manufacturing organizations that often hold meetings with their suppliers to exchange views and to discuss new projects. This is part of the knowledge exchange that very much forms the foundation of knowledge management.

Measures which may be useful include:

- . supplier meetings
- . supplier development programs
- . benchmarking activities among suppliers

These are some measures of intellectual capital and aids in managing knowledge (Pervaiz et al., 1999). By comparing horizontally across the matrix, the user can be prompted to think of further measures that would indicate the success or failure of KM activities. These could include (Pervaiz et al., 1999):

- . customer satisfaction;
- . customer retention;
- . customer relations.

Some of these measures are based on outcomes, as mentioned earlier, and some are just based on the actual numbers. Measures such as, the number of

repeat customers, can be in the form of just number of people and may not necessarily have a monetary value attached to it.

1.5.5. Processes

Another point stressed by Arora (2002) is that a well-organized and disciplined process may not exist in the organizations even if employees in the units are willing to exchange ideas. Unless knowledge sharing and exploitation is not systematic, employees may not be aware of the knowledge needs of other units.

Meetings are opportunities for all to exchange ideas. In particular, head of units meet occasionally to discuss issues on performance, strategy, and operations for future plans. During the meetings, information regarding units operations and innovations are made explicit and available to head of other units (Arora, 2002). However, it is presumably that there is a large amount of other new knowledge in the units not known by head of units but by employees who perform the assignments in the units (Arora, 2002). These small pieces of knowledge may not be demanded by the heads of units but they are beneficial to improve the quality of life of the employees (Arora, 2002). Indeed, this kind of knowledge is shared by chance such that employees in different units run into at different occasions and share a lot of rich knowledge in an informal format.

In brief, organizations should have a clearly established and formalized workflow enabling timely and efficient knowledge maintenance as well as validation of the content. To be able to deliver this, organizations need to design the processes, including those key processes needed to deliver both the overall organizational and knowledge management specific strategies.

1.5.6. Measures

In the corporate level, value of an organization depends not only on employees sharing knowledge, but also on the quality of knowledge they gathered.(Tayauova et al., 2014) In principle, knowledge management criteria must be guided by an organization's goals and bottom line results (Anantatmula

and Kanungo, 2005). If knowledge management initiatives do not contribute to an organization's business and performance, top management would not support such initiatives (Anantatmula and Kanungo, 2005). Thus, it is important to relate research findings to bottom line results.

Research findings revealed that knowledge management efforts result in soft measures, which are not directly tied to end results (Anantatmula and Kanungo, 2005). These results also imply that knowledge management outcomes are difficult to measure. However, efforts focused on improving these soft measures lead to gains in efficiency, effectiveness, and innovation, which in turn have a significant effect on what organizations look for (Anantatmula and Kanungo, 2005).

Arora (2002) underlines that few measurement methods such as experience curves, learning curves and half-life curves exist. However, these methods all focus on only a single measure of output like cost or price. Arora (2002) iterates that other competitive variables like quality, learning, delivery or new product developments that are affected by learning are ignored by the researchers. The methods concentrate on the end results but do not focus on cognition, behavior and performance improvement in learning (Arora, 2002).

There is a great large of ambiguity regarding measuring KM effectiveness. Hence, KM practitioners are to be motivated to discuss and accept one single standard for measuring KM effectiveness, comparing organizations on a common scale. An organization needs to follow a standard to benchmark itself and measure its efficiency. However, since it is obvious that initial few years are not appropriate to reap the benefits, organizations need to record and monitor some proxy variables, which presumably reflect the success of the KM method employed in the organization (Arora, 2002). While determining the KPIs for organization to monitor, one is supposed to keep knowledge exploitation process, knowledge innovation process and competency enhancing process in mind (Arora, 2002). The proxy variables may be used as a part of balanced scorecard of a CEO and other employees.

1.5.7. Competencies

Knowledge is described as capacity to act, which requires a continuous learning process (Botha, 2000). A capacity of an organization to act is formed by employees who have embedded knowledge, or simply called knowledge workers.

Knowledge repositories convert human capital to structural capital by capturing tacit knowledge of the workers (Arora, 2002). Knowledge repositories and communities of practice serve a means of enhancing skills and competencies of the workers. Employees may not be aware of a learning process they are experiencing and they may not immediately apply what they have learnt. However, they may apply at a later date what they may not use in quantifiable terms. It is generally accepted that learning may improve workforce productivity while reducing errors in their work (Arora, 2002).

On the other side, expertise regarding workplace is restricted to an employee such as an engineer or an expert. Anybody who applies for help concerning workplace processes may benefit much from those experts. However their area of influence is narrow since hierarchy of experts is large (Arora, 2002). Once organizations heavily rely on those experts, they sometimes massively suffer if the experts quit. Organizations are, therefore, in pursuit of alternative methods to overcome turnover of experts and employ methods such as job rotation, job enrichment and transfers. Moreover, organizations seek to upgrade knowledge and competency level of employees and to reduce the knowledge gap in the hierarchy of experts (Arora, 2002). Also, this need is addressed by knowledge management. Knowledge management organizes best practice sharing occasions to increase knowledge level and competency level of employees, resulting in productivity. Networking and sharing practices are main means of learning (Arora, 2002). Some knowledge management tools to promote collaboration are discussion databases, on-line chats, queries, and e-learning.

1.5.8. Technology and Infrastructure

Beckman (1999) mentions that KM enablers in the domain of information technology are the infrastructures for information technology that supports KM activities, activities such as knowledge databases, knowledge platforms, performance evaluation management systems, and performance integration systems. Alavi and Leidner (2001) and Fairuz et al., (2008) all agree that information technology plays an important role in supporting the organizational knowledge process.

Information technology is tightly connected to KM because it helps distribute structural knowledge vertically and horizontally, as well as make it easily searched and utilized (Ho, 2008). Knowledge assets tend to be created, accumulated, shared, and utilized among individuals more easily by employing information technology (IT) and information system. As a result, organizations and enterprises all try to implement KM with information technology (Skyrme and Amindon, 1997; Alavi and Leidner, 1999, 2001; McDermott, 1999; Zack, 1999).

Hendriks (1999) find that information and communication technology show direct and indirect influences on the motivation of KM sharing due to four functions: cast aside obstacles, provide information acquisition channels, improve processes, and identify the location of the knowledge owner and searcher (Ho, 2008). In this era of IT, a knowledge based view of the firm can explain convincingly why certain firms are more competitive under the same market conditions. The knowledge assets are dependent upon the quality of organizational knowledge and intangible assets in general.

Several papers have dealt with the strategic use of the Internet for KM activities. Dieng (2000) discussed the potential of the Internet and intranets in developing distributed KMS. For instance, XML-based meta language was developed for knowledge retrieval.

A systematic framework used to further analyze and discuss the potential role of information technologies in organizational KM is developed by Alavi et al.

(2001). The framework focuses on the sociology of knowledge and accepts organizations as social collectives (Hsieh, Hun and Chou, 2004). The framework identifies four processes in KM: (1) knowledge creation, (2) knowledge storage/retrieval, (3) knowledge transfer, and (4) knowledge application. The framework attaches importance to both cognitive and social aspects of organizational KM and iterates that KM is embodied in individuals' cognition and practices as well as organizational practices and culture (Hsieh, Hun and Chou, 2004).

According to Botha (2000), a second source of knowledge is an organization's formal and informal documentation. Many organizations neglect this sort of source. However, history files, minutes of meetings, decision making notes, engineering design notes, intellectual property rights like patents and copyrights, models, formulas, knowledge bases, and concept notes are some examples for second source of capacitive knowledge (Botha, 2000). Irony is that organizations try to practice many new ideas regarding knowledge management while they don't take knowledge embedded in the second sources into account. Botha (2000) advocates that this knowledge is supposed to get collected, evaluated, stored and served in a systematic and well-organized manner and organizations would have an invaluable intangible asset, which is unique and inimitable. Knowledge warehouse is the correct answer for organizations seeking to make use of knowledge.

Arora (2002) use the latest state of the art IT technologies to facilitate the use of knowledge repositories, leading to effective and efficient knowledge management system. For instance, IBM saved an average of 170 hours for consultants to write the proposals. Another example may come from Xerox Corporation that decreased average repair time by 50 per cent and saved 100 million USD.

Organizations may promote collaboration to share knowledge via socialization process or externalization process (Arora, 2002). Former process, which is known as a tacit-tacit transfer, may be implemented in the form of communities of practice and the latter, which is widely known as explicit to

implicit followed by an explicit to tacit i.e. internalization may be implemented via computer databases.

The results from the AHP method and the synthesizing of 10 experts' opinions have shown the following rankings in order of importance: 'information' (0.277); 'staff' (0.223); 'wisdom' (0.213); 'knowledge' (0.184); and 'data' (0.114). 'Information' and 'staff' were thus the most important constructs in KM practice (Wen, 2009).

'Flow and utilization rate of network' is the most important index in 'information'. 'Rate of staff severance' is the most important index in 'staff'. Such results show that the quantity and quality of staff are recognized as the most important factors in the operation of KM (Wen, 2009).

The main findings of a research made by Jones (2003) on knowledge management were that knowledge management activities requiring individuals to change their behavior or take time to learn new skills were most problematical.

While remedial action was often effective in increasing knowledge management benefits, more time would be necessary to demonstrate the benefits conclusively (Jones, 2003). The speed with which people are willing and able to change their behavior in the workplace was found to be the critical factor in the implementation of knowledge management (Jones, 2003).

1.6. Efforts to Measure the Performance of Knowledge Management

1.6.1. Philosophical Stances

There are two philosophical stances which may be taken, each of which leads to a simple model, which in turn can lead to action, in the formulation of an information, or knowledge, management program (Yates-Mercer and Bawden, 2001). These models may be referred to as the 'scalar' and 'cognitive' models.

1.6.1.1. Scalar/pyramid model

This model regards information, knowledge and related concepts as closely related entities which can be transformed into one another, outside the human mind. It is a common sense model, relying on an appeal to the intuitive difficulty of distinguishing between information and knowledge in normal discourse.

Generally accepted progression between the concepts of wisdom, knowledge and information; to which we may add data is conventionally seen as forming a pyramid – or sometimes a simple linear or scalar progression – with the broad mass of data at the base being distilled to the peak of wisdom. It is pragmatically accepted that the ‘distillation’ process involves what are generally termed ‘value added’ activities: summarizing, evaluating, comparing, classifying, etc. Also, moving from data to wisdom is generally seen as setting information within a context, or framework, of existing knowledge, the context giving the meaning.

Checkland and Holwell (1998) give a clear account of this viewpoint, adding an additional element, *capta* – those data to which one pays some interest – between data and information. They see the transformation from *capta* to information as involving the addition of context, and hence meaning, and from information to knowledge as involving the creation of large structures of related information.

Appealing though it is in some respects, this model is far from satisfying; in particular, it is unclear exactly how it is determined when the transition is made between the various states. Furthermore, in equating the basic nature of data, information and knowledge, it necessarily restricts itself to explicit, communicable information.

1.6.1.2. Cognitive

This model regards knowledge as something intrinsic to, and only existing within, the human mind and cognition. Knowledge, being subjective,

cannot be directly transferred or communicated from one person to another, but must be converted into information first. Information is then regarded as the objective – and therefore communicable and recordable – form of knowledge. Information is thus the bridge between the subjective knowledge in people’s heads.

This model is described clearly and concisely by Orna and Pettitt (1998). It is the model which underlies much of the cognitive approach to information science, espoused by writers such as Brookes (1980) and Belkin (1990).

1.6.1.3. Comparison of models

Which of these two models is accepted, explicitly or, more probably, implicitly, within an organization will determine how information and knowledge are understood, and hence what approach to their management and valuation is followed. An organization which believes in the scalar model, in which information is transformed into knowledge by value-added processes, will think of knowledge management in terms of a particular kind of information management. It will develop ‘know-how databases’, and ‘knowledge stores’, and will try to ‘capture’ the organization’s knowledge in software. In practice, this often results in the creation of extensive intranet or groupware systems. There will be no clear distinction between information and knowledge resources in such an organization, and many of the assumptions of information resource management (noted above) may well be applied universally. The value of information and knowledge will be assessed in essentially the same way, and there may well be a reliance on metrics to cover both.

An organization which believes in the cognitive model will believe that knowledge resides in the minds of its employees, and cannot realistically be ‘captured’.

Instead, such an organization will implement knowledge management largely by cultural means, by organizing their physical space appropriately, and by using appropriate communication tools – thus encouraging and enabling staff to

share their knowledge. Examples are: financial and other rewards for knowledge sharing; provision of well-appointed informal meeting areas; encouraging face-to-face discussion rather than e-mail communication. Software tools will largely be those which help identify those people who have useful knowledge, e.g. 'expertise indexes' and 'corporate yellow pages'. There will typically be a clear distinction between information management and knowledge management in such organization, the former being managed by systems, and the latter by policies. The value of knowledge in such organizations will be assessed by methods which closely relate the knowledge assets of an organization to its overall value and performance.

1.6.2. Knowledge Management Evaluations

1.6.2.1. Outcome-oriented knowledge management evaluations

Organizational leaders who make decisions about KM programs are often promised (and regularly request) so called bottom-line results, i.e. outcomes directly associated with higher returns on invested capital (Hellstrom and Jacob, 2003). Since any direct connection between knowledge and money is difficult to make, even in theory, proxy measures have been developed which attempt to emulate the 'matter-of-factness' of the bottom-line. Most notably these may be found in the tradition of measuring IC and its relation to a firm's book value (Edvinsson, 1997a; Stewart, 1997).

The outcomes of interest, when evaluating KM program impacts *qua* IC, reside in the combination of an organization's intangible assets, which are often seen as some combination of its structural capital and its human capital (OECD, 1999). In other words, IC is a *mélange* of items such as staff competencies, ability to exploit such competencies, customer relationships, brand equity, goodwill and patents: all of which may be assumed to be more or less tangible proxies for knowledge outcomes of KM programs.

As we will later see, there are clear limitations to a purely measurement-oriented approach to KM evaluation. However, taking the outcome-measurement

approach at face value, we may note that a high IC score is very clearly a positive outcome of good KM practice (Hellstrom and Jacob, 2003).

There are many frameworks for synthesizing knowledge assets into evaluation scores, some of the more notable being the Intangible Asset Monitor (Sveiby, 1997), the Balanced Scorecard (Kaplan and Norton, 1992), and the Skandia Value Scheme (Edvinsson, 1997b).

These frameworks seem to share a broad tripartite classification metaphor of human, customer and structural capital. Some of the difference between the models lies in the relative importance that is given to measuring employee value and customer values, but all of them, and especially the Balanced Scorecard, directly link these types of metrics to financial factors (Hellstrom and Jacob, 2003). One may say that such frameworks are typical bottom-line in their orientation (Hellstrom and Jacob, 2003).

The Intangible Asset Monitor tends to regard people as the main carrier of knowledge outcomes and to see increased capabilities/competencies as a major intermediate goal in profit generation. Other measures take into account process variables, albeit mainly in terms of fixed IC outcomes of processes, which have already taken place. For instance, the Intangible Asset Monitor concentrates on scores for growth, renewal, stability and efficiency, while the Balanced Scorecard focuses on customer learning and growth perspectives (Hellstrom and Jacob, 2003).

In an attempt to synthesize and broaden the scope of some of these frameworks, Low (2000) developed a model for measuring 'critical categories for nonfinancial performance'. This model consists of an index of a number of 'value drivers', namely: innovation, quality, customer relations, management capabilities, alliances, technology, brand value, employee relations and environmental and community issues (Hellstrom and Jacob, 2003). These are operationalized into measures derived from a diversity of sources, e.g. industry reports, expert judgments, governments filings, etc., which together combine in a single measure called the Value Creation Index (VCI). The VCI is then

standardized for different kinds of markets (e.g. manufacture and e-commerce), by adjusting it according to the correlation coefficient between the market value and the VCI value. This way the VCI weights each category differently according to its correlation with the market value, which (a) lends it a higher degree of accuracy, and (b) makes it possible to create evaluative bottom-line performance criteria according to branch (Low, 2000).

1.6.2.2. Process-oriented evaluation of knowledge management

The outcome measures outlined above offer KM programs a kind of anchorage in the bottom-line that may lend strength to the credibility of the overall field of KM (Hellstrom and Jacob, 2003). This is particularly true in so far as the success of ventures is often reported in hard facts and figures, these being difficult to disregard (albeit not to refute) in organizational life. Unfortunately, because they do not clearly connect to the actual processes of knowledge creation, they may unwittingly provide decision makers with the wrong reasons for scrapping or supporting a KM program. Parallel to the IC tradition, another practice of KM program evaluation seeks to focus on process variables further away from the bottom-line, as proxies for successful program impacts (Hellstrom and Jacob, 2003). The two approaches can be described as follows:

- the IC measures consider how successful the organization and its individuals have been at attaining their goals (Evangelidis, 1983);
- the process measures attempt to establish what people who are engaged in creating knowledge and innovations should be doing in the organization, and then seeing whether they are doing it or not.

In the spirit of this, a well-known consultancy firm developed measures for 'return on vision' rather than 'return on investment', i.e. measuring effects relating to employee satisfaction, drive and imagination (Hellstrom and Jacob, 2003). Those who embrace process alternatives will argue that this type of process outcome, apart from telling us more about how successful the KM program was,

is a better device or articulating and focusing long-term accountability (Sharman, 1993).

Liebowitz and Suen (2000) have been among the most recent to adapt existing evaluation metrics towards more process-oriented alternatives. Some of their measurements include:

- the number of new colleagues or partnerships spawned in the organization (as a proxy for transfer of tacit knowledge) – processes such as ‘knowledge fairs’ may contribute to such outcomes;
- the reuse rate of knowledge which is frequently accessed/reused;
- the number of new ideas that generates innovative products or services;
- the number of lessons learnt and best practices applied to create value-added;
- the number of ‘serious’ anecdotes presented about the value of the organization’s KM systems;
- the number of ‘apprentices’ that seniors mentor, and the success of these apprentices as they mature in the organization;
- interactions with academics, consultants and other advisors.

These factors are clearly process-oriented in the sense that they are both outcomes and facilitators of further production of knowledge. What is measured in this regard then is not so much performance itself as certain critical attributes of performance (Euske, 1984); not so much the hard outcomes of performance, as the critical precursors to such outcomes.

Further to this reasoning, advocates of the process perspective have argued that measuring all the impacts associated with knowledge and capability growth is too impractical (Edvinsson and Malone list 113 measures in their ‘Universal Intellectual Capital Report’). What actually matters is those vital signs that indicate how well activities within a process or the outputs of a process achieve a specified goal (Hronec, 1993). In addition, Turney (1992) has suggested that evaluations of processes related to activities such as KM programs must

clearly communicate how an activity is meeting the needs of both internal and external 'customers'.

Processes that stimulate knowledge production, and which are themselves outcomes, may be evaluated in their own right (Hellstrom and Jacob, 2003). However, it is also critical to ask in what respect a KM program affects the drivers which underpin 'soft performance' such as teamwork, communication, adaptation of other processes and tools (Ahmed, Lim and Zairi, 1999). This recursive stance begs the question of whether such processes are outcomes in a hard sense, since a change in drivers would likely change the whole aim of the KM exercise as well as its preferred outcomes. In many ways the outcome-oriented (hard) and the process-oriented (soft) measures differ qualitatively from each other, but still retain similar 'outcome quality' characteristics (Hellstrom and Jacob, 2003). The logic of outcomes in evaluation exercises poses special problems, the implications of which will be discussed in the next section.

1.6.3. Knowledge Management Performance Evaluation Approaches

A *qualitative analysis* can be used to the outcomes of a pilot study and the reviews by researchers of organizational learning (Huang, 2007). For example, the success of knowledge can be shared in an organizational culture, not only technological knowledge, but also the knowledge related to behavioral factors. In addition, expert interviews, critical success factors (CSFs) method, and questionnaires are used to implement qualitative methods for exploring specific human problems. The aim of *quantitative analysis* is to present the extent of the impact on both decision making and task performance, using historical data that is easily available, relevant, accurate, and timely.

This evaluation can avoid the drawbacks of qualitative analysis, especially in the subjective judgment of empirical results. Therefore, a quantitative research approach is designed to represent a tangible, visible and comparable 'ratio'. In other words, quantitative analysis can be used to measure the explicit knowledge of an organization or an individual, with both financial and non-financial indicators as discussed below.

Traditional *financial indicator analysis* focuses on well-known financial measures, such as the analysis of financial statements, the payback period, the return on investment (ROI), the net present value (NPV), the return of knowledge, and Tobin's *q*. These methods are best-suited to measure the value of daily transaction processing systems.

In fact, the *non-financial indicator analysis* is different from the traditional financial statement analysis. It uses non-financial indicators, such as: how often each employee logs into the knowledge bases; how many 'times' each employee brings up a proposal, how many 'topic numbers' there are on the discussion board, and how many communities of practice are there in the company? All these indicators are related to behavioral factors and system usage situations (Huang, 2007).

Internal performance analysis focuses on process efficiency and goal achievement efficiency. These methods evaluate KM performance through the gap between target and current value. These well-known methods include ROI, NPV, balanced scorecard, performance-based evaluation, activity-based evaluation, and other models (Huang, 2007).

External performance analysis is always compared with benchmark companies, primary competitors, or the whole industry average (Huang, 2007). With benchmarking or best practices methodologies, firms are able to determine their own KM performance and compare themselves with their competition, and take appropriate action.

Recent studies of KM and organizational learning in environmental projects emphasized the difficulties of learning from projects – not only within individual projects, but also across and between projects (Huang, 2007). In *project-oriented analysis*, nevertheless, a project organization requires particularly systematic and effective knowledge management, if it is to be used to avoid knowledge fragmentation and loss of organizational learning. In order to systematically manage the knowledge created within a project, the project itself must be systematically managed by the model.

An *organization-oriented analysis* is focused on the whole organization, and on the multi-dimensions and multi-layers in the firm. A KM performance evaluation can be analyzed from intellectual capital, BSC, technology, and process perspectives (Huang, 2007). The primary objective is to estimate the level of KM performance in the whole organization.

1.6.4. Knowledge Management Performance Models

Proper management and leveraging of knowledge can propel an organization to become more adaptive, innovative and intelligent (Tseng, 2008). Thus, KM has become an important strategy for improving corporate competitiveness and performance (Wong and Aspinwall, 2004, 2006). However, the links between performance and the knowledge aspects of the models are often ignored or not properly exploited (Robinson et al., 2005).

A model is a simplified representation of reality, developed with a specific goal; a maturity model follows the evolution of an organism from its early beginnings to a final status, be it one of declination and death or an ideal one of excellence and continuous improvement.

Several maturity models have been developed that try to identify the essentials of effective processes in other domains. These models are usually structured on stages that have to be overcome one at a time, by fulfilling a set of requisites, or may allow for continuous improvement. They have proved useful to:

- measure the current maturity of the process employed,
- evaluate the current status of the field practices,
- set an objective for process design endeavors,
- guide the evolution of organizational change, and
- allow comparisons or benchmarking with similar efforts of other units or companies.

Focusing on knowledge process improvement, a knowledge process is a process where knowledge is created, identified, stored, shared, and eventually used. On the other hand, having a knowledge management process implies an

explicit intent of modifying either the knowledge processes themselves, or the way in which regular business processes utilize knowledge.

One of the holistic models for evaluating the sufficiency of knowledge management practices of an organization is presented by Skyrme. Skyrme, introduces a toolkit to evaluate how well an organization is implementing the knowledge management.

The toolkit is based on a knowledge initiative framework which is composed of three layers: The top layer comprises the enablers, i.e. organization's structure, culture and environment that are harnessed by the compelling leadership for a knowledge-based company. The second layer of the framework comprises a set of levers that amplify the contribution of knowledge. These include knowledge processes that facilitate knowledge flows, knowledge centers that provide faster access to explicit knowledge and better ways of handling tacit knowledge. Thirdly, the foundation layer provides the capacity and capability that embeds knowledge into organization's infrastructure. It includes both the hard and soft elements. The guiding framework is derived from an analysis of factors that underscore the success of a knowledge-based business. The dimensions of the framework can easily be adapted to suit specific organizations.

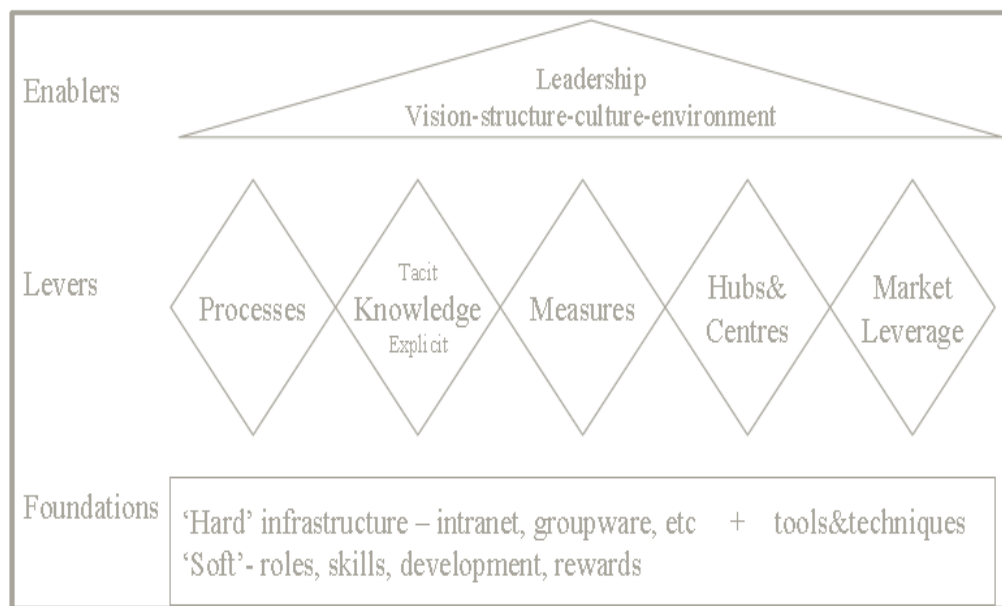


Figure 1.2. Skyrme's Knowledge Management Model

Another methodology is Knowledge Management Maturity Model (KMMM) which consists of development and analysis models. The development model defines five maturity levels and provides information how to make the next reasonable step in knowledge management development. The maturity levels were inspired by the levels of CMM from the Software Engineering Institute at Carnegie Mellon University and have been thematically worked out for Knowledge Management matters. The analysis model helps to take account of all important aspects of Knowledge Management and reveals which topics should be developed in future. In KMMM an auditing process is defined which structures planning, data collection by interviews and workshops, and feedback sessions.

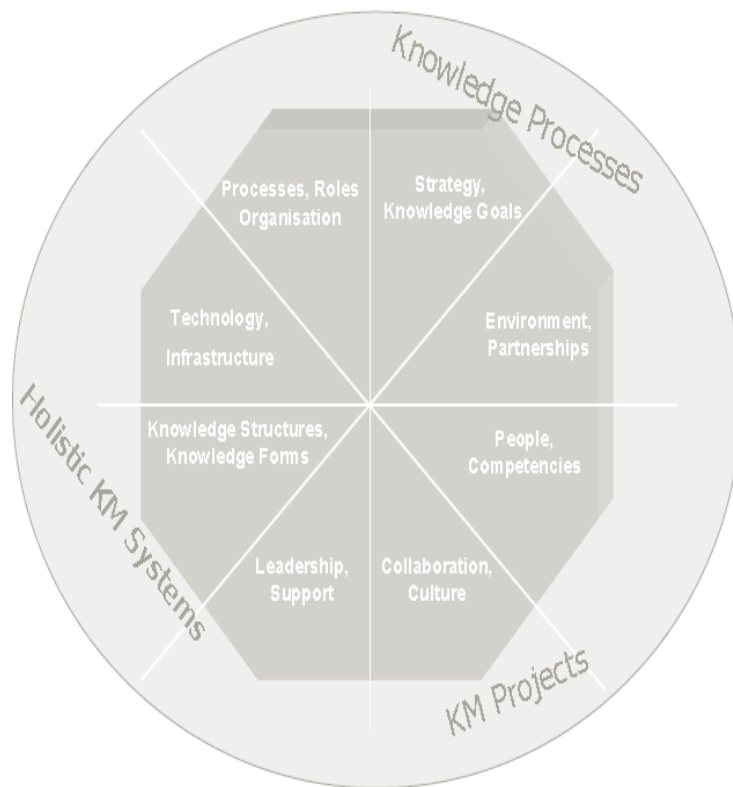


Figure 1.3. Knowledge Management Maturity Model

Siemens has registered KMMM as a trademark, meaning Knowledge Management Maturity Model (Ehms, 2003). KMMM comprises an analytical model (based on EFQM excellence model enablers), a development model inspired by CMM and a defined evaluation process. Siemens understands maturity

levels within KMMM as relatively robust states of an organization, based on activities and processes that are exercised along the time. KMMM does not allow level skipping and it is recommended to grow in synchrony on all features before focusing on the next level.

Tata Consulting 5iKM3 is a framework that integrates what it calls the three “Key Foundation Areas” (KFA) of knowledge management (people, processes and technology) into a control system and a knowledge system that link the knowledge assets with the operating processes (Tata, 2005). It includes an evaluation model to identify the status of the organization with respect to each KFA, the current processes, to decide which interventions are adequate and to plan the next steps.

Both approaches follow the original formulation of Carnegie Mellon Capability Maturity Model (CMM) with five levels of maturity that are expected to be reached stepwise (Paulik, 1993). CMM may be considered as an “open model” in the sense that there is a wealth of resources available to understand it before embarking into an assessment effort. Unfortunately, some of the knowledge management maturity models found in the literature is accompanied by proprietary methodologies that can be fully evaluated only after entering a consulting engagement, with scant case studies available for analysis.

Repsol YPF has defined a novel approach for improving its current practices of Knowledge Management within each business area. This methodology is inspired upon EFQM and FUNDIBEQ excellence models and Carnegie Mellon capability maturity model for software processes. The major contribution of this approach is to define a roadmap to reach further levels of maturity along five dimension of analysis, by stressing different areas for improvement. A survey instrument was developed to gather the subjective assessment of the members of the organization. This tool is supplemented by individual interviews and workshop held with the key players to evaluate further evidence of maturity in each dimension.

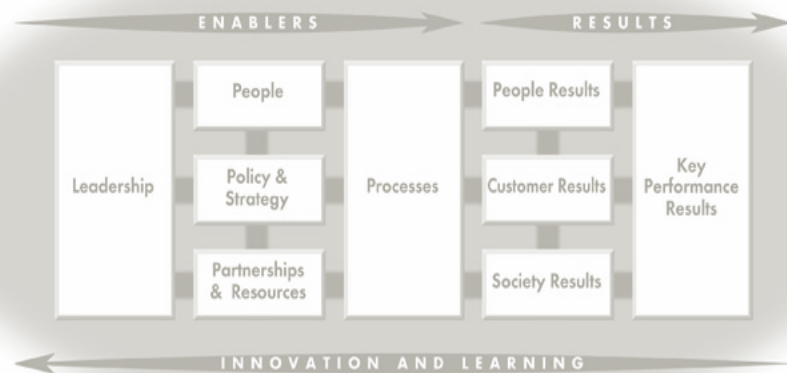


Figure 1.4. EFQM Model

Lee and et al (2005) proposed a new metric, which they called the knowledge management performance index (KMPI), to evaluate knowledge management performance. The basic assumption underlying it is that knowledge may be viewed from a unified perspective; it circulates in the organization creating knowledge assets and influencing organization performance.

Chen and Chen (2005) developed a new metric, knowledge management performance index (KMPI), for evaluating the performance of a firm in its KM at a point in time. The researcher therefore suggests that a KMPI can be used to determine KM activities from the following perspectives: knowledge creation, knowledge conversion, knowledge circulation and knowledge completion. Chen and et al., (2005) have presented an interesting example of linking between measuring models, integrating the KM process with the Balance Score Card in four interrelated main research streams. They have developed an index (KMPI) based on the Black–Scholes model. The authors state that the option pricing model can act as a measurement guideline for KM activities.

When KM activities efficiency is increased, KMPI will also be expanded, enabling firms to become knowledge intensive. The results have proved that the option pricing model can act as a measurement guideline for KM activities.

Ho (2008) concedes that company size does not necessarily express a significant relationship with the importance of the performance index. Accordingly, we can conclude that the number of employees does not affect the selection in the importance of the performance index

Harlow (2008) develops an operational definition of a tacit knowledge index (TKI) that provides a measurement tool for managers to use in selecting appropriate knowledge management methods for desired innovation and financial outcomes. The development of this scale is significant because no current research exists that develops an operational definition of tacit knowledge that combines the degree of tacit knowledge content of various KM methods with usage of methods at the firm to measure firm performance. This measure will be useful as firms try to measure their ability to create both a core competence in KM and maintain or improve their capability to create and disseminate tacit knowledge.

Measuring the value of knowledge assets and/or impact of knowledge management processes is the main thrust of this research and the aim is to enable knowledge creation that unlocks the mystery of tacit knowledge toward greater innovation within the firm as stated by Von Krogh, Ichigo and Nonaka (2000). Empirical studies have shown that 46 percent of executives believe that their firm's KMS performance is good to excellent at creating new knowledge but only 4 percent rate their firm's performance as good in measuring the value of knowledge assets and/or the impact of KM. In developing these processes, surveys have shown that the people side of the KMS, dealing mostly with sharing and creating tacit knowledge, is the most difficult area of KMS – 56 percent rate this as the most difficult area – and measuring knowledge assets and their value is the second most difficult process – 43 percent – (Ruggles, 1998).

This lack of empirical information on the impact of KMS that include both tacit and explicit methods has meant that firms often choose technology solutions that are designed to capture and disseminate mostly explicit knowledge (Almeida and Kogut, 1999). While these systems offer the advantage of ready usage metrics, their actual contribution to effective KM within the firm is less clear (Berman et al., 2002). The degree of explicit codification – more manuals or

product plans do not presage success at firms – does not indicate that the knowledge encoded is valuable or unique. Firms may have extensive libraries of codified knowledge that is rarely accessed or is bypassed by unmapped tacit processes (Harlow, 2008).

It is further argued that firms with greater degree of managing knowledge, and specifically tacit KM, will achieve higher than average returns (Harlow, 2008). The measures of economic effectiveness of KM systems have frequently used the Return on Sales (ROS), share price, growth of sales, and other financial metrics as a test to the success of KM systems (Sveiby, 1997). These metrics provide useful information but may be hard to measure in large global firms that use KM in only part of their operations.

These firms are able to use the tacit knowledge component of KM to create hard-to-duplicate core competence in managing, identifying, capturing, systemizing, and applying tacit knowledge to create customer value as measured by innovation and economic outcomes. In order to measure the innovation and economic outcomes of the firm, it is important to understand how and why tacit KM is both crucial and necessary in today's firms (Harlow, 2008).

The experts confirmed that what is being measured in each method is a measure of the medium of knowledge sharing or the method's throughput capability of tacit knowledge (Harlow, 2008).

When combined with usage at a firm, using a Likert scale measure, tacit knowledge is positively associated with firm performance (Harlow, 2008). Harlow (2008) tested that there is a positive association between the Tacit Knowledge Index (TKI) and firm financial outcomes and the hypothesis was accepted. Second, Harlow (2008) hypothesized that firms that have a high TKI will have a higher degree of innovation and concluded that TKI had a stronger relationship to innovation outcomes.

The results of the study provide empirical results that appear to indicate that use of tacit methods has a greater effect on innovation than on financial measures (Harlow, 2008). The implication is that firms that want to innovate

should employ a higher degree of tacit method usage than firms whose goals are financial. Further, firms whose environments require more innovation would be advised to use the methods that are highest in tacit knowledge throughput such as experting, collaboration and master craftsman.

Most favored criteria advocated by Anantatmula and Kanungo (2005) are as follows:

- Enhanced collaboration within organization
- Improved communication
- Improved employee skills
- Improved productivity
- Better decision making

Results suggest that respondents would use the most favored criteria to measure knowledge management efforts. The most favored criteria suggest that respondents associate knowledge management with improvement in communication and collaboration within organizations as well as improvement in employee skills. These outcomes will lead to improved productivity and better decision-making.

The criteria placed in the last quartile of the scatter plot are considered the least favored criteria. These results suggest that respondents would not use the least favored criteria to measure knowledge management efforts (Anantatmula and Kanungo, 2005). They are:

- Increased share price
- Increased market size
- Increased market share
- Entry into different market type
- Increased profits
- Better staff attraction/retention
- Return on investment of knowledge management efforts

The least favored criteria suggest that market-related results are not directly related to knowledge management efforts. It can be concluded that knowledge management efforts have internal focus and may have an indirect impact on business results, specifically market performance. It is interesting to note that the least favored criteria can be quantified and easily measured whereas the most favored criteria are difficult.

Han (2009) indicates that there is no performance relationship observed for KM activities for companies. This study distinguishes KM activities from the view of processes, wishing to provide a comprehensive measuring framework for the future research and increase the maneuverability for organizations' KM implementation, however, this doesn't mean that these activities are absolute linear or totally split open (Han, 2009).

Actually, there are close correlations among each process and dimension (Gold et al., 2001). Different organizations choose different KM activities based on their strategies, which means the KM for an enterprise is not necessarily include all the four processes, this is why we do the factor analysis and correlation analysis to test the instrument validity for the four processes separately.

However, most of the metrics and methods of knowledge measurement that have been developed are concentrated on measuring the knowledge within the organization, which in fact misses the main point (Huang, 2007). The crucial issue for KM performance measurement is to attain a competitive advantage. Therefore, its most important task is to compare the company's KM performance with that of its major competitors, to find out what is required to attain the competitive edge (Huang, 2007).

Huang (2007) considers three indicators for conducting KM performance measurement: stock price, price earnings ratio, and R&D expenditure. The proposed analytical network process (ANP) model proposed by Huang (2007) not only guides the decision group for the efficient conduct of KM performance measurement, but also enables them to visualize the impact of various criteria when arriving at the final results. In addition, the

interdependencies among the various criteria can be effectively captured using the ANP technique, something which has rarely been applied in the context of KM performance measurement for comparing with major competitors.

Huang (2007) proposed a methodology of comparing a firm's knowledge management performance with that of its major rivals using ANP to obtain a clear indication of how to obtain a competitive advantage. The methodology was designed to provide a detailed comparison of a firm's KM performance against its major rivals', and then provide effective information for improving its KM and increasing its quality of decision making.

In the past, few studies have undertaken a systematic investigation of the effectiveness of the KM process (Wen, 2009). This subject is strongly related to a range of output variables, including productivity, organizational performance, competitive advantage, and competitiveness (Wen, 2009).

In the establishment of an assessment model of KM effectiveness, there are several problems to overcome – including:

- KM has multiple objectives
- KM is difficult to evaluate
- KM is associated with 'fuzzy' problems
- KM is related to individual cognitive behavior

To establish a comprehensive and integrated assessment model, the opinions of experts with different interests from various areas of expertise have to be merged. In addition to utilizing the related literature, Wen (2009) used focus groups, analytic hierarchy process (AHP), and questionnaire analysis. These qualitative and quantitative methods have been integrated to find the relative weights of different levels and indices. The final model consists of 5 major constructs and 30 indices with ensured validity (Wen, 2009).

Fernandez and Sabherwal (2001) also propose some measures of KM effectiveness. Sveiby (2002) presents an operational effectiveness of KM. Some assessment tables were suggested by Storck and Hill (2002), Levett and Guenov (2000), and Gold et al. (2001). Housel and Bell pointed out that the most

important index is the feedback received. The above-mentioned measures are taken into account in study done by Wen (2009) to develop a measurement index of KM for Taiwan high-tech enterprises. The researcher has also provided some measures of KM effectiveness.

Hoy and Miskel felt that measurement of the effectiveness of organizational activity could be classified into four phases:

- knowledge adaptation effectiveness
- knowledge achievement effectiveness
- knowledge integration effectiveness
- knowledge potential effectiveness

Assessing the effectiveness of KM operations is thus an important issue, but the measures that are available to evaluate the effectiveness of KM are generally unsatisfactory (Wen, 2009). There is a need to develop an assessment model that can be used to make an accurate assessment of the effectiveness of KM. The model established by Wen (2009) can be used to evaluate KM performance in terms of the control and coordination of organizational knowledge.

Wen (2009) adopts the following steps in the construction of the model: (i) consulting with specialists, scholars, and practitioners in knowledge management among Taiwan's high-tech enterprises; (ii) obtaining the views of a focus group; (iii) the application of AHP; and (iv) a questionnaire survey of qualitative and quantitative methods used in KM assessment.

While many knowledge management case studies and theoretical texts list benefits to an organization of the implementation of a knowledge management strategy, the literature provides little evidence that systems have been devised to measure those benefits (Jones, 2003). Jones (2003) presents a case study that attempted to demonstrate the benefits of knowledge management by measuring its impact. Jones' (2003) work was carried out in the in-house legal division of the UK's Financial Services Authority over a period of 18 months.

A measurement model was devised based on concepts adapted from the Balanced Scorecard, named as the knowledge management benefits scorecard. The scorecard took each objective of the division's knowledge management strategy and listed knowledge management activities necessary to achieve each objective (Jones, 2003). Next, likely benefits to individuals and the division arising from each knowledge management activity were listed. Methods of collecting qualitative and quantitative measurements data were then devised. Results obtained showed that benefits arising from some knowledge management activities could be clearly demonstrated (Jones, 2003).

However, activities that required individuals to change their behavior or take time to learn new skills were more problematical. More time would be necessary to demonstrate the benefits of knowledge management conclusively (Jones, 2003).

Despite that the methods of evaluating KM performance have been widely studied, no consensus has been reached yet (Jong-Ae Kim, 2006). Although it is difficult to demonstrate direct linkages between KM and an organization's performance, the efforts to examine the interrelationships between the two have been made using both quantitative and qualitative approaches. Kim (2006) provides an overview of the approaches to evaluate the impacts of KM implementations on organizational performance as an effort to aid practitioners to identify frameworks for KM performance evaluation.

Teruya (2004) categorizes KM performance measurements into three general types: internal measurement, external measurement, and inferred value measurement.

Internal measurement evaluates how well KM strategies are implemented. Performance evaluation of KM strategies can be done using various methods such as surveys, interviews, and satisfaction ratings. The internal measurements often employ subjective measures that quantify one's perceptions by assigning values and weights. *External measurement* involves numerical or financial analyses such as return on investment and benefits to the organization

incurred by implementing KM. *Inferred value measurement* is based on speculation and often captures anecdotal benefits (Jong-Ae Kim, 2006).

Academics and practitioners have made efforts to develop the frameworks for evaluating the performance of KM practices. Bose (2004) emphasizes the importance of standardized KM metrics to quantify knowledge and convince stakeholders of the value of KM initiatives. With the need for standardized KM metrics, he also asserts that unique standards for measuring intellectual capital and KM initiatives need to be created by each company. Del-Rey-Chamorro et al. (2003) present a framework to evaluate the contributions of KM implementations to corporate objectives using a set of key performance indicators. Gooijer (2000) proposes an approach to measure the performance of KM practices

A conceptual framework of KMS, referenced to the KM gaps (Lin and Tseng, 2005b), is used as the basis of a study done by Tseng (2008). It has four components, which are depicted in Fig. 1.5.

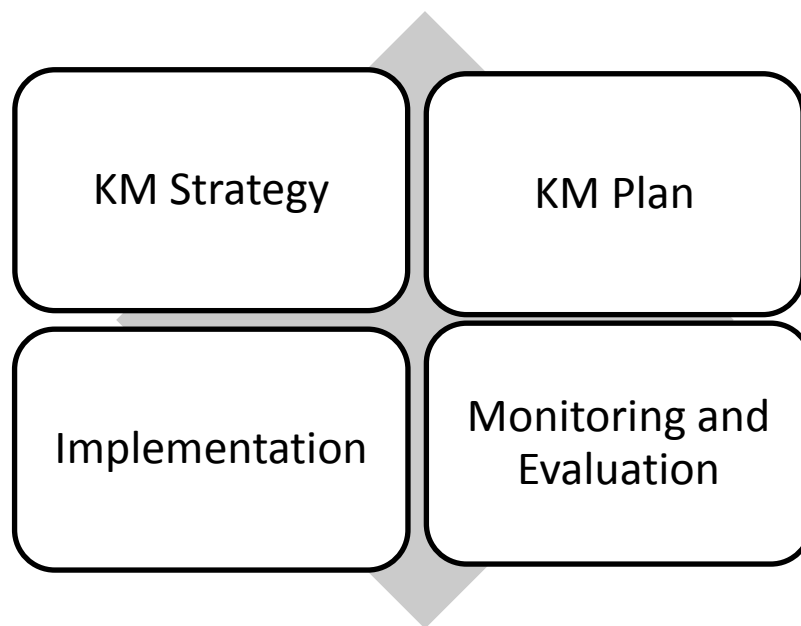


Figure 1.5. Knowledge Management System Components

The first component of KMS is KM strategy. Many firms cannot identify knowledge of where to go in their organization to obtain the relevant information and resources that are required to develop an appropriate strategic direction (Kim, Yu and Lee, 2003). Therefore, the role for top managers in implementing KM is to review the internal and external environments of the enterprise in order to understand its strength, weakness, opportunities, and threats in conducting KM activities (Ndlela and Toit, 2001; Wakefield, 2005). External analysis is crucial from the strategy aspect of KM, because it ensures that the enterprise can appropriately implement the KM program to achieve a sustainable competitive advantage (Krogh, Nonaka and Aben, 2001; Moorman, 1995). In this process, the weaknesses in competitors must be exploited and their strengths must be bypassed or neutralized. Also, depending on the outcome of the analysis of the enterprise's current position and capability with regard to the aspect of KM, the enterprise can address opportunities and threats to formulate a suitable KM strategy (Dess, Lumpkin and Covin, 1997; Hendriks and Vriens, 1999; Teece, 2000).

The plan of KM is the second component. Under the realization of the positions for the enterprise's internal and external environments, top management are able to enact a proper plan to guide the enterprise in implementing KM (Robinson, et al., 2005; Rubenstein-Montano et al., 2001).

Effective KM, based on knowledge, should be able to support the core tasks of business management, namely that of decision making and strategic planning (Yim et al., 2004). Although there are many ways in which KM can be practiced, but what method may be more suitable depending on the specific organization such as business object, nature of products and services, organizational culture, company size, availability of resources which will act as moderating factors that affect that how KM should be implemented (Wong and Aspinwall, 2006). Thus, in establishing the KM plan, it is crucial to diagnose and understand its value, and how suitable the plan to build the KMS for the enterprise. The action plan should include schedule, people involved and resources required (Goold, 2005). Furthermore, KM plans should also include of the design of the business's workflow and its functions (Chow et al., 2005).

Implementation of KM plan is the third component of KMS. Employees are often afraid that their personal value might be negatively affected after sharing their knowledge, especially, so they unwilling to share their own knowledge (Tseng, 2008). And, there is a tendency to keep knowledge in their personal computers, rather than to share and disseminate it to other employees (Wong & Aspinwall, 2006). Hence, the main stimulus for the company to implement KM is to improve this situation. Therefore, when implementing KM, top management must keep in mind that change is usually not accepted by employees, and it will take time before these changes become effective (Lin and Tseng, 2005b; Shaw and Edwards, 2005).

Furthermore, effective implementation of KM strategy includes a clear definition of what knowledge needs to be achieved and what motivations must be created (Campbell and Luchs, 1997). If different opinions exist within the organization about the definition of core knowledge, the value of knowledge, and the introduction procedures of the KMS, the enterprise will certainly be confronted with many obstacles when implementing KM.

KM performance measures is deeply concerned on fourth component, in which several argumentations involved in why financial measure and non-financial measure should be included in KM measurement system (Maltz et al., 2003).

It reveals that firm confront with difficulty in determining which specific measures are critical to their firm. Chakravarthy (1986) found that classic financial measures (ROE, ROC, ROS) are incapable of distinguishing differences in performance between these firms. Kaplan and Norton (1996) also asserted that traditional financial accounting measures (e.g., ROI, EPS) can give misleading signals for continuous improvement and innovation. It implies that the financial measures which are based on traditional accounting practices with emphasis on short-term indicators such as profit, turnover, cash flow and share prices, are not a fully set to measure the organization performance, while non-financial measures becoming important to organizations such as their customers, investors, and stakeholders (Robinson, et al., 2005). It is performance measures not only on

financial information, that non-financial measures are becoming important to organization (Fliaster, 2004). Based on the discussion mentioned above, research of Tseng (2008) will combine financial measure and non-financial measure to evaluate KMS performance.

Practicing KM for years can produce various forms of knowledge asset (intangible assets or intellectual capital) in firms (Lee, 2005). Edvinsson (1997a) show that the intellectual capital of a firm can be measured, documented, and monitored. In addition, Sveiby (1997) detailed how to use and measure intangible assets and how to monitor them for financial success.

Pfeffer and Sutton (1999) suggest KMPI, a new metric measurement in assessing KM performance a measurement mechanism for IT impacts; in it a metric of performance effects of IT applications was developed.

They measured the impact of automatic teller machines on market share and overall bank performance using an S-shaped logistic model: where y is the benefit of the IT application at time t , m is the upper bound on the benefits of the application, and a and b are constants that determine the shape of the curve (Lee, 2005). The rate at which the system benefits increase will be small while users learn a new application and integrate it into the existing operations. The rate then increases, as users become familiar with it. The rate, however, slows as the benefits approach the limit that can be gained from the application, or when competitors invest in similar applications in response to the benefits obtained by innovators. A similar rationale can be applied in the context of KMS, because knowledge asset will be limited. Rather, the increase rate will naturally saturate.

If KMP efficiency increases, then KMPI will improve, turning firms into knowledge-intensive businesses. The expansion of KMPI per unit time is thus also modest at first, then increases rapidly, and finally slows down. KMP has a dynamic nature because it represents a knowledge flow concept where five components of knowledge circulation are interlinked.

Lee (2005) proposed a new metric for assessing KM performance. KMP can affect the efficiency of work processes and performance of management

activities. Based on the argument regarding KMP characteristics, Lee (2005) claims that KMPI, can measure the quality of organizational knowledge, and that it is related to management performance. Lee's study shows that there is no conflict between the effects of KMP and KMPI. As the efficiency of the five components of KMP increases, KMPI is enhanced based on a review of the literature, several conclusions may be drawn. The complexity and multifaceted nature of organizational knowledge and KM has resulted in a need to develop a new metric for assessing KM performance.

To deal with this, Lee (2005) introduced a concept of KMP and applied it to devise a function of KMPI. The KMPI function was basically a logistic model in which the contribution of organizational knowledge accumulated by performing KM for years starts slowly but then increases rapidly, slowing down at some point at a mature level.

The power of KMPI to represent the financial performance of firms was tested. Three major financial indices were used and shown that there is a statistically significant correlation between them and KMPI. When KMPI increases, KM performance likewise improves. Thus, KMS designers should invest their limited IS resources in the design of an appropriate KMP. KMS designers can learn about the idea level of KCP by reviewing it, and thus leading to higher performance. It is difficult for IS staff members to predict the quality or level of knowledge management but it is much easier to estimate the level of each aspect of KMP. The use of KMPI will enhance the quality of decision-making in the investment of IS resources and establishing KMP. It improves the organization where knowledge is not optimally used. This supports the improvement of the learning capacity of organizations in evaluating results of knowledge intensive work processes, adapting knowledge, and applying new knowledge immediately.

Thus, KMS designers can recognize the value of KMP as it relates to organizational performance, allowing them to identify each pertinent KMP and develop a more accurate model of the KMS system.

KMPI provides some preliminary insights on how corporate knowledge activities should be organized to contribute maximally to KM performance. IT has a strong impact on the effectiveness of the five components of KMP. The Internet may become a crucial factor in making KMPI successful because it is used in daily management activities and is considered essential.

Instead of trying to evaluate knowledge directly, which may not be possible, assessing its contribution to business performance is a more useful approach (Anantatmula and Kanungo, 2005). However, this approach is still considered a major research issue. Major consulting organizations appear to agree with this approach as indicated by another case study, which also showed that measuring the effectiveness and contributions of knowledge management are a key concern for consulting organizations.

Another research study indicated that since knowledge management activities are an integral component of other management activities and processes, assessing knowledge management concerns how and when knowledge management is integrated into organizational activities, which can be measured. Thus, it is important to identify these activities and determine the contributions knowledge management makes to these activities. The study suggested that organizations should require less precision as well as more interest in trends than exact figures using a balance scorecard approach such as customer and employee satisfaction and intellectual capital. All of the research findings discussed above help confirm that knowledge management results are difficult to measure, which is a legitimate management concern.

There are no commonly agreed upon criteria or outcomes to assess knowledge management efforts (Anantatmula and Kanungo, 2005). Our research effort is focused on addressing this knowledge gap. Specifically, our research effort is aimed at establishing and structuring criteria for measuring efforts associated with knowledge management.

The primary focus of knowledge management is to utilize information technology and tools, business processes, best practices, and culture to develop

and share knowledge within an organization and to connect those who possess knowledge to those who do not. The knowledge management index (KMI) has been proposed by Crnkovic et al., (2005) as a parsimonious and useful tool to help organizations gauge their KM capabilities. This may be the first step in understanding the difference between what an organization is currently doing and what it needs to do in order to maintain and improve its performance level. At the macro level, the index enables organizations to compare themselves with each other. At the micro level, it calls attention to areas needing improvement in current and future KM initiatives. In either case, the KMI provides a robust indicator and basis for business decision-making and organizational support and development (Crnkovic et al., 2005).

Based on the literature discussed, it is clear that knowledge management is multi-faceted. A metric that depicts the health of knowledge management in organizations should take into account as many facets as possible. In the following section, we introduce and model such a metric. We call this metric the KMI of organizations, and we show how to construct it.

The following assumption is considered as the basis of our model: in every organization, there is persistent interaction between knowledge management processes under the influence of critical success factors, orchestrated by some actors: employees, customers, partners, and the environment of the organization.

A holistic approach to modeling and constructing the KMI of organizations extends the specific approach discussed above by striving to capture the resultant interaction of the processes and the actors (employees, customers, partners and the environment of the organization), rather than viewing them separately.

The joint interaction is captured by appropriate constructs relating the processes to the actors and vice versa. For each construct, a number of question items can be devised. The literature suggests that each construct should have at least two questionnaire items. Our survey follows this suggestion. If more constructs are needed, it can be easily accommodated in the EII calculations. Of

interest in the modeling of the EII is the total number of questionnaire items that can be measured to examine knowledge management as completely as possible.

In today's fast changing and non-linear business environment the only way to gain competitive advantage is by managing intellectual capital, which is more commonly known as knowledge management. There are basically three broad objectives of KM: leveraging the organization's knowledge; creating new knowledge or promoting innovation; and increasing collaboration and hence enhancing the skill level of employees.

The most common KM program involves development of a knowledge repository, and forming and nurturing of the communities of practice. These two, jointly, address all the three objectives of KM (Arora, 2002). Many organizations are embracing KM but few of them are able to implement it successfully to see the benefits. Implementation of KM is a strategic process and needs careful target setting and review. Organizations, which use balanced scorecard for strategy deployment, can effectively implement KM in their organization by developing and deploying a KM index.

In the present turbulent and discontinuous economy, knowledge is increasingly becoming the greatest asset of organizations. The basis of growth of modern society has shifted from natural resources and physical assets to intellectual capital. It has become the source of innovation, growth and value. Therefore, in today's world, it is absolutely critical to building, preserving and leveraging organizational knowledge.

2. MATERIAL AND METHOD

2.1. Model of the Study

On the basis of the above mentioned models, i.e. EFQM, KMMM, and BSC, and review of other relevant literature (most importantly Tseng, 2008; Kulkarni and Freeze, 2004; Chen and Chen, 2006; Crnkovic, Belardo and Asoh, 2005), the present research focuses on the following factors. These factors have been identified to ensure a comprehensive framework based on the relevant studies conducted. All factors from reviewed researches and models have been listed with their brief definition and similar ones are merged without leaving any category out.

- Leadership (LEA): leaders' involvement, guidance and "role model" image with respect to the organization's KM.
- Vision and Strategy (VIS): Clear strategy aligned with all functions, gathering regular feedback.
- Organization and Structure (ORG): Organizational structure supporting and enabling successful KM applications.
- Culture (CUL): Organizational culture encouraging KM activities.
- Partnerships (PAR): Involvement of customers and other external parties in KM cycle.
- Processes (PRO): Clearly established processes ensuring effective KM.
- Measures (MEA): Monitoring the success of KM activities.
- Competencies (COM): Implementing trainings for and coaching employees to increase the effectiveness of KM.
- Technology and Infrastructure (TEC): Technological infrastructure enabling effective and efficient KM system aligned with end-user needs.

In a similar vein, all relevant items are listed based on the literature review revealing out different researches measuring knowledge management performance or quantifying knowledge management efforts. After listing all items in an Excel sheet, each item, which aims to measure only one thing, is matched with one of the identified factors above. We have also used the KM process steps to make sure that we haven't missed any activities: Knowledge Creation, Knowledge Accumulation, Knowledge Sharing, Knowledge Utilization and Knowledge Internalization. Thus, each item in the survey is linked to one of the KM process steps as well as one of the KM factors.

207 items were listed in an Excel sheet. After matching process, every item was linked to one step of KM process and one factor of KM. Then each factor related items have been reviewed one by one in details to make sure that they are related to the linked factor and measures only and only one thing. After initial review, the number of items was decreased to 83.

The study attempts to construct an index to measure organization's intelligence considering dimensions mentioned above. Each dimension has been measured by various numbers of items. Then it explores whether there is a relationship between the index and the performance of the organization.

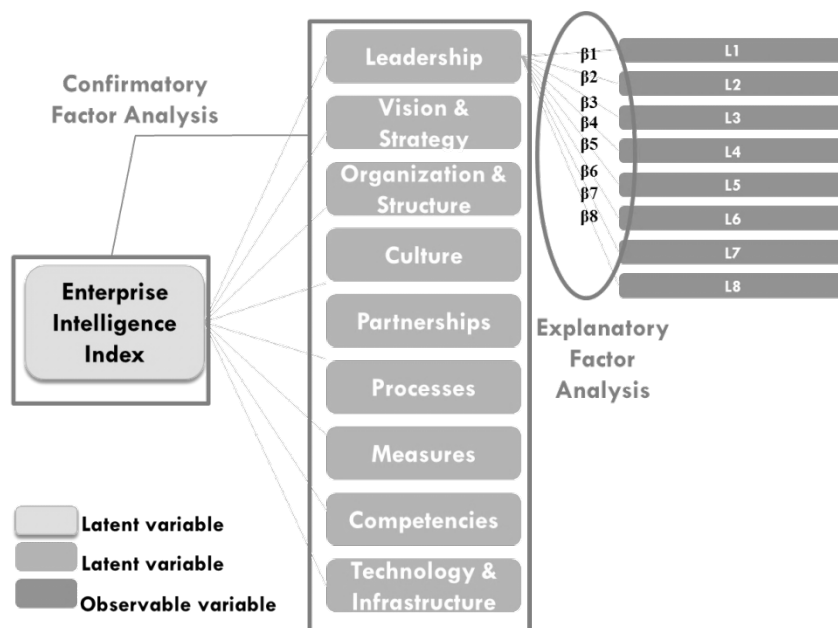


Figure 2.1. Model of the Study

2.2. Survey Instrument Development

Design of the survey is based on the study model depicted in Figure 2.1. Initially a questionnaire comprising 83 questions was prepared. Open-ended interviews with three academicians and five practitioners, all of whom had experience in studying or practicing KM for years were used to determine the content validity of questionnaire items.

Based on the feedback received, we have ended up with 42 items on the final survey. From a Knowledge Management process perspective, the “Knowledge Creation” items are removed since these items are considered as hygiene factors. We had still other four steps of the Knowledge Process: Accumulation, Sharing, Utilization and Internalization.

Upon completion of interviews, a pre-test was conducted with 42-item survey where 5 executives from different companies were asked to evaluate the instrument and comment on its clarity and understandability. After evaluation, necessary changes have been completed (e.g. grammar, phrasing, the content), we used five-point Likert scale for importance and performance, ranging from 1 (not important/successful at all) to 5 (very important/successful).

The questionnaire had also multiple choice questions to understand the structure of the organization: private or government; international or local; industry; years in operation; number of employees; annual turnover of the company and the department of the participant.

2.3. Data Collection

2.3.1. Data Collection Method

Participants responded online survey comprising 42 items of EII. Participants have been asked to evaluate how important each item is for their company. After completion of first set of questions, the participants have been asked to assess how successful their company is at each of the items. At the final

stage of the survey they are asked to complete some information related to their companies such as:

- The industry that the company operates in
- If it is public or private
- If it is local or international
- Annual turnover
- Number of years the company operates
- Number of employees
- The department that they are working for

The survey was kept online between January and March of 2012. The participants were invited to take survey depending on the suitability. I have collected 143 responses from senior managers of leading companies.

2.3.2. Profile of the Respondents

The target group is middle or top managers of the companies responsible for, or highly related to, KM activities in departments such as Information Technology, Human Resources, Marketing/Sales, and Strategy/Business development. Table 2.1 gives profile of respondents regarding departments. Number of marketing/sales department is larger than other departments. IT department follows marketing/sales department as number of other departments are very close to each other.

Table 2.1. Profile of the Respondents

Department	Number of Respondents	Number of Companies
Human Resources	24	12
IT	30	7
Marketing/Sales	61	24
Strategy/Business Development	28	17
Grand Total	143	60

The main industries that have been focused are depicted on Table 2.2 below. Finance, telecommunications and information technology industries take the first in line regarding respondents.

Table 2.2. Distribution of the Respondents

Industry	Number of Respondents	Number of Companies
Information Technology	36	15
Telecom	34	5
Finance	34	12
Pharmaceutical	10	5
Consulting/Research	7	6
FMCG	7	4
Energy	6	5
Manufacturing	5	4
Other	4	4
Grand Total	143	60

Another question in demography aims at sector questioning in which respondent is employed and results are displayed in Table 2.3. Almost all respondents work in a private company, but 2 respondents are government employees.

Table 2.3. Distribution of Companies Surveyed

Government/Private	Number of Respondents	Number of Companies
Government company	2	2
Private company	141	58
Grand Total	143	60

Another question in demography is related to operational area of companies. As Table 2.4 aims at sector questioning in which respondent is employed and results are displayed in Table 2.4. While nearly half of respondents (75) state operational area of their company is international, the rest marks as local.

Table 2.4. Area of Operations of Companies

	Number of Respondents	Number of Companies
International	75	35
Local	68	25
Grand Total	143	60

Operating years of the companies of respondents are given in Table 2.5 below. More than half of the companies (89) are in operating more than 20 years.

Table 2.5. Tenure of Respondents

	Number of Respondents	Number of Companies
0 - 5 years	3	3
10 - 20 years	37	12
6 - 10 years	14	5
Over 20 years	89	40
Grand Total	143	60

One question is asked on the size of companies regarding employees and results are displayed in Table 2.6 below. A great amount of respondents are from big companies while 11 companies are SMEs.

Table 2.6. Size of Companies

	Number of Respondents	Number of Companies
1-5	2	1
26 – 100	9	7
101 - 500	14	6
500 +	118	46
Grand Total	143	60

Last question is on annual turnover of companies. Annual turnover is directly related to company size that just 3 companies are below 1 million TL while 110 companies are over 150 million TL.

Table 2.7. Annual Turnover of Companies

	Number of Respondents	Number of Companies
Below 1 million TL	3	2
Between 1 - 5 million TL	13	3
Between 5 - 25 million TL	8	7
Between 25 - 150 million TL	9	8
Over 150 million TL	110	40
Grand Total	143	60

3. RESULTS AND DISCUSSION

3.1. Factor Analyses

The factorial structure and internal consistencies of all scales used in the study were investigated. Since it was a composite index, it is beneficial to test the factorial structure with explanatory and confirmatory methods. The overall fitness of factorial structure of each research variable was also tested with the confirmatory factor analysis (CFA) after completing explanatory factor analysis (EFA). Possible misspecifications as suggested by the so-called modification indexes and standardized residuals values were looked for and eventually a revised, re-specified model was fitted to the data.

3.1.1. Explanatory Factor Analysis of Enterprise Intelligence Index

Before conducting explanatory and confirmatory factor analyses, Kaiser – Meyer – Olkin (KMO) and Bartlett's test of sphericity were examined. The KMO measure of sampling adequacy revealed a value more than .50 which means that it is statistically appropriate to rely on the sampling to see if the correlations are meaningful ($KMO=.92$). Bartlett's test of sphericity was significant, $\chi^2 (561) = 3600,34, p < .001$ and yielded a significant result. These two tests showed that the data was fit to conduct factor analysis.

Table 3.1. Results of Principal Components Analysis of Enterprise Intelligence Index Scale (N = 143)

ITEM	F1	F2	F3	F4	F5	F6
LEA2	0,75					
LEA1	0,73					
LEA3	0,72					
VIS5	0,71					
VIS4	0,67					
VIS3	0,66					
VIS1	0,64					
VIS2	0,53					
TEC5		0,78				
TEC3		0,76				
TEC1		0,75				
TEC6		0,74				
TEC4		0,69				
TEC2		0,63				
CUL3		0,61				
PRO2			0,75			
PRO1			0,72			
PRO5			0,61			

Table 3.1.: Continued						
ITEM	F1	F2	F3	F4	F5	F6
MEA4			0,56			
MEA5			0,52			
MEA3			0,51			
PRO4			0,50			
ORG4			0,43			
MEA1				0,75		
COM1				0,72		
COM5				0,68		
CUL2				0,47		
PAR4					0,79	
PAR3					0,75	
PRO3					0,68	
PAR2					0,49	
ORG3						0,73
ORG1						0,69
ORG5						0,65
Eigen value	15,74	1,95	1,77	1,44	1,30	1,13
Variance explained	15,96	14,95	11,95	9,60	8,18	7,95

The analysis of 42 item scale revealed that there were 7 factors. However, below 8 items of several dimensions were eliminated from the analyses due to either cross or low (below .30) factor loadings were discharged from the analyses.

Table 3.2. Removed Items due to Low Factor Loadings

Removed Item	Factor	KM Process Step
Organization reviews the effectiveness of all training and development plans linked with the organization's knowledge management strategies and processes	Competencies	Knowledge Internalization
Organization ensures its people understand the organization's competitive strengths and can identify how their work and learning contribute to these strengths	Competencies	Knowledge Utilization
Management knows which employees are the carriers of valuable and scarce knowledge and sources of internal expertise have been mapped out	Competencies	Knowledge Sharing
Organization cultivates, exploits, develops and protects unique intellectual property in line with knowledge strategies and to maximize customer value	Culture	Knowledge Utilization
Organization encourages and supports individuals and teams to participate in improvement activities that will enhance the knowledge assets of the organization	Culture	Knowledge Accumulation
Organization uses a discrete set of variables (i.e., knowledge metrics, usage patterns, and/or business trends) to ensure our knowledge maintenance efforts focus on the most urgent knowledge needs	Measures	Knowledge Accumulation
The organization's structure is aligned to support the development, ownership and delivery of a knowledge management system	Organization/Structure	Knowledge Utilization
Organization gathers and understands information to define the markets and market segments the organization will operate in, both now and in the future	Partnerships	Knowledge Accumulation

The final EFA was conducted 34 items which loaded under 6 factors of Enterprise Intelligence Index (EII) construct (See Table 3.1) with the Eigen values of 15,73, 1,95, 1,76, 1,44, 1,30, and 1,12.

3.1.2. Confirmatory Factor Analysis of Enterprise Intelligence Index

Although EFA ended up with six factor solution, the CFA analysis was conducted in order to test the factorial structure of overall EII. In the CFA, different factorial predictions were investigated and comparative goodness-of-fit indexes were calculated. In the analysis, one-factor solution represented the model in which all items loaded under single EII construct. 6-Factor solution is the result of the EFA. In addition to these solutions, the predicted model of 9 factor solution of EII– Leadership, Vision & Strategy, Organization & Structure, Culture, Partnerships, Processes, Measures, Competencies, and Technology & Infrastructure – was tested and compared with other alternative models.

The results of the CFA yielded that one factor solution did not fit data well. The iteration of the model did not produce acceptable scores. In addition, 6-factor model (the result of the EFA) and original 9-factor solutions were also tested and compared with each other. The results of 6-factor model was nor fit data well, $\chi^2 (9, N=143) = 29.81$; $\chi^2/DF = 3.13$; $GFI = .93$; $AGFI = .85$, $CFI = .96$; $NFI = .95$; $RMSEA = .13$. The comparison of 9- factor solution showed a good fit with data. However, when the modification indexes were analyzed thoroughly, it was observed that the factors of Leadership and Vision were converged. Therefore, the CFA analyses were run again for 8-factor solution. The final analysis resulted that 8-factor solution showed excellent fit to data, $\chi^2(20 N=143) = 38.53$; $\chi^2/DF = 1.92$, $p > .05$; $GFI = .93$; $AGFI = .88$; $CFI = .98$; $NFI = .96$; $RMSEA = .08$. The χ^2 difference test was also conducted in order to check whether the difference between 9-factor and 8-factor models were significant. The analysis resulted that 8-factor solution is significantly better than the 9-factor solution, $\Delta\chi^2 = 28.84$, $p < 0.05$ (See Table 3.3).

Table 3.3. CFA Results of EII (N = 143)

Model	χ^2	DF	P	χ^2/DF	GFI	AGFI	CFI	NFI	RMSEA
Six Factor Solution	29.81	9	>.05	3.13	.93	.85	.96	.95	.13
Eight Factor Solution	38.53	20	>.05	1.92	.93	.88	.98	.96	.08
Nine Factor Solution	64.37	27	>.05	2.49	.90	.83	.93	.94	.10

Note: GFI = Goodness-of-Fit Index; AGFI = Adjusted Goodness-of-Fit Index; RMSEA = Root Mean Square Error of Approximation; CFI = Comparative Fit Index. Six Factor Solution= The model of EFA's result; Eight Factor Solution= Predicted dimensional structure of EII; Nine Factor Solution= Predicted dimensional structure of EII.

All factor loadings were significant and above the critical value of .70 (Figure 3.1). These factors explained the total 53% of overall EII. The inter-item consistency levels of the subscales were all at acceptable level (Cronbach's α levels were .90 for Leadership and Vision; .90 for Organization and Structure; .77 for Culture; .80 for Partnerships; .87 for Processes; .83 for Measures; .89 for Competencies; and .92 for Technology and Infrastructure). As a result, EII was found out as an eight dimensioned construct and further analyses were conducted with these dimensions.

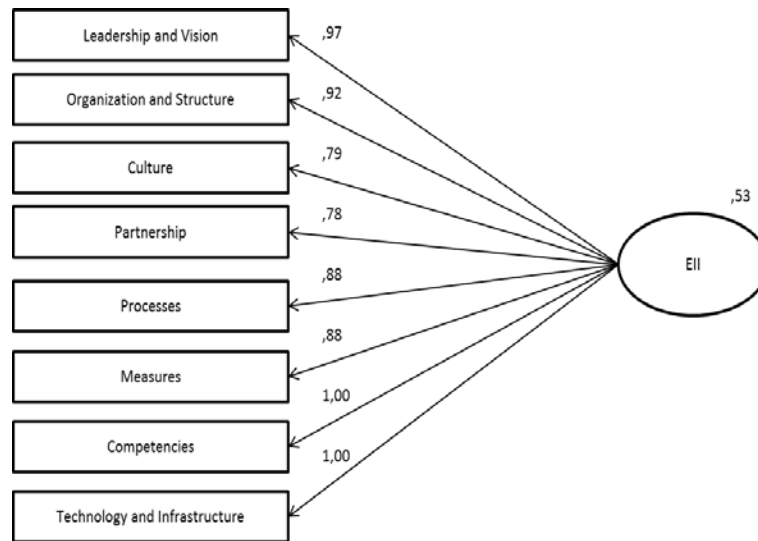


Figure 3.1. CFA Model of the EII

Table 3.4. Descriptive Statistics and Bivariate Correlations Among the EII Dimensions

No	EII Dimension	Mean	SD	1	2	3	4	5	6	7
1	Leadership and Vision	3,33	0,84							
2	Organization and Structure	3,04	0,86	,734**						
3	Culture	3,39	0,70	,680**	,660**					
4	Partnerships	3,33	0,76	,606**	,557**	,595**				
5	Processes	3,31	0,75	,696**	,646**	,712**	,686**			
6	Measures	3,35	0,79	,691**	,610**	,639**	,632**	,714**		
7	Competencies	3,28	0,85	,701**	,702**	,697**	,624**	,717**	,752**	
8	Technology and Infrastructure	3,27	0,90	,676**	,582**	,723**	,628**	,730**	,609**	,675**

**p<0.05; **p<0.01*

3.2. Correlation between Enterprise Intelligence Index and Performance Measures

We claim that EII can measure the quality of organizational knowledge, and/or indirectly within the firms' management performance. Therefore, we hypothesize that

firm with good quality organizational knowledge will increase their EII, and those with a higher EII will improve management performance. We adopted two specific measures (Price Earning Ratio and Customer Satisfaction) to translate management performance into tangible statistics. Thus, our research hypotheses were:

Hypothesis 1. If EII is greater, then the P/E is significantly better.

Hypothesis 2. If EII is greater, then the customer satisfaction is significantly better.

In order to test if there is any correlation between EII and organization's overall performance, we have identified two parameters: Price earnings ratio (P/E) and customer satisfaction. We have run analysis with data of 15 companies out of 60 companies which have stocks in Istanbul Stock Exchange (IMKB) and we have used 2012 P/E data by December 31st, 2012. We have also used Customer Satisfaction Index results of 15 companies participated to this research. Customer Satisfaction Index results have been published quarterly by Turkish Quality Association (Kal-Der) focusing on different industries. Analysis showed that both of the performance measures have significant correlation with EII (Please refer to Table 3.5).

Table 3.5. Correlation between EII and Performance Measures

Performance Measures	Correlation with EII
Price Earnings Ratio	,719*
Customer Satisfaction	,733*

**p<0.01*

3.3. Industry Specific Enterprise Intelligence Index

Once the study model is tested by EFA and CFA, and correlation between performance measures are proved significant and highly positive, industry specific enterprise intelligence may be attained.

Table 3.6. Industry Specific Enterprise Intelligence Index Results

Company Code	Industry	Index	Company Code	Industry	Index	Company Code	Industry	Index
Company 22	Information Technology	85%	Company 37	Energy	63%	Company 40	Information Technology	50%
Company 32	Information Technology	82%	Company 60	Finance	63%	Company 43	FMCG	50%
Company 7	Pharmaceutical	82%	Company 45	Manufacturing	63%	Company 35	Manufacturing	49%
Company 9	Manufacturing	81%	Company 57	Energy	63%	Company 18	Finance	46%
Company 10	Consulting/ Research	77%	Company 55	Telecom	62%	Company 50	Other	44%
Company 36	FMCG	75%	Company 28	Other	62%	Company 42	Finance	43%
Company 52	Information Technology	75%	Company 39	Consulting/ Research	61%	Company 13	Information Technology	42%
Company 14	Pharmaceutical	75%	Company 53	Telecom	59%	Company 15	Energy	41%
Company 24	Information Technology	74%	Company 21	Information Technology	58%	Company 51	Consulting/ Research	40%
Company 12	Finance	73%	Company 58	Telecom	58%	Company 46	Information Technology	38%
Company 2	Consulting/ Research	72%	Company 6	Telecom	57%	Company 27	Finance	36%

Table 3.6.: Continued

Company Code	Industry	Index	Company Code	Industry	Index	Company Code	Industry	Index
Company 31	Finance	72%	Company 44	Energy	57%	Company 8	Finance	34%
Company 1	Pharmaceutical	71%	Company 5	Information Technology	57%	Company 34	Other	34%
Company 3	Finance	71%	Company 54	Information Technology	57%	Company 19	Consulting/ Research	32%
Company 47	Information Technology	68%	Company 59	Finance	56%	Company 41	Energy	30%
Company 33	Pharmaceutical	67%	Company 17	Consulting/ Research	56%	Company 48	FMCG	29%
Company 26	Information Technology	67%	Company 20	Finance	56%	Company 25	Pharmaceutical	29%
Company 29	Other	67%	Company 38	FMCG	56%	Company 30	Manufacturing	23%
Company 11	Information Technology	66%	Company 49	Finance	54%			
Company 23	Finance	66%	Company 4	Information Technology	54%			
Company 56	Telecom	65%	Company 16	Information Technology	50%			

Companies having more than 500 employees are seemingly having a better Knowledge Management System. All industries but energy, FMCG, and IT have a better index degree.

Table 3.7. Comparison of Companies regarding Employees

Industry	EII where employees <500	EII where employees >500
Consulting/Research	36%	68%
Energy	56%	50%
Finance		52%
FMCG	75%	50%
Information Technology	64%	58%
Manufacturing	23%	64%
Pharmaceutical	29%	75%
Telecom		60%

The EII helps industries to see company specific or industry specific results. This benchmark is likely to encourage best practices among companies and industries. Based on the results, Pharmaceutical companies have the highest score among all industries (Please refer to Figure 3.2).

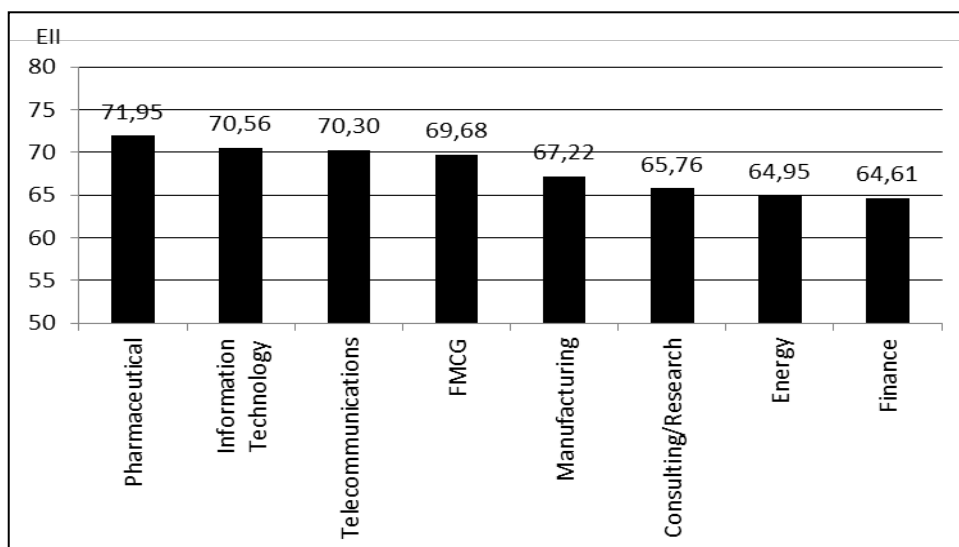


Figure 3.2. Comparison of EII of Different Industries

EII also provides opportunity for companies to identify a prioritized action plan in order to achieve better results with KM. Again, based on the survey results point out that “Technology and Infrastructure” and Leadership and Vision” factors are prior action areas since their performance ratings are relatively low although their importance ratings are higher compared to other factors (See Figure 3.3).

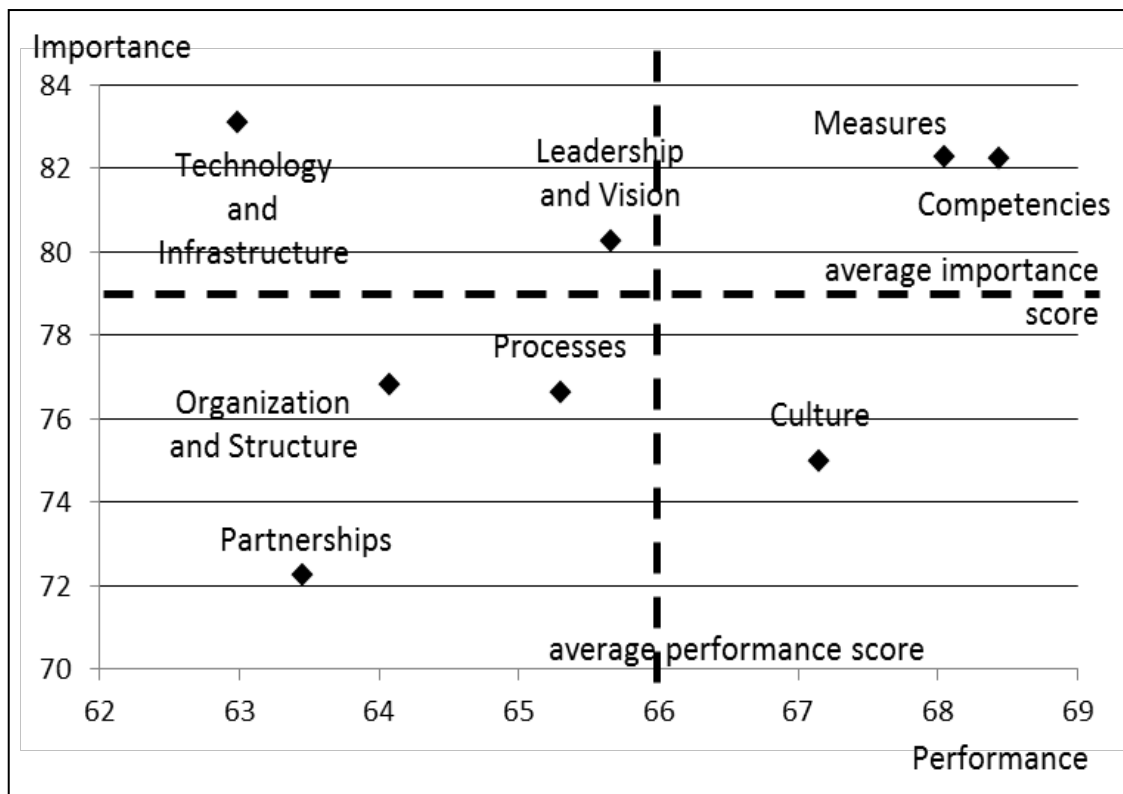


Figure 3.3. Quadrant Analysis of Dimensions based on Average Performance and Importance Ratings Covering All Responses

When we look at specific average performances of the industries, culture and measures matter more than the rest does (Please refer to Table 3.8).

Table 3.8. Factor Specific Average Performance of the Industries

Industry	Leadership and Vision	Organization and Structure	Culture	Partnerships	Processes	Measures	Competencies	Technology and Infrastructure
Consulting/ Research	3,32	3,36	3,48	2,81	3,36	3,43	3,57	3,36
Energy	3,23	3,29	3,44	3,06	3,08	3,04	3,17	2,64
Finance	2,99	2,54	3,21	3,11	3,18	3,24	3,35	3,15
FMCG	2,96	3,39	3,24	2,52	2,96	3,50	3,86	2,67
Information Technology	3,57	3,15	3,57	3,33	3,49	3,37	3,29	3,54
Manufacturing	3,20	3,35	2,93	3,53	3,25	3,25	3,30	3,07
Pharmaceutical	3,33	3,45	3,47	3,43	3,35	3,70	3,55	3,33
Telecom	3,60	3,10	3,51	3,30	3,37	3,63	3,38	3,31
Overall	3,33	3,04	3,41	3,20	3,31	3,40	3,37	3,27

Although, in overall, there is no significant difference between local and international companies, when we look at the industry specific results, we see that industry specific EII results may significantly differ.

Table 3.9. Difference between Local and International Companies

Industry	EII International	EII Local	EII Overall
Consulting/Research	59%		59%
Energy	43%	58%	53%
Finance	59%	48%	52%
FMCG	58%	29%	54%
Information Technology	58%	62%	60%
Manufacturing	56%		56%
Pharmaceutical	60%	75%	61%
Telecom	61%	59%	60%
Overall	58%	56%	57%

Again, in overall there seems to be no significant difference in the performance level per process step measured. However, in industry specific results, we can see the significant difference between different steps (See Table 3.9). This helps companies where to focus in their action plans to improve their EII.

“Knowledge Internalization” steps seem to be least successful in overall. Consulting/Research, Information Technology, Manufacturing, Pharmaceutical and Telecom industries have a close performance level among all process steps whereas Energy, Finance and FMCG have significant difference between the steps.

Table 3.10. Process Step Specific Results

Industry	Accumulation	Sharing	Utilization	Internalization
Consulting/ Research	59%	59%	58%	58%
Energy	54%	54%	50%	48%
Finance	55%	48%	56%	48%
FMCG	51%	49%	51%	55%
Information Technology	63%	60%	64%	57%
Manufacturing	58%	52%	58%	54%
Pharmaceutical	62%	59%	60%	60%
Telecom	62%	59%	61%	61%
Grand Total	59%	56%	59%	55%

4. CONCLUSIONS

4.1. Concluding Remarks

Contemporary business management attaches great importance to knowledge since it is as critical as tangible assets and it is a source of sustainable competitiveness for companies. Thus, knowledge management is becoming increasingly important as organizations realize that sustainable competitive advantage hinges on effective management of their vast and varied knowledge assets.

In today's fast changing and non-linear business environment gaining competitive advantage is by managing intellectual capital, by leveraging the organization's knowledge; creating new knowledge or promoting innovation; and increasing collaboration while enhancing the skill level of employees. Most organizations, therefore, today recognize that knowledge is the currency of the 21st century. However, there are as yet no time-tested or standard methodologies that organizations can employ to successful knowledge management because the field of knowledge management is still in its infancy and still evolving.

In short, KM is a kind of strategy that delivers the right knowledge to the right persons at the right time, helping members share information, and turning this sharing into actions that improve organizational effectiveness. However, despite large investments in KM technology, many of the performance outcomes are not clear and the causality between KM models and performance has not been established empirically.

Although there is general agreement that managing knowledge is beneficial, firms have had a hard time deciding what must be done in order to reap the maximum benefits of knowledge management. Many organizations are embracing KM but unfortunately few are able to implement it successfully to reap the benefits.

Current studies propose that organizations have intelligence which is defined as ability to acquire and apply knowledge skills. They create information from data, identify new information adding value to its processes through analyzing the information gathered and use the information in its processes. These studies also

indicate a potential as well as a need for a scale to measure KM in order for a better understanding of an organization's ability to keep and manage information.

However, implementation of KM is a strategic process and needs careful target setting and review. Furthermore, measurement is important: as you cannot manage what you cannot measure; to determine what to pay attention to and improve; to provide a scoreboard for people to monitor their own performance levels; to give an indication of the cost of poor implementation; to give a standard for making comparisons; to help efforts comply with business objectives.

The current study proposes that organizations have intelligence which is defined as ability to acquire and apply knowledge skills. They create information from data, identify new information adding value to its processes through analyzing the information gathered and use the information in its processes. All these indicate a need for a scale to measure Enterprise Intelligence Index (EII) in order for better understanding of an organization's ability to keep and manage information.

Thus, this study proposes a new index for assessing Enterprise Intelligence. Based on the argument regarding Knowledge Management Factors, we claim that EII can measure the quality of organizational knowledge, and that it is related to management performance.

The survey was kept online between January and March of 2012. The participants were invited to take survey depending on the suitability. I have collected 143 responses from senior managers of leading companies.

Initially, we have structured our model with nine factors, after explanatory and confirmatory factor analysis; we have finalized our model with eight factors merging "Leadership" and "Vision and Strategy" factors. Our study shows that as the success of the eight factors of Knowledge Management increases, EII is enhanced the results of the research.

EII can measure the quality of organizational knowledge, and/or indirectly within the firms' management performance. Therefore, we hypothesize that firm with

good quality organizational knowledge will increase their EII, and those with a higher EII will improve management performance.

EII also provides opportunity for companies to identify a prioritized action plan in order to achieve better results with KM. Again, based on the survey results point out that “Technology and Infrastructure” and Leadership and Vision” factors are prior action areas since their performance ratings are relatively low although their importance ratings are higher compared to other factors. Moreover, the EII helps industries to see company specific or industry specific results.

The study also aims at investigating relationship of enterprise intelligence index with financial performance and customer satisfaction results of companies. The power of EII to represent the financial performance of firms was tested. We used two major financial indices and showed that there is a statistically significant correlation between them and EII.

We have also examined the correlation of the index with customer satisfaction and price earnings ratios. The significant correlations indicates companies having higher “enterprise intelligence index” is more likely to have higher customer satisfaction and price earnings ratio.

Additionally, quadrant analysis has showed us, “Leadership and Vision” and “Technology and Infrastructure” are prior action areas since they have higher importance and lower performance compared to other factors.

4.2. Recommendations

On the basis of EFA, CFA and correlation analysis, we can conclude that the EII can not only measure the level of KM capabilities of an organization adequately, but also that its values significantly correlate with performance measures (P/E and customer satisfaction). If implemented, the EII would be a useful tool assisting organizations in prioritizing their KM efforts in order to increase their intelligence level through improving their KM systems. The EII would also allow them to keep track of the trends in KM performance over the years.

To this end, we may conclude that KM system designers should invest their limited resources in the design of an appropriate KM system. The use of EII will enhance the quality of decision-making in the investment of KM resources and establishing all factors. It improves the organization where knowledge is not optimally used. This supports the improvement of the learning capacity of organizations in evaluating results of knowledge intensive work processes, adapting knowledge, and applying new knowledge immediately. EII provides some preliminary insights on how corporate knowledge activities should be organized to contribute maximally to KM performance.

This analysis can be done at industry and company level and comparisons can provide insightful results. Action points at company level can help to define KM strategies and planning.

At this point, we may consider some constraints regarding the study. Once the study is cross-sectional, it may result in different findings if repeated. Furthermore, the study is based on perceptions of white collars. This introduces us social desirability problem as well as common method variance. To overcome this problem some questions in the survey is reverse coded and few are not graded. We need to keep in mind that respondents tend to write the ideal one rather than current one.

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APPENDIX

APPENDIX 1: SURVEY ITEMS:

Dimension	Item
Competencies	Employee knowledge is developed constantly and kept up-to-date by means of training, coaching and talent development programs
Competencies	Organization reviews the effectiveness of all training and development plans linked with the organization's knowledge management strategies and processes
Competencies	Organization ensures its people understand the organization's competitive strengths and can identify how their work and learning contribute to these strengths
Competencies	Management knows which employees are the carriers of valuable and scarce knowledge and sources of internal expertise have been mapped out
Competencies	Organization establishes and implements training and development plans to help ensure people match the future capability needs of organization
Culture	Organization cultivates, exploits, develops and protects unique intellectual property in line with knowledge strategies and to maximize customer value

Culture	Organization ensures the physical environment is organized in ways that facilitate knowledge transfer, e.g. Shared workspaces, large open spaces
Culture	There are no barriers for the use and exchange of knowledge
Culture	Organization encourages and supports individuals and teams to participate in improvement activities that will enhance the knowledge assets of the organization
KM Vision & Strategy	Organization uses an explicit knowledge strategy as a component for the planning of activities and setting of objectives throughout the organization
KM Vision & Strategy	Organization makes explicit how knowledge is being utilized to achieve competitive advantage
KM Vision & Strategy	Organization identifies the core knowledge which underpins its long term success
KM Vision & Strategy	Organization aligns knowledge policies and strategies with human resources plan
KM Vision & Strategy	Organization develops and uses people surveys to receive feedback on its approach to knowledge management and evaluate people awareness of knowledge issues

Leadership	Leaders develop clear values and expectations for knowledge management approach and knowledge assets
Leadership	Leaders personally communicate the organization's knowledge management strategy, plans, objectives and targets to people
Leadership	Leaders actively and personally get involved in terms of the way the organization is leveraging its existing knowledge and creating new knowledge to achieve its strategic goals
Measures	Organization uses market research, customer surveys and other forms of feedback to determine customer current needs and expectations for products and services
Measures	Organization uses a discrete set of variables (i.e., knowledge metrics, usage patterns, and/or business trends) to ensure our knowledge maintenance efforts focus on the most urgent knowledge needs
Measures	Organization monitors the performance of the products and services and uses this knowledge to further improve the processes
Measures	There are knowledge and learning objectives and related performance measures formulated in the corporate scorecard

Measures	Employees have knowledge and learning objectives and related performance measures in their Personal Balanced Scorecard aligned to organizational ambition
Organization/Structure	The organizational structure is simple, has few hierarchical levels, and consists of autonomous units
Organization/Structure	The organization's structure is aligned to support the development, ownership and delivery of a knowledge management system
Organization/Structure	There is task rotation to provide employees varied work
Organization/Structure	Organization identifies communication needs from a learning perspective and focuses on knowledge sharing across borders of departments/divisions and even organizations
Organization/Structure	Employees with valuable and scarce knowledge rotate among different business units and participate in a variety of improvement teams
Partnerships	Organization gathers and understands information to define the markets and market segments the organization will operate in, both now and in the future
Partnerships	Organization uses technology to link the organization's systems to external knowledge bases, e.g. Academic institutions

Partnerships	Customers and external partners directly participate in our knowledge efforts (via formal contribution and feedback channels) to the fullest extent possible
Partnerships	Organization ensures proactive involvement with customers in order to discuss and address their needs, expectations and concerns
Processes	Organization has a clearly established and formalized workflow enabling timely and efficient knowledge maintenance
Processes	Organization has an established and efficient workflow for the validation of any edited/newly created content
Processes	Organization designs and develops new products and services together with customers and partners that add value for the customers
Processes	Organization designs the organization's knowledge management processes, including those key processes needed to deliver both the overall organizational and knowledge management specific strategies
Processes	Organization identifies process stakeholders and managing interface issues inside the organization and with external partners for the effective management of end-to-end processes
Technology/Infrastructure	Organization's knowledge management technology is customized to employees' needs and will scale according to organization's future knowledge needs

Technology/Infrastructure	Organization composes knowledge in a concise and consistent format through the use of tools (i.e., templates, writing rules, and/or easy-to-read layouts) to enable highly consumable information
Technology/Infrastructure	User friendly communication and information systems are used to broadly spread knowledge among all employees.
Technology/Infrastructure	The necessary knowledge for important decisions is usually readily available and easily accessible via technology based systems
Technology/Infrastructure	Obtained and developed knowledge is systematically documented and made available to everyone in the organization
Technology/Infrastructure	Management information systems are integrated and continually updated

CURRICULUM VITAE

Full Name : Evren SATICI

Place and Date of Birth : Iskenderun / HATAY – 22.05.1980

E-Mail : evrensatici@gmail.com

Education

Degree	Department/Program	University	Graduation Year
Master	Engineering Management	Marmara University	2005
Bachelor	Industrial Engineering	Marmara University	2002

Job Experience

Year	Company	Position
2014, Sep – Present	Ericsson Headquarters, Group Function Human Resources	Head of Integrated HR Solutions
2012, Sep – 2014, Aug	Ericsson Headquarters, Group Function Human Resources	HR Process Globalization Project Manager
2012, Jan – Sep	Ericsson Region Middle East & North Africa, Human Resources	Organizational Effectiveness & Change Management Manager
2011, Jan – Dec	Ericsson Region Middle East & North Africa, Engagement Practices	Change Management Manager
2008, Mar – 2011, Jan	Peppers and Rogers Group	Management Consultant

2003, Apr – 2007, Aug	Yapı & Kredi Bankası, Organization / Quality Management Unit	Quality and Customer Satisfaction Specialist
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Conferences

Participated in the European Conference on Knowledge Management and presented the Paper *What is Your Organization's IQ? – A Practical Tool to Gauge the Enterprise Intelligence*, ECKM 2013 Kaunas University of Technology Kaunas, Lithuania