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Role of Knowledge Asset Indicators in Understanding Knowledge-Intensive Processes

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ABSTRACT

Organizations are increasingly engaging in implementing knowledge management systems to create, store, retrieve, and apply knowledge in achieving organizational goals and objectives. In that regard, the ability to identify knowledge assets is essential. Knowledge-intensive business processes rely heavily on appropriate utilization of knowledge and are also a source for new knowledge creation. As such, understanding the value of knowledge assets through various indicators can prove immensely helpful in better managing knowledge-intensive processes and deriving value from knowledge management systems. This paper presents a conceptual framework, which emphasizes the link between knowledge asset indicators and management of knowledge-intensive processes within an organization. Through a pilot case study used to emphasize these connections, this paper discusses the importance of developing organizational understanding of both internal and external knowledge asset indicators in enabling knowledge-intensive processes, and to ultimately achieve organizational strategic goals.

Keywords

Knowledge management, knowledge assets, knowledge-intensive processes, measurement indicators.

INTRODUCTION

Organizations are increasingly implementing knowledge management (KM) systems to be able to create, capture, retrieve and utilize organizational knowledge, whether tacit or explicit. While engaging in different aspects of KM processes, the ability to identify knowledge sources becomes essential. It is the process of examining and understanding how knowledge impacts the organizational goals and objectives through the different strategic as well as operational work processes (Nonaka, 1991).

The process of understanding the role of the organizational knowledge also involves considering the connection of knowledge assets and KM systems with respect to management of business processes, which are ultimately coupled with the organizational strategic goals. The need to understand connections between business processes and intellectual assets such as knowledge, experience, and creativity exists within the organization (Marjanovic and Seethamraju, 2008). Knowledge-intensive processes (KIPs) are business processes involving tasks highly dependent on one or more KM processes of creating, capturing, retrieving, and applying knowledge in the context of those processes (Marjanovic, 2005; Massey, Montoya-Weiss and O'Driscoll, 2002). Some basic characteristics associated with KIPs include high knowledge worker dependence in terms of expertise, contextual knowledge, creativity, innovation, or task learning curve (Epper, Seifried, and Ropnack, 1999). Thus, by understanding the role of knowledge assets, organizations can develop policies and guidelines that can help align KM systems to the relevant business activities within KIPs.

This paper presents a conceptual framework emphasizing the link between knowledge asset indicators that influence the KM processes, and the management of KIPs within an organization. In developing the framework, the article provides a foundation for identifying areas where knowledge asset indicators may be developed and identified by considering "knowledge as assets". A pilot study is provided which explores an organization's use of the knowledge asset indicators in its KIPs. The pilot study findings underscore the importance of developing both internal and external knowledge asset indicators in developing an understanding of an organization's knowledge assets, which in turn can potentially improve the management of KIPs and progress toward achieving strategic goals.

UNDERSTANDING KNOWLEDGE ASSETS

Knowledge assets within an organization include tangible as well as intangible knowledge and intellectual resources within an organization (Alavi and Liedner, 2001). This may include artifacts (e.g., products, patents) and services (e.g., procedures, methodologies) developed by an organization, as well as the knowledge resources utilized during the development, i.e.

artifacts (e.g., knowledge bases, data repositories) and processes (e.g., development techniques, protocols). Thus, knowledge objects incorporated into an organization's tangible objects can also be viewed as intellectual property or knowledge assets (Hill-King, 2007; Moon and Kym, 2006). This is especially true when utilizing intellectual property toward the achievement of competitive advantage. In a simple form, intellectual property can include the summation of all knowledge within an organization. This includes the knowledge and skills brought to the organization through employees, ideas, connections with customers and other external sources (Leitner, 2005; Poltorak and Lerner, 2002). In order to utilize knowledge as intellectual assets toward sustaining competitive advantage, an organization must have a clear understanding of the role of the knowledge assets in each of its key KIPs.

It has been shown that the two prominent management practices that lead to higher perceived levels of IT business value among managers include strategic alignment of IT with the business strategy, and IT investment evaluation (Tallon, Kraemer and Gurbaxani, 2000; Melville, Kraemer, and Gurbaxani, 2004). In the context of KM, strategic alignment of KM systems with knowledge management strategy is arguably crucial in supporting the role of knowledge assets in various KIPs. KM systems, aligned with knowledge management strategy, can facilitate effective use of knowledge assets through an underlying dominant knowledge management process of creation, storage, retrieval, or application (Alavi and Leidner, 2001).

Taxonomies by Hall (1992; 1993), Kogut and Zander (1992), Collins (1993), Blackler (1995), Stewart (1997), Nonaka, Toyama, and Konno (2000), Marr, Schiuma, and Neely (2004), and Li, Tsai, and Lin (2010) present numerous attempts by scholars for characterizing knowledge assets along different dimensions. As is evident in these taxonomies, knowledge assets are accessible through multiple areas within organizations, thus demonstrating the need for organizations to be aware of the various internal and external factors impacting KIPs.

ROLE OF KNOWLEDGE ASSET INDICATORS

To provide a foundation for organizations seeking to identify areas of knowledge which may serve as assets, two categories can be considered. As knowledge is impacted by both internal and external sources, the knowledge itself influences the KM processes occurring in the context of KIPs. Within these factors, non-technology factors such as human resources, also need to be considered since they have a distinct influence over the knowledge assets (Schryen, 2010). By defining the indicators according to the organizational KM strategies, the organization will be able to clarify their connection to organizational processes and related KM processes. The long term benefit of organizational connections between these strategies will be enhanced if the organization is committed to the identification of knowledge sources (Chen and Edgington, 2005).

Measuring the indicators is a topic for future research agendas; however, one model for consideration is proposed by Chen and Edgington (2005). In their model, the use of fixed (market value of hired employee) and variable compensation (contribution of worker) can be related to the internal indicators associated with human resources. Additional factors that contribute to the employee value also include the time period in which the tasks are completed. Direct costs associated with the collection, storing, and maintaining the knowledge can also be associated with the overall values. These direct costs can be associated with tangible assets such as infrastructure items.

Internal Indicators

The internal indicators include two separate areas for consideration, which may include human resources and infrastructure. The first area concentrates on the human resources aspect in the organization. Indicators within the component include, but not limited to, utilizing an employee's education level, years of experience, and employee training as a means of measuring potential knowledge. Within these internal components, the organization can identify special employee training programs, which lend themselves to enhancing an employee's specific knowledge to complete tasks. These training programs can include critical thinking, problem solving, or other general managerial improvement areas. Organizations can also review their current KM processes to help facilitate training opportunities through open exchanges of ideas and knowledge. These exchanges can occur through such programs as communities of practice and physical environments (Becerra-Fernandez, Gonzalez and Sabherwal, 2004). The implicit knowledge of the employees is transformed into productive forms of knowledge for the organization (Lucking and Pernikcka, 2009).

The second internal component to consider is the infrastructure within the organization. This infrastructure includes, but not limited to, the technology such as software, hardware, databases used to maintain the knowledge and information of the organization. The infrastructure also includes any of the legal mechanisms (such as patents, copyrights, trademarks) which are developed and maintained to protect the identified knowledge components. It should be noted these mechanisms could also exist within the external factors since the claim for patents, copyrights, and trademarks are handled through external agencies and regulations. Another aspect of the infrastructure is associated with the overall methodologies and processes which govern the creation of the knowledge. These are the processes which are developed and monitored by the organization.

External Indicators

The external factors exist outside of the organization but still have an influence in identifying knowledge assets. The factors to be considered may include the general public reaction to the company, brand reputation and loyalty, and customer loyalty. As the organization seeks to utilize these types, it is also essential for the organization to recognize which external factors are needed (Sveiby, 1997). Identifying factors which have limited or no connections will not be in the best interest of the organization. In order to utilize the external indicators, the organization must be able to sense and interpret the knowledge obtained through these sources. If these factors are not interpreted appropriately, the organization would not be able to use them in a manner which impacts either knowledge or business process management systems (Teece, 1998). However, as these external factors are understood, they can be used to help initiate new or alternative strategies.

As stated previously, the internal and external indicators need to be explored and developed based on the organizational objectives. As shown in Table 1, examples of the indicators and methods for identifying and working with knowledge in these areas are provided. These indicators are not considered to be industry-specific and can be seen across multiple organizational types. Financial costs of implementing methods and approaches will also need to be evaluated by each organization to determine the appropriate allocation of funds. Although some methods can be implemented with lower funding, indicators dealing with technology-based or external processes may see higher funding requirements (Menon and Pfeffer, 2003).

Indicators	Examples	Methods for Identifying Knowledge
Internal - Human Resources	Years of profession Employee training Education levels	Internal communication channels; Utilizing communities of practice; Employee seminars and orientations; employee recruitment strategies; policies; procedures
Internal - Infrastructure	Technology Legal Mechanisms KM/BPM processes	Collaboration software; group support systems; non-disclosure documents; patents; copyrights; knowledge repositories; common language
External	Brand reputation Customer satisfaction Distribution channels	Customer surveys; consultants; competitive benchmarking; suppliers; organization stakeholders; industry standards

Table 1. Examples and approaches to internal and external knowledge

A CONCEPTUAL FRAMEWORK

Within the literature, other frameworks and taxonomies have been presented which discuss knowledge as assets. Martin (2000) discussed how some studies have provided evidence of organizations relying on the management of intangible assets such as knowledge. One such approach proposed by Li, Tsai, and Lin (2010) explored knowledge assets by utilizing four types of knowledge which included core knowledge, dynamic knowledge, supportive knowledge, and low-value knowledge. Li et al. (2010) further stated each type provides the organizational perspective of the durability and profitability of the knowledge. Although the taxonomy illustrated the use of the four categories, Li et al. (2010) also recognized knowledge can alter their types based on changing environments. With environments impacting knowledge, Jashapara (2005) proposed an integrative framework illustrating organizational learning, culture, strategy, systems/technology and their interconnections to each other along with knowledge management. As part of Jashapara's (2005) framework, the concept of intellectual capital was connected to the component incorporating strategy. This framework provided an understanding of how organizational components relate to each other and also recognized the importance of intellectual capital in the organization. Also, as knowledge is being considered, the need exists to have quality of content (correct, consistent, and suitable) and context (where it becomes meaningful to the user) (Wang and Wang, 2009). To further the concept of measuring the value of intellectual assets, Montequin, Fernandez, Cabal, and Gutierrez (2006) provided a perspective of the Intellectual Capital (IC) model, which linked human, structural, and relational capital in order to determine value of knowledge assets. However, the IC model does not link the indicators associated with the three components to the KM and business process management (BPM) strategies. A Learning with Knowledge Cycle linking the KM processes in a circular design was presented by Rowley (2001). Although this circular design illustrated the cycle of KM processes, it did not present further connections to other organizational systems.

The above reviewed frameworks have provided indications of intellectual assets; however, a need still exists to provide a framework, which incorporates the aspect of knowledge-intensive processes to the internal and external sources of knowledge. As shown in Figure 1, a framework is proposed which presents an illustration of how KIPs influence the KM processes within an organization. The internal and external factors are represented within the KM processes to illustrate the need to have the KIPs influence how the knowledge from the factors is related. The management of KIPs is becoming the focus of recent research efforts in BPM areas. Due to their inherent nature, such processes cannot be automated in a conventional manner. They require requisite knowledge at the appropriate tasks in the processes based on their knowledge needs. In that regard, understanding of knowledge assets and their indicators can lead to better resource allocation and management of KIPs.

Although organizations may choose to allocate more resources to one particular aspect of the framework (Menon and Pfeffer, 2003), any approach to defining the indicators for an organization should be based on established goals. Although each organization’s objective may differ, the goal should be communicated accordingly (Nambisan, Agarwal and Tanniru, 1999). As stated by Chan and Chao (2008), a common goal of strategies among the organization is needed to provide the support required to successfully implement the organizational tasks. As these internal and external areas are reviewed and developed, the amount of knowledge from these areas will be able to improve opportunities for new knowledge creation (Teigland and Wasko, 2003).

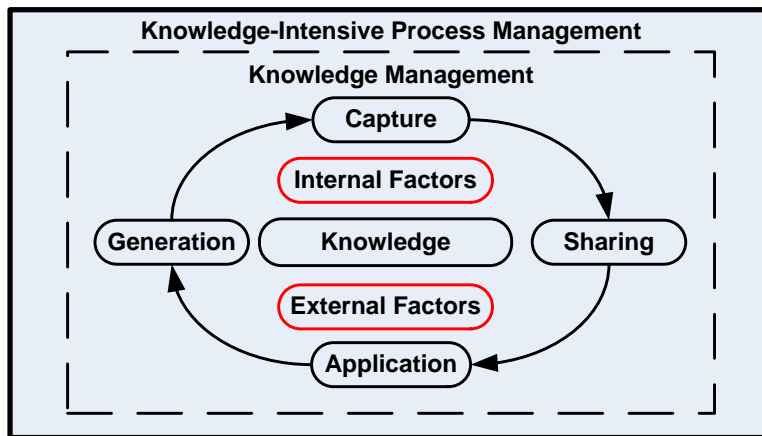


Figure 1. Framework connecting internal and external factors to KIP

Part of the process of identifying the internal and external measurement indicators also includes the need to understand the connection between the indicators and organizational systems. KM and BPM systems will utilize the knowledge obtained through the indicators as determined by their assigned tasks. Within Alavi and Leidner (2001), the four processes of knowledge management were discussed including the creating, storing, transferring, and applying of knowledge. As the sources of knowledge are identified, the impact on these KM processes need to be reviewed. For example, to help promote knowledge sharing, employee training can provide a means of converting tacit knowledge into explicit knowledge or vice versa. BPM includes the methods and resources to manage business processes (Bandara, Indulska, Chong and Sadiq, 2007). It is these systems which are also an important aspect to consider when identifying and utilizing the internal and external indicators. If the organization has a clear understanding of their KIPs, the organization will also be able to use those processes to effectively develop methodologies to implement KM processes which dictate the nature of how knowledge is created, captured, transferred, or applied. Reviewing the processes of how to conduct these tasks can be dealt through process modeling techniques, as described by Recker and Rosemann (2010). Bridging the connection between these measurement factors and the KM and KIP processes requires the organization to have a concise plan in place effectively express the knowledge (Pee, Kankanhalli and Kim, 2010). Another aspect to consider as mentioned by Pee et al. (2010) is the ability of the individual to also recognize the importance of the knowledge being gained through these internal factors.

As suggested by Marjanovic and Freeze (2011), KIPs are centered around the human aspect within organizations. By understanding the nature of the knowledge-assets, such as human resources, KIP can be better managed by defining the process structure in which knowledge is captured (Massey et al., 2002). This structure then provides opportunities to enhance KIP by also managing how knowledge is shared. By providing opportunities such as observations, training, and meetings through a variety of tasks and resources will provide beneficial results to the organization (Slaughter and Kirsch, 2006). Effectively utilizing the knowledge assets through KIP will be based on the overall perspective of the organizational managers. Even though the assets may be identified, the executives will need to display a role in the processes to help build

collaborative efforts (Marjanovic and Seethamraju, 2008). As suggested by April (2002) to assist in the management of KIP involving internal and external indicators, a set of guidelines can be recommended as shown in Table 2. To expand on these guidelines, a set of implications can then be defined within each of the categories.

Indicator	Management Guidelines	Implications
Human Resources	Understand what, when, where, and how knowledge is created, shared, and applied between organizational units.	Knowledge is then obtained through collaborative efforts to support the knowledge processes (Chen and Edgington, 2005)
Infrastructure	Understand what, when, where, and how knowledge is related to specific tasks, objectives, and projects	Technology serves as a key element supporting the organizational strategic goals (Gold, Malhotra and Segars, 2001)
External	Understand what, when, where, and how knowledge is connected to customers, external constituents, and industry	Used to support the evaluation and altering of knowledge processes designed to enhance individual or group productivity (Massey et al., 2002)

Table 2. Management guidelines for KIP and indicators

The framework is designed to provide the following guidance to organizations: (1) identifying the knowledge asset indicators associated with the organization, and (2) understanding how these knowledge asset indicators can be utilized to support the alignment of business processes and KM.

A CASE STUDY

Description

To help illustrate the use of the framework within a real-life environment, a pilot case study was implemented. This research method was selected to provide information from a single organization. As stated by Silverman (1998), Myers and Newman (2007), this methodology can be an appropriate method for obtaining perceptions from the respondents within the environment being studied. Further, the case study approach is appropriate for exploring the connections between technology components and organizational structures (Darke, Shanks and Broadbent, 1998; Yin, 2003). Lee and Hubona (2009) also acknowledge the use of case studies provide an additional level of understanding to the researcher due to the observation and discussions with the human subjects.

Utilizing this organization allowed for the opportunity to evaluate the framework in a manner which allowed for discovery to occur. To evaluate the internal and external measurement indicators, members of one higher educational institution were interviewed. The individuals selected were based on their role at the institution which included members of the human resources and information services departments. In addition individuals within the public relations and student development areas were consulted. Along with the interviews, historical documents related to student and employee satisfaction survey, years of service, and training opportunities were reviewed.

As a pilot case study, the main approach to the data collection and analysis was based on the descriptions obtained through the interviews and archival documents. Within the interview structures, a series of questions were asked of the individuals. Questions related to each area (human resources, infrastructure, and external) were utilized. For example, when interviewing individuals within the human resources department, questions dealing with levels of education, average years of service, and training opportunities were asked. Infrastructure questions dealt with the types of technology utilized and supported to provide opportunities for knowledge storing and sharing were provided. To deal with the perspective of external indicators, individuals within the public relations and student development departments were asked a series of questions dealing with brand recognition, distribution, and student satisfaction.

Evaluation

Within the organization, 285 full- and part-time employees provide a wide range of duties and completing a variety of tasks. As a whole, 45% of the employees have been with the organization five years or less with about 13% providing over 20 years of experience to the organization. To help coordinate employee training and knowledge-sharing opportunities, the organization provides opportunities for members of the staff to meet. However, since the size of the meetings is often large, the opportunity to create or exchange knowledge is often limited. The organization has also established internal communication channels in which information can be exchanged on a monthly basis. This method allows individuals (or groups) to share knowledge with the rest of the organization. To help make the knowledge relevant to the organization as a

whole, individuals and groups are encourage to provide more generalized information which may be applied. To emphasize the need to enhance their own KIP, the organization has encouraged senior members of the staff within departments to state their knowledge more explicitly. For example, the administrative and faculty handbooks have undergone several improvements over the past few years in the attempt to transfer knowledge into written expressions. Through this process, the knowledge obtained through multiple years of service is being transferred and shared in a more effective manner. The organizations leaders recognized the need to have this knowledge shared formally in written manuals and handbooks to better direct current and new employees. This again demonstrated the benefits of having executives playing a crucial role in the collaborative efforts of the KM processes.

As a result of the efforts within the Information Services department, the organization has been provided multiple opportunities for knowledge sharing. These opportunities were seen as examples of the indicators within the infrastructure component of the internal indicators. Employees have been given access to an online portal in which information can be shared to all individuals or to a select few based on individual involvement within committees and organizations. Employees also have access to E-mail supported by the organization. If E-mail is sent to a larger group, the message will be reviewed before being released. Special network folders dealing with committees or activities can be created so a group of individuals can share and exchange documents as needed. All access to the portal is restricted to those individuals within the organizations. The technology accessed by employees is to intentionally provide opportunities for sustaining the KM processes. The technology (software and hardware) emphasizes the importance of being able to create, store, share, and apply knowledge across the organization.

To help identify the external indicators, the organization implements variety of activities. First, the overall satisfaction of the students is based on a survey administered once a year to a random selection of students. However, the selection of students is also based on student classification in order to obtained data from across all student levels. Second, the public relations department handles the areas associated with the promotion and development of the institution brand. Although the PR department focuses its attention on the geographical region within its state, the department has been seeking to improve its brand recognition outside of the local and state regions. The distribution channels include local media (radio, TV, print, and Internet) along with channels designed to reach broader audiences outside their local and state regions. Working with these external indicators provides the organization the opportunity to gain knowledge from outside the environment. With this knowledge, the organization has been able to review current processes in order to enhance areas where improvement may be needed.

Overall, the organization uses their internal and external indicators to help increase their general knowledge base. They have also established methods in which to utilize the knowledge to design or revise business processes. As an example, based on recommendations to change the process in which new students work through the course registration processes, a task force was created to review current tasks. It was determined duplicated efforts impacted the overall process and nearly one-third of the identified tasks were eliminated. The reduction of the number of tasks help decrease the overall time involved to work toward the established goal. As this example illustrates, the organization examined their internal knowledge sources (employees, infrastructure) and implemented new processes to manage the knowledge more effectively.

In summary, the framework can be used to help identify potential areas of knowledge assets. It was observed the strategic goals included the emphasis on opportunities for further developing intellectual and learning opportunities, providing technologies and facilities supporting the learning, and enhancing the organizational environment which supports the sharing and application of knowledge. This alignment within the organization's strategic plan agrees with the proposed framework. To move the organization forward, it would be feasible for them to develop or refine policies (and processes), which formally acknowledge the knowledge asset indicators. Within these policies, the organization can identify a set of metrics and measurements which can be used to conduct periodic evaluations of their knowledge asset indicators and their alignment with knowledge-intensive processes. The organization's interpretation of the evaluation results can then be useful in the identification of which knowledge assets provide organizational value based on their strategic goals.

LIMITATIONS AND IMPLICATIONS

The challenge of identifying measurement indicators can be a challenge within KM processes; however, organizations need to align these processes with their overall process management strategies. The challenge is amplified when organizations do not have a clear understanding of their KM processes. By first clarifying and building their awareness, the organization can begin to develop a common language to be used to assist in the identification of measurement factors across the organization. For managers, understanding the implications of the indicators provides opportunities to enhance organizational processes. However, as stated by Janz and Prasarnphanich (2003), there are some questions which might deem useful to organizations. Janz et al. (2003) indicated the need for the organization to understand how the knowledge impacts the work processes, what

is the impact of employee expertise on the organization's knowledge, and how does collaboration between employees impact the knowledge processes.

Another limitation for consideration is the subjective nature of measurement indicators. Since they can be seen in the broader scope, they may not address the specific types of knowledge utilized in business process or KM systems. To address this concern, organizations can use the framework as a guide for discussion in order to further identify subsets of the indicators. A third limitation associated with the indicators is the dynamic nature of the components. Each area of the factors can change since they can be influenced either by intentional or unexpected changes in the environment (Teece, 1998).

The use of the pilot case study provided an opportunity to illustrate the use the framework within a real world setting. However, the use of only one case study can lead to a generalizing of the framework. Additional cases can be studied across other organizations of either similar or differing types to facilitate comparative evaluation and add further to validation of the framework. These additional case studies would also help identify other potential indicators, which can further refine the framework. Expanding the framework to also address the KM processes directly would represent potential future agendas. For example, once the internal and external indicators are identified, the organization can address the following: (1) How is the knowledge from these sources physically captured and adapted to the need of the organization? (2) What is the life cycle of the knowledge assets or their sources? and (3) How is the knowledge obtained from these sources valued within the practices of the organization? Each of these questions would be important for the organization to answer to help clarify and understand the role of the knowledge assets in the organizational structures.

CONCLUSION

As stated by Moon and Kym (2006), organizations can benefit from having a foundation for identifying measurement indicators. Prior research does indicate the growing importance of knowledge management and the need for organizations to develop a better understanding of their KM processes. If the organization places a higher emphasis on knowledge management, the measurement indicators will serve as a means for the organization to also assign value to their knowledge areas.

Current research does provide a trend in the growing awareness within organizations to include knowledge as intellectual assets. However, the need still exists to provide guidance on the process of assigning value to the knowledge. The internal and external factors can serve as part of the process to help organizations move toward a formal business process of identifying knowledge assets. In addition, organizations will gain a better perspective of how their knowledge management and business process strategies can be integrated.

This paper provides an important contribution for organizations seeking to identify areas of knowledge which can serve as knowledge assets. The framework proposed in the paper provides an indication of how these internal and external indicators can be connected to the organizational processes of KM and KIP. The ability of the organization to revisit or develop new processes to enhance their knowledge-base will be impacted by how well they align their KM and BPM strategies.

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