

# USING ONTOLOGIES FOR KNOWLEDGE MANAGEMENT: ASSESSING TECHNOLOGY APPLICATIONS WITHIN AN ORGANISATION

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**Abstract-** This research work deals with the use of ontologies for knowledge management and the application of technology within an organization. Knowledge management has immense value to the organisation's activities. It is well known that knowledge has an immense value in all kinds of businesses and people's everyday life. The work presented in this dissertation aims to make a stronger connection between knowledge management and organizations. The approach taken is to use ontology based knowledge management. The study tries to propose technologies that support knowledge management activities within an organisation. In order to achieve this objective, the use of ontologies for knowledge management plays very important role in different ways.

**Index Terms-** Knowledge Management, Ontology, Technology.

## I. INTRODUCTION

Organisations in the last few years have been looking at knowledge as a resource. They are giving such an important status to the knowledge resource that a special type of information systems are also being developed as knowledge management systems (Alavi and Leidner, 2001). Organisations need to acquire new knowledge and approach of managing that which will transform their operations in a continuous fashion for survival. (Van Eijnatten, 2004; Stacey, 2003). The goal of knowledge management is a practical one: to improve organisation capabilities through better use of the organisation's individual and collective knowledge resources. These resources include skills, capabilities, experience, routines, and norms, as well as technologies (Probst, 1998).

"Knowledge management (KM) is the set of activities and/or processes that seeks to change the organisation's present pattern of knowledge processing to enhance both it and its knowledge outcomes" (Firestone, 2008, p.17). This implies that knowledge management doesn't directly manage knowledge outcomes, but only impacts processes, which in turn impact outcomes.

The most common approaches to KM seem to be technology-oriented; they emphasize the explicit nature of knowledge, and tend to interpret it as an object that can be stored in repositories, manipulated, and transferred via information and communication technologies. These approaches are also described as the content perspective on KM (Hayes and Walsham, 2003).

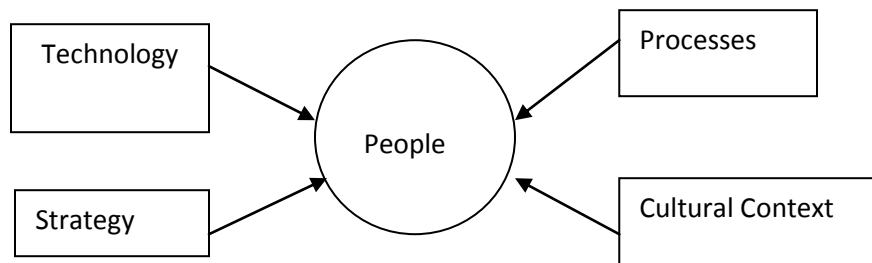
Nonaka et al. (2001) suggest that socialization, externalization, combination and internalization can be used to create organisational knowledge by means of interacting between explicit and tacit knowledge. Literature has shown that a number of knowledge management approaches have been developed with the purpose of managing organisational knowledge, for example, the re-distributed knowledge management framework is developed to manage organisational help desk knowledge (Leung, 2011). Other examples

include the integrative framework that established an effective knowledge transfer process within an organisation (Goh, 2002), the distributed knowledge management framework that allows individual knowledge workers and distributed communities to manage organisational knowledge with the support of ontology (Pirro et al. 2010) and the distribution, interaction, competition and evolution (DICE) model that examines organisational knowledge from an ecological perspective (Chen et al. 2008). In order to manage knowledge, ontology plays an important role in enabling the processing and sharing of knowledge between experts and knowledge users. Besides it also provides a shared and common understanding of a domain that can be communicated across people and application systems.

Knowledge management is concerned with the representation, organisation, acquisition, creation, usage and evolution of knowledge in its many forms. To build effective technologies for knowledge management, there is the need to understand how individuals, groups and organisations use knowledge. Given that more and more knowledge is becoming encoded in computer-readable forms, there is the need to build tools which can effectively search through databases, files, websites and the like, to extract information, capture its meaning, organize it and make it available (Jurisica *et al.*, 1999).

Broadly, knowledge management is a purposeful and systematic management of knowledge and the associated processes and tools with the aim of realising fully the potential of knowledge in making effective decisions, solving problems, facilitating innovations and creativity and achieving competitive advantage at all levels (personal, group, organisation, country and so on (Kebede, 2010).

On this basis, it can be said that knowledge management is the coming together of organisational processes, information processing technologies, organisational strategies and culture for the enhanced management and leverage of human knowledge and learning to the benefit of the company (see figure 1).



**Fig 1.** Key elements in Knowledge management (Source: Ahmed et al., 2002)

A fundamental to knowledge management is the codification of knowledge into two basic forms: explicit knowledge (i.e easily codified and shared) and tacit knowledge (e.g experiential, intuitive and communicated most effectively in face-to-face encounters). There is however, a middle ground. With dedicated and focused efforts, some knowledge believed to be tacit can be transformed into explicit knowledge. This body of knowledge is the organisation's implicit knowledge (Frappaolo, 2008).

## II. TECHNOLOGIES SUPPORTING KNOWLEDGE PROCESSES

The most frequent way to present KM technologies is to associate them with knowledge processes, e.g. creation, storage and retrieval, transfer, and application; or socialization, externalization, combination, and internalization. Studies using this approach usually adopt a particular perspective of KM, identify a set of core processes, and list technologies that can be used to support them (Nonaka et al., 2001; Marwick, 2001; Alavi and Tiwana, 2003; Becerra-Fernandez et al., 2004; Jashapara, 2004). Their objective is either to

demonstrate that technology can actually support KM, or to illustrate how a particular KM model can be implemented with the aid of technology.

Technology can support and enable knowledge management in two ways:

1. It can provide the means for people to organise, store and access explicit knowledge and information, such as in electronic libraries or best practice databases.
2. It can help to connect people with people so that they can share tacit knowledge, such as through white pages, groupware or video conferencing.

Prakasan et al (2007) in Holsapple and Wu (2008) conclude that knowledge management has experienced sudden growth and produced a substantial literature. They point out that there are varying definitions and conceptions of knowledge management but that whatever view is adopted should recognise that knowledge management is of strategic importance to an organisation's success. One such view is provided by the collaboratively engineered knowledge management ontology, which defines knowledge management as "an entity's systematic and deliberate efforts to expand, cultivate, and apply available knowledge in ways that add value to the entity, in the sense of positive results in accomplishing its objectives or fulfilling its purpose" (Holsapple and Joshi, 2004). The ontology scopes out knowledge management very broadly as any process of generating new knowledge, acquiring valuable knowledge from outside sources, selecting needed knowledge from internal sources, assimilating knowledge to alter the state of internal knowledge resources, embedding knowledge into organisational outputs, and/or leading, coordinating, controlling and measuring these five kinds of activities.

### III. ONTOLOGIES IN KNOWLEDGE MANAGEMENT

Jurisica, *et al.* (1999) defines ontology as "a branch of Philosophy concerned with the study of what exists". Ontologies provide a common understanding of a domain that can be communicated across people and application systems, and thus facilitate knowledge sharing and reuse (Fensel, 2000; Borst *et al.* 1997).

Steels (1993) in Gomez-Perez et al. (2004) states that, the objectives of knowledge management in an organisation are to promote knowledge growth, knowledge communication and knowledge preservation in the organisation. To achieve these objectives, corporate memories, persistent representation of knowledge and information are needed in an organisation. Knowledge management encourages organisations to create and use knowledge continuously to gain competitive advantage. Simultaneously, it also aims to improve the quality, content, value and transferability of individual and group knowledge within an organisation (Mentzas, *et al.*, 2001). The adoption of advanced technology is important to enable organisation to access useful knowledge from anywhere in the network. However, some of the knowledge management approaches range from industrial specific, theoretical, to procedure-wise, for example, the re-distributed knowledge management framework is developed to manage organisational help desk knowledge (Leung & Lau, 2006). Another example is the integrative framework that establishes an effective knowledge transfer process within an organisation (Goh, 2002). These designs are incapable of cooperating in the current distributed knowledge environment, particularly areas that deal with organisational knowledge. Generally, the approaches are customised to suit individual organisational knowledge management strategies and business requirements without consideration of system interoperability.

To improve inter-organisational knowledge management practice, the use of ontology is becoming increasingly important in the area of knowledge management research. The concept of ontology can also be applied to solve the interoperation problem in the distributed

knowledge management system environment. Ontology is defined as an explicit specification of a conceptualization, while a conceptualization is an abstract, simplified view of the world that we wish to represent for some purpose (Gruber, 1993).

In this approach, explicit knowledge of the knowledge management system is annotated in a form that is machine-processable metadata based on the domain or topic specific ontology (Davies et al., 2005; Mentzas et al., 2001). Using the ontology, one knowledge management system can communicate with others in spite of the underlying system, syntax and structure heterogeneities, thus allowing the involved systems to understand incoming requests and return the required knowledge as they are using the same set of vocabularies. Besides, the exploitation of ontological metadata enables ontology-based searching to take place for the retrieval of a more precise collection of knowledge.

#### IV. RESEARCH METHODOLOGY

This paper uses three case studies as overall research strategy to explore knowledge management practices within an organisation. The reasons for using case studies as research strategy are that each case discussed their issues and viewpoints on knowledge management practices within an organisation. Moreover, case studies allow for exploration and practical solutions for complex issues as well as developing new knowledge and skills for research. Therefore this research use journals and other sources from various authors in knowledge management.

#### V. DISCUSSION OF FINDINGS

The findings from the case studies used for this research.

Case Study 1: A case study of knowledge management implementation for Taiwanese Information Consulting Company. The case study states the kind of knowledge intensive enterprise, which solve customers' problem based on customization. The case discusses the importance of knowledge management to information consulting companies.

To the specialised consultants, they use management application software that is the accumulation of the knowledge as powerful tool to accomplish their consulting job. The key point of management consulting is to provide the customer with value –added element. The content of service includes collection of information, conversion of information. The objective of consulting service is to provide customer with his experience, knowledge and solutions to customer's problems.

The key point for consultants implementing knowledge management is knowledge and experience. The study discovered that professional knowledge is not only obtained from outside but also from the interaction of organisation's members. Information consulting company belongs to knowledge-intense enterprise, and need to master knowledge and wisdom to increase enterprises competitiveness.

The case proposed the goal of knowledge management enterprise. The expected benefits are:

1. Increase in the value and amount of an organisation's overall knowledge.
2. Elevating the service skill of consulting and advising, customer satisfaction and transferring of knowledge.
3. Enhancing the interior exchange within an organisation and the efficiency of obtaining the knowledge.
4. Increasing the knowledge learning ability for groups and individuals.

The case proposed a modified formula as  $KM = (P + L + H)S$ , where;

KM = Knowledge Management

P = People

L = Learning

H = Handling

S = Sharing

+ = Connection

This formula represents the knowledge management that can readily be implemented by connecting internet, learning previous processed information and unlimited sharing.

#### Case Study 2: A case study of Brazilian Energy Utility Company

Case study 2 is on the utilization of ontologies in a knowledge management project conducted by one of the largest Brazilian electric utilities active both in the production and in the distribution of energy. The case demonstrates that ontologies are, in many ways, a useful tool in knowledge management applications and shows that their use is not limited to the development of automated systems. The authors advocate that ontologies can be successfully used in knowledge management initiatives provided they are evaluated as to their content.

The authors in the case study states that within the information systems realm, ontologies are generally used as system models but their usage has not been restricted to software development. They advocate that once assessed as to its content, ontology may provide benefits to corporate communication and therefore, provide support to knowledge management initiatives.

Ontologies made a contribution to knowledge management in many ways.

1. In the preservation of specialised knowledge
2. In IS development for knowledge management support and interoperability
3. In reaching a consensus by means of content evaluation

Ontology is an instrument capable of making a common language operational. This promotes improvements in communication in the organisation.

#### Case study 3: A case study of Indonesia University of Education

Indonesia University of Education is a public university implementing knowledge management systems to increase competitive advantage and improve the performance of the university/higher education. There are two categories of knowledge namely the academic knowledge and organisational knowledge. The academic knowledge is the main aim for higher education, while the organisational knowledge includes knowledge which refers to the whole business process of the institution of education in terms of lack or excellence.

Academic knowledge framework is suggested to go through four main processes to form a culture of knowledge and collaboration.

1. Making knowledge visible
2. Increasing knowledge intensity
3. Building knowledge infrastructure
4. Developing knowledge culture

## VI. CONCLUSION

The most important role of ontology in knowledge management is to enable and enhance knowledge sharing and reusing. Moreover, it provides a common mode of communication. Technologies are now being called upon to support knowledge management and not just to process data or information. Many advances contribute to taking information systems beyond mere data into the realm of

knowledge. However, the key to providing useful support for knowledge management is founded on how meaning is embedded in information models as defined in terms of ontologies.

This research has presented the findings of three case studies conducted to investigate the implementation of Knowledge Management within an organisation. In order to build a true knowledge-based enterprise, assimilating and integrating Knowledge Management practices into the daily work routines of organisations is important. The case studies provide useful insights and directions for which KM can be implemented in reality.

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