The Potential Roles of Engineers in Knowledge Management: An Overview

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ABSTRACT

For ages, engineers have worked with tangible resources such as physical parts, components, subassemblies and products. However, with the advent of the knowledge economy, knowledge has become one of the most indispensable resources for viability and success. Nowadays, organisations are adopting Knowledge Management (KM) in order to convert themselves into knowledge-based enterprises. Engineers with their varied knowledge, skills and expertise can certainly be utilised to assist in the KM arena.

1.0. INTRODUCTION

The quest to achieve sustained competitiveness in the volatile marketplace has triggered organisations to embrace Knowledge Management (KM). Generally, it is viewed as an enabler that helps organisations to improve their decision making, productivity, efficiency, innovation and responsiveness. Although there is a widespread recognition of the importance of KM, it is still a fairly new discipline and there is little shared understanding of its concepts, especially among engineers. The main objective of this article is to give an overview of the KM notion and to explain how engineers can play a part in this discipline. It is hoped that this article will provide a beneficial means for them to better comprehend KM and to address its associated practical issues.

2.0 KNOWLEDGE AND KM

There is no single uniformly acceptable definition of knowledge, but rather, it can be defined from different perspectives. All too often, knowledge is defined based on its distinction with data and information. Summarising from Wong and Aspinwall [1], data are merely discrete objective facts, while information is structured and organised data. Knowledge on the other hand, can be considered as meaningful and valuable information which has been processed by human minds. Hence, data are components of information, while the latter is a subset of knowledge.

Another way to define knowledge is to classify it as either tacit or explicit [2]. The first type primarily resides in peoples' minds and it is relatively difficult to be expressed, codified and documented. In contrast, explicit knowledge is that which has been articulated, codified and formalised in some electronic or physical form.

Generally, knowledge can also be conceptualised from a process or product viewpoint. The first concept implies that it is a dynamic flux which is frequently created by human beings and emerges through the process of social interaction. However, when knowledge is viewed as a product, it can be perceived to be any piece of idea, know-what, know-how or meaningful information that can be used to achieve an objective.

In its broadest sense, KM can be understood as a formalised and active approach to manage knowledge resources in an organisation. It is also often viewed as comprising a series of processes such as creating, acquiring, capturing, organising, classifying, storing, sharing and applying knowledge, to name but a few. Thus, organisations will need to manage not only their knowledge, but also the processes that act upon it. In addition, KM is concerned with the management of technological, cultural, operational, behavioural and organisational factors that could affect its performance. As an integrative concept, KM has been defined as the consolidation of "knowledge-based systems, artificial intelligence, software engineering, business process improvement, human resources management and organisational behaviour concepts" [3] so that the knowledge resources, processes and factors can be optimally managed.

Indisputably, technology is a key element for implementing KM. Technology can for example, enable rapid search and retrieval of knowledge, and support its transfer and sharing between organisational members. KM technology is not a single technology, but rather a broad collection of technological tools that needs to be integrated to create a KM system. Table 1 gives a representative sample of some of the technological tools that can be applied. Those more common ones include knowledge bases, searching, mapping, collaborative, and expert and intelligent tools. All the tools listed in Table 1 help in the development of a KM system which in turn represents part of an organisation's overall KM initiative.

3.0 WHY ENGINEERS?

The knowledge that engineers possess is wide, ranging from technical-based to management-oriented subjects. Depending on the areas of specialisation,

engineers have knowledge in programming, software engineering, system design, system engineering, ergonomics, maintenance, technology management, project management etc. Each of these areas is important in tackling relevant KM issues and problems in an organisation. In addition, engineers are frequently involved in the design, implementation, installation and improvement of complex systems. KM itself is certainly a complex system that not only deals with technology, but also with people and the interaction between the two. The ultimate goal for organisations is no doubt to have a reliable and robust KM system and programme. Hence, the expertise and experiences of engineers can certainly be utilised to address this challenging issue.

4.0 ROLES OF ENGINEERS IN KM

Design and development

One of the main roles of engineers is to be involved in the design and construction of a KM system. Attention needs to be given to the layout of the system. If this issue is not adequately addressed, the system will be equivalent to a poorly organised factory floor where raw materials, tools and machines are all jumbled up. In this respect, engineers can apply their knowledge in design, workflow and layout principles to develop a good KM system so that the users can easily find their way around it. In addition, it is important that a clear and standard knowledge structure or ontology is applied. This will facilitate the users to understand and browse through the contents of the repository, and extract the needed information. Since organisational members are the ultimate end-users of the KM system, their views and needs should be taken into account in its design. For example, organisational members should be solicited about what information they need, how it could be shared, how it should be represented in and accessed from the system, which search engine to use, and how the search results should be displayed. It is crucial that the developed system fits well into an organisation's context and situation.

Table 1: Technological Tools for KM (adapted from Wong and Aspinwall [4])

TOOLS	DESCRIPTIONS / PURPOSES
Knowledge repository, knowledge base, knowledge inventory or knowledge warehouse	Store explicit knowledge, manuals, policies, procedures, reports, lessons learnt, best practices etc. Help to preserve organisational memory.
Search engine or information retrieval system	Search and retrieve information kept in a repository.
Document management system	Store, process and manage corporate documents.
Knowledge map, knowledge taxonomy, knowledge directory, corporate yellow page, mapping of internal expertise and expertise locator	Facilitate the finding of knowledge on various topics and/or the person who has the needed knowledge.
Groupware, electronic discussion forum, electronic meeting system, electronic bulletin board, chat room and email	Support human collaboration and provide a means for individuals to share ideas and knowledge.
Workflow system	Enable users to plan and regulate the flow of information.
Help-desk application	Provide response or answer to both internal and external queries.
Expert system (artificial intelligence, genetic algorithm, neural network, case-based reasoning, rule-based reasoning and decision support tool)	Support decision making and generate an acceptable solution to a particular problem or case.
Data mining and data analysis tool	Help users to interpret, discover relationship or trend, or create new knowledge from a set of complex data.
Learning and simulation tool	Support and enhance individual learning.

Implementation

Engineers can certainly play an important role in implementing KM. Its implementation is not a snapshot process, but it involves a series of activities that needs to be rolled out in a systematic manner. In the first instance, an organisation will need to determine the scope of the initiative and identify which target area to focus. Following this, the KM system may be pilot tested before an attempt is made to implement it. An organisation may then proceed with say, providing training to the employees, rolling out the use of the system, reviewing its performance, improving it, expanding the initiative, and formalising its practices. All these activities need careful scheduling and coordination to ensure that they can be accomplished on time and that the resources required (e.g. time, human and financial resources) are properly allocated. Engineers are well trained in the areas of scheduling and project management, and thus their knowledge can certainly be applied to aid the implementation of KM. They can for example, help to schedule the tasks to be performed, determine the time scale and resources required to achieve a particular milestone, and execute the programme.

Optimisation

No matter how aesthetic a KM system is, its true benefits cannot be attained if people seldom or do not use it. Therefore, optimising the system is a central aspect to ensure that it is widely accepted and used throughout an organisation. This could entail

enhancing its efficiency, making it more user-friendly, and embedding into it technology which is simple but effective. Engineers are expert in human factors and ergonomics issues, and they have knowledge in various technologies, thus making them the best candidates to optimise a KM system. In addition, it is crucial to assimilate and integrate KM practices into the daily work activities of the employees. Engineers have been dealing with issues which are closely connected, such as cultivating a quality culture into the manufacturing routines of the employees. It is therefore advantageous if engineers can apply the same concept in order to make KM an integral part of the working philosophy of an organisation.

Measurement

'You cannot manage what you cannot measure'. This saying certainly holds true for KM. Measurement provides a basis for organisations to track the progress of KM and to evaluate, control and monitor its performance. Measurement is also needed to demonstrate the benefits that can be gained from implementing KM. This could include justifying the benefits quantitatively or qualitatively, as well as evaluating the impact that KM has on the bottom line financial results of an organisation. The expertise that engineers have, such as in the area of engineering economy can definitely address this activity phase. For example, they can assist in developing relevant performance metrics or indicators, calculating the ROI (Return on Investment) and even adopting some well defined techniques such as the 'balanced scorecard' to measure KM. It is important that hard financial measures are supplemented by soft non-financial ones in order to generate a more holistic measurement approach.

Maintenance

The value of the developed KM system will diminish if it is not properly maintained and monitored. Without an appropriate mechanism to maintain the system itself, it may breakdown, become obsolete, and over time, it will be abandoned. On the other hand, if its contents are not monitored, knowledge may be organised or categorised improperly, and scattered in different folders or locations. It is very likely that the relevancy of knowledge is not checked and outdated information is not purged. As a result, more junk rather than valuable information will be kept in the system and employees will be unsure whether or not the knowledge residing in it is up to date. Engineers who have experience working with maintenance problems can contribute to this issue by developing formal protocols and procedures to maintain the system as well as its contents. They can help to design a KM system which is intelligent in a sense that it can self-generate signals to alert the organisation when there is any malfunction. It is also beneficial to build a system which is adaptive such that it can be modified or upgraded to accommodate for changes in technologies. Essentially, another area of interest is to develop software that can enable the automatic organisation, auditing and cleansing of knowledge contents in the system.

5.0 CONCLUSIONS

This article has basically described the fundamentals of KM and discussed some related roles that can be taken up by engineers. Over the years, engineers have worked with tangible and physical resources in an organisation. However, the expertise, experiences and skills that they possess are valuable in dealing with intangibles i.e. knowledge. It is time to make engineers better acquainted with KM, and the author believes that they are certainly well suited to systematise and optimise an organisational KM initiative. ■

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