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Knowledge Management: A Review

Alka Bansal

1. INTRODUCTION

The knowledge in an enterprise resides in various places such as: databases, knowledge bases, filing cabinets and peoples' heads and is distributed right across the enterprise. Most often one part of an enterprise repeats work of another part simply because it is not possible to keep track of, and make use of, knowledge of other parts. Enterprises need to know:

- What their knowledge assets are, and
- How to manage and make use of these assets to get maximum returns.

The increasing use of electronic group collaboration tools, such as e-mail, voice mail, audio and video conferencing, etc. to support team work has generated interest to develop the tools and techniques to capture the process that occurs when people use those tools for re-use by the others. 'Knowledge management' (KM), as it is called, is important for enterprises whose principal currency is knowledge, rather than physical or financial resources. These are enterprises who have always been wholly devoted to knowledge work, such as consultancies; a growing number of enterprises who discover that knowledge of how to produce products is as saleable as the products themselves; and any enterprise who realises that its knowledge is an asset to be managed.

The core issue of KM is to place knowledge under management remit to get value from it–to realise intellectual capital. For example, market value of biotechnology companies is clearly based on their knowledge assets, rather than traditional capital.

While the world of business is experienced in managing physical and financial capital, companies have difficulty in finding cost-effective solutions to simple practical questions concerning knowledge, such as:

- People at one laboratory of an organisation may be knowing how to solve some problem. How can other laboratory team at a distance be helped?
- Employees with a lifetime's experience will leave the organisation. How to capture and re-use their knowledge later?
- Reasons of success of a war project; why such unique decisions were taken; how did they deal with the circumstances?
- How people start learning from their experiences and help other people stop repeating mistakes they made?
- How can one get new people into projects to work speedly and contribute quickly?

While there are no categorical or perfect answers to any of these questions, one of the electronic collaboration tools used for distributed group work, is needed as solutions.

2. DEFINITION

2.1 Knowledge

According to Denham Grey, 'Knowledge is the full utilisation of information and data, coupled with the potential of people's skills, competencies, ideas, intuitions, commitments and motivations.' A holistic view considers knowledge to be present in ideas, judgements, talents, root causes, relationships, perspectives, and concepts. Knowledge is stored in the individual brain or encoded in organisational processes, documents, products, services, facilities, and systems.

In today's economy, knowledge is people, money, learning, flexibility, power, and

competitive advantage. Knowledge is more relevant to sustained business than capital, labour or land. Nevertheless, it remains the most neglected asset. It is more than justified true belief and is essential for action, performance and adaption. Knowledge provides the ability to respond to novel situations.

Knowledge is action, focussed innovation, pooled expertise, special relationships and alliances. Knowledge is value-added behaviour and activities. For knowledge to be of value it must be focussed, current, tested and shared.

2.2 Knowledge Management

Knowledge Management (KM) is an audit of 'intellectual assets' that highlights unique sources, critical functions and potential bottlenecks which hinder knowledge flow to the point of use. It protects intellectual assets from decay, seeks opportunities to enhance decisions, services and products through adding intelligence, increasing value and providing flexibility.

Maarten Sierhuis defines KM and supporting concepts as follows:

KM as the word implies, is the ability to manage 'knowledge'. Every one is familiar with the term information management. This term came about when people realised that information is a resource that needs to be managed to be useful in an organisation. From this, the ideas of information analysis and information planning came about. When one considers knowledge as a resource, one needs ways for managing the knowledge in an organisation. One can use techniques and methods, developed as part of knowledge technology to analyse knowledge sources in an organisation. Using these techniques one can perform knowledge analysis (KA) and knowledge planning (KP).

2.2.1 *Knowledge Analysis*

In KA, knowledge source is analysed in terms of its usefulness, its weaknesses and its appropriateness within the organisation. It is a necessary step for the ability to manage knowledge. Within knowledge analysis, knowledge modelling and knowledge acquisition techniques can be used.

2.2.2 *Knowledge Planning*

When an organisation has a grip on its knowledge (i.e., has performed knowledge analysis), it will be able to plan well. An organisation will now be able to develop a multi-year knowledge plan that defines how the organisation will develop its knowledge resources, either by training its human agents, or by developing knowledge-based systems to support the human agents, or by other means that allow the organisation to stay competitive.

2.2.3 *Knowledge Technology*

The application of techniques and methods from the field of artificial intelligence (AI), or more specifically, the field of knowledge-based systems, knowledge technology (KT) has been around for quite some time, and most people know about the application of KT in the form of expert systems and decision support systems. Techniques and methods to design these kind of systems are well known. A known methodology for building knowledge-based systems is CommonKADS (formerly known as KADS).

2.2.4 *Computer Supported Work Systems (CSWS)*

This is a formal and informal (human) activity system within an organisation where the (human) agents are supported by computer systems. The application of KT is very helpful in such work systems, although definitely not the only important factor in the analysis and design, nor in the effectiveness of the activity system.

Given the importance of knowledge in virtually all areas of daily and commercial life, two knowledge-related aspects are vital for viability and success at any level:

2.2.4.1 Knowledge assets—These comprise the knowledge regarding markets, products, technologies and organisations that a business owns or needs to own and enable its business processes to generate profits, add value, etc. Knowledge assets (to be applied or exploited) must be nurtured, preserved, and used to the

largest extent possible by both individuals and organisations.

2.2.4.2 **Knowledge-related processes**—These help to create, build, compile, organise, transform, transfer, pool, apply, and safeguard knowledge – must be carefully and explicitly managed in all affected areas.

KM is not only about managing these knowledge assets but managing the processes that act upon the assets. These processes include: developing knowledge, preserving knowledge, using knowledge, and sharing knowledge. Therefore, KM involves the identification and analysis of available and required knowledge assets and knowledge asset related processes, and the subsequent planning and control of actions to develop both the assets and the processes so as to fulfil organisational objectives.

Many efforts in KM aim to take implicit knowledge held by a few people, make it explicit in suitable contexts, and make it a basis for informed actions by the whole enterprise. Several things are needed to bring isolated packets of valuable knowledge into a useful common context. First, the people who possess the knowledge must be persuaded and convinced that it is in their interest to share it, and to help to make it explicit. Second, an understandable way of representing the knowledge is needed. Third, software that uses the knowledge will often be needed.

3. KNOWLEDGE MANAGEMENT FRAMEWORK

The KM framework, based on work by van der Spek and de Hoog, covers:

3.1 Identifying What Knowledge Assets a Company Possesses

- Where is the knowledge asset?
- What does it contain?
- What is its use?
- What form is it in?
- How to access it?

3.2 Analysing How Knowledge Can Add Value

- What are the opportunities for using the knowledge asset?
- What would be the effect of its use?
- What are the current obstacles to its use?
- What would be its increased value to the organisation?

3.3 Specifying What actions are Necessary to Achieve Better Usability & Added Value

- How to plan actions to use the knowledge asset?
- How to enact actions?
- How to monitor actions?

3.4 Reviewing the Use of Knowledge to Ensure Added Value

- Did the use of knowledge produce the desired added value?
- How can the knowledge asset be maintained for this use?
- Did the use create new opportunities?

4. TOOLS FOR KNOWLEDGE MANAGEMENT

There are very few tools providing a truly integrated set of functions to support the tasks associated with KM. Some of the tools that have been used to support various aspects of managing knowledge are listed here:

4.1 Knowledge Capture

- PC Pack—a portable package of integrated tools for requirements and knowledge engineering.
- Clementine Data Mining (or Knowledge Discovery)—a software package from ISL.
- Intelligent Miner—a data mining tool from IBM.
- The Information Discovery System (IDIS)—a data mining tool from Information Discovery.

4.2 Knowledge Sharing

- ART* Enterprise—object-oriented client/server tool with case-based retrieval of

both structured and unstructured information from Brightware.

- GrapeVINE—available in two versions—one for Lotus Notes and the other for Netscape in which users can set up an interest profile that identifies what is useful to them and so filter information.
- Knowledge Software—PKM (Personal Knowledge Manager) and PDP (Personal Development Plan), both based on Lotus Notes.
- Knowledge Xchange—TM Knowledge Management System—a Lotus Notes-based system.

5. PRINCIPLES OF KNOWLEDGE MANAGEMENT

The following are the principles of KM given by Thomas H Davenport:

5.1 KM is Expensive

Knowledge is an asset, but its effective management requires investment of money or labour, for the following essential activities of KM:

- Knowledge capture, i.e., creation of documents and storing into computer systems
- Adding value to knowledge through editing, packaging, and pruning
- Developing knowledge categorisation approaches and categorising new contributions to knowledge
- Developing information technology infrastructure and applications for the distribution of knowledge
- Educating employees on the creation, sharing, and use of knowledge.

5.2 Effective Management of Knowledge Requires Hybrid Solutions of People and Technology

Human beings may be expensive and can have their own viewpoints, but they are needed to interpret knowledge within a broader context, to combine it with other types of information, or to synthesise various unstructured forms of knowledge. For these tasks, humans excel and their excellence should be utilised.

Computers and communications systems are good for the capture, transformation, and distribution of highly structured knowledge that changes rapidly.

5.3 Knowledge Management is Highly Political

As knowledge is power, knowledge managers have to acknowledge and cultivate politics. They will act as brokers between those who have knowledge and those who may use it. At the highest level, they will try shape the governance of knowledge for its better utilisation across the organisation.

5.4 KM Requires Knowledge Managers

Knowledge cannot be well-managed until some group within an organisation has clear responsibility for the job. The group might perform the tasks of collecting and categorising knowledge, establishing a knowledge-oriented technology infrastructure and monitoring the use of knowledge.

5.5 KM Benefits More from Maps than Models, More from Markets than from Hierarchies

Most organisations simply map the knowledge that its consumers seem to require. The dispersion of knowledge as described in a map may be illogical, but is still more helpful to a user than a hypothetical knowledge model available in the market that is difficult to understand and rarely fully implemented. Mapping organisational knowledge is the only activity most likely to yield better access.

5.6 Sharing and Using Knowledge are Often Unnatural Acts

An employee in an organisation may feel that if his knowledge is a valuable resource, why should he share it? And if his job is to create knowledge, why should he put his job at risk by allowing it to be used by others instead of its use by him only? The knowledge managers do well if they assume that the

natural tendency of employees is to hoard their knowledge and look suspiciously upon that from others. People in an organisation have to be motivated to make them realise that to undertake work of entering their knowledge into a system and to seek out knowledge from others is not threatening, but just a plain effort.

The knowledge manager should adopt the principle of not taking, sharing and using knowledge for granted. They should not assume that making information available will necessarily lead to its use. They should realise that sharing and using knowledge have to be motivated through time-honoured techniques, such as performance evaluation, compensation, etc.

There are some firms that are beginning to evaluate and reward their personnel for knowledge sharing.

5.7 KM Means Improving Knowledge Work Processes

It is important to address and improve the generic KM process, but knowledge is being generated, used, and shared intensively in a few specific knowledge work processes. The specific processes may vary within a firm and industry, but they include market research, product design and development, and even more transactional processes like order configuration and pricing. If real improvements are to be made in KM, improvements must be made in these key processes.

5.8 Knowledge Access is Only the Beginning

If knowledge access was sufficient, there would have been long queues outside the nation's libraries. Access is important, but successful KM also requires attention and engagement. It has been said that attention is the currency of the information age.

More active involvement with knowledge can be achieved through summarising and reporting it to others, role-playing and games based on usage of the knowledge, and receiving the knowledge through close interaction with knowledge providers. This is particularly important when the knowledge to be received is tacit. Some firms have already begun to help their managers and employees engage in KM.

5.9 KM Never Ends

KM has no end as new technologies, management approaches, regulatory issues, and customer concerns are always emerging. Companies change their strategies, organisational structures, and product and service emphases. New managers and professionals have new needs for knowledge.

5.10 KM Requires a Knowledge Contract

There needs to be a clarity regarding who owns or has usage rights to employee knowledge. Is the knowledge of employees owned or rented? Is all of the knowledge in employees' heads the property of the employer? How about the knowledge in file cabinets or computer disk drives? What about the knowledge of consultants while they are consulting? Outsourced employees? Few firms have policies to deal with these issues.

Many organisations have held employee knowledge—at least that developed between office hours—to be the property of the corporation. However, some difficulties are being faced, as employees move more quickly to new jobs and new organisations, the distinction between work life and home life is more ephemeral, and there are more contingent workers. In any case, few firms have done a good job of extracting and documenting employee's knowledge. If knowledge is really becoming a more valued resource in organisations, one can expect to see more attention to the legalities of KM. Intellectual property law is already the fastest-growing field in the legal profession, and it will still grow faster.

6. CASE STUDIES

6.1 Knowledge Management at Hewlett-Packard

Hewlett-Packard (HP) has been a knowledge-oriented company since its inception. KM is exploding at HP. While there has been no top-down mandate to manage

knowledge at this highly decentralised computer and electronics firm, many departments are undertaking specific efforts to better manage knowledge. Managers of many companies are attempting to capture and distribute knowledge resident in their own business units and departments.

The efforts are springing up quickly, and it is difficult even to identify and track all of them. The Computer Systems Marketing Organisation, for example, has put a large amount of marketing knowledge into a www-based system that can be accessed around the world. It contains product information, competitive intelligence, white papers, and ready-to-deliver marketing presentations. HP Laboratories are developing approaches to facilitate access to both internal and external knowledge. Corporate Information System are putting document-based knowledge of procedures, personnel, and available information into Web and Lotus Notes systems. The Computer Systems Marketing Organisation is also attempting to map various sources of knowledge about information systems development and management around HP.

Perhaps the most focussed, intensive approach to KM is in the Product Processes Organisation (PPO), which provides services such as information on purchasing, engineering, market intelligence, change management, and environmental and safety consulting to HP product divisions. The organisation has adopted many approaches to knowledge transfer in the past, including catalogues of documents, video and audio tapes of meetings, best practice databases, and the work innovation network, a series of meetings and ongoing discussions on change management topics. However, until recently, there had been no formal responsibility for KM in PPO.

In 1995, however, PPO formed a KM group within PPO's Information Systems group. Its initial charter was to capture and leverage product generation-oriented knowledge for managers of the product generation process in various HP product divisions. The group quickly developed a prototype of a Web-based KM system called Knowledge Links. Its primary content is knowledge about the product generation process; the knowledge may come from a variety of functional perspectives, including marketing, R&D, engineering, and manufacturing. The knowledge going into Knowledge Links comes from outside the KM group, but group members add value by identifying, editing, and formatting the knowledge, and making it easily accessible and usable.

The PPO's Knowledge Management group intends to develop a variety of other services to PPO and HP. It plans to develop versions of Knowledge Links for other types of knowledge for internal HP clients. It has developed an assessment tool to be used in assessing the levels of KM capability in PPO and other HP groups. It is beginning to map key knowledge domains within PPO. Finally, within the context of a Knowledge Links development activity, the group consults about how best to create knowledge-creating and sharing behaviours, without which the technology is of little value.

6.2 Knowledge Management at Maritime Telephone & Telegraph

Another example where KM is getting started is Maritime Telephone & Telegraph in Halifax, Nova Scotia. Recently, the telecommunication provider began using a knowledge-oriented process for bringing products to market. Employees were asked to use the system to store information in an intranet based repository at every step in a product's launch. For example, when they project a product's revenue, they'll use a Web-based form not only to enter the projections, but also to store notes about how they arrived at the figures. The information will be stored in a database that is part of iNet Developer, a Web development tool from Pictorius Inc. in Halifax. Managers would be able to look at projections early in the marketing process.

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Contributor

Smt Alka Bansal is Scientist C at DESIDOC, Metcalfe House, Delhi - 110 054.