December 1998

Four Views of Knowledge and Knowledge Management

Robert McQueen
University of Waikato

Four Views of Knowledge and Knowledge Management

Robert J. McQueen
University of Waikato

Abstract

This paper presents four views of knowledge: access to information, repositories of information, sets of rules, and knowing/understanding. Examples are given of how these definitions are both enabling and constraining the application of information technology to the area of knowledge management, and a call is made for multiple views of knowledge so that future systems may achieve greater success.

Introduction

There is a growing diversity in views on what is knowledge, and how it can be captured and used in computing systems (Murray, 1996). Whatever the definition of knowledge management, it is viewed as a crucial factor for competitive success by executives in organisations (Ernst & Young, 1997). Our purpose here is to present four different views of knowledge, without trying to persuade that one is more valid than the other. All are valid, in that there is a group of practitioners and researchers which holds that view to be true. For these views, information technology either has a present integral role, or has the potential to play an important part. From the discussion, it is hoped that the reader can inductively build their own personal view of knowledge, and knowledge management and the role that information technology might take to support knowledge capture, storage, and retrieval for each of these views.

Data, Information and Understanding

First, we develop some working concepts, for the purposes of this discussion, about data and information which can be used in the subsequent presentation of the four views.

Data is numbers and text, and, for the purposes of this discussion, stored in some form of computer accessible format such as a database, file or spreadsheet. Data is usually highly structured, such as fields in a record or a table in a database, and through that structure relationships to other data are captured. Once the data structure is known, retrieval is usually a trivial intellectual process, but may be an overwhelming administrative process.

Information is data in a contextual environment which helps give shape, and make sense of the raw numbers and text. The context in which data is presented might be internally self generated (means, standard deviations, accumulations by dept, division), internally comparison generated (against last year's equivalents, this year's budget), or externally comparison generated (against industry sales, GNP, inflation)

Understanding is likely to result when data is transformed into information, and presented to a person (such as a manager) experienced with the environment from which the data was collected. This understanding, when combined with that person's experience and beliefs, then may lead to actions (do nothing, tweak slightly, make radical changes) which in turn are expected to achieve desired results. Understanding and knowledge are strongly related and interdependent.

Tacit and explicit knowledge concepts first developed by Polanyi have been explained in the context of knowledge management by Sveiby (1996). Nonaka and Takeuchi (1995) suggest the following:

> *...we classify human knowledge into two kinds. One is explicit knowledge, which can be articulated in formal language including grammatical statements, mathematical expressions, specifications, manuals, and so forth. This kind of knowledge thus can be transmitted across individuals formally and easily. ....A more important kind of knowledge is tacit knowledge, which is hard to articulate with formal language. It is personal knowledge embedded in individual experience and involves intangible factors such as personal belief, perspective, and the value system. (pp. viii)*

Four Views of Knowledge

We now look at four views of knowledge. For each view, we first suggest a short definition of knowledge from that view, and describe an example of how that practitioners holding that view may be implementing knowledge management systems.

*View 1: Knowledge Is **Access** to Information*

This view may be held by publishers and database builders. We use the word publisher in a broad context to incorporate not only traditional publishers, but also organisations who build computer-based document repositories, containing items such as manuals, standards and product specifications. "Database builder" is used to describe those who wish to provide integrated corporate information in easily accessible repositories, which are used both for transaction processing of the day-to-day activities

of the organisation, and also as an archive to which queries can be made. This view is that useable (and sharable) knowledge must already be in an explicit form, and perhaps combines and confuses the concepts of data, information and knowledge.

This view then perceives that *knowledge* can be retrieved through access to documents and databases containing data and information which is vital to the successful operation of the organisation. To facilitate knowledge sharing, the data and information must be added to the databases, or published in an electronic form. The knowledge sharing infrastructure is the database and document repositories, together with the access technology, often implemented through an intranet. This view of knowledge as access to information then implies that organisational databases and document repositories must be built to facilitate access to these databases and documents, and this can be partitioned into the technical issues of storage, and access. Organisations that adopt this view of knowledge then perceive knowledge management to invoke two problems: a technical problem of storing and providing access to databases and document repositories, and an incentive problem of ensuring useful data is available in databases, and useful documents are created and available in electronic form.

*View 2: Knowledge Can Be Stored in **Repositories of Electronic Communication***

This view is frequently held by consulting firms. These firms earn revenue by applying the expertise held by (or accessible to) their professional consulting staff, to the problems of their clients. Knowledge is perceived as the understanding that their consulting staff have in a given area of expertise, such as tax planning or process redesign. Hence, to build more client relationships, the requirement is to make the understanding held by an individual senior consultant more broadly available to other less expert consultants within the firm, as well as to some customers directly. However, the senior consultant's knowledge, or deep understanding of an area of expertise, may be difficult to capture and embody into "how-to" manuals or other sharable media. This view recognises that it is difficult to convert the tacit knowledge held by experts into explicit, how-to knowledge, and that the capture of dialogue among experts may be an important technique.

To address this problem, many of the major international consulting companies have installed software systems which provide both a medium, and an archive repository for electronic message based discussions organised by contextual area. For example, Price Waterhouse was an early adopter of groupware Lotus Notes. Notes provides an architecture where consultants from offices around the world can read, and contribute to these local, regional and international discussions on hundreds of topics. While the *medium* of the Notes infrastructure provides a place where experts with a narrow interest in that topic area can exchange messages and opinion with others with similar interests, the Notes database also becomes an archive, or *repository* of the comments and opinions of these experts, which can be searched and utilised by other less expert consultants. The repositories can also be used to locate experts in an area, who may then be drawn in to a consulting situation either for direct work with a client, or indirectly to support local consultants.

*View 3: Knowledge Is **Sets of Rules***

This view is held by expert system designers, machine learning researchers, and business process designers. A knowledge engineer extracts sets of rules, such as diagnostic procedures, from a domain expert who has extensive experience. These rules can then be embodied in an expert system that can guide a person much less experienced through the necessary steps in a diagnostic or design process. The rulesets and decision trees may be automatically generated through machine learning and data mining procedures, where large datasets, such as telephone toll call records, may be analysed to create understanding of usage patterns. This view holds that useable explicit knowledge is most easily embodied in sets of rules, and that knowledge engineering and machine learning techniques are important in converting the understanding of an expert, or the hidden meaning in a database.

Process re-engineering and improvement efforts may be characterised as a formal methodology to embody tacit knowledge held by participants into a design for a business process. Group members brainstorm ideas based on their own experience, beliefs, and view of the future, debate and refine these ideas through group discussion into proposals, and then participate in the design of new processes (sets of rules and procedures) which incorporate this group knowledge. Workflow systems and other process management technologies can be then be implemented to embody and control these new processes.

*View 4: Knowledge Is **"Knowing", "Understanding"***

This is the philosophical view of knowledge that some say this only happens in humans and therefore, is not possible to mechanise. If this view is to be accepted, then the role of information technology and knowledge management is to provide sources for searching (information repositories) and stimulation (information streams) so that individuals can expand their personal knowledge, and apply that knowledge to assist the organisation in meeting its goals. This view holds that the conversion of tacit knowledge to useable and transferable forms of explicit knowledge is extremely difficult, and unlikely to result in success.

Some may hold to this pure view of knowledge, while still suggesting that technology may be able to assist if knowledge can exist outside the human mind. The use of knowledge embodied in such future systems may not be just query based, such as a human interactively searching a machine based repository, but rather more proactive, such as a machine implemented knowledge agent making unsolicited suggestions to a human based on environment factors of interest and the processing of incoming streams of data and information.

Implications for Knowledge Management

Potential uses of information technology to support knowledge embodiment, storage and retrieval activities may be confounded by widely differing perceptions on a definition of knowledge. There exist a diversity of definitions of knowledge and knowledge management, which often have been constructed to take advantage of some existing component of technology such as document imaging or electronic group communication. We suggest that multiple, overlapping and non-exclusive views of knowledge and knowledge management may assist in identifying the future technology and architectures to make broad based innovation in this area a reality.

References

Ernst & Young. (1997) Executive perspectives on knowledge in the organization (report). Publisher: The Ernst & Young Center for Business Innovation and Business Intelligence.

Murray, Philip C.(1996) New Language for new leverage: The terminology of knowledge management, Knowledge Management Metazine. http://www.ktic.com/topic6/13_term0.html.

Nonaka, I. and Takeuchi, H. (1995) The Knowledge Creating Company. Publisher: Oxford University Press, New York.

Sveiby, Karl E. (1996). Tacit Knowledge. http://www2.eis.net.au/%7Ekarlerik/Polanyi.html