Accessing Corporate Memory – Some Knowledge Structure Concepts

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Abstract A model of a “Corporate Memory” that influences an organisation in carrying out its purpose, and is a repository of information and knowledge beneficial to the future operation of the organisation is used to suggest ways of deriving value from different components of that “Corporate Memory”. The model is combined with a generic representation of key organisation functions (in this case, representative of a manufacturing organisation) to provide a basis for knowledge “maps” that reflect what an organisation knows and where that knowledge is located.

BACKGROUND

If, as many argue, intellectual assets are more important than tangible assets in effectively achieving the purpose of an organisation in the 21st century, serious effort must be put into using these intellectual assets efficiently, in the same way that efficient use of tangible assets is the norm today. But what are these assets, how do we retain them, and how do we know if they are being used efficiently.

Intellectual assets are developed using knowledge and learning processes, and throughout this paper, different views of knowledge and knowledge transfer will be explored. There is reference to the value of knowledge. Under some circumstances people in a particular community will take a philosophical view of knowledge and learning, placing value on the improved understanding of their environment provided. In other circumstances, a pragmatic view will be taken, placing value on the use of knowledge to produce beneficial outcomes, and that is the view taken in this paper. Historically, Universities would be associated with the former view, and Business with the latter, but today it is necessary to strike a balance between the two. If a University does not commercialise its knowledge to

some extent, or if a Business does not understand how its environment is changing, then both face extinction.

Thus, for a particular organisation, there will be internal and external aspects to the knowledge important to it that will contribute to a distinctive “corporate memory”. And it is suggested here that the balance is changing, and will continue to change, with external knowledge becoming more important. For example, in a “virtual organisation”, the bulk of the knowledge accessed will be outside of the notional “organisation”. So in discussing “Corporate Memory” in this paper, whilst internal and external elements are featured, one needs to think flexibly about where the boundaries might be.

If a representation of corporate memory is to be of value, then a number of issues have to be addressed:

- What aspects of corporate memory might be of most value (is it the company policy manual, or is it something else)?
- How is this memory made visible and accessed (particularly if significant components of it are outside of the organisation)?

The approach taken to considering these issues is to use a model as a framework for discussion, but consider ways that knowledge sets may be represented and structured to simply provide visibility of different facets of knowledge.

AN INTELLECTUAL ASSETS PERSPECTIVE

Historically the perceived value of a company has been driven by its financial and capital assets. But today, some of the worlds largest companies have a market value many times the value of their capital base. The additional value is considered to be related to “customer assets” and “intellectual assets”, with an emphasis on the latter. Some [14] seek ways to characterise and value these intangibles. Some component parts of these assets are individual competencies, internal structures (eg unique practices and systems) and external structures (eg networks of contacts).

Efforts to identify and enhance core competencies are seen as the source of a company’s sustainable competitive advantage, and considerable efforts to codify expert knowledge to make it easier to both retain by a company and to share internally to enhance operations [15]. Legal protection of ownership by patent, copyright, trademark or whatever else makes sense is a focus for many companies. Such approaches have an underlying assumption that drawing all these resources within a company will offer an advantage.

But other approaches pull together a network of companies that between them have all of the resources to tackle a particular opportunity or task, and

this involves sharing intellectual property. Some, such as Australian company Moreton Bay Ventures go further, and adopt an open source approach, making new knowledge freely available on the condition that subsequent enhancements and applications will be available back to the company at no cost. Then Moreton Bay Ventures develops higher level applications using the enhanced knowledge.

These quite different strategies; *formalise knowledge to retain control of it, or formalise knowledge to share it and stimulate its growth, have a common objective – obtain leverage from what the company “knows”*. Just what an organisation “knows” and how to characterise it will be discussed in subsequent sections of this paper.

OBTAINING LEVERAGE FROM A REPRESENTATION OF CORPORATE MEMORY

What does an organisation “know”, and how can this provide leverage. What an organisation “knows” can be characterised using the notion of a “Corporate Memory” that influences the organisation in carrying out its purpose, and is a repository of information and knowledge beneficial to the future operation of that organisation. It will be reflected in the repertoire of practices and routines that are the norm for the organisation, and will have both tacit (vested in people) and explicit (documented and codified) components [12]. It will have both internal (e.g. company computer systems) and external (e.g. a network of contacts) aspects.

In Europe, some information technology researchers are exploring possible codified corporate memory attributes. In broad terms, they have identified the following:

- Different kinds of interfaces that might suggest decisions to the user, or explain results, or critique input decisions
- An administration function that inserts rules, finds redundancies and contradictions
- A data base that has case-specific information, general information on external rules and data attributes, and an ontological or meta-information layer that controls the evolution of the information repository

Another group trying to establish a knowledge reference model is focussing on several key design objectives:

- Ease of use, building on experience with book referencing, library science and such-like existing analogues
- Semantic precision, with information relationships and descriptors

- Bearing all of this in mind, a high level systems engineering style model was evolved over a period of a year or so with contributions and critique from some colleagues. The corporate memory model is made up of a mixture of knowledge sets (some of which may be outside of the business) that could be treated like sub-systems of a total system, with information or knowledge flows between them. The model (Figure 1) has 8 sub-tier knowledge sets:

- Various kinds of external contacts (generally a “know – who “ knowledge set)
- An internal know how knowledge set (commonly thought of as “intellectual assets”)
- Owner influences and rules
- Employee/ Community influences and rules (eg through union intervention)
- Customer influences and rules
- Company data warehousing of different sorts
- Operational/Business rule sets and routines

- Operations implementation strategies that determine how the knowledge flows will interact with the firms primary business.

POTENTIAL SOURCES OF LEVERAGE

From examination of the sub-tier knowledge sets described above, different kinds of leverage a particular business might develop by focussing on a particular sub-tier set can be envisaged, as shown in the table below. It might be noted however, that individual sets are part of a total system, and to realise and sustain leverage, multiple knowledge elements are involved. For example, a good Franchise Operation commonly has a Data Warehouse and Business Rule-set as integral parts of the Operational Implementation

DESIRABLE KNOWLEDGE REPRESENTATION ATTRIBUTES

So we have a model, and we can see ways of potentially obtaining leverage from our knowledge assets, but how can the “knowledge” within each sub-tier set be represented so it can be shared and enhanced (Table 1)?

Table 1 Examples of sub-tier knowledge set

SUB-TIER KNOWLEDGE SET	EXAMPLE OF POTENTIAL LEVERAGE
COMPANY INTELLECTUAL ASSETS	<ul style="list-style-type: none"> • STRENGTH IN CORE COMPETENCIES • PATENTS • COPYRIGHT MATERIAL
EXTERNAL KNOWLEDGE BASE	<ul style="list-style-type: none"> • EARLY TREND & OPPORTUNITY SPOTTING, DEAL BROKERING • POWERFUL “VIRTUAL” ORGANISATION
DATA WAREHOUSE	<ul style="list-style-type: none"> • RE-USE OF KNOWLEDGE (EG EXPERT ASSISTANTS) • TARGETED MARKETING (EG READERS DIGEST APPROACH)
OPERATIONS/BUSINESS RULES	<ul style="list-style-type: none"> • MAKE OR CHANGE INDUSTRY NORMS
OPERATIONAL IMPLEMENTATION	<ul style="list-style-type: none"> • AGILE SYSTEM • FRANCHISE OF WELL DEVELOPED, PROFITABLE BUSINESS SYSTEM

- Lundvall and Johnson [10], noted four kinds of knowledge:
- Know-what, which is knowledge about facts. Know-what is information that can be broken down into bits and easily codified
 - Know-why, which is knowledge about principles and laws – it reduces the frequency of errors in technological trials

- Know-how, which is skills, the capability to undertake a given task successfully
- Know-who, which is information about who knows what and who knows how to do what

They also suggested that in most organisations, these types of knowledge must cover at least three distinct domains: technical competencies and capabilities, organization capabilities and “system” capabilities in terms of interactive links.

It was noted that know-what and know-why are closest to the traditional concepts of science that can be readily transmitted as information. Know-how and know-who are not so easily transmitted, requiring personal contact, observation opportunities and social interaction with an extended network.

In considering ways to exchange knowledge in a recent international research program, knowledge to be transferred was classified as available in Documentary form (reports, e-mail), or in Procedural form (models, processes) or as Background knowledge (personal or organisational tacit knowledge). In the same project, management roles of co-ordinator, collaborator and communicator were formalised to facilitate operations in a “virtual” project environment. In broad terms, they dealt with technical, organisational, and systems knowledge domains respectively, and were thus consistent with the above observations [10].

With ready access to the Internet and other sophisticated data search possibilities, Berreby [3] notes that the situation can lead to a paradox: extra details can obscure patterns and make it harder to get useful facts; and quotes the view of a colleague concerned with knowledge management – that the emphasis is no longer on information processing, storage and analysis; but on representation. He discusses the use of a range of sensory perceptions besides words and numbers: colour, texture, sound; to be able to rapidly assimilate “represented” information through metaphor and analogy. A related view is that the expanding supply of codified knowledge is increasing the demand for skills relating to the recognition of patterns in data and selecting relevant data for scrutiny [11].

In dealing with large volumes of information in the past, people have developed special “maps” (eg a street directory) and “Indexes” (eg library indexing systems). Such devices enable information to be organised in a hierarchical way that enables big-picture visibility and top-down searching, or using supplementary information, detailed visibility and bottom-up searching. They also have a relatively stable structures and a small number of attributes (eg the standard symbols for roads, railway lines etc on a map) that provide semantic precision, but which combined together provide a large amount of information at a glance.

Some of the notions discussed above are put together in Table 2 to suggest a knowledge classification and representation approach. The notion of “maps” will be considered again later in this paper.

Table 2 Knowledge classification and representation

KNOW- LEDGE TYPE	CLASSIFICAT- ION APPROACH	REPRESENTATION APPROACH	EXAMPLE
KNOW- WHAT	Documentary (eg reports)	Analogue map Plus associated digital data	<ul style="list-style-type: none"> • Street directory using standardised symbols • Document framework with standard software (eg Microsoft Word)
KNOW- WHY	Procedural (eg models)	Analogue map Plus associated digital data	<ul style="list-style-type: none"> • Street directory using standardised symbols • Model framework with exchange standards (eg STEP)
KNOW- WHO	Background (eg experience unique to an individual or organisation)	Shared personal information within a classification structure <u>Plus</u>	<ul style="list-style-type: none"> • “Who’s–Who” indexes • White pages / yellow pages telephone directories
KNOW- HOW		Personal contact processes	<ul style="list-style-type: none"> • Video-conferencing

The approaches to knowledge representation discussed so far require a stable framework within which the representation resides. The model of corporate memory presented earlier is considered to be stable, and is useful in understanding *where* knowledge may be found, and how different knowledge flows lead to action, but it does not address the issue of different knowledge domains. It can be argued that at some level of abstraction, all organisations are the same, for example, as noted earlier, all will have technological, organisational and systems aspects to their operations. All manufacturing operations buy things, work on them, and package and sell things. All organisations have some kind of Human Resources management system.

DIFFERENT VIEWS OF ORGANISATIONAL KNOWLEDGE

Here are some illustrative examples of models used within some parts of an Aerospace company, Hawker de Havilland, over a number of years to provide a systems framework for corporate knowledge.

The first was used in the early 1990’s during a period of intensive Business Process Re-engineering [2]. It was derived from work done in an associated company to try and develop a coherent computer systems

approach between disparate divisions of a recently agglomerated business. The business process was defined as a number of functional systems linked by information flows. The systems were:

- *Operations research*: containing executive information systems, some longer term business opportunity research and planning functions
- *Engineering design*: containing product development and definition sub-systems and compliance demonstration functions
- *Manufacturing engineering*: containing process development and build definition sub-systems and change management functions
- *Materials management*: containing provisioning and purchasing sub-systems and inventory management functions
- *Shop floor management*: containing daily planning and scheduling sub-systems and various reporting functions
- *Customer order support*: containing estimating and pricing sub-systems and order administration / technical support functions
- *Quality management*: containing quality system definition and maintenance sub-systems and continuous improvement functions
- *Personnel and administration*: containing payroll and job recording sub-systems and other personnel functions
- *Financial control and accounting*: containing financial and cost accounting sub-systems and various reporting functions
- *Production scheduling and control*: containing production strategic planning sub-systems and overall manufacturing control functions
- *Project management*: containing programme and configuration control sub-systems and various liaison and reporting functions

Each functional system and sub-system had a brief description, and a data dictionary provided a consistent terminology for information that flowed within and between functional systems.

This model was used for a number of purposes:

1. As a framework to collect information about a myriad of mainframe, personal computer and manual systems used by individuals within the organisation to carry out their daily tasks
2. As a checklist to confirm that all activities had been assigned to someone after a substantial re-organisation
3. As a benchmarking framework to compare resource utilisation in different Operating Divisions of the organisation

A second model, currently in use in some parts of the business was developed by a colleague, Ross Penfold, building on his experience with such modelling in another industry. This model defines, at a very general level, systems that it is considered any business must have as:

- *Leadership and management systems*: including vision, mission, strategic planning and strategic change elements
- *Customer and commercial systems*: including marketing, financial management, information technology and procurement elements
- *Human resources systems*: including employee and labour relations , people and organisational development, performance measurement and remuneration system elements
- *Technology systems*: including production processes, process capability development and process control elements
- *Innovation systems*: including research and development, and continuous improvement methodologies
- *Quality systems*: including quality assurance systems and quality control processes elements
- *Asset management systems*: including maintenance, OH&S assurance and environmental management elements

As with the previous model there are sub-systems that are probably company or industry unique. There are three views available of each system; a daily operations view, a tactical planning and organising view, and a longer term strategic view. The model can be accessed from the company intranet system, with hyperlinks to existing documents, procedures, computer programs or web-based information. At this stage, the full representation is only available for some systems.

It is noted that how useful particular knowledge is depends on environment and context. If this changes with time, then maintaining an up-to-date knowledge system can be a significant task. For example, a Company may retain copies of some particular legislation to keep up to date, but if the rate of change is too high, or the company does not have some-one who can interpret the significance of changes, this information will not be useful. The company may choose to take expert advice from a consultant instead, moving from an internal knowledge set to an external one. Examples like this highlight the need for a stable reference architecture that is kept relevant by some simple process.

Another issue relates to the opportunity to convert new knowledge to action within a particular organisation. Acquiring new knowledge that cannot be used may not be regarded as value adding. A number of potential cultural barriers are observed [13]:

- *Ignorance*: those who have the knowledge don't realise others may find it useful, those who could use it don't know it exists
- *No absorptive capacity*: lack of resources or study time to make adaptation of an idea useful

- *Lack of pre-existing relationships*: no personal dialogue that builds confidence and shares views
- *Lack of motivation*: No clear reason for making a change perceived.

O'Dell and Grayson [13] have also observed a number of systemic barriers that tend to dominate some companies

- *The silo company*: focussed units with no incentive to share information
- *The NIH company*: that values local knowledge creation over knowledge sharing
- *The Babel company*: with far-flung employees that lack a common purpose
- *The By-the-book company*: that considers documented knowledge is the only valid form
- *The Bolt-on company*: that considers adding knowledge transfer responsibilities to a duty statement is all that is needed.

It is suggested that different forms may exist within one organisation.

SOME PARTICULAR ISSUES IN THE “VIRTUAL ORGANISATION”

In considering a conventional organisation using the model of corporate memory described earlier, there were four internal knowledge sets that influenced the working of the organisation, and four external ones.

It is suggested here that in a “Virtual Enterprise”, there is only one internal knowledge set: that related to a negotiated set of business rules, with an implementation strategy knowledge set being evolved as the work of the enterprise proceeds. This may be illustrated by drawing on a case study of a Film-making Enterprise [8], where an Enterprise is established for the project, then completely disbanded when the project is finished. The project starts with an idea by one or a few individuals plus some shareholders who determine artistic and financial “rules”. The project accesses knowledge through clusters of industry specialists and resources (eg around Hollywood) who help develop an implementation strategy, then do the work. Knowledge transfer is primarily through socialisation processes occurring in parallel with film production, and some elements of “corporate memory” are held at an Industry level, not at the level of an individual firm.

Today, the expression “Virtual Enterprise” tends to be associated with electronically connected, remote participants (but as the example above illustrates, this need not necessarily be the case). Where a team is separated in time and/or place of work, it may be considered that “rules” and “intellectual assets” are being represented in terms of information exchange

standards and software. Considerable effort is being put into the development of these tools, which facilitate transfer of documentary and procedural knowledge. But it seems that tools to facilitate exchange of background knowledge are less developed.

Coleman [4] has recently presented some views on electronic collaboration and the evolution of “community”. Several definitions of electronic collaboration are offered, but the one selected to support discussion here is “intentional group processes plus software to support them”, where collaboration is seen as many-to-many and goal oriented, whereas communication is seen as one-to-one and unstructured. A kind of scorecard is presented to help people think about the readiness of their organisation to pursue full scale electronic collaboration, with the following factors being rated out of 10:

- Technology (provides everything needed to collaborate) – weighting factor = 1
- Culture (trust, common goals, acceptance of risk-taking and sharing) – weighting factor = 2
- Economics (is it economically critical to collaborate) – weighting factor = 3
- Politics (management believes it is important) – weighting factor = 4

It is noted that technology is not the main driver. Coleman has also observed that the weighting factors may be different in different countries, depending on the national disposition towards teamwork. The factors shown above are for North America. The evolution of “community” is seen as developing from network applications such as e-mail and groupware in the early 1990’s through knowledge management in the late 1990’s. Whilst real-time collaboration tools (audio, visual and data) are rapidly evolving, there is considerable turbulence in the product range available.

There are suggestions that a virtual enterprise be treated like a project, with a finite life. This is effectively the approach supported by the GERAM architecture referred to earlier. Many conventional firms are becoming more project oriented as product life cycles decrease and as more work is outsourced, but there are special issues associated with distributed project management [5].

DISCUSSION

This paper set out to explore some knowledge structure concepts for accessing corporate memory. A representation of that memory, characterised as a number of interlinked generic knowledge sets has been presented. It has been noted that all knowledge sets will have both explicit and tacit

knowledge components. In further discussing approaches to structure, it appears that a multiplicity of views, each with sub-tier components is needed. A particular organisation's operating environment and infrastructure may help or hinder knowledge transfer. The diversity represented in these different perspectives is possibly what makes the concept of knowledge management complex and fuzzy when it comes to implementation of a program of some sort.

Allee [1] observes this fuzziness and contends knowledge is "too complex and fluid to be designed, processed and managed from an old thinking perspective". She observes twelve qualities of knowledge:

- "Knowledge is "messy"" (interconnections between aspects of knowledge and the contextual significance associated with it make it hard to compartmentalize it)
- "Knowledge is self-organizing" (it has a life of its own, it is created and killed off as purposes and values change)
- "Knowledge seeks community" (as illustrated by the explosive growth of the Internet)
- "Knowledge travels on language" (without language and the jargon associated with a particular field, we cannot communicate what we know)
- "Knowledge is slippery" (too much formality, e.g. in codification, can lead to the unwanted side effect of stifling creativity and new knowledge)
- "Knowledge likes looseness" (we can waste resources trying to control knowledge processes too tightly – the survival rate of diverse, decentralized systems is higher)
- "Knowledge experiments" (the on-going conversation about knowledge is more important than the right answer in opening up new options to explore)
- "Knowledge does not grow forever" (unlearning, letting go old ways, contributes to the vitality and evolution of knowledge)
- "Knowledge is a social phenomenon" (only people together can make knowledge happen. Knowledge managers cannot manage knowledge itself, only some processes for acquiring it and using it)
- "Knowledge grows organically" (it is a waste of time to create rules about knowledge, it is better to remove barriers to self-organization)
- "Knowledge is multi-modal" (it must be supported at multiple levels and in various ways that support a systems approach, reflection, experimentation)

- “Knowledge is multi-dimensional” (privileged positioning of explicit knowledge, communication and sharing of tacit knowledge and enhancing knowledge competencies all lead to more effective ways of creating, adapting and acquiring knowledge)

Particular organisations have tried to deal with this complexity by focussing on a subset thought important to the organisation, but this has not always been successful. Lucier and Torsilieri [9] noted that some initiatives taken in the name of knowledge management (eg putting a company manual on-line) may not lead to improvement unless there is associated action to beneficially change some current practices. Similarly, Davenport [7] observes that just building a framework, without content that will make business sense and stimulate its use, may be wasteful.

In this paper, the intention is to establish a multi-tier framework that is relatively simple. Earlier discussion had suggested primary links between particular corporate memory knowledge sets and the way they might provide leverage to deliver value to a particular firm, eg franchising might build on well developed implementation strategies. This kind of view might be used to make business sense of the content of a corporate memory representation. Taking this approach, for each knowledge set, documentary, procedural and background knowledge elements would be identified for each domain relevant to a particular business. And for each domain an application area would be identified (eg strategic, tactical or operational). This would yield the kind of framework element illustrated below, and could provide the basis of Knowledge “maps” of an organisation (Figure 2).

For example, if the 8 knowledge sets of the corporate memory model described earlier were combined with the 7 business systems identified by Hawker de Havilland, then there would be 56 framework elements of the type represented in the diagram above. Current knowledge access status could be readily appreciated by scanning a 8 X 7 matrix representation where each entry contained a symbol (eg tick / cross) representing status (eg substantial knowledge accessible; or some knowledge accessible; or little knowledge accessible or status unknown). This would enable scanning of the matrix to see where gaps exist, for comparison with the Enterprise’s strategic needs, as there might be some framework elements less important than others in particular circumstances (eg individual employee career development may not be a key issue in a virtual enterprise). A similar approach could be taken within each framework element. Whilst most businesses may require a number of sub-tier domains (eg project management as a subset of Leadership and Management systems) to be identified to provide adequate visibility, (substantially increasing the number

of elements), this relatively simple pictorial overview is still considered to be useful .

Figure 2 Knowledge maps of an organisation

It was noted in the figure above that each knowledge type / knowledge application area combination should have both an analogue and a digital representation. An example of this would be a “mindmap” created utilising *MindManager* software that can flexibly represent knowledge artifacts, with access to more detail via sub-tier maps and hyperlinks (refer www.mindjet.com for further details).

The notion of knowledge “maps” described here is consistent with the views of Davenport [6] who felt that knowing where knowledge can be simply accessed is important to the success of a knowledge program.

CONCLUSIONS

A model of “corporate memory” has been used to indicate how different internal and external facets of that memory might deliver value to a particular organisation. It is suggested that a “Virtual Enterprise” has a larger number of external components to its “corporate memory”, and has some special knowledge transfer needs.

The model plus its characteristic components (documentary, procedural and background knowledge) has been used in conjunction with generic knowledge domain and knowledge application views to suggest a stable framework that assists in “mapping” organisational knowledge.

A number of success factors and potential barriers to be considered in any knowledge program have been noted. These indicate that whilst

technology and culture aspects are important to the successful operation of a knowledge program, sound economics and a supportive Enterprise political climate are critical in the establishment phase.

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