
Measuring Success in Knowledge Management: An Australian Case Study Perspective

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Abstract

There is a fundamental shift in the economic environment of developed nations away from tangible manufactured goods towards value added services. This has facilitated the emergence of knowledge management as a business discipline at the turn of the twentieth century.

A review of the literature developed the knowledge management process model. This model identified the processes of generation of knowledge, representation of knowledge, access to knowledge and transfer of knowledge as dependent variables. Further, the independent variables of organisational structure, organisational culture and technology infrastructure were identified as inhibitors or enablers of the knowledge management process.

A number of success factors related to organisational culture that inhibit or enable knowledge management were identified as being: responsibility for knowledge; knowledge resources; knowledge performance measures and staff development. Success factors related to organisational culture were identified as: expert authority; knowledge transfer; employee induction; innovation process; organisational focus; cost reduction focus; knowledge sharing; behaviour incentives for knowledge sharing; human networks; information value and the recognition of knowledge as a business asset. Finally the success factors associated with the technology infrastructure were identified as: corporate standards; information technology effectiveness; techno-centricity and user capabilities.

The application of the diagnostic tool presented in this paper provides a practical starting point for managers to discover the state of knowledge management in the organisation. Measurement and benchmarking of all success factors can provide invaluable insights into where to initiate action and allocate resources.

Introduction

There is a fundamental shift in the economic environment of developed nations away from tangible manufactured goods towards value added services. This has facilitated the emergence of knowledge management as a business discipline at the turn of the twentieth century. The growth of interest in knowledge in the 1990's is an outcome of a shift away from industrial era paradigms with knowledge becoming the key source of wealth (Savage, 1990; Davis & Davidson, 1991; Quinn, 1992; Nonaka & Takeuchi, 1995; Prusak, 1996; Svieby, 1997; Davenport & Prusak, 1998).

In 1991, the service sector accounted for 74 per cent of total employment output in the United States. Similar trends are being experienced across the developed nations,

including Australia. The Australian Bureau of Statistics Balance of Payments figures for January 1996 reveal that approximately 50 per cent of Australia's export trade was in merchandised goods, (including agricultural products) with 50 per cent in services. This has grown from a mix of 80 per cent merchandise to 20 per cent services in the immediate post World War II years and this pattern is expected to continue.

This growth pattern is attributed to increases in productivity brought about largely by advances in technology (Quinn, 1992). An increasing percentage of profits on manufactured goods come from the intellectual component of what they term "Smart Products" which provide the intangible satisfaction sought (Davis & Botkin, 1994, pp. 165 - 170).

In the business context, knowledge is driving innovation and organisations are competing on knowledge intensive products in a knowledge based economy (Drucker, 1993). Given this increasing importance of knowledge in economic activity, there needs to be a focus on managing this knowledge as a business asset (Svieby, 1997). This recognition of value provides the impetus for conducting research into how knowledge management is applied in practice.

The value of knowledge as a business asset is generally recognised. However, there is a paucity of rigorous scholarly research into the discipline (Teece, 1998, Australian Government, 1999). A scan of the literature reveals that few studies to date deal with the Australian business environment.

This research provides value to the academic community and business community alike. Firstly, the academic community will benefit from the explanation and deeper understanding of the phenomenon of knowledge management. Secondly, business managers attempting to understand and implement knowledge management programmes in their organisations will benefit from learning how knowledge management has been practically applied.

Methodology

A case study approach was selected for this research. The case study procedures and protocol were developed to provide a systematic and rigorous approach to the study that would be capable of replication.

A review of the literature developed the knowledge management model identifying the processes of generation of knowledge, representation of knowledge, access to knowledge and transfer of knowledge as dependent variables. Further, the independent variables of organisation structure, organisation culture and technology infrastructure were identified as inhibitors or enablers of the knowledge management process.

The research questions were derived from this model and the survey instrument and analysis procedures were developed. The findings were then validated by a panel composed of academics and practitioners in knowledge management who assisted in clustering the emergent findings into logical groups and determining labels that described these groups of constituent variables or success factors.

Research Problem and Research Questions

The research problem under investigation is "*How is knowledge management practiced in Australian Organisations*". The existence of different paradigms of knowledge management provides a conceptual platform from which to investigate the research problem and the following research questions are to be investigated.

- **Research Question 1.** '*How does the independent variable of organisational structure inhibit or enable the knowledge management process?*'
- **Research Question 2.** '*How does the independent variable of organisational culture inhibit or enable the knowledge management process?*'
- **Research Question 3.** '*How does the independent variable of technology infrastructure inhibit or enable the knowledge management process?*'

Two large Australian based organisations provided the data for this study. Neither organisation would agree to being identified by the study as it was felt that competitive advantage would be diminished if their knowledge management practices were to become available for public scrutiny.

Both organisations share a manufacturing background and both have been subjected to pressures to cut costs over recent years. ManCo is a traditional manufacturing company focussing on its capabilities in chemical and explosives applications.

CompCo is a computer services company which has evolved from an organisation that was a major manufacturer of computer equipment.

What is Business Knowledge?

Among the many definitions advanced in theory the following working definition encapsulates three important aspects of knowledge: '*Knowledge is a body of information resident within an individual organised by judgement experience and rules*' (Ernst & Young, 1995).

Firstly the definition recognises that knowledge is based on information, secondly, that it requires some human interaction and thirdly that it requires some structure to bring it to life. Consequently, this definition is adopted for this research.

The recognition of the distinction between tacit and explicit knowledge is also fundamental to a complete discussion of the nature of business knowledge (Nonaka, 1991; Nonaka & Takeuchi, 1995; Svieby, 1997). Knowledge can be defined as information combined with experience, context, interpretation and reflection and is a high value form of information that is ready to apply to decisions and actions (Davenport, De Long & Beers, 1998. P.43).

Knowledge Management Processes

The literature indicates a general set of processes constituting knowledge management (Kogut & Zander, 1992). Although there are differences in terminology, the processes of acquisition of knowledge, the representation of knowledge, access to knowledge and transfer of knowledge are recognisable across the various models proposed. Further, the need for appropriate organisational structures, organisational culture and technology infrastructure to facilitate the operation of these processes has been identified.

An organisation consists of a value chain of processes (Porter, 1985). A process being a structured, measured set of activities designed to produce a specific output. This value chain model is adapted to provide a framework for knowledge management processes.

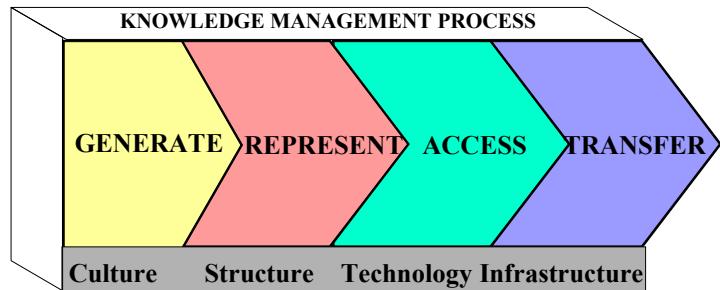


Figure 1.0 The Knowledge Management Process Model

Generation of Knowledge

The knowledge generation process is concerned with the way in which an organisation acquires or creates knowledge. This generation can occur through the creation of new knowledge, viewing existing knowledge in a new way, generating knowledge from experience, research or it can be acquired from external sources (Drucker, 1985).

Representation of Knowledge

The representation of knowledge process includes two primary sub-processes: knowledge codification and storage. Codification literally turns knowledge into code by making it organised, explicit, portable, and easy to understand. Having codified the organisation's knowledge a recognisable structure or taxonomy is required to provide governance over its storage. This representation of knowledge involves the codification of random and unrelated pieces of data and information (Wilson, 1983). Further, we must recognise the existence of tacit, people based knowledge and give attention to how it is represented and stored.

Access to Knowledge

The access to knowledge process is concerned with understanding where knowledge is needed, how to obtain it and having the ability to obtain it. Efforts to improve access to knowledge range from location tools like information maps or networks directing people to other knowledgeable people; to more elaborate computer-based repositories and search tools.

Transfer of Knowledge

Knowledge transfer is an outward movement of knowledge from one knowledge store, either in human, hard copy or technological form, to another. At the individual level knowledge transfer is social, and is usually informal (Kim, 1993). Further, it must be recognised that knowledge is partly tacit and highly contextual and therefore only partially transferable (Nonaka & Takeuchi, 1995).

Independent variables impacting on effective knowledge management

Further, the literature identified a number of recurring independent variables that appeared to inhibit or enable effective knowledge management. These are: organisational structure; organisational culture; and technology infrastructure.

It is important to recognise that there are dependencies between each of these independent variables and any distinction between the independent variables themselves must be accepted at a pragmatic rather than absolute level. The following section provides a discussion of the success factors (constituent variables) identified through this research. This provides business managers with a pragmatic framework for understanding some of the inhibitors and enablers of knowledge management initiatives.

Structure

Organisational structure as an independent variable affects the facilitation of the knowledge processes. For the purposes of this study structure is defined as ‘any formal processes or standards that are created by the organisation to regiment its work activities.

Organisational design can provide a structure enabling knowledge creation (Nonaka & Takeuchi, 1994). We must note a contrast in models of organisation structure between an organic structure and a mechanistic structure. The former provides open channels of communication, loose, control and consensus decision making and contrast with a mechanistic structure which is hierarchical and dominated by a linear and vertical span of control.

Knowledge structures are important components in the development of a corporate behaviour and the behaviour of its individuals (Kiernan, 1993). In hierarchical management structures there is a tendency to guard knowledge and create functional silos (Davenport & Prusak, 1998). Network structures and cross functional teams attempt to

break down these functional silos and encourage knowledge sharing and are more appropriate to fostering a ‘learning organisation’ culture.

The structure that an organisation provides facilitates effective knowledge management if there is a disciplined approach to work activities within these structures. Both organisations displayed evidence of disciplined processes governing performance measurement and staff development. However, there was an inconsistent application of these processes in the organisation that results in less than optimum performance. In both organisations studied, these success factors were perceived to have an inhibiting influence on effective knowledge management that offered significant scope for improvement.

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A fundamental issue arising is the lack of responsibility and individual accountability for performance of knowledge related activity. However, if organisations develop the structures to manage staff development, knowledge resources, and knowledge performance measurement then there is the potential to create an effective knowledge sharing organisation.

Success factors identified in relation to the organisational structure are as follows in table 1.0.

Success factor	Discussion
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Responsibility for knowledge	The absence of formal structures in the form of policies, procedures and processes constrains effective knowledge sharing between individuals and groups across the whole organisation.
Knowledge resources	The knowledge resources available and the formal processes in place to manage knowledge are a structural inhibitor or enabler of the knowledge management processes. This requires a formal discipline to structure knowledge resources in a way conducive for effective storage and retrieval.
Knowledge performance measures	The lack of a formal, structured approach to measuring the use of and contribution to organisational knowledge is an inhibitor of effective knowledge management.
Staff development	The development of managers and staff is a fundamental method of acquiring and creating new knowledge. A structured approach and recognition of the value of staff development contributes to effective knowledge management

Table 1.0 - Success factors associated with the independent variable of organisational structure

Culture

Organisations are made up of individuals, each with their own unique behaviours, norms and values (Prusak, 1996). Organisational culture is an aggregate of the shared understandings of individuals that influence the collective behaviour of the organisation (Lyles & Swenk, 1992). The collective behaviour of these individuals within an organisation creates its culture. To be successful the organisational culture must be held together by a vision. For example, the ‘we don’t copy here’ vision, which shapes the corporate culture of Sharp Corporation (Nonaka & Takeuchi, 1995).

The data reveal the perception that people are not used to sharing knowledge. Not because they are unwilling to do so but because they are not used to sharing. This is exacerbated by the lack of application or development of the processes for transferring knowledge, inducting new employees, and for innovative activity.

A key factor in encouraging a change in the culture is a move towards providing incentives that reward knowledge sharing behaviour and the provision of a process to assist people to share knowledge across the organisation.

Moreover, although there is lip service given to the value of knowledge there is a lack of tangible encouragement for people based interactions and human networking. The low value attached to knowledge as a business asset impeded activity that could enhance the business. However, there was a growing recognition of this value in both organisations studied.

These success factors associated with organisational culture are presented in table 2.0 following.

Success factor	Discussion
Expert authority	This is the recognition of people who possess an expertise in a given discipline.
Knowledge transfer	The provision of an organised process positively impacts knowledge transfer.
Employee induction	A lack of a structured induction process can have a negative impact on the independent variable of organisational culture.
Innovation process	A constraint on the ability to innovate caused either by lack of time or implementation skills is an inhibitor of effective knowledge management. This constraint arises in an organisation's culture and is an outcome of task orientation and a lack of freedom and time to experiment.
Organisational focus	The propensity of an organisation to focus internally or externally impacts the way individuals can share knowledge.. For many externally focussed organisations, such as consulting houses where staff are based away from the business office, this can be a challenge.
Cost reduction focus	The emphasis on cost reduction can dictate that people focus solely on their immediate task that restricts time to interact and pass on knowledge on an interpersonal level and inhibit knowledge sharing.
Knowledge sharing	There was an identified willingness to share knowledge on an individual level but the lack of process and incentives to make sharing simple can frustrate these good intentions. When knowledge sharing does occur it usually happens on a reactive basis.
Behaviour incentives for knowledge sharing	The absence of incentive and the lack of rewards or sanctions for knowledge sharing were identified as inhibitors within organisational culture.
Human networks	Human networks as mechanisms for knowledge sharing were recognised as valuable, but suffered from a lack of sponsorship and the ability of individuals to devote the time to maintain and nurture these networks. There is an importance attached to the cultural acceptance of developing and participating in these knowledge sharing networks.
Information value	There was a perception that knowledge should be measured and an expectation that this would be beneficial to the organisation. However, no explicit measurement of knowledge was found. This indicates a lack of understanding of the value of information and knowledge.

Table 2.0 - Success factors associated with the independent variable of culture

Technology Infrastructure

The technology employed by a firm enables the knowledge management processes to acquire, store and share information quickly and easily. However, poor implementation or over emphasis on this technology can inhibit the effectiveness of knowledge management (Leonard-Barton, 1995).

The technology infrastructure consists of the hardware, software and telecommunications equipment utilised by an organisation and includes the supporting

administrative policies and procedures. This technology infrastructure affects the way in which work is performed and the behaviour of the individuals doing that work and represents a key intangible asset to the organisation. Advances in technology have meant that physical location is no longer a barrier to collaborative teamwork and knowledge sharing (Chesbrough & Teece, 1996).

Inefficiencies are created as people are forced to recreate knowledge that already exists or cannot be located. A corporate taxonomy and standards to which people can relate assists the navigation of the stored knowledge assets.

A further issue relating to the technology infrastructure is associated with inadequate training and orientation of the user communities. The technology infrastructure can be misunderstood and create inefficiencies through misuse.

However, there was a positive perception of the opportunities to improve the effectiveness of knowledge management. This was seen to be achievable through improvement in the performance of the information technology implementation process relating to each of these constituent variables. In turn this would improve the overall effectiveness of the independent variable of technology infrastructure in supporting effective knowledge management.

The success factors associated with the technology infrastructure are as follows in table 3.0.

The discussion so far has developed a model of knowledge management and identified three critical independent variables that enable effective knowledge management. Further, subsets these variables (success factors) have been presented. The following section presents those findings as a practical tool for determining the health of organisational knowledge management processes.

Success factor	Discussion
Corporate standards	A lack of corporate standards for storing and representing knowledge meant that knowledge management was inhibited. Organisations have a wealth of knowledge in their databases and people, but had no structure to communicate its existence to others or for others to access this knowledge.
Information technology effectiveness	Access to the internet and World Wide Web was perceived as both potential valuable and a time waster. Further there is a common perception that the

	Information Technology function does not deliver on its promises.
Techno-centricity	This techno-centric approach on the part of information technologists towards provision of business solutions including internet technologies inhibits effective knowledge sharing. End-users of technical systems are inadequately oriented in the use of the technology and have little input into the design and implementation process. Further, the technological tools provided may well be the latest available versions of technology but these do not necessarily support the real business needs.
User capabilities	The capabilities of users to utilise the technical resource effectively was identified as an inhibitor of knowledge management. The sheer volume of information available meant that it was difficult to identify relevant information and communicate this to others effectively.

Table 3.0 - Success factors associated with technology Infrastructure

Knowledge Management Diagnostic Framework

The literature review noted a paucity of research that could inform about the way knowledge management actually occurs. Case studies on knowledge management have focussed on what has been achieved rather than on what has been done (Davenport & Prusak 1998; Hansen et. al., 1999). Further, this material tended to report at a relatively high level focussing on single issues rather than taking a holistic approach.

The previous section has developed a model of knowledge management that builds on the theory of knowledge management on the analysis of the data of the research. The model that emerges identifies a number of variables that contribute to the success of knowledge management. The manifest relationships between these variables and success factors are shown in figure 2.0 following.

This model of knowledge management can serve as a useful diagnostic tool for managers to assess the state of knowledge management in their own organisations and to develop action plans aimed at improvement.

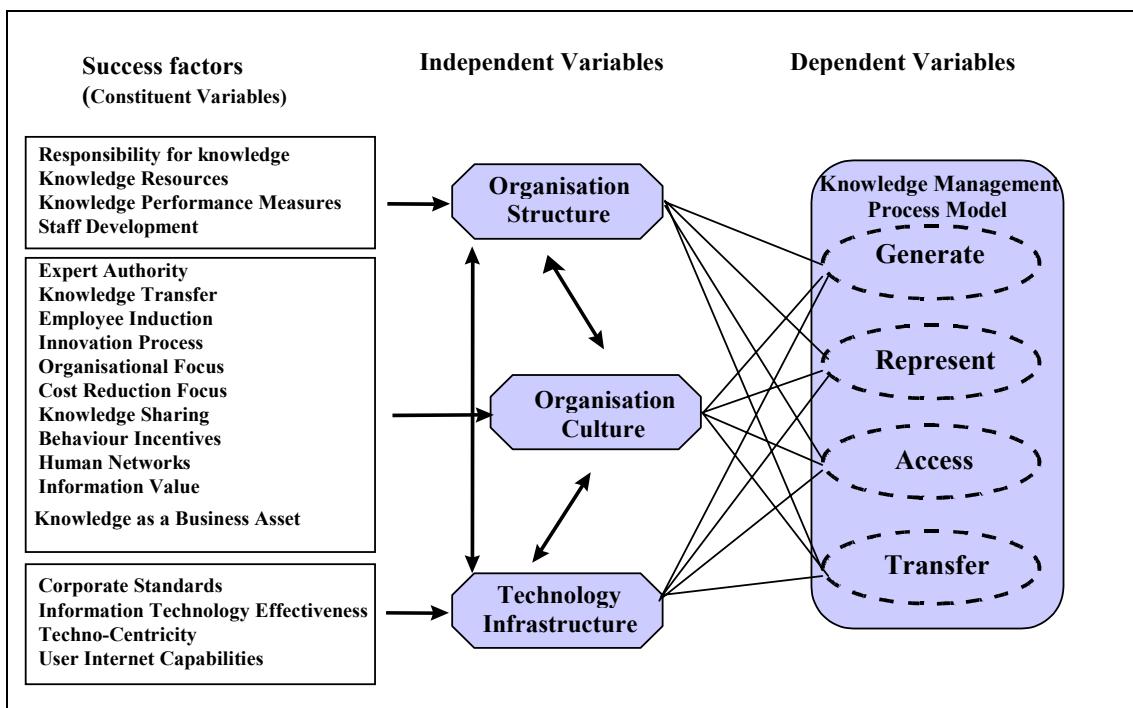


Figure 2.0 - The Knowledge Management Model

This diagnosis can be achieved by taking the success as the basis of assessment or ‘health check’. The use of this tool could indicate an organisation’s status in terms of effectiveness in knowledge management and identify where attention is needed. Each success factor informs about the positive or negative influence it effects on the independent variables of organisational structure, organisational culture and technology infrastructure that, in turn determine the overall effectiveness of knowledge management. Remedial actions based on suggested ‘best practice’ identified in the literature can then be considered.

Moreover, using the success factors identified, benchmarking of performance could provide valuable insights for the development of improvement actions. These benchmarks can be collected from the growing body of literature or through participation in knowledge sharing networks or forums. At the very least these benchmarks provide a basis for performance improvement and monitoring of progress.

An adapted Likert rating scale approach could provide a framework for quantifying this assessment. However, the data can be collected by a number of alternate research methods. Each of these methods has positive and negative implications in terms of

completeness and validity. Potential methods include interviews, workshops with key personnel or by self-administration by the manager investigating knowledge management.

Discussion

Earlier we noted that there was an increasing interest in knowledge management in the business community and there was little detailed information exacerbated by a lack of research into the discipline of knowledge management (Teece, 1998). This leads us to conclude that knowledge management is not practiced in Australian organisations as well as it might be. The research evidence has shown that there are a number of success factors impacting on the way knowledge management is actually practiced. Most of the success factors identified were perceived to be inhibiting effective knowledge management. However, each of the success factors present an opportunity for improvement in the way in which knowledge management is practiced in the future and mark a baseline for improvement initiatives.

The major influence on knowledge management is found to be from the independent variable of organisational culture. This is demonstrated by the identification of success factors primarily related to organisational culture that centre on the behavioural aspects of the individuals of the organisation. Underlying this behaviour is a lack of recognition of the value of knowledge as an asset and knowledge management processes.

The study found that management in both organisations gave an endorsement of the value of knowledge. However, this endorsement did not translate into tangible support or definitive action. Among the actions found to be absent include: ensuring organisational processes were consistently applied; providing time and resources to enable individuals to interact, discuss experiences and experiment; and the implementation of incentives to encourage knowledge sharing between individuals and groups.

The identification of the organisational culture as the critical independent variable is consistent with recurring themes in the literature (Senge, 1991; Amidon, 1997; Davenport & Prusak, 1998). Unfortunately, organisational culture and human behaviour are difficult to change (Senge, 1991). However, the identification of these constituent variables relating to organisational culture provide a starting point for organisations to begin to effect the changes required.

The independent variable of organisational structure was seen to fail to exert a positive influence over the areas of assignment of responsibility through the management structure to ensure knowledge was created and utilised effectively.

There was also a recognition that functional boundaries existed in both organisations that restricted knowledge exchange. However, this issue was not seen as a critical issue related to structure. The problem was considered to be an outcome of the lack of process to overcome the difficulties associated with knowledge sharing and an associated perception of the misapplication of technology.

Finally the independent variable of technology infrastructure was not viewed as a major inhibitor of the effective operation of the knowledge management processes although this infrastructure was considered poorly implemented in both organisations. The success factors of corporate standards, information technology effectiveness, technocentricity and user capabilities indicated a problem in the planning, implementation and application of the technology infrastructure, rather than a problem with the technology itself.

Conclusions

Managing knowledge at the organisational level means allowing people to have the benefit of knowledge that does not come from their own experience, but from the experience of others, both past and present, from within and outside the organisation (Nonaka & Takeuchi, 1995). The proper balance of organisational structure, organisational behaviours and technology infrastructure facilitates the generation, representation, transfer and provision of access to its knowledge.

A common interest in the business phenomenon of knowledge management is found in both organisations. Both are cautiously investigating the benefits and costs of adopting a knowledge management focus. Given that this is the position of a majority of organisations the guidance provided in this paper can provide a useful starting point.

The application of the diagnostic tool presented in this paper provides a practical starting point for managers to discover the state of knowledge management in the organisation and provide insights into where to take action.

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