'We know more than we can tell'. Can IT systems facilitate the creation, storage, transfer and application of knowledge for performance improvement? An experience at a medium size manufacturing company in North America

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'All the work contained within is my own unaided effort and conforms with the University's guidelines on plagiarism'

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Abstract:

Knowledge Management is an imprecise term that covers a diverse and often conflicting set of knowledge taxonomies; the root of which is trying to understand the meaning of truth and knowing. Unfortunately it is term that most practitioners and theorists use as an umbrella term but many organizations have misconstrued the meaning and have implemented knowledge management initiatives that seek to ‘capture’ knowledge as an asset on IT systems then distribute and apply across the organization.

This dissertation will seek to highlight the many different knowledge types and the diverse approaches that can be deployed to create, store, transfer and apply knowledge within an organizational environment. To do this I will introduce a unified ‘knowledge cycle’ model that draws and blends many concepts of traditional knowledge models and apply it to a single organization that is the subject of the case study below.

The dissertation will conclude that the ‘Socially Constructed’ knowledge taxonomy that seeks to exploit people’s tacit knowledge is increasingly the approach that organizations should adopt in the post-industrial era of Social Capital. The lesson for IT practitioners is that they should act as orchestrators and stewards of knowledge and not as captors.

Problem: Can Organizations manage knowledge and can IT help?

Charles Wheeler, the veteran BBC Far East Correspondent was stationed in Japan during Korean War. An inexperienced news editor in London sent him a terse one-line telegram. “Need 1000 words. Will Japan turn communist?” His response was “No. A thousand times NO”

In an attempt to leverage knowledge, organizations have been inundated with assorted methods for retaining employee wisdom. The benefits from a successful knowledge management (KM) program can help create competitive advantage. As a result, numerous knowledge management solutions have been crafted and implemented. Unfortunately, many of these implementations have failed because they have focused on technology rather than creating an atmosphere conducive to knowledge capture and

sharing. However Knowledge Management initiatives can provide the means to accumulate organize and access the firm’s most essential asset.

Many authors have written off Knowledge Management as a fad in the ‘*Nonsense of Knowledge Management’ (Wilson 2000)* It is argued that knowledge is not a commodity that can be managed, traded, exploited like other tangible assets. The term Knowledge Management has also become an umbrella term constituting a myriad of many disparate theories, systems and observations that it renders it impossible to classify under a general unified management theory. (Malhotra 2002) (1)

If we accept the premise that knowledge is not a ‘thing’ that can be managed then there seems even less reason to suppose that implementing IT systems to capture and transfer knowledge can possibly have a tangible affect on a company’s performance. Some authors conclude that, at best, these systems are nothing more than Information Resource Management (IRM) systems *(Galliers & Newell 2001)*. Other authors rightly point to the documented failures of KM/IT initiatives. (Malhotra 2004) (2) There is a danger that such a view may stifle further research and gain new insights that would otherwise be undiscovered or unlearnt from the failures of the past.

Carr says that ‘IT Doesn’t Matter’ (3) because data or information cannot in itself confer Competitive Advantage. Also, despite the generally held belief that the great productivity gains at the turn of the millennium were due to the large uptick in the investment in IT in 2001, McKinsey looked at the correlation between IT Investments and Productivity in Industries and found a positive correlation in just 6 out of 39 industries (4). On the other hand how much better is a company’s performance enhanced by its ability to retrieve information to help formulate policies or use spreadsheets and databases to analyze large volumes of data to elicit pattern unseen when viewed as raw data?

We are left with a conundrum. We see an enterprise’s creativity and innovation (Apple iPhone™, Garmin GPS™, etc) but we do not necessarily see the mechanism by which these enterprises transformed information into knowledge for competitive advantage. Although we accept the notion that IT cannot capture knowledge, without IT innovation and creativity would be diminished. Consequently we must look deeper to ascertain how knowledge is being created and how IT is facilitating the process knowledge creation in those enterprises.

To get to this answer maybe *(like the inexperienced editor's telegram to Charles Wheeler)* it's the question that needs better construction? Rather than attempting to objectify knowledge as a thing and have IT systems capture it, we should we should recognize knowledge as a process and use IT to facilitate and enhance that process and then measure its success.

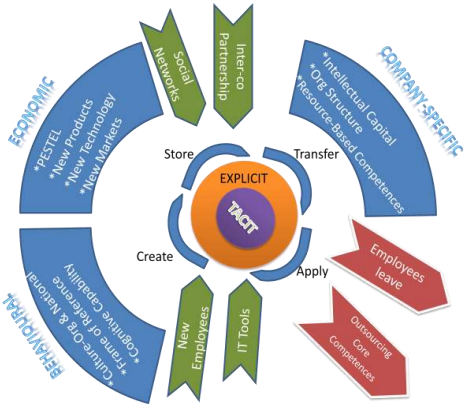
This dissertation will start with a review of KM and IT to ascertain some of the current themes underpinning this area of research. In particular, understanding the epistemology of knowledge; types of knowledge, creation, transfer, storage and application of knowledge by and between individuals and groups. The dissertation will evaluate the effect of organizational culture and individual beliefs on the construction and interpretation of knowledge. **Subsequently when the term KM or Knowledge Management is mentioned in this dissertation it should be considered short-hand for the broader interpretation provided above rather than the narrower definition of explicit knowledge capture and re-use in IT systems**.

The dissertation will introduce the IT dimension by reviewing KM/IT initiatives at some well known companies to see if we can illicit some evidence and models to support the hypothesis. The next section will look at a relatively new and consequently little researched social networking and collaboration applications and their potential contribution to the hypothesis.

Hypothesis, Model and Methodological Approach

Hypothesis 1. IT systems can facilitate the creation, storage, transfer and application of knowledge for organizational performance improvement. This can only be achieved and optimized if the favorable cultural, economic, organizational structure and assets are conducive to the creation and sharing of knowledge.

Hypothesis 2. Where there is not the favorable cultural, economic, organizational structure and assets to facilitate knowledge transfer, the cycle of knowledge creation will be slowed down but information technology can be used to affect a more favorable environment upon which KM initiatives could eventually prosper.



The model will be explained in detail when discussing how it was used within the context of the Case Study. The figure below summarizes the framework that this dissertation will use to test the hypothesis. The framework is broken in to three parts. The first looks at the role of knowledge within the organization. The second looks at the role of IT to facilitate knowledge enhancing capabilities. The third parts looks at the methodological approaches that will help to develop the model that will be used in the case study to assess what factors contribute to the development of knowledge within an organization.

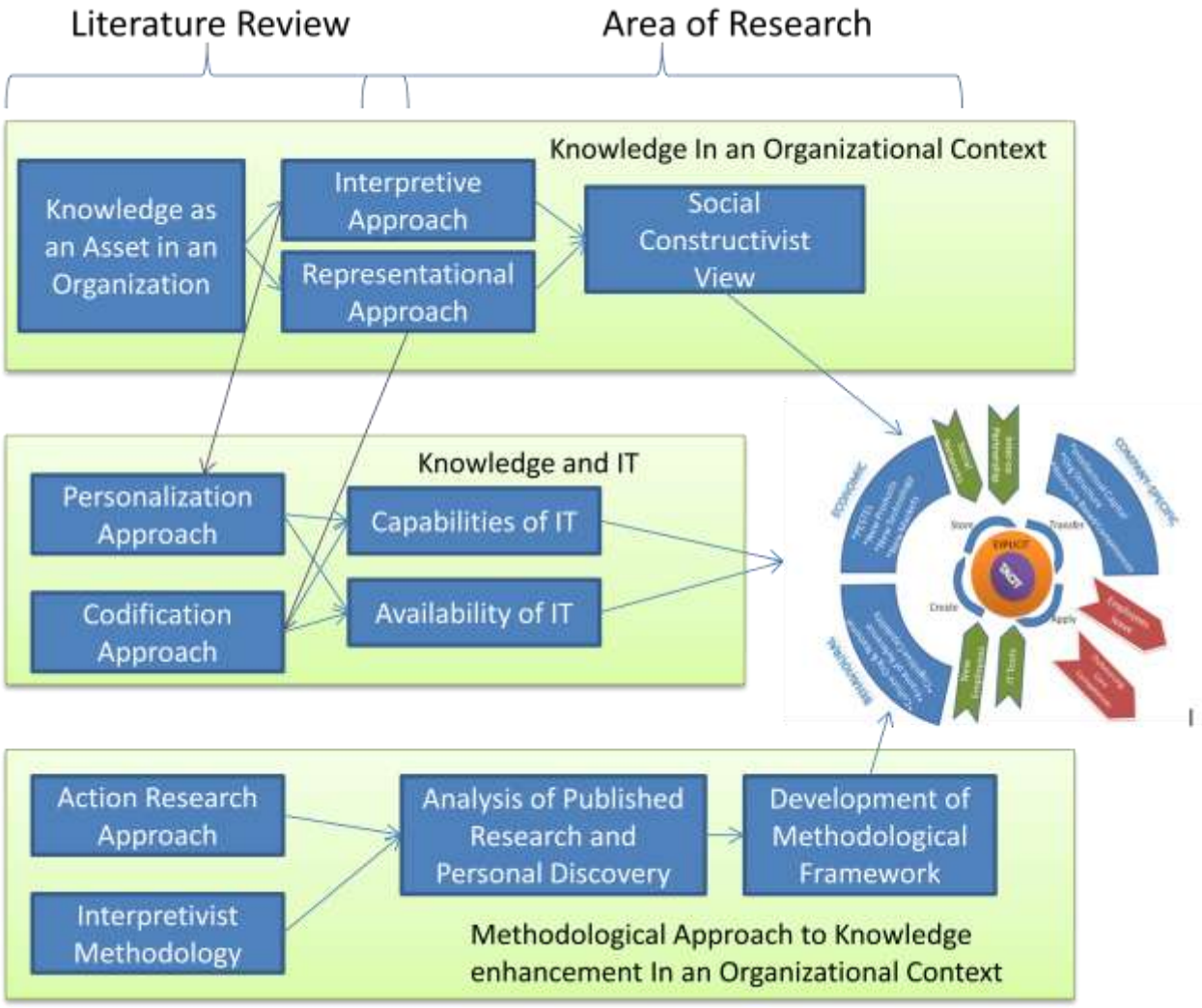


Figure 1: Knowledge Dissertation Framework

It is not within the scope of this dissertation to do add to the body of knowledge by polling lots of organizations to understand how they use IT to facilitate the transfer for knowledge within its organization. It is believed that the causal relationship between business performance and knowledge generation varies so much between organizations and is at a much deeper level in the organization as to make it difficult to elicit general patterns and recommendations. Instead the dissertation will focus on a single organization and evaluate its relationship between knowledge creation and business performance and the utilization of IT in that process.

What is Knowledge?

Before we can discover ways of how we can create, store, transfer and apply knowledge in an organizational environment we must be clear about what knowledge is. We can start by saying what it is not. It is not **Data** and it is not **Information**. We can define data as a stream of unstructured transactions, word or values. Peppard & Ward (5) calls it raw material that needs to be transformed into something of value. The terms Information and Knowledge are often used interchangeably but in the context of the dissertation they are completely different. Information is structured or processed data. Peppard & Ward (5) define this as data in context. We can classify a sales report that sorts and categorizes customer orders in different formats as information. Regardless of how we categorize, present and communicate the information it has no value in itself. It is the processing of that information by the recipient that can create knowledge. For example, if someone communicates the information in a foreign language the recipient cannot process the information as knowledge if he or she cannot understand the information even though they have experience of the subject matter therein. Alternatively, the communication of detailed engineering specifications to a divorce lawyer instead of a patent lawyer will not convey the same level of knowledge processing even though both of them clearly understand the words and meaning conveyed in the specifications.

The level of abstraction of the information that the patent lawyer gains by reading the information will enable him or her to take action or decisions far more effectively that the divorce lawyer. As observers we will see the outcome of the actions through results. In this discourse we see a linear pattern emerging, or generic model of packaged knowledge, that at least one author has named DIKAR (Data, Information, Knowledge, Action and Results)[1] (Peppard & Ward (5) p. 207)

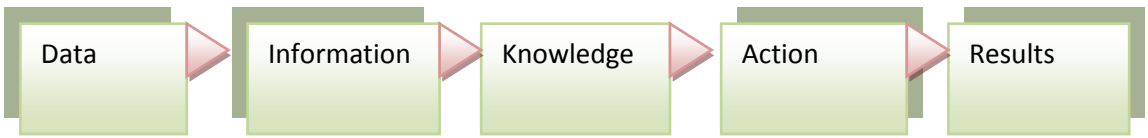


Figure 2: DIKAR Knowledge processing model

[1] After Venkatraman

This simple model shows the process by which **Data** is processed to generate **Information** which is interpreted to create **Knowledge** which leads to **Action** that will drive the business **Results**. Organizations can also move backwards through this process when they strategize.

If we focus back on the *Knowledge* part of the model we need to understand why the two lawyers interpret the information differently that might result in different courses of action, with different results and this model tells us nothing about the virtue of the actions taken or the value to the organization of the results.

The epistemology of knowledge is a very highly researched subject in its own right but we can look at some of the main themes. Greek philosophers understood knowledge to be *'justified true-belief'*[2]. To believe something is not enough. I might believe that I will recover from a serious illness. Even if I do recover from the illness it is still not *justified* true belief. For it to be justified I would need some basis to show that is was justified, such as medical certification. Finally the term self-belief implies that knowledge is a *personal construction*. Once again this argues against the notion that knowledge is a tangible thing. If it is personal it means that each person will interpret and apply the information differently. That interpretation in turn is colored by a person's frame-of-reference such as previous experiences, other self-beliefs, organizational, group and national cultures etc. If the interpretation of information to create personal knowledge is partly based on other personally held beliefs we are in danger of an infinite regress by which ones self-belief is justified by some further self belief, which could lead us to conclude that true knowledge can never really exist. However, for the basis of this dissertation we shall accept there is a worldview or *Weltanschauung*[3] of a construction of knowledge that most people will share as axiomatic. Therefore, not only does knowledge only reside in humans and not in artifacts, (although it may be represented through artifacts) and personally constructed by humans, it is in a constant state of flux, changing and being reinterpreted as the information as a person's frame of reference changes and subject to physiological influences such as memory retention.

[2] When applying the process of knowledge to data to make judgments of the real world, Galliers and Newell drop the word 'true' Galliers and Newell: Strategy as Data plus Sense-Making in Images of Strategy (Cummings and Wilson 2005)

[3] Weltanschauung – person's worldview, philosophical outlook

Knowledge types can be defined in many different ways. From the table below is summarized some of the more well known Knowledge taxonomies and their explanations. The dissertation will evaluate the value of these taxonomies in more detail below.

Knowledge Taxonomies and Examples		
Knowledge Type	Definitions	Examples
Tacit	Knowledge rooted in experience & contextual. Not articulated	Providing tailored customer service to a client's problem
Explicit	Articulated general knowledge	Knowing information pertaining to the client's company
Individual	Self-created based on justified self-belief	Insights & experience gained from working on a project
Social	Constructed through the collective actions of the group	Brainstorming
Declarative	Know-about	Selecting a car
Procedural	Know-how	How to maintain a car
Causal	Know-why	Understanding the workings of a car
Conditional	Know-when	Knowing when to accelerate or brake when driving
Relational	Know-with	Driving a car on an icy road
Pragmatic	Useful knowledge	Best Practices, past experiences, project templates, toolkits

Table 1: Knowledge Taxonomies and Examples

Knowing rather than Knowledge

If knowledge is a too abstract a term to use in the course of this discussion then maybe *knowing* is a more exact term. It seems more likely that knowledge is knowing or practical know-how. It is not intelligence but it seems axiomatic that the level of intelligence is a factor in key in the abstraction and sense-making of information that can create knowledge.

Key Characteristics of Data, Information and Knowledge

We notice from the table below that, in contrast to information and data, the focus of knowledge is what it *does* rather than *what it is*. For instance each of the data and information definitions can take on a physical form whereas knowledge is ephemeral, intangible and represented in artifacts and patents and embedded in people's heads, myths and rituals.

Definitions	Data	Information	Knowledge
is….	Explicit	Interpretive	Tacit
about…	Exploitation	Exploring	Creating
aim is…	Reuse	Categorizing	Re-Categorizing
approach is…	Efficiency	Effectivity	Innovation
output is	Predetermined	Constrained	Flexible
is…	Context Free	Parameterized	Context Driven
encourages…	Direction	Communication	Sense-making
learning locus…	None	Single-Loop	Double-Loop
output….	Transactions	Reports/Graphs	Taking Action
form….	Unstructured	Structured	Construction

Table 2: Adapted from Galliers & Newell: Back to the Future: From Knowledge Management to Data Management

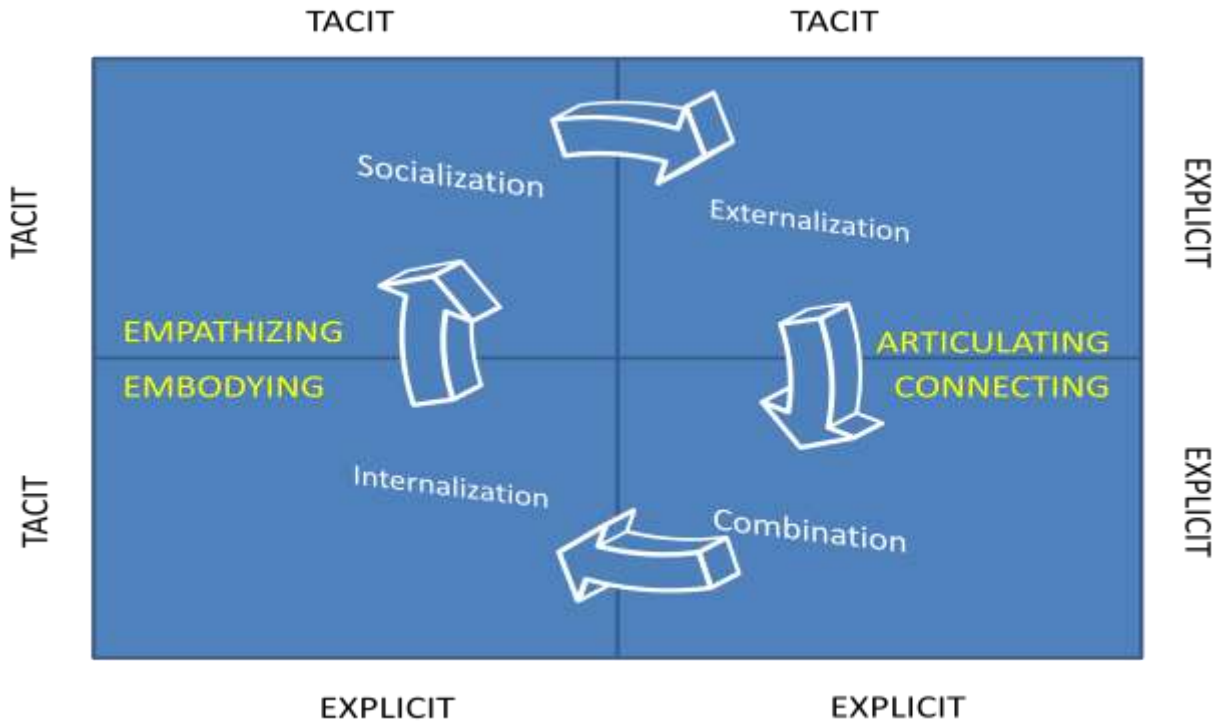
Transferring Knowledge - We know more than we can say.

Because everybody's construction of knowledge is different it makes the transfer of knowledge problematic. Polanyi (6) tackled this problem by distinguishing between two different types of knowledge. One was the propositional or explicit knowledge and the other is know-how or tacit Knowledge. The ***explicit*** knowledge could be an engineer's knowledge of laws, rules and procedures that

are written down and read and abstracted by an apprentice who acquires a close approximation of the knowledge of the teacher and is able to carry out the tasks to same level of proficiency. The explicit nature of the information, insofar that it is physical and has some permanency, increases the level of abstraction.

The ***tacit*** knowledge is the knowledge that is hard or impossible to articulate. Polanyi says it is inexpressible because it has become internalized and inaccessible to the conscious mind. Put simply, ***we know more than we can say***. Even though Polanyi separates tacit from explicit knowledge, explicit knowledge cannot exist without tacit knowledge. In fact all explicit knowledge is rooted in tacit knowledge.

Nonaka (7) adapted Polanyi’s philosophical nature of knowledge into a model that could explain how knowledge can be transferred between humans for creative purposes through a knowledge conversion process. The model below consists of a four stage process.



- Socialization transfers tacit knowledge through observation, practice and imitation.

- Externalization is the dialogue and collective reflection that relies on analogy and metaphor to translate tacit knowledge into explicit documentation.
- Combination reconfigures and categorizes the explicit information and diffuses it through the organization and finally,
- Internalization translates explicit knowledge back in to individual tacit knowledge.

This becomes an iterative process that creates a virtuous knowledge spiral, although the processes are not intended to be sequential but intertwined. Whilst this is superficially attractive model it assumes that by merely immersing, practicing and imitating the skills the tacit knowledge can be converted from one person or group to another. Even allowing for the use of metaphor and analogy, the idea that tacit knowledge can be made explicit seems to run contrary to Polanyi's theory that inexpressible tacit knowledge can ever be captured. If we go back to the frame-of-reference view, we know that individuals will construct the tacit information received differently and that non-verbal signals will either be missed or ignored etc. Von Krogh's (8) constructionist perspective considers tacit knowledge to be part perceptive and part fine-motor skills such as playing a violin. The recipient of the tacit information may be able to construct the knowledge of what violin concerto to play at what tempo by may never develop the motor skills to play it as well as the maestro. Scharmer (9) proposes two types of tacit knowledge. The tacit knowledge that is tacit merely because it has yet to be expressed by the possessor of the knowledge (*not-yet embodied*) and the (*self-transcending*) tacit knowledge that the possessor is not consciously aware of. Collins (10) categorizes 5 types of tacit (knowing or behaving) Concealed, Mismatched salience, Ostensive, Unrecognized and Uncognizable.

Even if we use Leonard and Sensiper's (11) view that knowledge sits on a continuum between tacit at one end and explicit at the other, there will still be types of knowledge that will be highly tacit that prevents verbal and non verbal communication.

We are left to choose between an *autopoietic*[4] view that describes knowledge as self-created, contextual and not directly transferable and the *representationist* view that views knowledge as representing a pre-given reality, unchanging, objective with universal laws and therefore directly transferable. Most of the attempts to use IT to transfer knowledge to transform business have tended to

[4] Autopoesis – In this context self-created belief or purpose

the *cognitivist* and *representationist* view of knowledge and approach the issue as one where you have to make implicit knowledge explicit rather than accept the dichotomous nature of knowledge.

Some Knowledge Perspectives		
Perspective	**Theorist**	**Implications for KM &IT**
Knowledge is tacit & not articulated. Explicit knowledge is rooted in tacit knowledge	Polanyi	IT has little to offer as knowledge cannot be captured but should encourage person-to-person discourse through email etc
Tacit knowledge can be made Explicit through Socialization and diffused through the organization	Nonaka	IT can help once Tacit knowledge is made Explicit by storing and diffusing knowledge through organization, Email, databases etc.
Tacit knowledge is either knowledge not yet expressed or unconscious to possessor	Scharmer	Once knowledge is embodied IT can captured it on databases and disseminate it electronically
Tacit knowledge is either concealed, ostensive, unrecognized, uncognizable, mismatched salience	Collins	IT Knowledge bases / forums may make sense of abstracts ideas and themes
Knowledge is a continuum between highly tacit and highly explicit	Sensiper, Leonard	Blogs and Wikis provide rich explanations of tacit knowledge and relational databases for explicit knowledge
Knowledge is capability & competences	Prahalad, Hamel	Co-specialize and intregrate IT assets to give positional advantage
Knowledge is Intellectual Capital	Edvinsson	Invest highly is new technology and exploit assets
Knowledge is Sense-Making	Wieck, Senge	Complement IT implementations with social interactions, process development

Table 3: Some Examples Knowledge Perspectives

What counts as knowledge?

Not only do we have to succeed in tacitly and explicitly transferring knowledge but it must be of some use and there must be some *Action* to visibly represent that the information has been processed to generate knowledge. Merali and Snowdon (12) says that legitimate knowledge is in the 'Information space' and is *"making sense of the information and trying to influence the future using this intelligence"*

Even though the models depicting tacit knowledge transfer to enable business transformation are flawed does not mean we should not try to develop models and programs that facilitate just that.

"it is the process of learning that is important rather than what is learned, meaning that the capacity to develop organizational capability may be more important than the specific knowledge gained' Schendel (1996) (13)

One conclusion for the quest of knowledge exploitation for competitive advantage in an organization must be that we should understand how knowledge is formed, what types of knowledge exist, the contextual and dynamic nature of knowledge and the limitations the organization faces when it tries to transfer it. Once understood, it should lead the organization away from capturing and embodying knowledge as a thing and more towards creating the environment in which knowledge can be nurtured, leveraged, shared and ultimately recombined to create new knowledge. The next step is to understand how best to use IT resources to facilitate this within an organizational structure.

Using knowledge in an organizational environment

Organizations consist of individuals. The organization normally manages these individuals for the sake of cohesion and effective utilization into functional groups that are connected to other groups by way of a traditional M-form, Matrix or even Network form according to the scale, industry, location, maturity, objectives and other factors. These organizations also interact with other organizations and individuals and over time these organizations are observed to be 'organic' insofar that they change, grow, shrink and merge according the economic and social influences. It is not possible to be prescriptive as to what is the best organizational form an organization should adopt when using IT to transfer knowledge but one must understand how the organizational structure affects ***how*** IT resources are deployed and alternatively how they can use IT, in turn, to ***affect*** the organizational structure. It is useful to focus on the behavior of individuals and formal and informal groups in an organizational culture for specific attention. Research conducted at the Cranfield School of Management has identified culture as the top of the list of concerns amongst organizations regarding knowledge management (Ward & Peppard p515). We know that organizational culture is exemplified by its beliefs, experiences, attitudes and

values incorporated into an aretaic[5] and deontic[6] ethos, organizational artifacts – awards, slogans and mission statements and, at a deeper level, of spoken and unspoken stories, taboos and historical events that can unconsciously shape the membership of the organization and can acclimatize and assimilate new members. If the IT practitioner's role is to change employees' behaviors by using IT systems to share, store, distribute and apply organizational knowledge then an understanding of the underlying tacit cultural norms is imperative. (Schein (14), Hofstede (15) et al)

We can learn from this that the ability to share knowledge is part organizational structure and part culture. For instance the organizational members may be unable to share knowledge due to: (16)

- *Organizational dissonance*, - fragmented organizational structure, functional silos, poor structural investment that prevents the capturing and storing of information.
- *Too busy to share or learn*, - Too busy focusing on operational priorities and tendency for 'single loop learning' and not willing to challenge traditional beliefs.
- *Distrustful of the reasons for transfer* - Fear of losing status in the organization.
- *A lack of motivation* – Reward structures do not promote the importance of knowledge transference.

There is disagreement as to whether knowledge can reside in groups as well as individuals or only in individuals. Von Krogh and Roos (17)argue that tacit knowledge is wholly a trait of individuals. Grant (1995) (18)says that knowledge is created and held by individuals, not organizations. An autopoetic view may tend towards the belief that knowledge is self-created and dependent on our own justified true-belief that will be unique but there is also knowledge is embedded in relationships. Choo (1998) (19) draws on the Polanyi's concept of tacit knowledge and says there is a similar characteristics in groups where knowledge can be transferred through the rich modes of discourse that include the use of analogies, metaphors or models and through the communal telling of stories" *(e.g. tacit knowing or behaving)*

We have already noted that knowledge is a process and therefore and that act of knowing and acting on that knowledge is what gives meaning to that knowledge and hence the transfer for use is bound up with collective action we take as individuals within organizational groups. *"We act within a social and*

[5] An ethos or set of virtues or moral code that emphasizes character above rules
[6] An ethos based on duty or obligation

physical world and since knowing is an aspect of action it is about interaction with that world. When we act we give shape to the physical world. This knowing does not focus on what we possess in our heads but our interactions within things of the social and physical world" (Hildreth; Kimble: Duality of Knowledge (20)*)*

Wenger (21) suggests a process called *Legitimate Peripheral Participation* in Communities of Practice as a way nurturing and sustaining knowledge. It is the Participation element that allows the negotiation of meaning. This negotiation of meaning is not necessarily harmonious or free from conflict in fact it may not even be useful if everything is *reified* as it means that there is little scope for shared experience and collective learning. Galliers & Newell (2001) (22) pulls together the ideas of sense-making (Senge (1990) (23), Weick (1993) (24)) with negotiation of meaning quoting Senge saying that *"Making sense of data will require debate and dialogue such that truth can be negotiated in the particular problem/opportunity domain"* Galliers goes on to emphasize the importance of *social capital* since it is within Communities of Practice that such a debate will occur.

We could conclude that knowledge is indeed in the possession of individuals and not the organization but that the creation of the individual's knowledge and the application of that knowledge is enhanced and facilitated by the informal and formal structures and embedded culture that gives the organization its identity.

We should also note that the success of that knowledge transfer will be based on the level of trust, power-distance (Hofstede 1991 (15)) shared values as well as the instruments and artifacts that are used to communicate the knowledge. It is important therefore to understand the organizational structure and the culture of the organization embodied by its individual and groups and apply technological solutions (e.g. Intranets, Wiki's Email, etc, See Case Study) best suited for the environment.

Intellectual and Social capital and Knowledge

The concept of *social capital* seems to be attaining increasing importance in the knowledge management literature. To be clear here the definition that is being used is *"Resources available and through personal relationships at work – goodwill, opportunity, power and influence"* (Cummings 2005 (25). We can compare this with the definition of economic capital which can be broadly defined as the exploitation of labor land and machinery for the purposes of production. Many authors argue (de Gues,

2000 (26)) that in the latter part of the twentieth century the balance between the exploitation of capital started to tip towards the nurturing of social capital as a way of creating and sustaining competitive advantage. Authors noted that in contrast to most of the last century there had been a leveling between organizations in their ability to manufacture products. Capital had become less scarce and essentially most manufacturing organizations that were still in business could manufacture well performing cars, televisions, refrigerators, etc. at a low cost. It was speculated that competitive advantage would be increasingly sustained not just by lower costs of production but understanding what the customers want and being able to provide niche and customized solutions for specialized market segments. Consequently knowledge held in the heads of labor is becoming the most valuable component.

The key question for this dissertation is what form of social capital is likely to give the firm competitive advantage, how is it to be organized and how can information technology facilitate connecting and integrating knowledge within the firm?

A critical evaluation of knowledge management models – and using them within an IT Domain

At this point it is worth recapping the key features of knowledge and knowing and using this information to critical review the models for their usefulness for the organization using IT to transfer knowledge.

- The models need to have within their construction that knowledge is not a *thing* but a process of knowing encompassing an individual's justified true-belief.
- That types knowledge (or knowing) range from the explicit, conscious, expressive, somewhat static information that is interpreted through a widely shared frame-of-reference amongst individuals which is easier to share *and* the tacit, dynamic changing, non-verbal, unconsciously known know-how that is more difficult or impossible to share.
- That knowledge is only useful if the knowing is acted upon in some observable way in decisions, artifacts, symbols, etc.

- That knowledge can reside and be transferred between individuals and groups anywhere in an organization and the negotiation of meaning helps share the knowledge creation and sharing, but
    - Less tangible cultural factors such as language, status, respect, organizational factors and individual traits such as resistance to change, trust, motivation and psychological needs are significant influences in the ability to create and transfer knowledge as well as more tangible organizational structures, ownership, process, workload and rewards.
- An understanding that organizational culture, organizational structure and individual traits will influence the IT processes that can be used to facilitate the creation and transfer of knowledge but can also be used to change behavior also.

Knowledge Category models

It was discussed above how Nonaka's knowledge management model's weakness is its tenet that tacit knowledge can be made explicit through externalization. If tacit knowledge really is incapable of being communicated by verbal or visual communication and is unconsciously known then successful externalization is impossible. Nonaka's model looks far too mechanistic and it is likely that knowledge transfer is more complicated and varied than this model depicts. Nonetheless, the transferring and creating of new explicit knowledge through *Combination* and could be accomplished through bodies of knowledge captured on IT databases and shared through organizational intranets and social networking sites (wiki's. blogs, etc.)

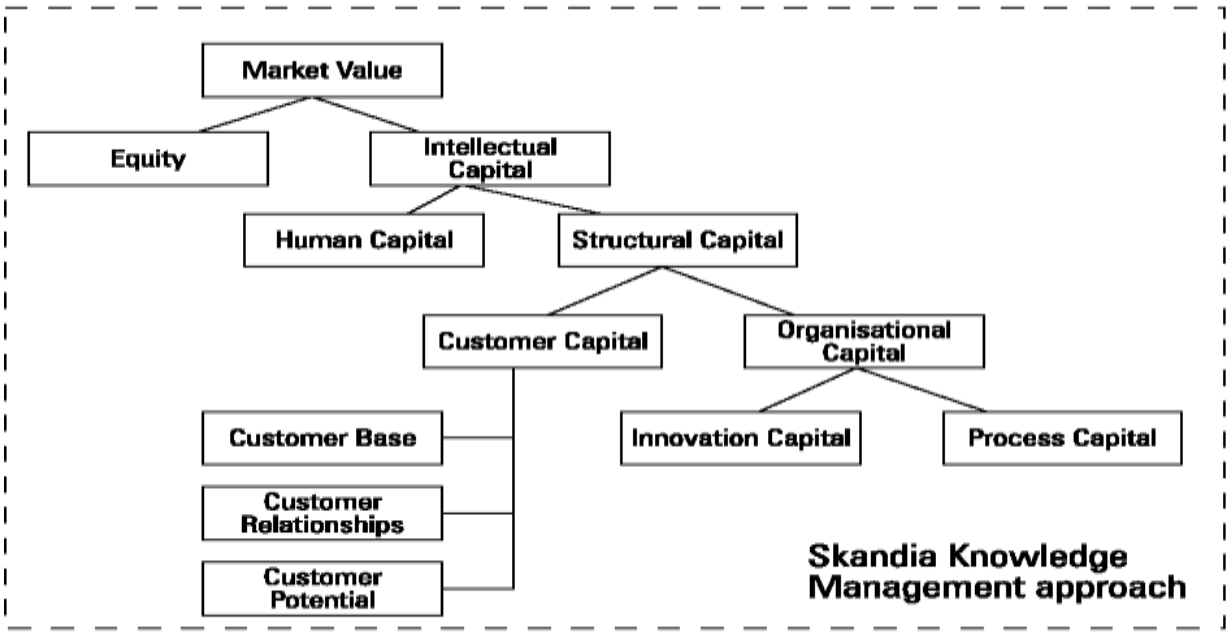
Nonaka and Hedlund (1993 (27))adapted Nonaka's model and created a more sophisticated model that identified four agents or carriers of knowledge; the individual, the group and the organization and extra-organizational agents such as suppliers and customers and competitors. The model also identified the best methods by which to transfer explicit and tacit knowledge between these groups. It still uses a segregated simplistic rather than holistic and complex approach to knowledge. To the IT solutions specified above we could add email and video-conferencing as method to facilitate the transfer of knowledge within and between organizations.

Boisot (1987) (28) also uses a knowledge category model which considers knowledge as either codified or un-codified and diffused or un-diffused in an organization. The codified undiffused information such

as rules, laws and procedures can be easily captured and stored on database and distributed on intranets as necessary. The codified diffused information can be held in electronic libraries (Athens). When faced with the un-codified diffused and undiffused knowledge we are limited as to what IT can do to facilitate knowledge transference. Face-to- face socialization and story-telling, organizational artifacts are believed to be the best way of transferring knowledge. IT can help by engendering a sense of identify through standardization of email and website domain names (see Case Study later), internal instant messaging services and intranets that host wiki’s and blogs. However its mechanistic categorization does not reveal the contextual variability within an organization which can blur the categorizations. The knowledge category models do highlight knowledge transforming processes of socialization and the definitions and methods by which explicit knowledge can be transferred. Nonetheless these models are difficult to use as templates in an organizational setting.

Intellectual Capital Models

The Skandia Intellectual Capital (IC) (Chase, 1997) (4) model is one of the most widely cited IC models. This model is useful for identifying and linking the elements that make up an organization’s overall reservoir of knowledge capital and direction can be given to sustaining the knowledge throughout the organization. Even allowing for the difficulty of commoditizing and measuring intellectual capital in such a scientific way it seems to de-emphasize knowledge as a social phenomenon. Although it might be possible to generate hundreds of metrics to value the company’s stock of IC it does not provide any direction as to how to increase the IC value of the organization. Its usefulness for the Knowledge Management initiatives is more in terms of the awareness of what makes up the collective stock of knowledge and the ability to measure the success of the KM initiatives not as model to drive the initiatives. We need to look for models that provide a more balanced approach to knowledge between scientific and social approaches and value both the business and employee benefits of knowledge management.



Source: Chase (1997)

Figure 3: Reproduced from A critical review of knowledge management models (McAdam, McCreedy 1999)

Socially constructed models

Socially Constructed models assume a wide definition of knowledge and propose a holistic approach with knowledge being linked within the social and learning processes within and outside the organization (Clarke & Staunton 1998 (29), Demerest 1997 (30) and Scarborough 1996 (31)). Their approaches cover strategic, structural, cultural and systems knowledge. The Demerest model for instance gives equal weight to the business benefits of KM as well as the emancipatory benefits for employees for the exploiting and generation of knowledge.

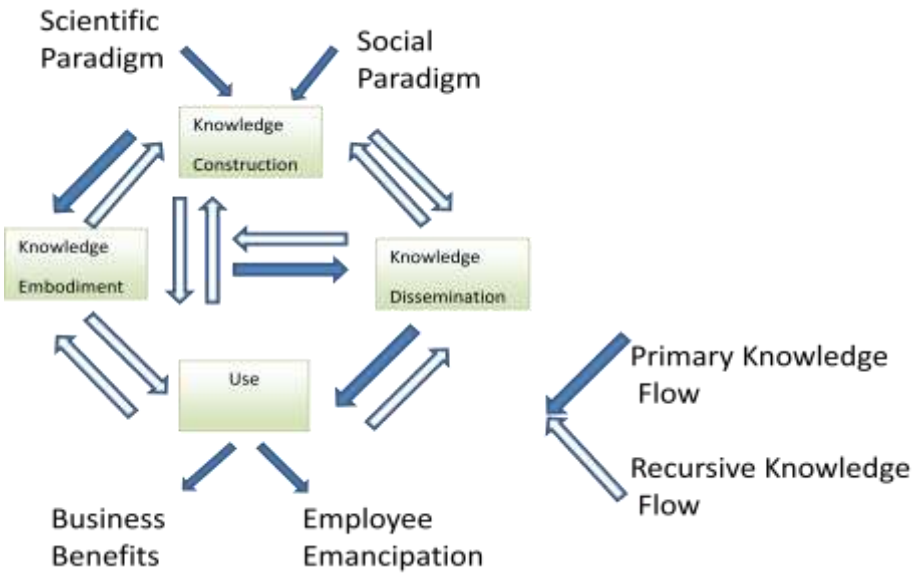


Figure 4 Demerest Knowledge Management Model

Galliers and Newell's approach draws on the 'Sense-making' work of Weick (1993) (24) and Senge (1990) (23)that blends both an Information Systems and Organizational Behavior approach which illustrates the:

- Interpretative nature of data and information.
- The importance of context in making sense of individuals' knowledge.
- The difference between knowledge, data and information.
- That people inform themselves and become more knowledgeable by interpreting data directly from the real world through informal social interaction and formal data processes like IT systems.

These models are helpful as it illustrates not just the scientific but the social and structured constructions of knowledge. The process of knowledge throughout the organization is viewed not as sequential but complex, circulatory almost organic in nature. It also highlights what Grant (1995) (18)

has said is the *'importance of integrating mechanisms for leveraging individual's knowledge for productive tasks'*. Hence we start to see knowledge metaphorically that can emerge, self-produce, self-organize, adapt (Merali, Snowden, 2000) (12) and develop in unexpected serendipitous ways within a 'healthy' organization where the transfer of knowledge is either rapid and circulatory, or can alternatively decay over time, in a sclerotic organization.

The value of these models is that they give clear insight in to how process and transfer of knowledge should work within a complex, adaptive organic organization with clear reference to the behavioral aspects of culture, groups and social interaction that help to generate sustainable competitive advantage. If we combine that with our understanding of Intellectual Capital and Resource-Based View (Prahalad, Hamel 1990 (32); Peteraf 1993 (33); Grant (1995) (18) models that attempt to identify, stretch and leverage our organization's ability to exploit our core competences we can proceed to step of developing IT Strategy models that specifically encompass ways of implementing a knowledge creation and transference model within the organization.

To complement this we also need to identify models that both understand the organizational structure (e.g. Scott Morton MIT90's (1991) (34), McKinsey7's, Venkatraman's Stage approach to IT-reconfiguration (1994) (35)), and a systems approach for describing and implementing the initiatives (e.g. SSM). It is also useful to research what other companies have done and learn from their successes and mistakes.

Scanning the organizational environment for evidence from real life examples

Knowledge Management in Organizations

According to a survey of European firms by KPMG (36) almost half the companies reported suffering a significant setback when losing key employees. In another survey, from Cranfield Business School (16) (1998), it reported that businesses believed they had much of the knowledge they required but had difficulty identifying that it existed and leveraging it across the organization. These findings are borne out by Davenport and Prusak (1998) (32) who suggested that KM initiatives tend to have three aims in order support the basic knowledge creation, storage, transfer and application.

- Make knowledge visible – documents, databases, intranets.

- Encourage a knowledge sharing culture – Rewards, employee empowerment.
- Build a knowledge sharing infrastructure – 'Information Space' infrastructures, interactions, collaborations.

Reviewing the literature on IT case studies the evidence does point to a focus on the first aim with fewer examples of organizations also achieving the 2nd and 3rd aims. For instance E&Y, Anderson, Bain and McKinsey (Alavi, Leidner (2001) (36)have created 'databases' of information that consultants can use to add information and experiences that can be utilized by employees across the organization. Hanson and Tierney (1999) (37) make a distinction between these companies as either having a **'Codification strategy'** (E&Y, Anderson) or **'Personalization strategy'** (Bain, McKinsey). The codification strategy entails large investments in IT systems to extract information from consultants to be reused as guides, benchmarks, best practices and market segmentation. It usefulness resides in the ability to store and reuse data without directly contacting the person who created it. It avoids reinvention and the company builds up a corporate memory. However, the information is shorn of its context; summarization of data may cause the embedded value of the information to be lost. It is expensive and the reliance on 'best practice' may deter the consultant of discovering the 'right practice' that will create new knowledge and value.

The McKinsey and Bain Personalization strategy focuses on dialogue and relationships between consultants. Knowledge resides with the consultant not as information in databases. Consequently, they arrive at deeper insights that cannot be codified, fosters greater use of informal networks, uses established and broader technology tools such as email, phone as well as electronic document systems. The direct investment in IT tools is lower but knowledge is shared on a one to one basis and not one-to-many but knowledge may be lost when an employee leaves and it relies more on the cognitive ability of the receiver to apply it successfully.

The first strategy is biased towards the creating, storing of *knowledge* whilst the second has better prospects of transferring and applying knowledge but Tierney (37) says it is important not to attempt both. The organization must decide whether its value proposition is a competitive / economic strategy where high quality information can be reused amongst large teams, quickly and cheaply as possible (e.g. Financial Audits); or alternatively a value proposition that solves difficult problems faced by clients creatively through the development of informal networks to share rich, tacit information. (E.g. Product

Branding). However, Galliers and Newell (2001) say that it's an IT myth IT can store, transfer and facilitate knowledge exploitation through reuse. They re-emphasize the incongruous use of knowledge when it is really just data and. Gill (1995) argues that systems developers specify the *'minutiae of machinery*' while disregard people in organizations Davenport and Prusak (1998) (38) makes a general comment that firms often *'glorify information technology and ignore human psychology'*, However Davenport et al (1997) (39)do cite the use of Lotus Notes as knowledge repository as *'an attempt to accelerate and broaden the traditional knowledge sharing that happens with the socialization of newcomers, the generation of myths and stories within Communities of Practice, the general transmission of cultural rituals and organizational routines'* (Davenport, De Long and Beers 1997 (39)) Therefore it seems plausible to reconcile the use of IT with human psychology if using knowledge repositories is combined with the process of experience, context, interpretation and reflection.

The second and third aims above are less well publicized. Ruggles (1998) (40) relates an example from Chrysler. His research discovered that organizing teams by platform type prevented the ability to leverage information across the whole group. Chrysler formed 'Tech Cul', which brought engineers face-to-face to build collective knowledge from their respective specialty areas. In another example, Buckman Laboratories used on-line forums with threaded topics, indexed by subject matter, author and date to solve their customers Chemical problems (Zack 1998) (41)

What constitutes success in Knowledge management projects?

The evidence provides some narrative on different KM initiatives and some anecdotal conclusions but does not provide the criteria by which the aims can be measured. Many authors have chosen similar criteria for success. Bixler (42)(2002) determined *'Four Pillars for Success'* being leadership, organization, technology and learning in support of KM initiative. Gartner uses 'explicit' and 'tacit' values and objectives for KM initiatives

- Capture and Store
- Search and Retrieve.
- Structure and Navigate.
- Share and Collaborate.

- Synthesize and Personalize.
- Solve and Recommend.
- Integrate and Maintain.

Davenport, De Long and Beers (39) (1997) suggest that indicators of effectiveness of KM initiatives are:

- Growth in the resources attached to the project.
- Growth in the volume of knowledge content and usage.
- The likelihood that the project would survive without the support of some key individuals.
- Some evidence of monetary return either from the activity itself or deriving from the activity.

Knowledge Management initiatives that produced organization-wide impacts with measureable returns are rare. BP is one of the best known examples. Its Virtual Teamwork project is a *"holistic approach integrating three key performance drivers: people, process and technology"* (Chase 1997) (4). This initiative reportedly saved $4.5million on the construction of a single platform. The most commonly cited successes were those linked to incremental operational improvements linked to New Product Development, Customer Service, Training and Education where it is difficult to translate those achievements into tangible performance gains. Those organizations that reported more successful KM projects tended to share the same organizational traits.

- A technological and organizational infrastructure that included Desktops, email, access to the internet and even video-conferencing in large firms (e.g. BP)
- A link to Economic value. Using knowledge management to reduce the time to bring products to market, or provide access to information to improve customer service. Hoffman-LaRoche (39) calculated they lose $1m for every day's delay bringing a new drug to market.
- A structured knowledge repository. Knowledge by definition is fuzzy but knowledge nets and semantic tools help organize thoughts and ideas. Teltech (39)tagged key terms that engineers could use in searches.

- Clarity of purpose. Not ‘we are going to reduce cycle times’ but ‘we are going to reduce cycle times by this amount’ For instance, Skandia’s Intellectual Capital development had clear and precise objectives and measures from which knowledge management tools could be developed to support it.

- A Knowledge oriented culture and motivational practices which focused on ensuring the long-term sharing, use and creation of information. Highly visible incentives to reward the sharing and diffusing information rather than the hording it for job-security or status reasons. E.g. Buckman Laboratories (39) rewarded top knowledge sharers with vacations.

- Multiple Channels for Knowledge Management. These include email, the web, databases, face-to-face, telephone. Users can pick the most appropriate method of transference based upon the information being communicated. For instance E&Y (39)used Lotus Notes to share explicit information about audit issues and McKinsey used face-to-face or telephone conversations to convey rich tacit information to produce innovative ideas.

Failures of KM projects are more prevalent but case studies are less well documented. The FoxMeyer Drug Company (Scott 1998) (43) went into bankruptcy in part due to a failed SAP implementation. The factors cited included a lack of ‘trust’ between the consultants and the firm, poor morale and the organizational structure which prevented transference of knowledge between sites. More generally the banking industry learned some lessons from the automation of banking services in the 1990’s. They failed to understand the difference between the explicit information and tacit knowledge that the customers wanted. Customers were happy to interact with technology (ATM, automated telephone systems) for cash deposits and withdrawals but had a preference for dealing real people when they had questions and balked at using call centers that offered purely standardized information.

What we can learn from these failures is the appreciation of the *information technology – organizational culture relationship*. The culture affects the ability of the KM initiative to succeed and yet IT can help to change the culture also.

Using ‘new tools’ to improve the likelihood of the success of KM initiatives

It was reported (Davenport et al 1997) (39) that McKinsey spent 10% of revenues on KM and Buckman Laboratories 6% and the financial auditor firms between 4-6%. These are colossal sums of money for

companies of their size and the bar has to be raised very high to justify success. However, in the beginning of the 21st Century new non-proprietary open source Knowledge Management tools are being developed that can be used very cheaply, ensures that knowledge remains current, encourages a knowledge sharing culture and creation of new knowledge. These are the new social networking tools and sites, weblogs and wikis.

*"There is no longer need for countless conference calls, meetings and emails back-and-forth to resolve issues and understand requirements (Krause 2004). Entire projects are being drafted, designed, edited and coordinated by teams through the use of a wiki, where the observable principle allows visitors to view, contribute and collaborate at much faster rates through virtual real-time conversations (Dickerson 2004). In this manner, employing wiki pages as a collaboration tool does more than just integrate the KM system into an employee's work process; it essentially becomes the actual work process" (*Reinhart 2005) (44)

Personal and Collaborative Publishing: Weblogs and Wiki's

Weblogs and Wiki's are personal and collaborative journals published on the World Wide Web or an Intranet. Technically they are very simple content management systems. They enable individuals to publish text and images in a very easy way. Every entry receives a permanent URL through which it can be addressed later, and is archived in a searchable repository. The benefits of weblogs and wikis have been espoused as a personal filing cabinet that can link older ideas to new ones and as personal knowledge journals. Fielder(2003) (45) said they become representations of patterns of meaning. Also it is a way of getting feedback to your ideas and a way of developing weblog conversations with others. We can compare the use of weblogs with what constitutes truth and knowledge discussed above. That is, making sense of information, negotiating meaning, developing deep relationships and encouraging collaboration.

Elements of Truth and Knowledge	Wikis and Blogs
Knowledge in a constant state of flux	Linking Old and entries and revising
Making Sense of Information	Contextualization through feedback from others
Negotiation of meaning	Weblog Conversations, Editing Wiki's
Building and Maintaining Connections	Finding Wiki's and Blogs of personal interest
Collaboration	Constant revising and correction to Wiki entries

Figure 5: Elements of Truth and Knowledge and the uses of Wiki's and Blogs

There has been an explosion of volume of information that is available over the internet to employees. The information is of varying quality and accuracy. Nonetheless, for the organization, social networking tools make it easier to revise and comment upon what has been written and have the potential to reduce misunderstanding, encourage organizational learning and knowledge sharing through discourse. These tools also demonstrate a more balanced approach to knowledge management as not just initiatives to lower costs, easy retrieval of information and storage but also something that lead to new knowledge creation within and across organizational boundaries.

Summary of Literature

From the literature the types of knowledge taxonomies are so varied that it defies the ability of an organization to manage it and even it were possible it could be detrimental to the creation of new knowledge if it could. Knowledge Management seems like an imprecise term for what organizations are trying to achieve in this field but it looks like the only term that most practitioners and theorists use to describe the nature and uses of knowledge. Those who have undertaken KM initiatives seem to be successful if they distinguish between explicit and tacit knowledge and deploy IT tools to best suit the types of knowledge and the context in which knowledge will be used. For instance using databases to capture context free, codified information distributed on a many-to-many basis and alternatively more personal technologies like voice, teleconference, wiki's and blogs to convey richer, contextual and more tacit data. These published findings will from part of the motivation and methodology for the implementation of knowledge management initiatives in the company that is the subject of the case study.

Case Study

The concluding part of this dissertation will focus on a Case Study of an organization and its attempts to use IT to further the knowledge creation to improve its operational and financial performance. With reference to the material discussed above and the development of a unified knowledge management mode we will examine:

- the nature of knowledge within the organization,
- the key objectives of the KM initiatives,
- the tools that were used,
- the measurements of success,
- the results of the initiatives,
- the lessons learned for future km initiatives at this organization and, more generally, for all organizations.

Background of the Knowledge Management Case Study

Waddington's is an established name in British manufacturing. Throughout the last century it was best known for its board games such as "Cluedo" and "Monopoly" and its ubiquitous playing cards. Less well known was that it was a large paper and plastics packaging manufacturer. In the late 1990's, Waddington's was purchased by the US games manufacturer, Hasbro. Hasbro immediately sold off Waddington's US plastics business to a private equity buyer. In turn the private equity owner merged 3 other smaller plastics companies with Waddington and renamed the company WNA. It changed the focus of the business away from board games to the burgeoning plastics-based (or more accurately known as resin-based) foodservice market. The three companies consisted of four sites geographically spread across the US. Each facility retained its name, product base, market and management structure. In the early days of the company the only tangible evidence of an entity called WNA was a small office in Kentucky where the CFO and CEO worked assisted by a secretary. The only sense the employees had that they worked in a larger entity was in the individual finance departments which had to prepare monthly reports for the consolidated reporting to the banks. The operational objective was product-based, concerned with meeting outputs and performance measures and with no attempt to leverage

competences across the wide organization. A close approximation would be a "Leader archetype". (McGee, Merali 1998) (46).

Although profitable, the company was not producing operational synergies and this was not helped by having each site's Managing Director responsible for operations and sales. This made for a very 'inward looking' organization and frequent 'turf-wars' as directors fought to keep products and markets at *their* sites regardless of the economic and operational benefits of restructuring the organization to meet the increasing competition from larger manufacturers.



Figure 6 Distributed manufacturing base of WNA in 2003

I became involved with the company as a consultant managing their ERP implementation and then as IT Director. The CEO and CFO believed Information Technology, through the implementation of an across the board ERP application, would help to facilitate the organizational cohesion and control they required. This was an extremely risky and expensive initiative as the organization's structure, process

consistency and integrating mechanisms just did not exist. Indeed the first year of the implementation from an IT project perspective was a waste as the CEO and CFO brought the 'tectonic plates' of these disparate companies into some loose but more cohesive organization. In retrospect this conflict was inevitable and necessary and it needed to be played out to its conclusion.

The ERP implementation met its explicit objectives. It provided WNA with a single integrated manufacturing, distribution and finance application, which enabled a rolled-up view of the organization's performance while at the same time eliminated the cost and complexity of maintaining four separate, older ERP applications. However, the ERP implementation had only a marginal impact on the coordination and integration mechanisms in the company. What is more, new acquisitions were being lined up and it became apparent that more needed to be done to integrate the existing businesses while developing a structure by which WNA could integrate new companies more quickly.

Strategic positioning of WNA

Using the most popular strategic portfolio models[7] the strategy consultant *may* analyze WNA as a mature resin-based industry with low unit-cost value, relatively low but stable levels of growth intense competition[8], powerful customers,[9] powerful suppliers[10] and conclude that a Cost Leadership strategy focusing on high volume, high investment in tangible assets and low unit cost of production was the most suitable recommendation. That analysis seems out of place in a post-'Dot-Com' economy where companies need to be simultaneously low cost producers and provide a customized product range. When responding quickly to customers requirements, competitor moves and offering new products and services, WNA needs to be every bit as dynamic as the *high-tech* electronics manufacturer and, although IT is not the key driver to developing a sustainable competitive advantage, it could provide the linking mechanisms and feedback loops that could facilitate knowledge management within the company.

A significant part of the growth of the new company was its ability to introduce new products and bring them through design and operational phases quickly, which made for highly sought after products with consistent quality at a low marginal cost. E.g. Masterpiece. It could produce products that competitors found technically difficult to produce e.g. heat sensitive, light sensitive and 3-D souvenir cups. WNA also

[7] Boston Box, Porters Generic Strategies etc
[8] Major competitors are Solo Sweetheart, Georgia Pacific, China
[9] Major customers are Sysco, Bunzl, Wal-Mart
[10] Major suppliers are International Paper, Chevron

held patents for products that could only be copied by competitors under license. For example the Reflections range of stainless steel-looking plastic ware. (See examples below)These products demonstrated the company’s accumulated product knowledge or know-how over a number of years. This knowledge was possessed by the designers who created the product, the engineers who designed the molds on which the products were produced and the more explicitly through artifacts such as the trademarks and patents that the company filed.



Figure 7 Masterpiece, Souvenir Cups, 'Reflections'

The early priority as IT Director was focused on improving WNA’s ERP competences and implementing new sites on to the application as they were acquired, reducing IT costs by eliminating duplication, improving IT response to user requests, improving effectiveness and adding new IT functionality as necessary to meet strategic and operational demands. IT strategies developed early on focused on the integration/interfacing of IT systems with each other to better co-ordinate processes between the sites but it was really done at the level of linking and integrating systems rather than the users who used the systems. However, it is clear that the focus was not on the areas that helped create or sustain knowledge in the company that. It was not until I attended a Business Transformation course at Warwick University that I began to think in terms of more holistic systems and a ‘*behaviorist’* approach to IT induced business configuration and identifying and leveraging knowledge as the key objective for any IT implemented initiative as depicted in the figure below.

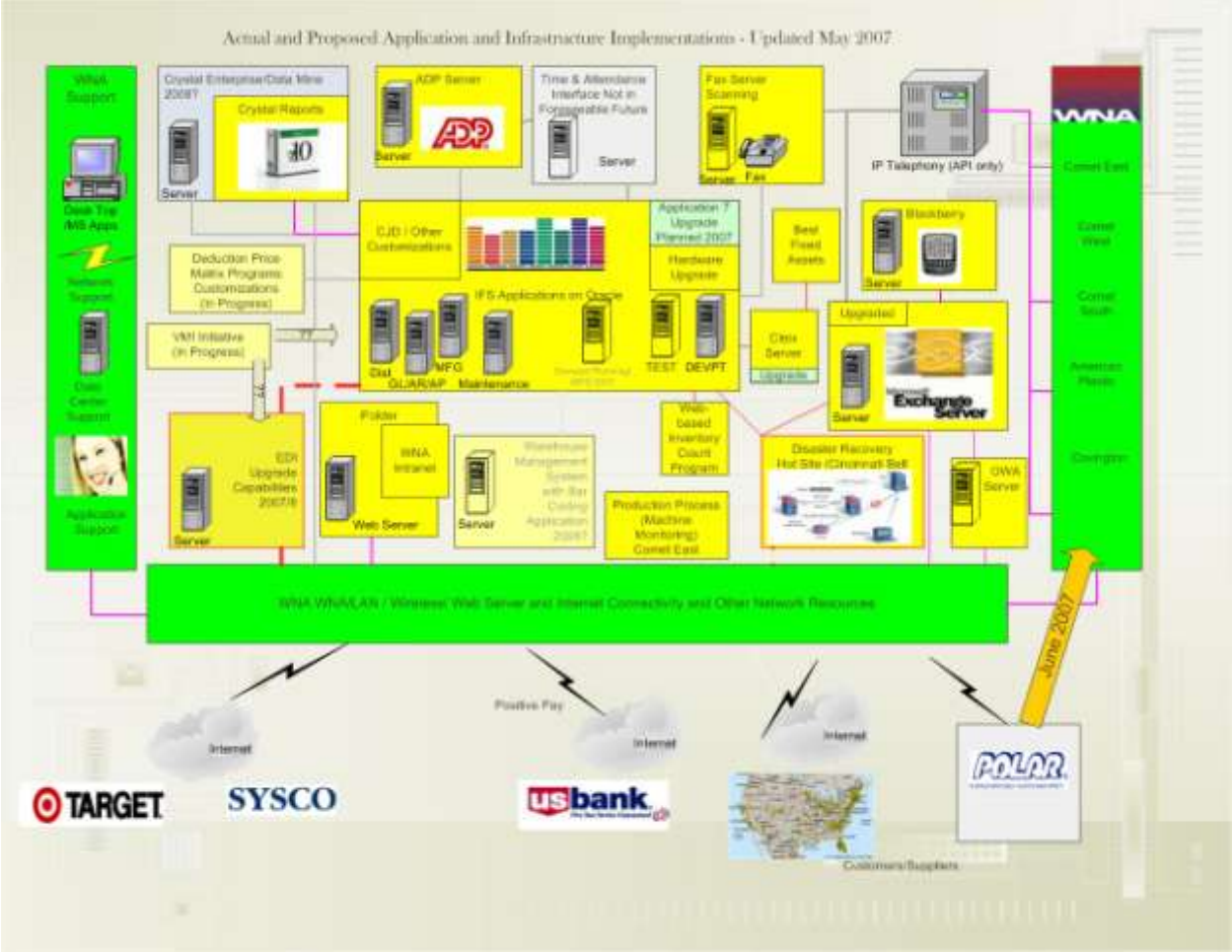


Figure 8: WNA IT Application and Integration Infrastructure

Towards Developing an Hypothesis

The hypothesis, (that was introduced at the beginning of the dissertation and drove future knowledge management initiatives at WNA) was that IT systems could facilitate the creation, storage, transfer and application of knowledge for performance improvement. This can only be achieved and optimized if the favorable cultural, economic, organizational structure and assets are conducive to the creation and sharing of knowledge.

The second part of the hypothesis is that where there is not the favorable cultural, economic, organizational structure and assets to facilitate knowledge transfer, the cycle of knowledge creation would be slowed down but information technology could be used to affect a more favorable environment upon which KM initiative could eventually prosper.

To test this hypothesis a model was developed that brought together most of the elements incorporated in the literature and distilled it into the single unified "knowledge cycle" model described below.

Unified Model of the Cycle of Knowledge and Influences incorporating the Creation, Storage, Transfer and Application of Knowledge

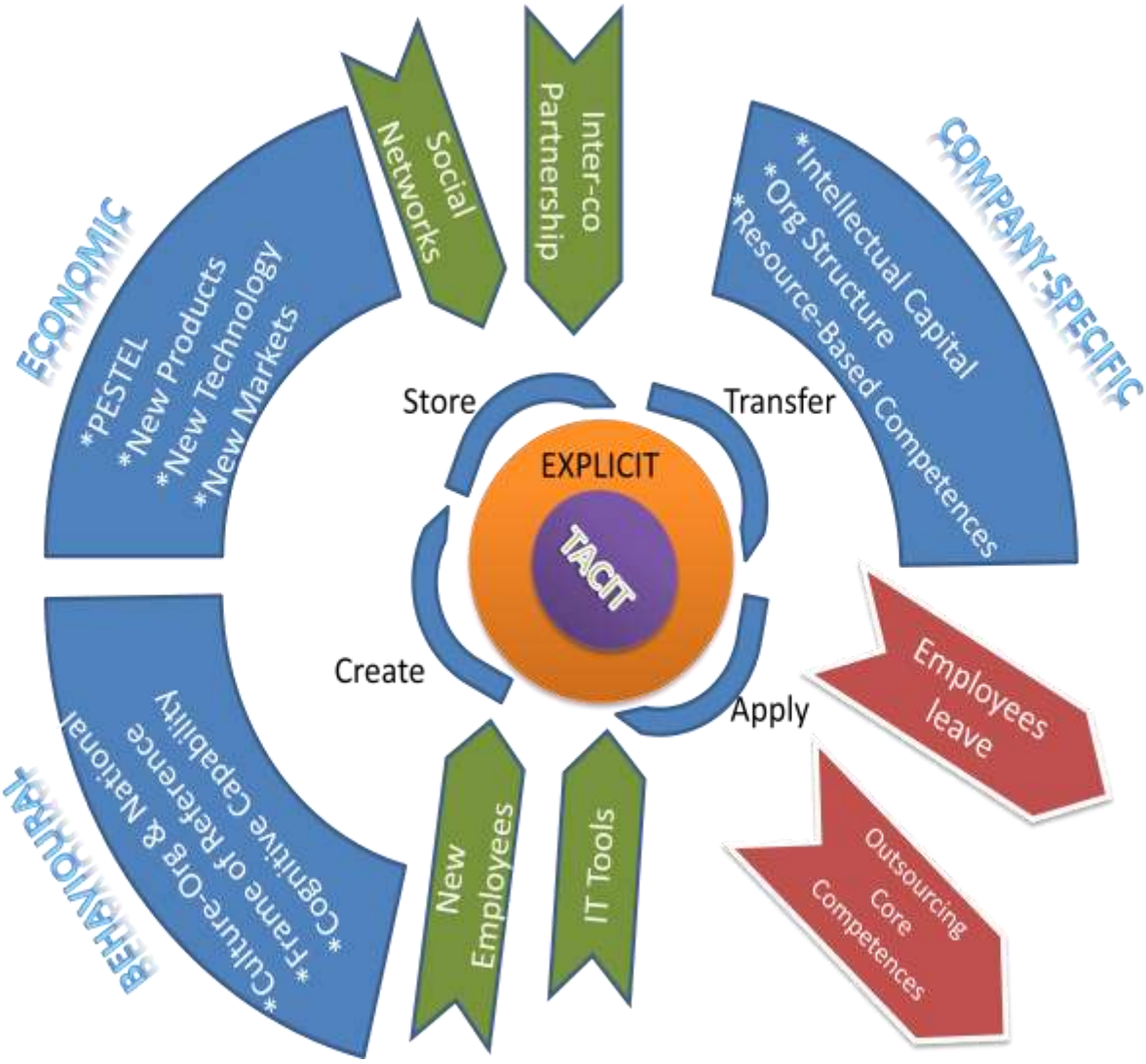


Figure 9: Model depicting the Cycle of Knowledge

The model above depicts the dynamic nature of knowledge within the organization. The model is not proposed as all-inclusive list of influences on the knowledge cycle but as an illustrative model that a practitioner could use to understand the context, or lens, through which knowledge management

initiatives could be implemented. At the center is **tacit** knowledge. This is the kernel or seed from which **explicit** knowledge is derived (Polanyi (6)) and all other knowledge influences depends upon. Around the Explicit and Tacit knowledge the dynamic Creation, Storage, Transfer and Application of knowledge takes place. The rate or speed of this knowledge cycle is influenced by Behavioral and Cultural (e.g. Galliers, Hofstede (15) et al), Economic (e.g. Porter et al) and Company-Specific (e.g. Porter, Hamel (32), Edvinsson et al) influences and variables (BLUE). These influences are sometimes outside the direct control of the organization (e.g. Economic, Governmental, National character) or are deeply embedded in an organization, sometimes unconscious to the organization and take a long time to modify. On the other hand there are accelerants and leakages (or *decelerants*) of knowledge that are in the direct decision-making control of the organization (Green and Red)

Economic influences,

We would expect a healthy economy and access to new markets and technology would have a positive influence of the cycle of knowledge. In a recession or overly regulated market it would have a negative influence (not withstanding that it may spur innovation or behavioral changes to offset the negative influence).

Company-specific influences

Within the Company-specific influences, we would expect that a company’s acquisition of intellectual and physical assets and the leveraging of those assets within a resource-based view would positively influence the cycle. The loss of company specific advantages such as the expiry of patents or the copying of technology will reduce the influence of this variable

Behavioral and cultural influences

These will play a role but it may be much more difficult to gauge their influence However, we should look at the size of the company, its organizational structure and culture (e.g. M-form or Network, Mentor or lion-tamer, high or low power-distance (Hofstede 1991 (15)Merali, McGee 1998 (46)) and be cognizant of the nature and construction of knowledge within individuals and between groups.

The other hypothesis within the model is that there are specific accelerants and *decelerants* due to ‘leakages’ of knowledge.

New Employees

The hiring of new employees with skills that the company does not already possess will enable it to acquire new knowledge and combine it with existing knowledge to create new knowledge (Nonaka 1991 (7)) more quickly than it might have done had it developed knowledge internally. The acquiring of new knowledge this way may be achieved discretely by hiring new employees as necessary or through the acquisition of a company.

Social Networking

Social networking (or Communities of Practice, Wenger, Snyder et al 2002 (47)) allows the employees within the organization to use knowledge acquired outside the company and use it for the benefit of the company to create new knowledge. This could be achieved through memberships of guilds, professional bodies, internet forums, etc. where members communicate and share experiences asynchronously or synchronously to develop new ideas and innovations.

Inter-company Partnerships

This accelerant covers the gamut of Joint-Ventures, Supply-Chain relationships, trade associations and external consultancy. It should also include regulatory bodies that ensure compliance to health and safety, accounting standards, credit-rating and asset appraisals. The point being here that compliance to standards may accelerate the acquisition of knowledge to satisfy the regulatory bodies. “Red-tape” regulation may on the other hand have an adverse effect and Joint-ventures may, if not properly managed, may lead to knowledge loss.

IT Tools

IT technology is an important facet within the scope of this dissertation as the hypothesis contends that IT technology can facilitate the creation, storage, transfer and application of knowledge and more importantly act as an accelerant if carefully deployed. The definition of IT tools is broad and encompasses data, voice, databases, internets/intranets, networks and hardware. The dissertation will argue that IT can change the nature of knowledge as well as the location and possessor of knowledge.

Employee reductions and Outsourcing of Core competences

When a company downsizes or employees leave or retire from an organization there is chance that valuable knowledge leaves the organization and may be deployed against them in a competitive environment. Outsourcing of core-competences is another decelerant. There are many anecdotal

examples where organizations outsourced their core competences and loss their ability to innovate. For instance, GE subcontracted the manufacturing of microwaves to Samsung who eventually became the industry leader in the manufacturer of microwaves. More recently, the outsourcing of banking services and computer hardware help desks to call center companies meant that these companies were no longer interacting with their customers directly and were increasingly unaware of what new services their customers wanted or what they liked or disliked about their current products and services. The main point here is not that products and services should never be outsourced but companies should engage in the outsourcing of explicit, easily copied, publically available knowledge and focus on building tacit knowledge assets in-house.

A Metaphor for the Knowledge Cycle

The knowledge cycle can be interpreted as a metaphorical water mill. Water is the mechanism that regulates the rate of knowledge and the flour equates to the stock of knowledge. Increasing the flow of water through the sluice gate will result in more flour being ground. Alternatively, increasing the size of the wheel, maintaining the gearing or designing better water buckets would increase the efficiency and rate at which flour is ground. Poorly maintained water-mills, droughts or the loss of an experience water-mill operator will reduce the output and stock of ground flour.



The model, its underlying hypothesis and metaphor will be used in the case study to ascertain the success of the knowledge management initiatives.

The Knowledge Management Initiatives

Using this model a series of KM initiatives were implemented at WNA.

1. Messaging Services. Email, Instant Messenger, Blackberry ™
2. Operational applications. ERP
3. Collaboration and Social Networking Tools.

a. Intranet and Internet,
b. *Windows Sharepoint* ™,

The aims of each of the initiatives was to facilitate the creation, storage, transfer and use of knowledge using and measuring its success with reference to the model

Strategic, Cultural, Technical Preparation for KM Initiatives

Strategic Preparation

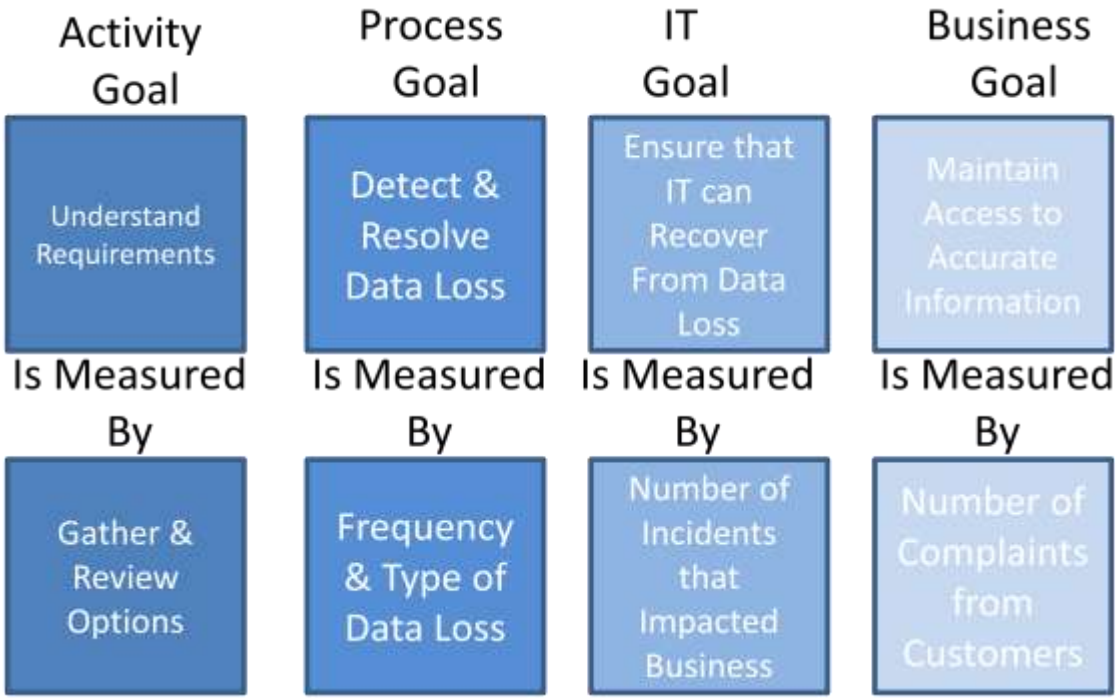
The intent was not to concentrate on the technical implementations of applications and hardware and assume that knowledge would emerge automatically from their installation. Instead, it became apparent that the 'hard' and 'soft' factors are needed to be taken into considerations to achieve the objectives. For this the McKinsey 7'S framework[11] was used. However, it is not just a simple task of making ad-hoc, unrelated changes to the IT environment and ticking the 7 boxes when they were complete. The internet was searched for an integrated set of overall guidelines, toolsets best practices and measures that could be used to strategize implement and measure the impact of the changes. For this CoBIT *(Control Objectives for Information and Related Technology)* was selected[12] The CoBIT framework helped the company develop a unified and structured approach to its IT investment. For instance it measures each facet of IT performance by using a Maturity Model. The model ranks the task or process as:

0 Non-existent, - the task or process in not undertaken.
1. Initial - the organization recognizes that the issue exists but has not been addressed.
2. Repeatable – the task is done but in a non-structured approach.
3. Defined, the issues or process is documented and undertaken but interpretation is left up to individual managers.
4. Managed – It is possible to measure and monitor compliance and determine what corrective action is required.
5. Optimized Process have been developed and refined to the level of best practice and continuous improvement.

Figure 10: CoBIT Maturity Model

[11] strategy, structure, style, staff, systems, and style shared values
[12] www.isaca.org

The ranking process is the approach Venkatraman (1994) (35) in his 5-stage process towards IT reconfiguration. The other main theme running through the CoBIT process is the linking and measuring activities through process, IT and business goals. Below is an example for Disaster Recovery and Business Continuity that was developed



CoBIT enabled WNA to identify tasks or processes that were not done and to measure, improve and link the tasks together.

Organizational and Cultural Preparation

The change of approach needed to be communicated and accepted by the rest of the organization. A series of presentations and meetings was arranged with stakeholders in the organization. The objective of the meetings was to reposition IT as a ***service provider*** whose purpose was aligned to, and supporting the projects that the stakeholders were involved in, and to involve IT in projects at their conception to enable the supporting of the technological environments more effectively. The other objective was to reposition IT as a ***solutions provider***. That is, to suggest and recommend technologies to better achieve

the objectives of the individual stakeholder and the performance of the organization as a whole. The presentations used a *Systems Approach* to solving organizational challenges and focused on the linkages between the business requirements, the stakeholders and the supporting role IT could provide. The examples taken from the presentations (below) highlight both the challenge and the solution IT could provide. Though not expressly articulated in the presentations, the presentations de-emphasized the role of IT hardware as being *the* solution (although hardware was a necessary element) and emphasized using IT to help create a 'knowledge network' through which all information and data would be available to facilitate the ***creation, storage, transfer and application of knowledge***. Another implicit output from the eventual implementation of the structure would be to change the organization culture from an inward and intra-site, information-hording mentality to an outward facing, sharing culture focused on meeting the challenges from outside the organization.

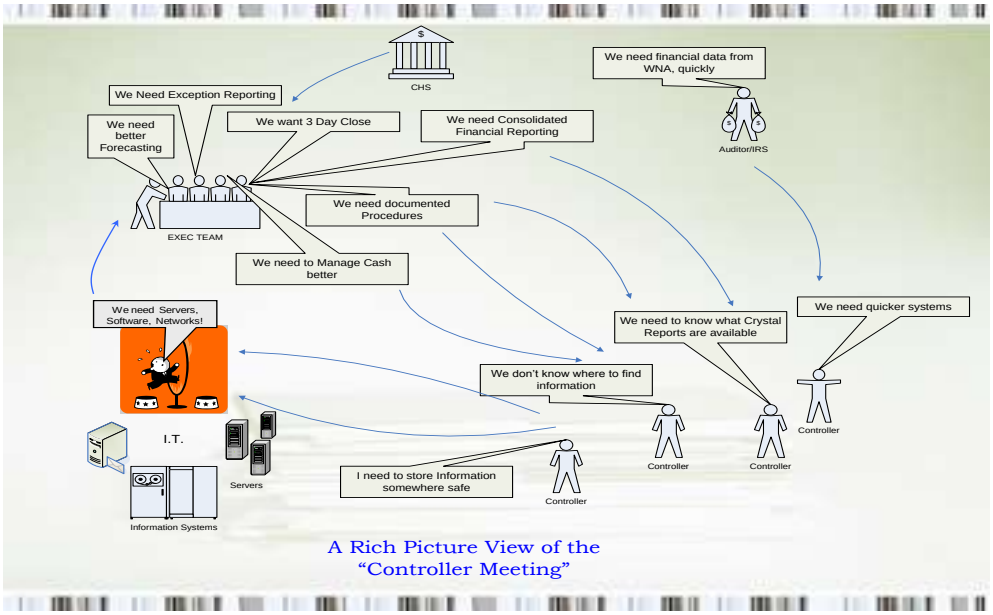


Figure 11: A Rich Picture of the Challenges that Employees Face

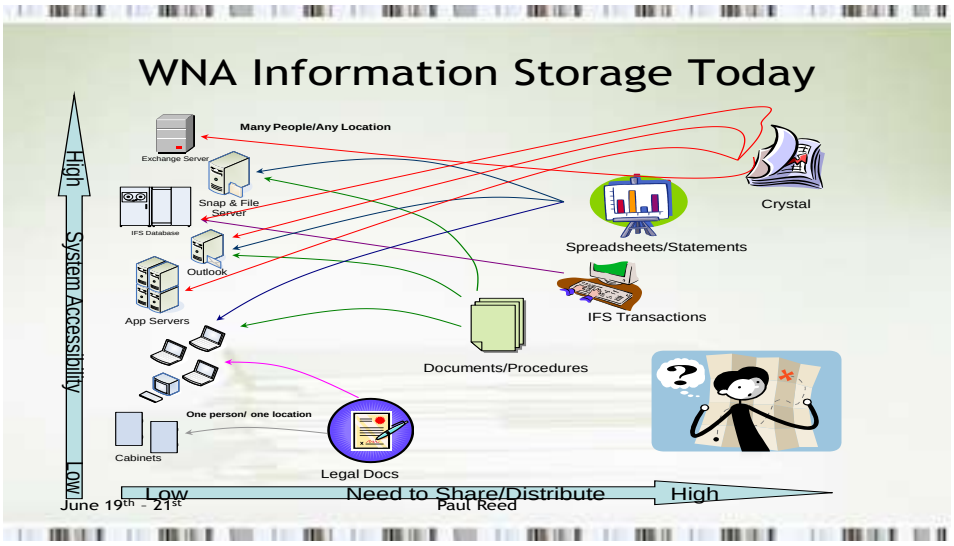


Figure 12: Pre-implementation of sub-optimal storage of data

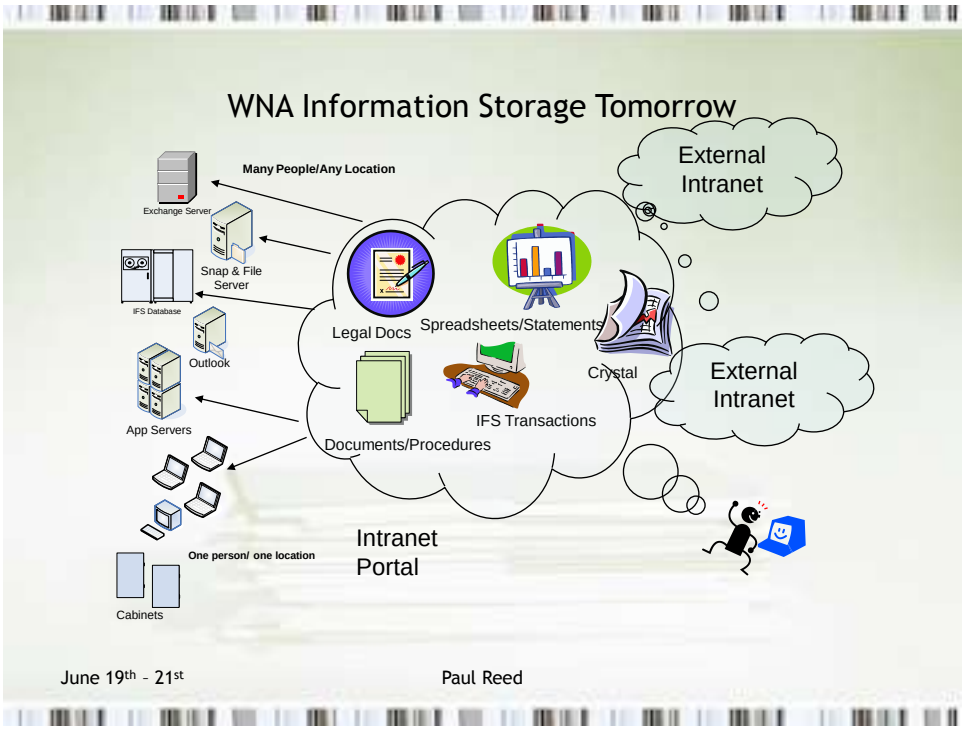


Figure 13: Proposed solution for data storage

Technical Preparation

The realities of organizational dynamics means that in reality it is not often possible to implement strategies in a sequential systematic approach without regard to other challenges, priorities and competition for organizational and monetary resources. Even when structures are put in place they are never 'frozen'[13] for long. Organizational imperatives necessitate unfreezing the implemented initiative, refining it and 'freezing' it again.

IT did not see the constant freezing and refreezing of processes as necessarily disruptive. It was accepted as part of the organizational environment. The key to sustaining the knowledge cycle therefore, was to understand the environment and create an underlying IT infrastructure with known boundaries and act within that information space to produce loose-linking adaptive applications and hardware components that could be reconfigured to suit requirements. Therefore, the loose-fitting application structure as depicted earlier was built upon a high-speed network domain that linked all the sites together as one entity.

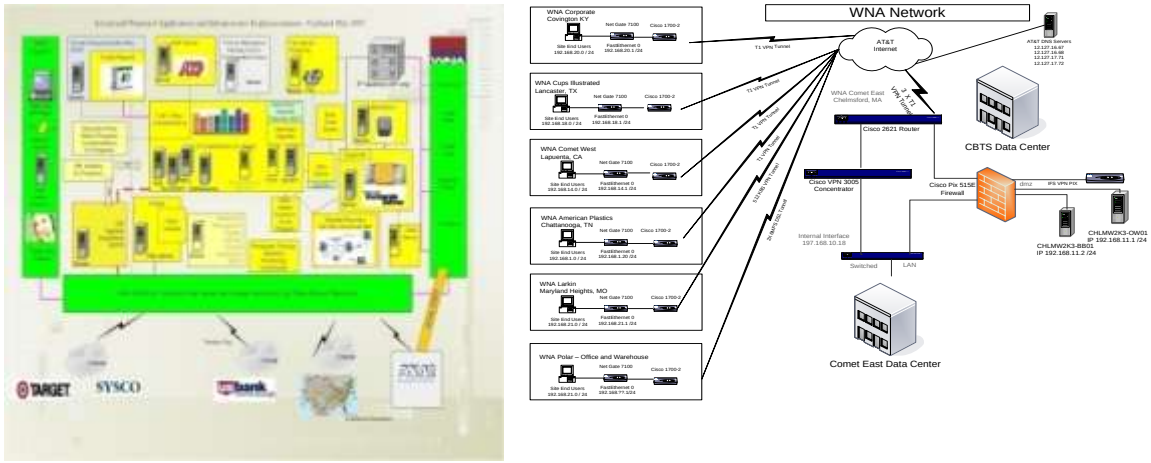


Figure 14: The developed Application and Network topology at WNA

[13] See Kurt Lewin's Unfreeze-Change-Freeze Change Management method

Overlaying the Knowledge Management Initiatives on Top of the Strategic, Technical and Cultural Preparation

Research methodology

To provide the feedback for the case study a limited number of questionnaires were provided to some internal employees and other third parties who have a relationship with WNA. Other information sources included notes, documentation and first-hand experience of WNA over long period. Only a limited weight was placed on the results of the questionnaire as too few users where questioned in a single environment. Consequently it is not necessarily possible to extrapolate the results for other organizations. Also, because the focus of the dissertation was primarily about the experience at WNA an 'interpretivist approach' was adopted where meanings *"emerge from the interaction of social actors that is fluid, ambiguous and context dependent"* Hochschild (48)(1983) This required focusing on the rich tacit nature of the information that people hold, as opposed to generalizations, to elicit the nature and usage of knowledge at WNA. This method would also fit the view that knowledge is both explicit in nature as well as being of social construction. The complementary use of questionnaires, interviews and documented information would ensure the validity of the findings as well as highlight any incongruities.

From the analysis of the information generated for each KM initiative researched it should be possible to reach conclusions concerning knowledge creation, storage/retrieval, transfer and application at WNA and also the role of IT in the application of across the organization.

Interviews / questionnaires	Interviews	Questionnaires
IT Employees	2	5
End Users	4	25
Senior Management	2	4
Consultants	2	2

Table 4: Questionnaires and Interviews Completed

To help me reach those conclusions the questions and interview's underlying objectives were constructed to illicit the determinants and application of knowledge at WNA. I used a modified set of

research questions posed by Alavi & Leidner (2001) (36) when conducting their research into knowledge management and the role of IT to support these processes.

Knowledge Creation
1. What conditions facilitate knowledge creation at WNA?
2. Does the organizational structure facilitate knowledge creation?
3. Can IT enhance knowledge creation?
4. How is external knowledge exploited for internal use?

Implementation of Messaging Services

The inherited environment

The implementation of a unified Email, Blackberry and Instant messenger services sought to bring together the users at the sites in to a more cohesive pan-North America user group. Prior to implementation of the Outlook Exchange Server™, users were using hosted email domain names that identified themselves as the companies that they once belonged e.g *Waddington.com, API.com, cupsillustrated.com* etc. Worse still users who were recently employed by the company used their own Internet Service Provider (ISP) email address for business purposes e.g. *yahoo.com, hotmail.com, att.net etc.*

This served to re-enforce the impression that the companies were separate and non-cohesive groups with no company identity. To companies that dealt with WNA it presented and impression of a company lacking professionalism, an identity or even substance. There were practical difficulties also. Users from one site would be less likely to email a colleague at another site because they would not know their email address. Customers and suppliers had similar issues making sure that they emailed the right person. Users were not keen to lose their own sense of company specific identity by changing their email addresses but equally internal and external users alike were frustrated when emails did not reach their intended target because of the limitations of their hosted services.

The Implementation of unified messaging services

With the implementation of a single network domain (WNAGlobal) it was possible to implement a single Exchange Server using the Outlook email client. All users were given a new email address. The IT implementation of the Exchange Server became a visible demonstration of WNA as a single organizational entity. Users could look up the email recipient in the Global Address Book. They were encouraged to adhere to good email use guidelines. Maintaining email on the Exchange Server increased the ability to retrieve historical email if the PC or laptop failed.

Additional messaging features

The over-riding objective of the email system and a measure of its success would be the ability for any user to communicate with internal or external users at any time of the day or night, regardless of where they were, to facilitate increased collaboration. For instance users could use email when not connected to the network so long as they were connected to the internet. Users could now access and send email in airport departure halls or hotel rooms. Users who used a computer at work could still access their emails on another computer by using the Internet webmail feature. The maturing and increasing availabilities of Blackberry PDA's produced another possibility. It was possible to send and receive emails via the Exchange Server and Blackberry Enterprise Server ™ even if the user did not have access to a computer.

The Relevancy of Email to Knowledge Management

Email has been shown to increase the weak ties in organizations and accelerate the growth of knowledge creation (Nonaka 1994). Four years after the implementation of a unified email system the survey confirmed that 100% of users who were given an email account use it daily. The users asked about the uses of email at work. 80% of users considered it the primary method of business communication both within and outside the organization. Many users used it to share calendars and invite users to meetings and conference calls. Fewer users used email as a *To-Do* list of tasks and fewer still used it to prioritize emails in relation to their importance, priority, category of information enclosed. The reason they did or did not utilize some of these lesser features could be a feature of the relevancy of the feature, their role in the organization and the *'IT-Savvy-ness'* of the user in question. It was

possible that the longer a user used email the more likely, over time, to start using these less well known features.

Do you agree or disagree with the following statements	% Agreeing
I use often or always use Email…..	
To communicate with work colleagues	100
As the primary method of communication	80
Use it to communicate in place of the phone	75
To store and retrieve information and attachments	75
To communicate with people outside the organization	65
To schedule meetings and appointments	35
To sort, categorize or prioritize emails	15
To look up information on Public Folders	10
To add Tasks	10

Table 5: Email Qu.1

What was also interesting was that for many users it replaced Windows Explorer ™ as the primary method of storing and sorting information. These users used the Mailbox and not Explorer to store their documents.

Do you agree or disagree with the following statements	% Agreeing
When I receive a business email I always or often….	
Save email and attachment in mailbox	90
Forward it	40
Delete it	10
Print it	5
Save it to the computer (Windows Explorer)	5

Table 6: Email Qu.2

For the vast majority of users email was the most important or second most important IT-based application they used. There was also a correlation between the seniority of the manager and the importance of email to that manager.

Do you agree or disagree with the following statements	% Agreeing
For me the following IT applications are the most or 2nd most important in terms of attaining my work-based objectives	
Email	100
ERP	80
Spreadsheets	60
Word Processing	50
Reporting tools (i.e. Crystal Reports)	40
Other	40
Presentational (i.e. PowerPoint)	20
Database (i.e. Access)	10

Table 7: Email Qu.3.

The tendency was that the more senior the managerial role performed the more important email was to fulfilling that role's objectives. This correlation was supported by the table below which shows that senior managers had the largest mailboxes. In fact the size, in megabytes, of the top 3% of all mailboxes accounted for the 22% of the total used capacity on the Exchange Server.

User	Role	Size (MB's)	Emails
AM	Sales Director	10,244,787	69,512
MC	CFO	9,934,670	46,456
KH	CMO	8,500,265	77,040
ME	CEO	7,822,609	84,368
KH	Site General Manager	6,745,813	27,986
JE	Executive Asst	5,827,729	23,916
BM	Financial Controller	5,527,289	18,050
RS	Non-Manager	5,430,167	9,115
DG	COO	5,382,315	59,045
		65,415,644	
Total size of all mail boxes		**306,257,050**	

Users' names have been replaced by their initials

Table 8: Email Mailbox sizes

The ubiquitous use of email is no better demonstrated by the CEO. He has a mail box that is close to 8GB in size and in the four years that the Exchange Server has been in place he has on average received or sent 70 emails for every working day.

The final question that was asked was about the time spent working on emails. Users, mostly senior managers, spend the day constantly checking their email on Outlook or the Blackberry. How quickly they respond on the email depends on the content of the email. If the email requires a quick answer then the response will almost be instantaneous. The other type of email is the one that contains attachments. Time would normally be set aside to analyze the content of email later in the day or week.

Question	Average
How many times a day to you check your email?	12
How many hours a day are you creating or responding to emails?	3

Table 9: Email Qu.4.

Finally two pieces of raw statistical information was included. The figures show on average what times of the day and month emails are sent and received during the day

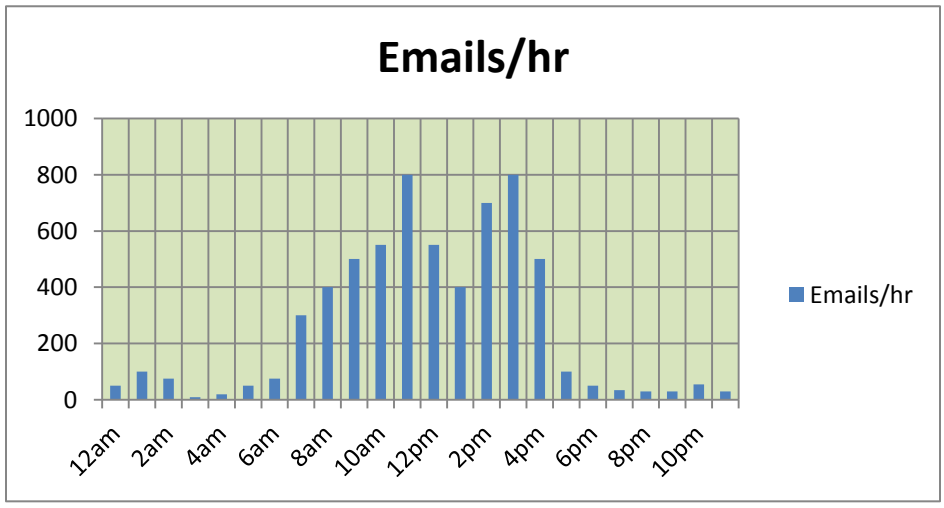


Figure 15: Volume of Email Traffic per Hour

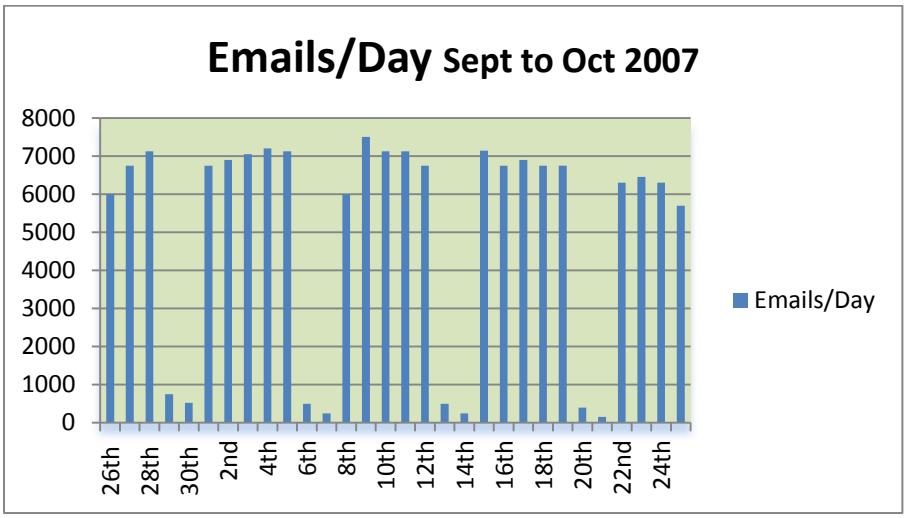


Figure 16: Volume of Emails transacted per day

The statistics highlight the contribution email has to a business world where communication between users is not restricted to the 'normal' business hours of the organization. 11.00a.m. Eastern Standard Time was the busiest hour for emails to be sent. Montreal, Boston, Chattanooga and Cincinnati offices are in the Eastern time-zone. The Dallas office is in the Central time-zone and the Los Angeles office is in the Pacific time-zone. For a company like WNA that is spread across many time zones, the ability to operate over an extended work day is critical to its business operation. However, even after all facilities are closed in the evening there continues to be a small but significant level of email communication taking place. During the follow up interviews the context and subject of these emails was more clearly understood.

1. The emails sent after 5.00pm or at weekends tended to be managers and directors who had access to email on their laptop, Blackberry or PC at home.
2. The emails tended to be longer and be replying to, or sending emails that did not require an immediate response. For instance, these emails often contained attachments which required analysis.
3. The email context was different. Emails sent during the day tended to the shorter communication that either requested or replied to with explicit non-ambiguous information. Emails in the evening tended more to the reflective, opinionated, ambiguous and, potentially, even strategic.

Interesting areas for future research at WNA would be to investigate the true nature and context of emails sent during and outside the normal work day and test the hypothesis that work-day emails are more likely to include information for the creation and transfer of explicit knowledge and outside of office hours emails, contained richer, contextual information with a greater propensity to create and transfer tacit knowledge. It is possible that users find it easier to initiate new ideas on email rather than face-to-face. Further research at WNA could measure the efficiency of email to help facilitate the creation of tacit knowledge compared to face-to-face or voice communication.

Instant Messaging

Introduction

Instant Messenger is primarily a technology to conduct one-to-one personal chats. At WNA the 'inherited' IM application was the free AOL instant Messenger. Users used their IM account for communication with their friends and family as well as business colleagues. In 2005 users were converted to Trillian ™, which is a multiprotocol IM messenger application for the Windows environment that connects uses of IM services from AOL, Yahoo and IRC amongst others.

Instant Messenger and the contribution to the creation and transfer of knowledge at WNA

If at one end of the spectrum email can be defined as an asynchronous conversation and at the other phone calls a synchronous conversation, then IM is a semi-synchronous text conversation. The response to a question can be immediate and makes it possible for a semi-interactive conversational thread to continue through the day or even longer. Giga Information Group (49)reports that 85% of all mid to large organizations use IM but only 10% of companies have a formal IT policy to regulate a secure enterprise instant messenger. IDC (49) indicates that only 70% of IM conversations during working hours are work related. These findings are similar to those at WNA. The use of Instant Messenger was not obligated by the company but some managers and directors would mandate that their team be connected at all time.

The lack of formal policy meant that about 40% of users had an IM address. Unlike Outlook there is no Global Address book to look up other IM users and the address format was not uniformly created

The users were asked general questions about how they used IM at WNA and the responses were followed up with interviews to validate the responses.

	Average Response
How many IM users are there on your 'Buddy' list?	15 'Buddies'
What proportion of those Buddy's are non-WNA employee business users?	25%
What proportion are family and friends?	20%
How many business-related IM conversations do you have per day?	3 Conversations
How many minutes a day are you actively using IM?	15 minutes
Do you often include invite multiple users to an IM conversation?	No
Do you often send attachments in your IM conversation?	No
Do you often use IM outside of business hours on business related matters?	No
Do you save your Instant Messages for future retrieval?	No

From the responses and interviews the following conclusions were derived

1. IM provided instant collaboration for a significant number of employees and was used to supplement the use of the phone and email rather than a replacement for those technologies.
2. The nature of the Instant Message tended towards a short series of non-ambiguous questions requiring immediate answers but could develop into knowledge acquiring opportunities. Below is a transcript of a random IM conversation and provides a microcosm of non-structured information transfer, conjecture, supposition, collaboration, knowledge acquisition, action and, to some extent, serendipity.

WNA USER A: Do you know if the domain admin password was changed? I'm trying to log into the blackberry server and it doesn't like my username and password.
WNA USER A: I'd ask Sherri but she's not at her desk.
WNA USER Z: I believe she did. It was to prevent Ashsish logging in and making changes without our knowledge
WNA USER A: ok - Sherri told me she'd give it to me in a bit
WNA USER A: Dan Carroll's isn't getting emails on his blackberry. Anyone else having a problem?
WNA USER Z: mine are coming through fine. No one has meantoned any problems to me

WNA USER A: ok thx

WNA USER A: Dan's blackberry is in contact with the server, but hasn't sent anything since 12/24. Any suggestions?

WNA USER A: His device type is Mobitex. His is the only one that is that type. Could that be a problem?

WNA USER Z: Mobitex is a wireless network architecture. I dont know if Blackberry uses that

WNA USER A: He's got one of the old aether systems blackberries.

WNA USER Z: The obviuous things to check is to make sure that he has a GPRS signal, that he logged on to the redirector on his laptop and look in the BES to see if the messages are backing up pending to be sent

WNA USER A: He's got no messages pending. Curt, Joan and Kelly all have 200+ messages pending.

WNA USER Z: You will need to contact these people. Looks like Curt never finished seting up the blackberry. Also ask Joan and Kelly if they think they have problems. They could be on vacation and not tuned on their laptop or Blackberry for a while

WNA USER A: Steph has 300+, but I think she's on maternity leave.

WNA USER A: He doesn't have an indicator for GPRS and he says nothing changed on his laptop.

WNA USER A: Do you think disabling and reenabling redirection would help?

WNA USER A: Or is there a better way to reset?

WNA USER Z: The GPRS indicator is the problem more than likely. I would do a reset of the device. (stick a pin gently in to the reset device hole under the battery lid

WNA USER A: ok thx

WNA USER A is away at 11:23:39 AM.

WNA USER A returned at 11:37:01 AM.

WNA USER A is away at 12:03:46 PM.

WNA USER A returned at 12:28:28 PM.

WNA USER A: Mary Klakulak has a problem with the display on her laptop. There's a white bar in it. A guy looked at it and said something was disconnected. He pressed the display together and it was ok. She'll be in Covington tomorrow. Can you look and see if you think it needs to go in for repair?

WNA USER A: It was only ok temporarily until the guy let go of it.

WNA USER Z: ok, I will take a look at it and make sure that all wire attached and screwed tightly. It may need a newe screen display. I got a new one for my laptop. Its tricky and time consuming to replace but it can be done

WNA USER A: ok, thx

WNA USER A: I think this is the same person who killed a blackberry within a week. I'm just wondering if something went wrong or did she damage the laptop.

WNA USER A: Do you know about the Dell laptop battery recall?

WNA USER Z: no, not heard anything

WNA USER A is away at 1:08:58 PM.

WNA USER A returned at 1:59:30 PM.

WNA USER A: http://www.computerworld.com/printthis/2005/0,4814,1 07177,00.html

WNA USER A: I'm wondering if I should send an email around, asking people to check their if the recall applies to their

batteries. I think the problem is overheating.

WNA USER Z: yes, most of the dell laptops we have bought in the past 12months are affected

WNA USER Z: I one I am using is unaffected. I will look at the other batteries in this office

WNA USER A: ok

Figure 17: Example of IM conversation and knowledge transfer

We can see from this transcript that the conversation is a mixture of questions requiring response or volunteering information to the other user. There is a mixture of topics discussed. The conversation starts requesting a piece of explicit information. "***WNA USER A**: Do you know if the domain admin password was changed?"* The conversation progresses to a collaborative exchange of information and troubleshooting. ***WNA USER A**: Dan's blackberry is in contact with the server, but hasn't sent anything since 12/24. Any suggestions?"*. The two users try to interactively provide a solution and *WNA USER Z* provides some tricks and tips that have been learnt previously to *WNA USER A* that successfully provides the solution (See the thread highlighted in yellow). This is a good example of the explicit knowledge possessed by User *Z* being transferred as information to Users *A. User A* then can retain the information as knowledge that he or she can apply to similar problems in future. The IM thread continues throughout the day touching on different topics. One topic is about a battery recall. *WNA User A* decides to do some research on the internet and returns to conversation and provides an internet link to the information needed. '***WNA USER A**: http://www.computerworld.com/printthis/2005/0,4814,107177,00.html*

***WNA USER A**: I'm wondering if I should send an email around, asking people to check their if the recall applies to their batteries. I think the problem is overheating'*. Armed with this information, *User A* and *Z* decide on action to apply their newly acquired knowledge within the organizational domain.

3. Users are sometimes less guarded in the information they are willing to exchange with each other via IM. Similar to face-to-face conversations there is less opportunity to think carefully about the veracity or appropriateness of the response. This could be beneficial as the exchange is less likely to be subjected to qualification but the information may be less reliable.
4. Few users store their conversations for future retrieval and this limits the opportunity to reuse explicit information for future transfer, although as the exchange above demonstrates, IM's can be saved as easily as emails.

5. IM users did not tend to use the other IM features such as three-way text messaging or attachments.
6. IM usage was more prevalent within the Customer Service, Shipping and Marketing functions. This could be viewed as the *sharp end* of the business where quick responses to the disposition of customer orders were vital. Within Finance it was rarely used and some users deliberately set 'Away from Desk' messages on their IM status or logged out completely because they found IM distracting.

WNA users were not exploiting the knowledge acquiring potential of IM. Instead they found other methods of transferring information more convenient or appropriate. However, over the years employees had become adept at collectively 'knowing' when it was appropriate to use either or face-to-face, telephone, Instant Messenger or Email to transmit the information they wished to convey.

The Contribution to Knowledge Management

It is important to get the email implementation 'right' in terms of ease of use, stability and what it is used for. There is no claim here that the email system is itself creating, storing, transferring and applying knowledge but it is believed that it is facilitating the knowledge process. If the company lost access to its repository of historical emails and no longer had the ability to email in the future the performance of the company would be severely compromised. With reference to the *Knowledge Cycle model*, the research shows that emails are being used to group, sort and cross-reference and store significant amounts of information on a centrally located and easily retrievable system. It has enhanced the ability of users to communicate and collaborate within and outside the organization. The email is being used to convey dynamically changing information but also opinions, thoughts and ideas that can be conveyed to many individuals immediately both within and outside the organization. This undoubtedly increases the speed and creation of new explicit and tacit knowledge creation within the organization twenty-four hours a day and seven days a week. The creation of a single email domain has helped create a sense of identity and trust between the uses in the organization and helps the integration of new companies into the organization.

On the negative side, the volume of email sent between users and the inappropriate use of *Copy* and *Forward* means that information can be irrelevant to the user or can be a ploy to push a problem on to someone else. Trust can be eroded if users believe that opinions and views communicated in

confidence will be freely forwarded to others and could result in a conflict that would not occur had there been a face to face contact.

We should also be careful to ensure that email and Instant Messenger is used to convey the most appropriate type of information. Email is an efficient method of conveying a lot of detailed and explicit data and information. Some authors (50) conclude it should not be used where the information in question is 'richer' more tacit and subject to interpretation or requires constant feedback. In these circumstances, voice or face-to-face communications should be preferred. Although this view is shared in this dissertation, the initial email might be the catalyst for the subsequent face-to-face negotiation that ultimately creates the tacit knowledge. The Knowledge Cycle model below is updated with the economic, behavioral and company-specific impacts of the KM Messaging initiative.

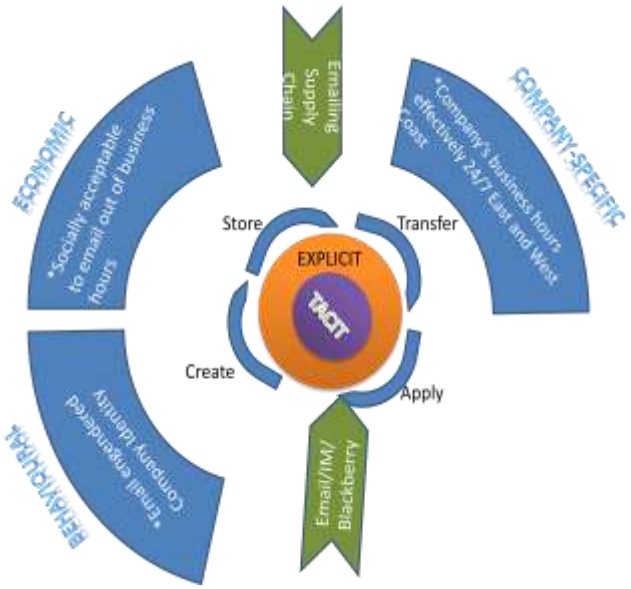


Figure 18: The Impact of Messaging Systems on the Knowledge Cycle

Enterprise Resource Planning Application

ERP systems are touted by software developers and implementation consultants as applications that can play an important part '*improving a company's competitiveness through improving the way in which strategically important information is produced shared and managed across functions and locations.*' (Communications of the ACM 2000). (51) Bingi (1999) (52)stated that MRP systems provide the enterprise with a common language beneficial to the integration of operational activities. The

methodology by which the ERP application is implemented is part software and part hardware installation. More significantly it is process definition, adherence to best practices, process consistency or repetition, training and learning by doing. Consequently we should observe the positive outcomes of an ERP implementation to be increased productivity, reduced costs and improved decision making. However, from these definitions only some of them are conducive to knowledge leveraging and creation *('process definition' and 'learning by doing')* some of expected outcomes are knowledge 'neutral' insofar as they leverage existing knowledge but do not create new knowledge *('best practice' and 'process repetition'*). Some of the outcomes could be counterproductive to knowledge creation. Reducing costs may result in the loss of *Social Capital*. Process definition may lead to an overly restrictive but efficient process, which may reduce the opportunities for a flexible innovative response to situationally complicated challenges. In some companies ERP implementations are seen as panaceas to fix everything that is wrong with the company (that may actually require diverse solutions) while simultaneously attempting to embed all the skills, experience and knowledge within the operating system of the ERP system.

Searching for the correlation between the use of ERP systems and development of knowledge management capabilities does not provide many examples of a conclusive evidence of a link. ERP systems and their underlying databases are developed with a bias towards ease and speed of data entry and less with the retrieval. It is 'easier' to think in terms of what data an enterprise needs to enter into a system but more difficult to quantify all the different ways that data might be used for knowledge creation. Chen (2001) (53) articulated the dilemma. ERP plays a data collection role and when that information reaches a certain size it is classified appropriately in to valuable information for management's reference when making decisions but … *"importantly this information is post-mortem and cannot provide reference to determine future strategies".* The implication here is that the ERP system may be providing the metric of performance by which past decisions can be judged and to a lesser extent the creating of new knowledge. Also implicit in this is where knowledge is created; it is likely to be the explicit *'codified'* knowledge.

Possible Objectives & Characteristics of ERP Implementation	Possible Objectives and Characteristics of Knowledge Management Initiatives
Replace legacy systems – Create common infrastructure	Develop integrating infrastructure to share information across systems and between organizations.
Restructure production, traffic, customer service etc	Build intra-company relationships between departments, Develop Supply Chain relationships with customers and suppliers
Centralization of functions	
Standardization, Efficiency, Cost Reduction	Develop flexible and loose operating processes
Discrete Project with explicit end date and budget	Interconnected set of various projects developed continually and asynchronously

Table 10: Possible conflicting objectives of ERP and KM initiatives

In the table above, the objectives on the left lend themselves to the cognitive / codification implementation strategy where firms seek to embed explicit processes and tasks within the application and retrieve as necessary. On the right a more appropriate strategy is a personalization / community approach where firms understand that the tacit knowledge is possessed by the employees and the IT system is used to leverage the knowledge across the organization. Also there is implicit in the objectives an emergent strategy that seeks to exploit already known operational opportunities through the use of the IT system as well as identifying new operational opportunities through the use and familiarity of the IT system.

At WNA, like many companies of a similar size, the primary objectives were biased to those on the left hand side of the column while espousing the aspirations of the virtues on the right, except for the last objective. WNA maintained an ERP-specific group of implementers who continued to support and extend the system post *'Go live'*. This allowed the implementation to take on some of the characteristics of the right hand side of the column. Processes and procedures were continually modified to meet changing business needs or to make operation more efficient.

Knowledge creation, retrieval, transfer and application opportunities through the use of the ERP at WNA

We can evaluate the contribution to Knowledge Management with reference to a number of implementation tasks.

1. Knowledge Process - As-is to To-Be Process development

Description: WNA undertook a process mapping phase that identified the most prominent current processes and then improved and realigned them to the business objectives and the parameterized software functionality.

How was it used to create knowledge?

The process entailed face-to-face and other forms of communication between the implementation consultants, IT staff and the Key Users representing different departments in a series of daily sessions held over a short period of time. The current processes were mapped using a combination of flow chart symbols and the *Business Modeler* application module. The ERP system provides the *'Best Practice'* scenario depending on the production mode of the organization e.g. *Engineer-to-order, Configure-to-Order, Make-to-Stock* etc. The process was modified through negotiation with the key users to create the ***'right practice'*** for WNA (i.e. the desired 'to-be')

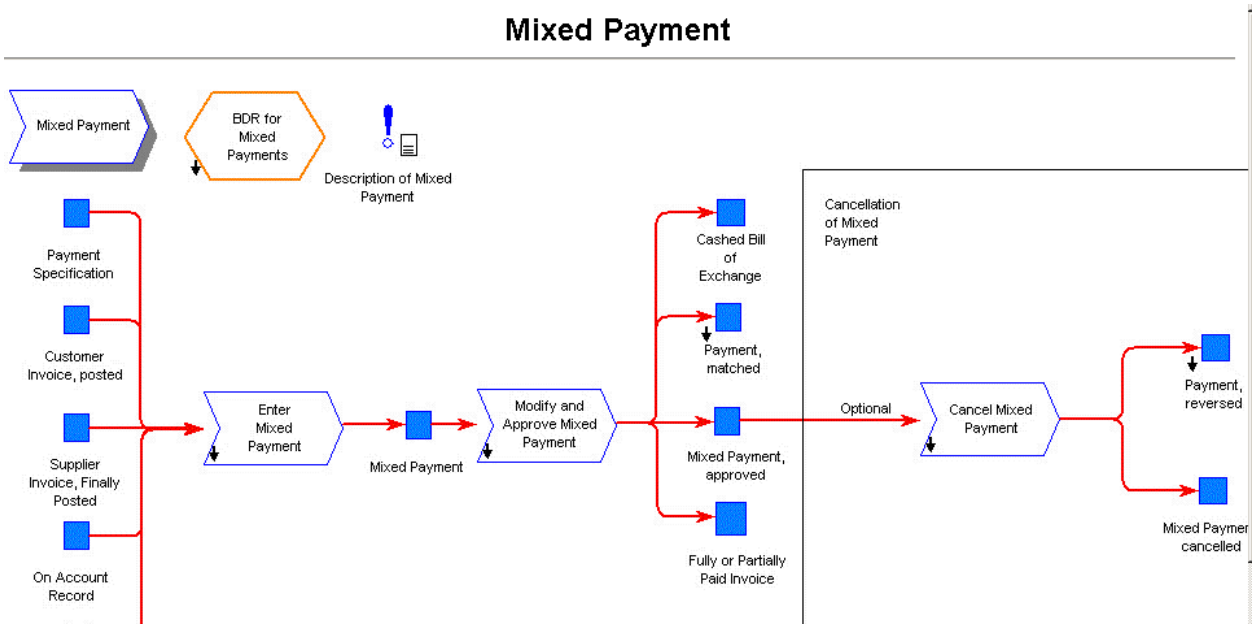


Figure 19: Example of 'Mixed Payment' process flow using *Business Modeler*

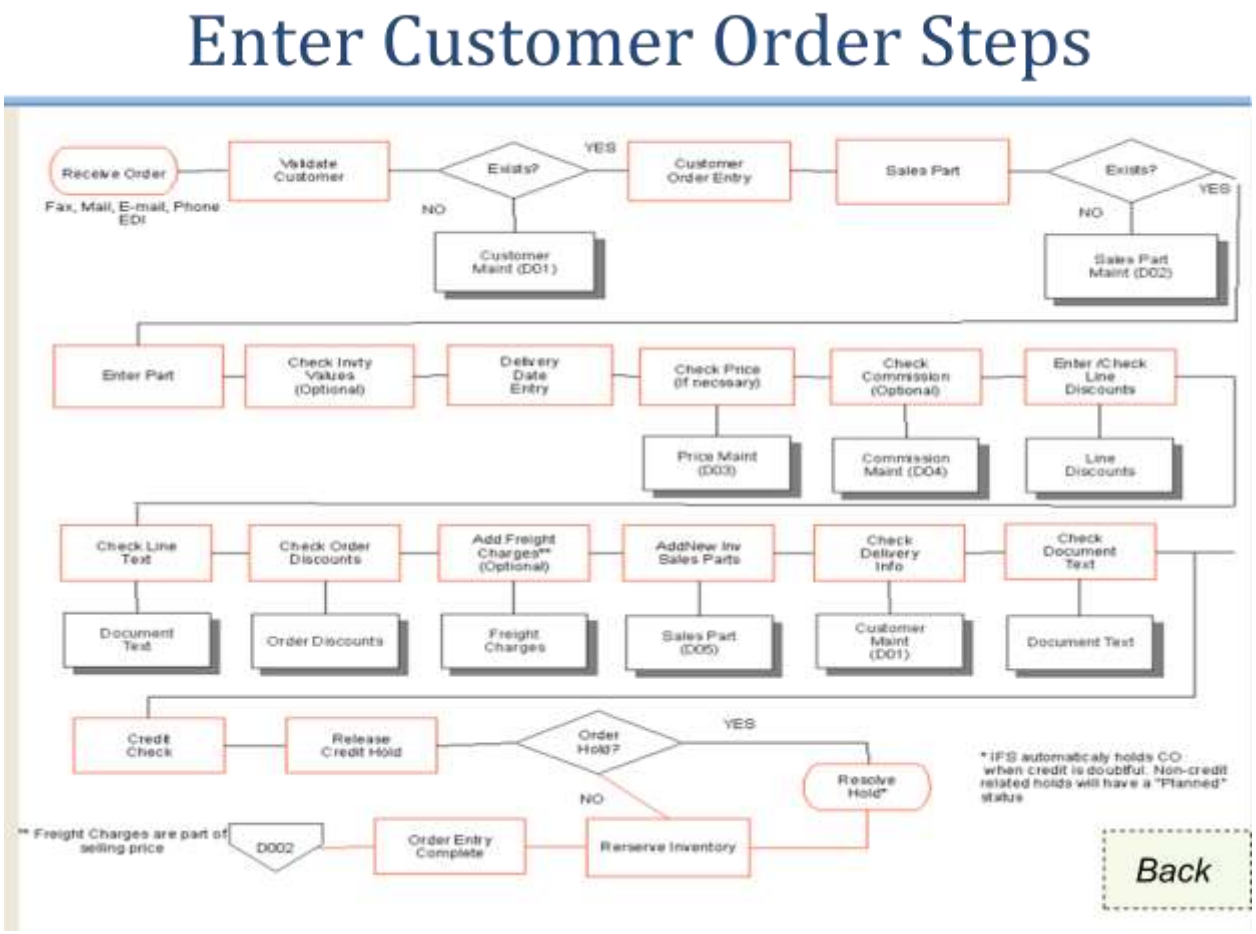


Figure 20: Customer Order Entry process using Flow Diagram

The process closely parallels Nonaka's (7) Spiral of Knowledge where tacit knowledge is articulated and made explicit. It also highlights the influence of external parties in shaping the new knowledge. Consultants bring their past experiences of implementations and add context to the business models, which helps to shape the new process.

Even allowing for the contextualization of the flow diagrams provided by the consultants, the flow diagrams, and to a lesser extent the Business Modeler, can be criticized for over simplifying complicated processes and inability representing alternatives to the process that potentially denies the operation the opportunity to use a more flexible approach. To ameliorate that criticism WNA developed *'Rich Pictures'*

(see below) to show the dynamic relationships between the processes during the *'As-is/To-be'* stage and creating a narrower set of options using the process flow diagrams when training the *'end-users'*

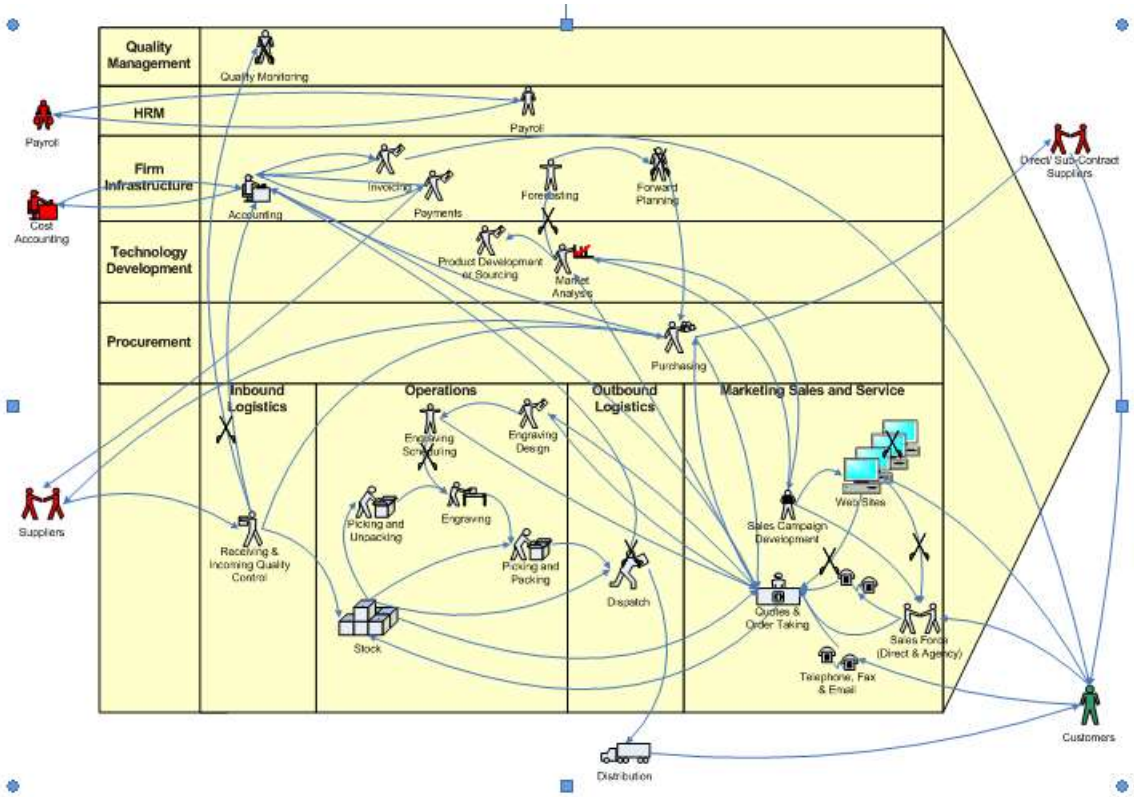


Figure 21: A 'Rich Picture' interpretation of the Shipping process

Example: WNA is a *make-to-stock* manufacturer but one of its primary objectives is to turn inventory multiple times a year. One of the challenges is trying to provide a broad product range, at the same time producing in economically large batches and responding to customer requirements at short notice. In other words Production Planning tries simultaneously to be both **flexible** and **efficient**. A consequence of this strategy was often the product was being manufactured the day of dispatch. The *'vanilla'* version of the ERP software worked in a sequential step process where products would be **inventoried**,

reserved, **picked**, **documents printed**, **shipped** and **invoiced**. If there was no product in stock the goods could not be shipped and if the process could not start until the products were in stock then there would not be enough time to ship the goods that day. The most efficient process was discussed and agreed by the implementation team. It looked, at first, to be counter-intuitive. It was to **generate shipping documentation**, **ship the goods** then in the ERP system **inventory the goods**, **reserve, pick, confirm shipment** and then **invoice**. Although simultaneously completing the task and entry in to the ERP system (perhaps with a bar-coded system) was the *'ideal'* solution; the team believed a pragmatic solution would balance the needs for speed, efficiency, cost and flexibility. To enable this process to be implemented required the 'breaking' of the sequential processing rules in the ERP system by customization.

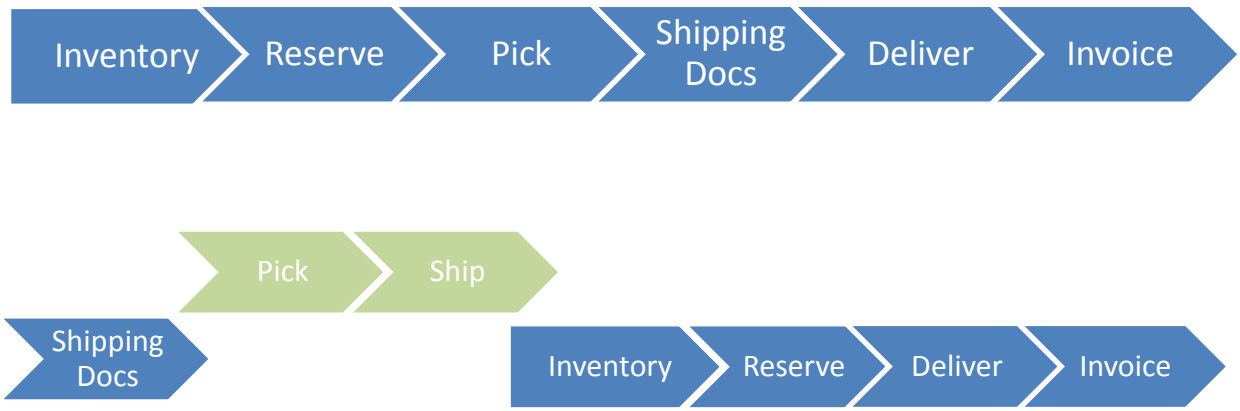


Figure 22: 'Best Practice' and Pragmatic Shipping process

The solution had the following benefits:

- It reduced the occurrences of shipping goods late because the shipping documents were already printed when inventory became available.
- It avoided the cost of adding additional entry clerks to maintain the system in real-time. Instead the personnel were allocated to ensure the product was properly picked and packed.

- The shipping manager was able to print the shipping documents up to two weeks ahead of time and schedule truck stops and call ahead for appointments at the customer's Distribution Centers.

What was contribution to KM?

The 'As-is/To-Be' phase of the project, as exemplified by the *'Shipping VAP'* above, demonstrated creation of new explicit knowledge through the development of new processes and the storage and retrieval of the knowledge processes that were embedded in Rich Pictures, Process Flow diagrams and the parameterization and customization of the application. The contribution to improved organizational performance was demonstrated through reduced labor costs, more efficient utilization of trucks and showed that the IT system could be aligned with the 'Just-in-Time' environment of the organization in the most pragmatic way. This phase of the project also brought together the collective knowledge and experience of internal and external 'experts' who collectively developed new processes and closely paralleled Nonaka's *'Spiral of Knowledge'* and the DIKAR model.

2. Knowledge Process – Learning, Training and Education

Description: It was recognized that having the consultants training all the users in a classroom was very expensive, it was difficult for end users to grasp the concepts and distracted the consultants from providing the specialized knowledge to those who needed it. Consultants tended to think in terms of concepts, choices and aggregated processes. End users thought in terms of predetermined steps, outcomes and the disaggregated detailed processes. What is often necessary is for internal 'Key Users' to provide the context to the concepts, make the choices and disseminate the information to the end user in the form one-on-one training and personalized 'User Manuals'. The approach is often known as 'Train-the-Trainer'.

How was it used to create knowledge?

At WNA, the following information was collated into an overall training program.

- The To-Be processes developed in the preceding phase of the project.
- The E-learning ERP training application.

- A populated and parameterized training database.
- Web-based hyperlinked help screens.
- Organization's established policies and procedures.

The Consultants, Key Users and IT team needed to distill this information and create discrete learning modules containing exercises taught through training classes to user groups. Training for the end-user took place close to the 'Go Live' phase as possible. This avoided any late changes to the processes having to be re-taught to the user. The emphasis was on practice and repetition to reduce the chances of the users forgetting what they had learned.

Example. Once the *'To-Be'* phase was completed and approved by the Project Team, the Key and End Users were assembled in the project team room and provided with an overview of the scope, timeframe and content of the forthcoming Training courses. (*See Order Fulfillment example below*) Through demonstrations of the application and Power Point ™ slides, the users where shown an example of an 'end-to-end' process. The intention was to convey to the users the integrated nature of the processes and to understand how the processes they were responsible for helped to ensure the successful execution of the completed task. Implicit in the demonstration was the interdependence and reliance each of the users had on each other and that good information sharing and collaboration would benefit them as well as everyone else involved in the process.

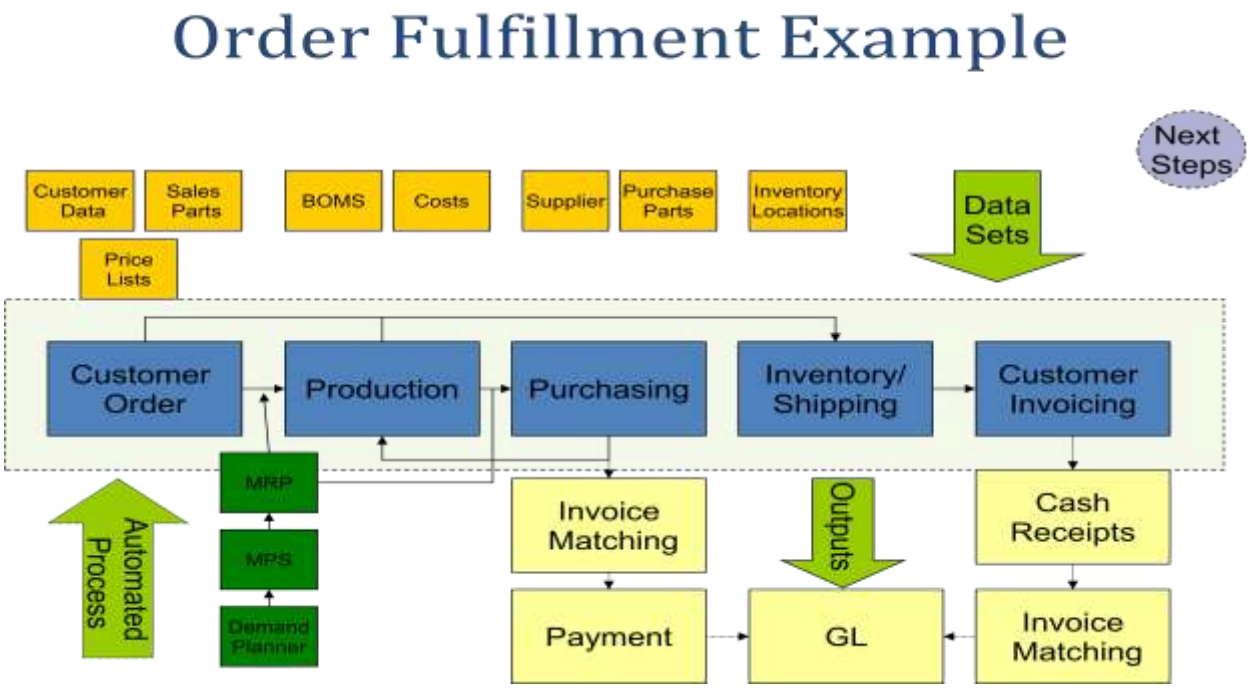


Figure 23: Example of Order Fulfillment process shown to 'End Users'

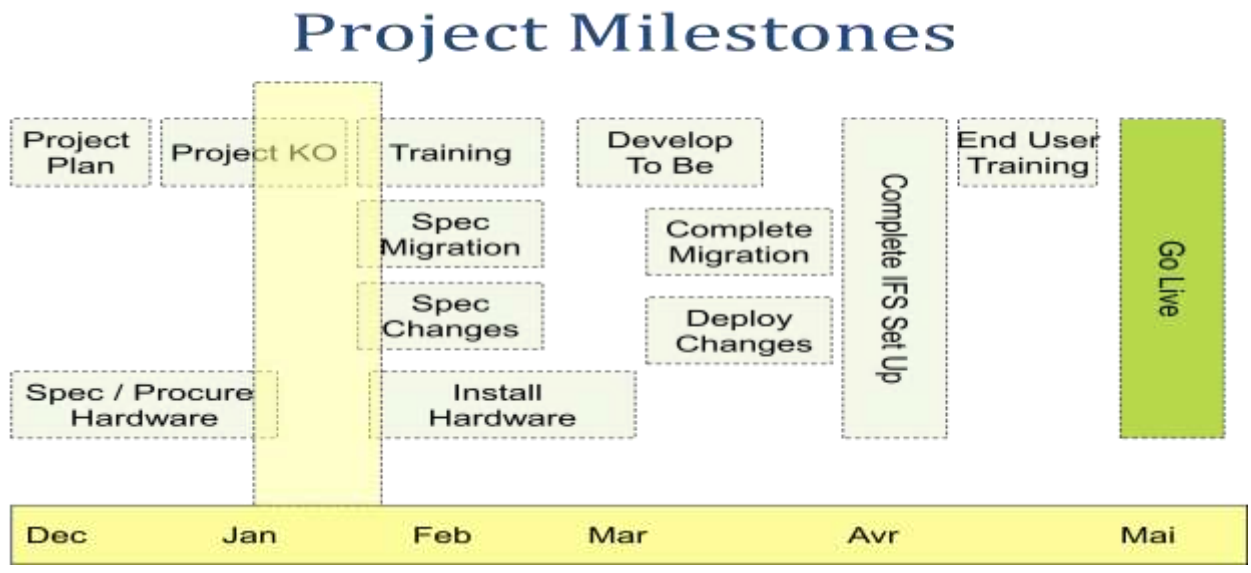


Figure 24: Presentation of Project Milestones shown to 'End Users'

Over the following weeks the end users were then given instruction on their discrete processes by using the application in conjunction with the personalized User Manuals. This process was not an absolutely top-down although process consistency between all the sites was a major objective. When end users could demonstrate flaws or necessary deviations in the processes (especially in French speaking Montreal) these changes were made to the process without comprising the overall objectives.

What was the contribution to KM?

The initial stages of the learning process where the consultants, IT and Key Users devised the training modules was both tacit and explicit information sharing. The implicit knowledge that these groups possessed was made explicit though socialization. At this stage there were opportunities for process validation and modification. The explicit knowledge was given organizational context and reproduced through user manuals, one-to-many and one-to-one training to the end users. The end users internalized the knowledge and made it implicit to the job. At the latter stage of the learning process there is little scope for re-interpretation. The focus is on information retrieval and knowledge transfer and application. Learning is by practice and repetition until cognitively embedded and in most cases the end users would not consult the personalized user manuals soon after '*Go live'*.

The Learning, Education and Training initiative increased the knowledge at WNA by enabling simulation and testing of processes, by setting a collaborative workspace, identifying the workflow between processes, highlighted the communication and interdependence of the groups within the organization within a learning environment.

3. Knowledge Process - Customizations

Description: By customizing the ERP application creates the potential to create a sustainable competitive advantage by uniquely modifying the code to more closely align the IT system with the requirements of the organization. It also strives to capture the collective company-specific knowledge of the organization within the functions and application of the software.

How was it used to create knowledge?

There are various levels of customization that can be done to an ERP system. The most superficial level is parameterization. The level of parameterization can be so extensive that no two companies are likely to have the same settings, even within the same industry vertical. Another example is where ERP

software applications provide end user customization tools. An example of this is a ‘Configure-to-Order’ module that enables the organization to create a customized product subject to limitations and constraints configured by the end user. The most extensive type of customization is where the underlying code is changed. Customizations benefit the organization by implementing value added processes that improve the performance of the company. The disadvantages of customization is that they are expensive, difficult to specify and program and difficult to assimilate with the rest of the application. A more significant disadvantage is that the customization will not be upgraded when the company migrates to a new version of the software and locks itself in to a self-created technology constraint that precludes future innovation.

Example: The role of the Marketing function is to provide a range of products to its customers, sell it at a price that covers the cost of production plus profit and sell at a volume that the production department’s output can match. There is an extensive set of marketing programs to support those objectives at WNA. For instance:

- Paying Commissions to brokers who sell the product into niche markets.
- Rebates to customers and buying groups based on meeting sales volume targets.
- Price support for distributors who sell on to non-profits institutions such as schools.
- Deviated pricing programs for targeted sales promotions and entering new markets.
- Escalated and de-escalated pricing linked to the cost of oil.

It is unlikely that any ERP system or specialized *best-of-breed* application can support the complexity, range and dynamic nature of the pricing programs that marketing develops and IT needs to support. Consequently WNA maintained it marketing programs on spreadsheets populated with data re-entered from the ERP system. The process was extremely time-consuming, there was lack of organization-wide visibility of the programs and increasing inaccuracy as new marketing programs were being developed. It was estimated that WNA was overpaying customers and brokers $100,000 per year in the form of rebates and commissions. Given the extent of the overpayment, it was decided to create a specification to write a new module so that the programs could be entered directly in to the ERP system.

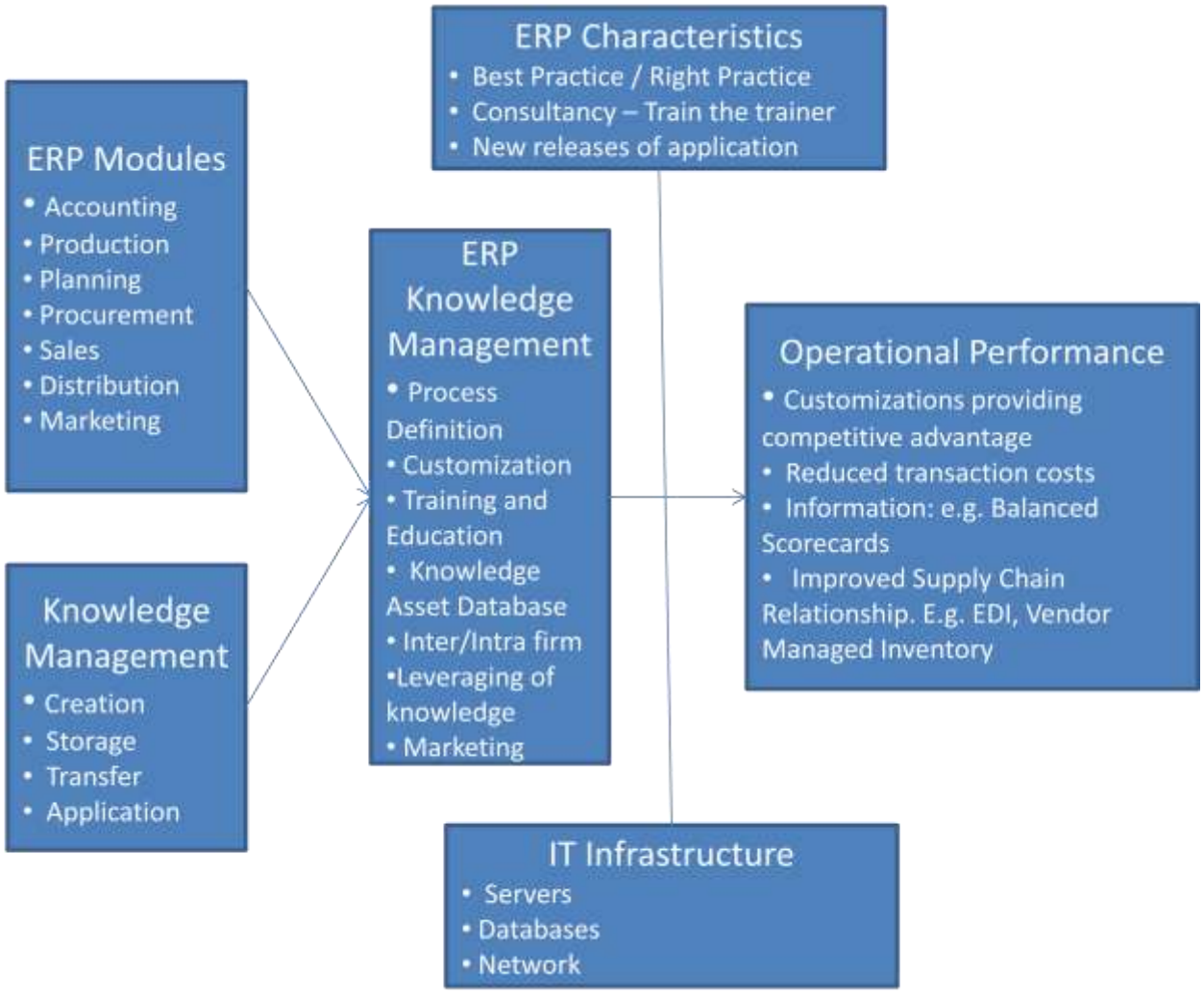
The Contribution to KM

The resulting customization demonstrated all the elements of DIKAR and the knowledge cycle. The data that was entered as part of the customer entry process was retrieved through sorted and grouped reports. The Customization team that comprised WNA and IFS team members analyzed the information and with the newly acquired knowledge used it to develop a customization specification. The knowledge was transferred to the software programmer using the specification, interpretation and communication of the specification by the customization team. Feedback was provided by the programmer when certain specification requests broke the programming logic. Deliveries of the partially coded program were delivered and tested according to a formal test plan. Additional feedback was provided by the customization team when either required functionality did not work or additional enhancements were identified. The result was completed program modifications that more accurately calculated the pricing programs and reduced the administrative costs of apply those programs.

The newly acquired and applied knowledge was the result of teams working together within, and at the boundaries of, the organization. WNA worked with the ERP consultants, the brokers, distributors and customers to ensure the smooth implementation of the customization. It also helped to solidify the relationship with the customers. By providing bespoke marketing programs tailored to suit individual customers it strengthened the relationship, improved the supply chain and increased the customer's switching costs of moving to a WNA competitor.

Summary of ERP KM initiative

ERP systems have the potential to create, store, transfer and apply new knowledge in an explicit ways through the entry of data that allows the classification of information for decisions making. There is evidence at WNA that it has realized this potential as well as succeeding at a more tacit level of knowledge creation by leveraging its IT infrastructure across the enterprise, changing the culture and applying that culture to all the subsidiaries through the developing and implementing of consistent process and procedure. The relationship between the ERP system and the knowledge management objectives can be summarized in the figure below:



At WNA the ERP system has provided support for the continued development of knowledge over a sustained length of time. It can be shown to have a positive effect in the following areas

Facilitated change in culture

From four ERP systems to one has enabled intra-company relationships to grow and rivalry to decrease. There was also a shift in and location of knowledge ownership. Information moved shifted away from user-controlled spreadsheets and databases with little company-wide scrutiny to highly visible data not directly controlled by any one user and centralized databases subject to substantial internal (Management) and external scrutiny (Auditors)

Continued development of ERP system

External auditors[14] highlighted WNA's IT investment in, and adoption of, a continuous implementation of ERP modules, processes and procedures as positively contributing to its operational performance rather than using ERP solely to squeeze costs and duplication out of the organization.

Provided a process consistency

All sites undertake similar processes according to externally audited standards linked to ERP user manuals. Sites are allowed localized processes when working in particular markets such as French-speaking Quebec.

Integration and linkages to support external relationships

The use of EDI, 'Vendor Managed Inventory' initiatives and customized Marketing programs has helped solidify WNA's relationships with its customers, distributors and brokers. It engendered goodwill and reduced intra-company business costs.

Provided information for decision-making

Balanced Score Cards and monthly financial and budgetary reports allows monitoring of business and operating trends and provide some input towards future decision-making.

Best practice and process consistency has reduced flexibility and creativity

One negative aspect of the ERP implementation is that adherence to set policies and procedures and pre-set parameterization of the system reduces operational flexibility and deters creating thinking and innovation.

[14] The report by Protiviti an independent IT Risk Assessment Consulting organization identified the strengths of the ERP system at WNA as *" an appropriate ERP system that has been successfully, consistently and effectively used enterprise-wide. Several of our interviews confirmed that the business users of the system are knowledgeable about IFS's capabilities and are satisfied with its functionality and performance*"

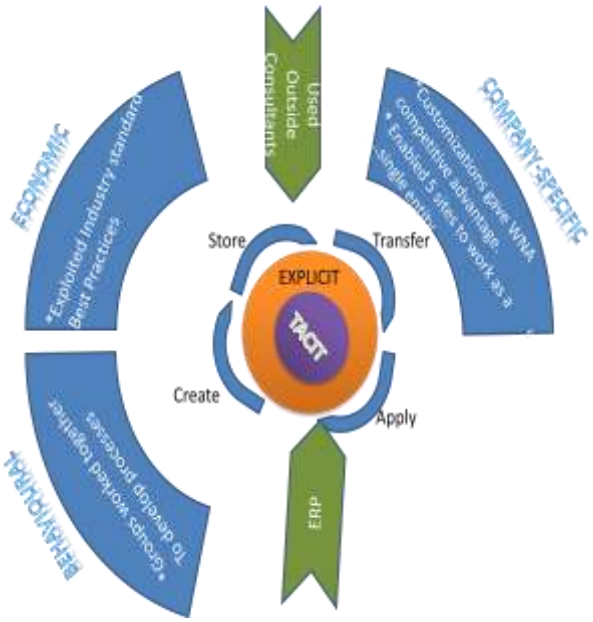


Figure 25: The impact of ERP on the Knowledge Cycle

Knowledge creation, retrieval, transfer and application opportunities through the use of collaboration and Social Networking tools at WNA

Introduction

It was stated earlier that the IT strategy at WNA was to react and align the IT assets to support the business needs but also **anticipate** them. The implementation of collaboration and social networking tools falls firmly in the second category and getting capital expenditure approval to develop tools when competing projects have far better defined payback is difficult.

The objective of the knowledge management initiative to implement collaboration and social networking tools was to develop IT applications that could be used by formal and informal groups within and outside the company to enhance knowledge creation and sharing opportunities. This was to be achieved by creating an intranet portal through which all information repositories could be accessed.

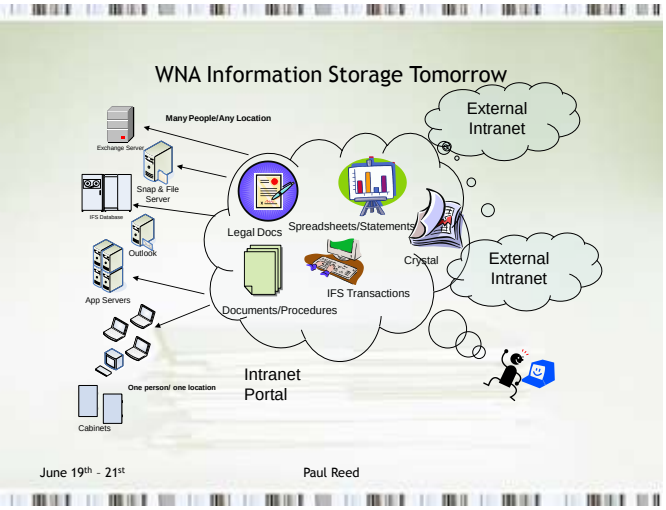


Figure 26: Creating an Intranet Portal to enhance collaboration

A corporate intranet is an efficient tool for the storage and flow of explicit knowledge. Such a tool can quicken employee responses and improve decision making, which can lead to innovation (Bennett and Gabriel, 1999) (54). It was hoped that the implementation of collaboration and social networking tools would have the potential for tacit and explicit knowledge creation and transfer through the easy storage and retrieval of information. In addition users would get access to externally controlled forums and other sites where information resided which might also be relevant.

WNA Intranet

No formal capital expenditure authorization was forthcoming to develop the intranet and therefore the site was developed using the existing IT budget and utilizing the current IT infrastructure and 'freeware' where ever possible. The implementation steps were as follows:

- Design an overall intranet website and provide links based on department.
- Use Windows ™ Group Policy on the network to force the site to be the users' home page upon starting the internet or email.
- Educate the users as to the features and potential of the intranet.
- Upload all IT documentation to the site and direct users there as the primary source of IT information.
- Ensure that IT posts all alerts (system failures, schedules maintenance and email alerts) to get users familiar with looking and using the intranet site.

The result of the implementation was a primitive-looking intranet web-site which lacked many of the best practices and features that a professionally designed site would have included. Excepting IT, three other departments expressed a preference using it for their users.

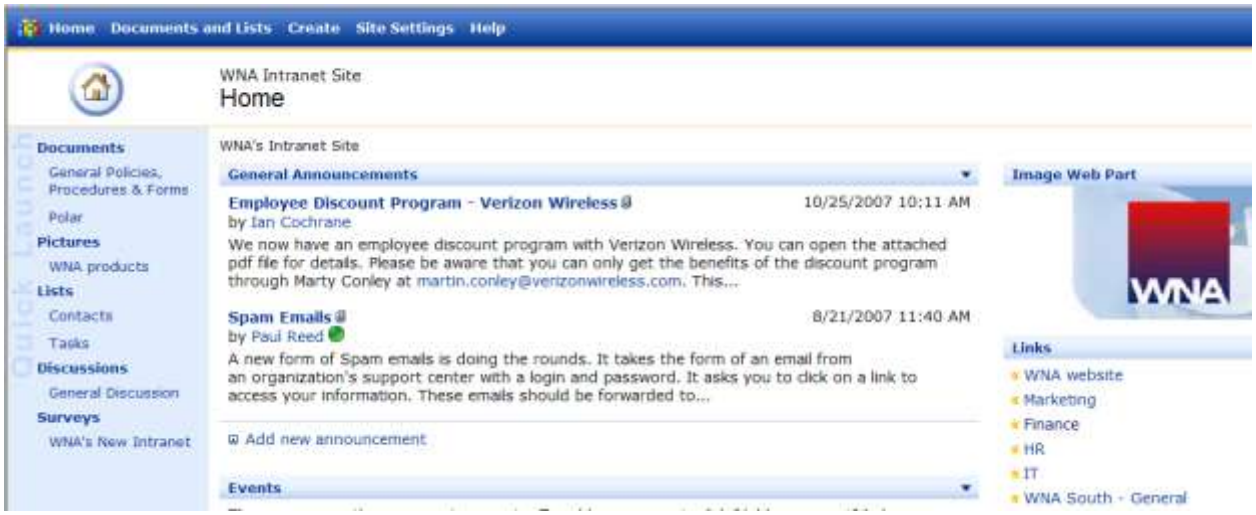


Figure 27: WNA Intranet site

Finance Department

The objective of the Finance group was to create a space where financial and auditable data would be available to the individual site Financial Controllers and the Corporate Controller on a timely basis.

Results and experience

The CFO mandated that a reconciled preliminary financial close using the ERP system be completed by the third day of the next fiscal month. The corporate controller would sign off that each site had completed the close upon receipt of an automated email alert that the relevant financial documentation had been uploaded to the intranet. The controller would then prepare the consolidated financial spreadsheets and monthly financial report by day 10. Upon sign off by the CEO, the consolidated reports were filed with the financial regulatory authorities. The creation of a mandated and specific set of financial operating procedures and metrics ensured a 100% adoption rate by the financial users and over a three-year period the number of days to close the financial books had reduced from 15 days to 3 days while at the same time the number of financial reporting sites had increased from three to six.

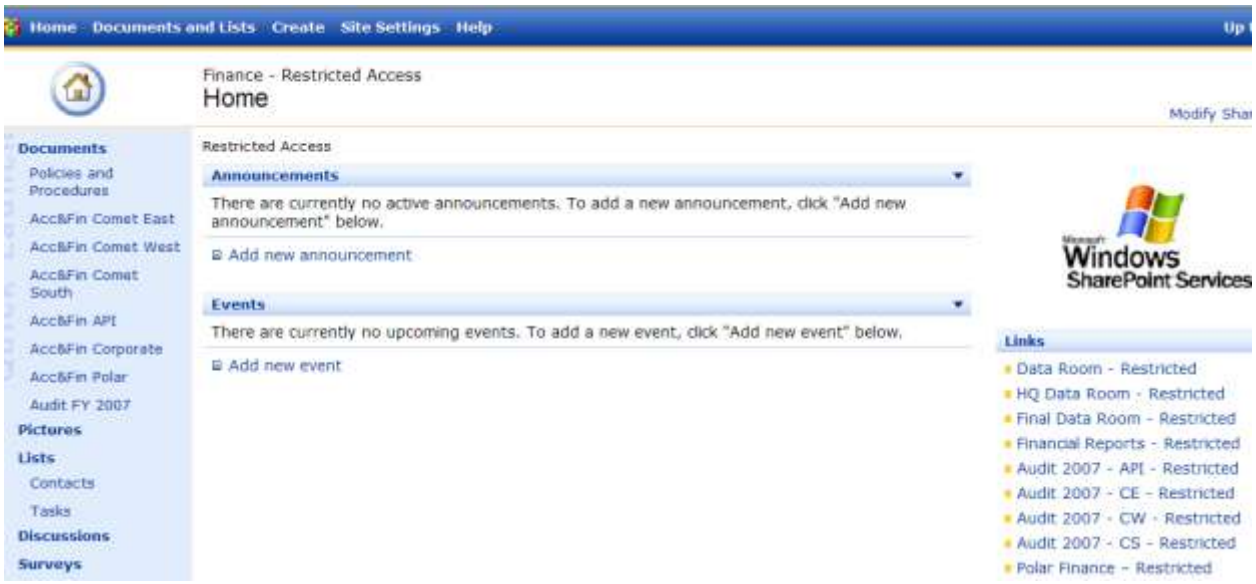


Figure 28: The 'Finance' site on the intranet

The next step was to extend the process to the annual financial audit. A new audit site was developed and access was given to the financial controllers and the external auditors. The process was essentially the same. Upon completion of an auditable document, each site's financial controller would upload the document to the ***Audit*** intranet site. This would generate an email alert that would notify the corporate controller and the auditors that a new document was ready for auditing. The objective was to reduce the period from year end close to the reporting of preliminary audited results from 75 days to 45 days and reduce auditing costs by reducing the number of days the auditing firm would be engaged and the number of days the auditor needed to be on site to gather and work on the financial documents. In the financial year 2006/2007 all but the Canadian site managed to meet the targets. Auditing costs were reduced by $30,000 but this was well below the $100,000 targeted cost savings.

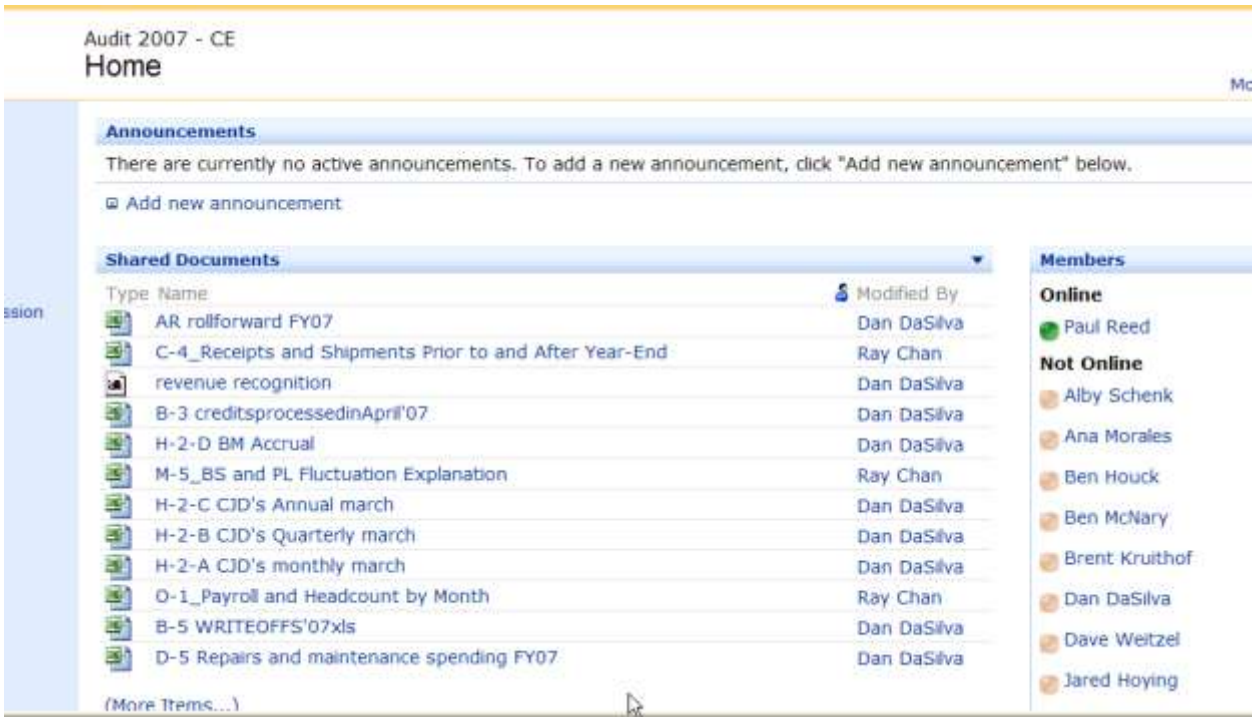


Figure 29: Example of Audit data on Intranet site

The next financial initiative to use the intranet was potentially the one that could produce the greatest impact. The decision of the private equity owner to put WNA up for sale in the summer of 2007 would require the creation of a "Data Room" intranet site. On this site all the relevant operational, financial, tax, HR documentation required to sell the company by all the relevant departments was uploaded and validated by the CFO and the rest of the Executive team. Once validated, the data was transferred to an independently controlled virtual on-demand workspace data-room managed by *Intralinks*. (www.intralinks.com). Over 12,000 documents were uploaded to this site and allowed prospective buyers to view all the relevant purchasing data in one place in a secure, controlled internet site. The eventual buyer would use the extensive and detailed information with the more tacit observations derived from the on-site visits and interviews as the basis of the subsequent purchase price negotiations. From the seller's perspective, they are able to tell which buyers are interested in purchasing the company. The internet tools would provide them the ability to see how many and which particular documents were viewed and for how long each potential buyer viewed the site. With this information and the face-to-face interviews the sellers could determine how serious the potential buyer was and at what price to pitch the company at. Based upon the feedback from the page views on the

intranet site the seller could also anticipate what questions and concerns the potential buyers may raise and prepare accordingly.

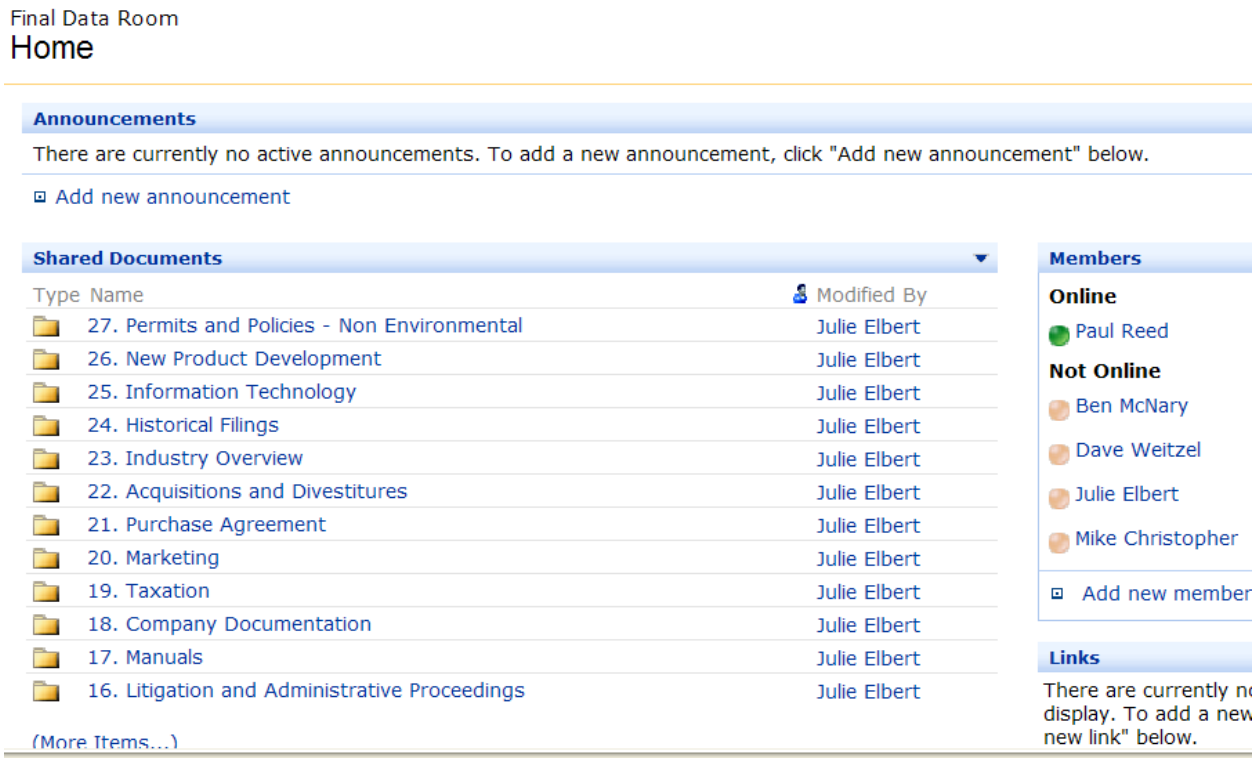


Figure 30: Example of Data Room sale documents

Contribution to Knowledge Management

The transferring and sharing of financial information on the Intranet seems like a natural partnership. The data is very explicit and tangible as it is expressed and communicated very easily in spreadsheets and other financial reports. Although it is not entirely context free it enables interpretation by external parties relatively easily because it conforms to industry standard Generally Accepted Accounting Principles (GAAP).

The shared workspaces provided the ability to collaborate and transfer information across North America internally as well as with third parties that would otherwise be faxed, phoned, emailed, duplicated and reside on a myriad of systems. During the interviews with the financial controllers they indicated that one of the main benefits was that they now had visibility of each other's financial data as

well as understanding of how other sites classified and accounted for different financial situations, e.g. contingencies reserves, accruals, deferred taxation provisions, etc. This information was then applied to their own environment (explicitly) as well as providing the catalyst for controller-to-controller(s) periodic meetings which supplemented their explicit knowledge with more tacit and rich transfers of knowledge which resulted in a *de facto* Communities of Practice.

This experience can be compared and contrasted with the HR and Marketing Groups. The results to date are less impressive. Initial material was uploaded to the sites but the collaboration workspace has not succeeded in its objective of transferring knowledge. The 'technology' was relatively unfamiliar to them and they found it difficult to recognize the merits of using it. Although secure, HR and Marketing departments are still very wary about sharing confidential information about their employees and customers because they cannot control access themselves but need to rely on the IT department to do so. In Marketing the development of a weblog and discussion forum did not work because all the members of the forum were known to each other so there was a relative lack of anonymity when adding a comment or question to the forum unlike what would normally be the case with an internet forum.

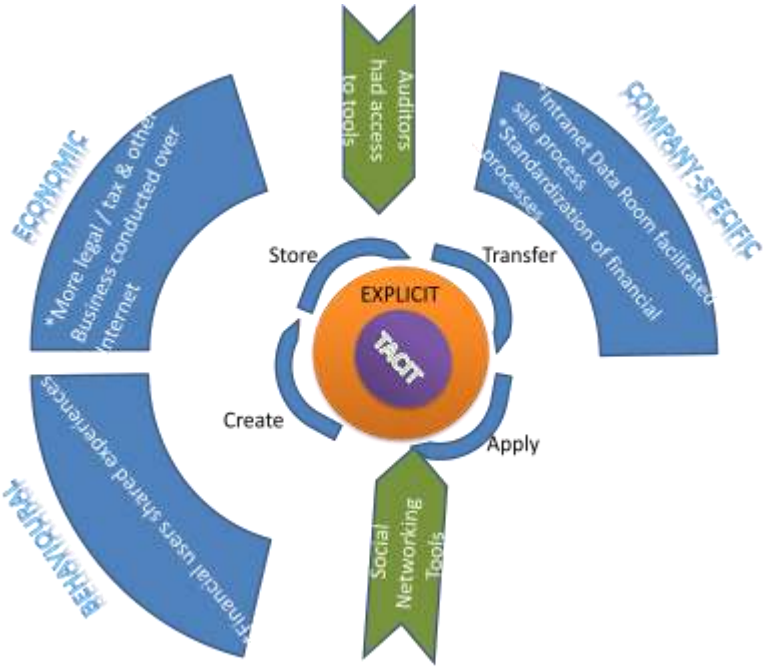


Figure 31: The impact of Social Networking tools on the Knowledge Cycle

The Overall experience of Knowledge management at WNA

In the final piece of research for the dissertation it was decided to compare the usefulness of each of the technologies and their contribution to knowledge management at WNA. The users were asked to rank according to the Likert scale the use and effectiveness of various technologies for managing knowledge that they would be familiar with. When asked to rank their usage, the respondent would score 5 if they always used the technology through to 1 if they never used the technology. When asked to rank effectiveness the respondent would score 5 if the technology was personally very effective for them through to 1 if it was of no use to them whatsoever.

From the results it became apparent that more conventional and well known technologies scored better than newer more sophisticated tools and that more tacit and rich forms of knowledge transfer such as face-to-face conversations and the telephone were preferred over tools that distributed structured and codified knowledge (ERP systems and Help Desks). This supports the notion that face-to-face communication is a pre-requisite for successful knowledge management (Davenport, Prusak 1998) (38)

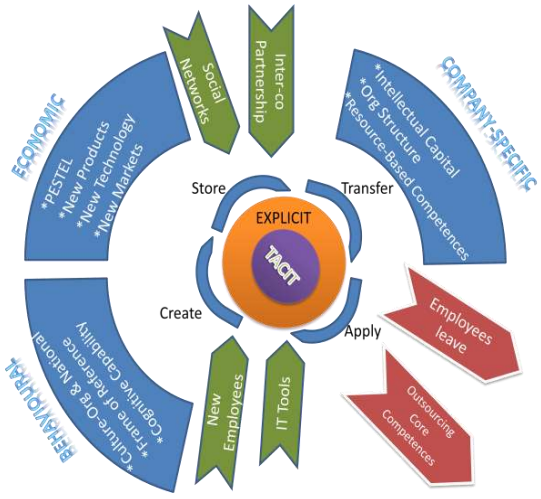
Technologies and Techniques	Mean Value		Technologies and techniques
	Usage	Effectiveness	
Email	4.5	4.8	Face-to-Face Meetings
ERP system	4.5	4.5	Email
Telephone	4.5	4.5	Documents & Crystal Reports
Face - to - Face Meetings	4.3	4.3	Telephone
Bulletin Board Meetings	4.0	4.0	Instant Messaging
Instant Messaging	4.0	4.0	Off-site Internal Conferences
Internet / Intranet	4.0	3.8	Internet / Intranet
Documents & Crystal Reports	3.8	3.5	ERP
IT Training & Education	3.5	3.5	Bulletin Board Meetings
Project Initiatives - e.g. Six Sigma	3.5	3.5	IT Training & Education
IT Help Desk	2.5	3.5	Off-site External Conferences
Off-site External Conferences	2.0	3.0	Outside Specialist Consultants
Off-site Internal Conferences	2.0	3.0	Video Conferencing e.g. Web-Ex
Outside Specialist Consultants	2.0	2.8	Project Initiatives - e.g. Six Sigma
Document Workspaces/Collaboration Tools	2.0	2.0	Document Workspaces/Collaboration Tools
Video Conferencing e.g. Web Ex	2.0	2.0	IT Help Desk

In the interviews that followed the questionnaire the reasoning behind the rankings that the respondents had given became clear. Users preferred knowledge storage disseminating technologies and techniques that they could control and modify. Face-to-face communications are easy to control. Email and Instant Messaging are other examples. Users were very careful how they shared the information. The recipients of their emails and instant messages could be specifically selected and the responses could be nearly instantaneous. This problem is acknowledged by Nahapiet and Ghoshal (1998) (55) who assert that the availability of electronic knowledge exchange does not automatically include a willingness to share the information and build new intellectual capital. Those technologies and techniques that were perceived to be under the control of IT were less well used and were deemed less effective (Collaboration tools). Frequently users noted that some of the tools were too 'cumbersome' to

use. For instance it was easier to send an email attachment and request the recipient to respond specifically based upon the content of the email than to upload the document to the intranet and anticipate that the recipient would analyze it in the way the sender required. This supported the notion that users preferred to send explicit information with more contextual explanations of the information they were sharing with others. Although the volume and relevancy of the documentation stored on the intranet was significant there is a danger that IT is building what Scarborough et al (1999) (56) described as "Corporate 'Tower of Babel' where information drives out understanding"

It was also noticed that users would rather ask for information and documents 'on-demand' through email, face-to-face and phone conversations than go and search for it on the intranet or public folders. This can be explained maybe by laziness and unfamiliarity about using the tools to retrieve the information as well as wanting someone else to validate that the information they request is accurate, up to date and relevant for the purpose they want to use it for. If this is the case then one wonders how much further technological tools can progress in such environments.

Conclusions and recommendations



The objective of the knowledge management initiatives in the case study was to show how successfully they contributed to the creation, storage, transfer and application of knowledge within the underlying

contexts that influence the cycle of knowledge such as Company-specific advantages, Behavioral and Economic variables outside the immediate control of the company's executives as well as specific variables that the company can exercise control over.

The case study examined a number of IT technologies implemented at WNA and examined the contribution to knowledge that these technologies had and consequently the following conclusions were derived.

Knowledge Ownership

The implementation of the ERP resulted in a shift the ownership and accessibility of information at WNA. The shift was away from user-generated spreadsheets and access databases that controlled the input, storage, transfer and use of the information to centrally stored information that was assembled by many users through data entry screens. The universal creation and access of data increased its credibility and allowed increased analysis and categorization of the information. Sophisticated reporting tools such as Crystal reports were used for decision-making purposes, which in turn generated action that required knowledge interpreted from information derived from data. The open-standard architecture of the ERP system allowed greater integration with external parties through the use of EDI and Vendor-Managed Supply Chain initiatives. The knowledge cycle is therefore clearly observable at the operational level but far less easy to discern at the strategic level.

The Demerest Model suggests that the flow of information will increase employee emancipation. There is no direct evidence to support this at WNA. Although this may well have been an outcome the perception of the users was that they were constrained and by the process flows, parameterization and categorization of data decided upon by others which limited their ability to enter and retrieve information as they had done previously. They were also intimidated by the new IT tools which were unfamiliar to them.

Need for a strong IT infrastructure

WNA is a distributed group of companies across North America and it required a robust set of network, hardware infrastructure and applications to 'bind' these sites together and derives the operational synergies of a larger organization. The implementation of the company-wide email system contributed

to the stronger linkages between the sites as well as providing a visible embodiment of WNA as a single entity.

It also became apparent that the success of the ERP and Email system increased demand further for more extensively accessible enterprise-wide applications. IT was, therefore, creating demand for, as well as responding to, increased demand for knowledge creating tools.

The changing culture of the organization

IT-based initiatives need to be aware of the current organizational culture as well as an agent of change. Roll-outs of the ERP Implementation blueprint often met resistance from newly acquired companies as they identified that they would lose a certain amount of autonomy and would have to change deeply rooted processes. Occasionally they would have to replace a well-executed process for one that would work less well for them but had benefits for the organization as a whole. The best approach was one where IT focused on forcing the sites to change the processes that had the biggest impact on the organization and being flexible on the interpretation of less critical processes and seeks to change those in the future. By the end of 2007 the WNA organization was in a position to drop any reference to old proprietary names and brands in favor of a single WNA name and brand and this was facilitated by the adoption a single IT structure and set of applications that had been developed over previous four years.

The Possessor of Knowledge

Knowledge is possessed by the individual but that knowledge is enhanced when working with groups and IT can facilitate group work through the use of email, ERP and Intranet tools. The development of operational processes and customizations were the results of collaboration between internal and external groups. The limitations of the notion that knowledge can be stored electronically can be demonstrated by the IT policy of making available the email and documents of ex-employees to all the employees in the functional group. It was noted that this information was rarely queried. Instead employees would rather re-create the information themselves than re-use someone else's.

The use of different IT tools for different knowledge enhancing activities

It was noticed that users used telephone conversations or attachments to email to provide context to the explicit information they were sending rather than allowing the recipients to interpret the information themselves. This may account for the success of the email implementation and the relative

lack of interest in the intranet tools which sought to capture context-free documentation and information. IT needs to ensure that it is using the right tools for the objective at hand. It should not be, nor was it, the objective to electronically capture and disseminate knowledge within WNA but to deploy a wide range of different tools that matched the tacit and explicit nature of the knowledge that was being communicated

Social networking and on-line tools

Many Social Networking tools were regarded as non-business applications by many, partly because they had used them in their personal lives or as a way to network with partners, but not with other employees. They maybe some awkwardness in using these tools internally because using them outside the organization they allow people a certain amount of anonymity when espousing their ideas and opinions that you do not have at work. However, IT used these tools extensively because there was a wealth of information (mostly context free) on the purchasing, fixing, appraising and troubleshooting of hardware and software. Well known examples included 'Experts Exchange' www.experts-exchange.com (subscription-based), Microsoft forums, Blackberry forums. These forums were under-utilized by less technically confident users or where problems were more contextual or company specific.

The Motivation to use IT tools to Facilitate Knowledge Management

Where there was a motivation to use IT tools the success of the knowledge management initiative was much greater. For instance when it was personally beneficial to users such as the use of company email or instant messaging; where it was mandated by a manager/director or where it was a normal cost or method of doing business (e.g. Fed-Ex / UPS Powership or Intralinks). When these motivations exist then adoption and acceptance was nearly universal.

IT was a Basis for Competing and not the 'Order Winner'.

There is no direct evidence to suggest that IT tools increased sales but without IT those sales could not have been made (For instance EDI transactions). It is a valid conclusion that IT provided the tools to ***create*** new knowledge, ***capture*** the information upon which decisions could be made and ***communicated*** quickly and widely. (E.g. Crystal reporting tools, the ERP system and email) It is far less clear how IT was used to ***apply*** new knowledge. It is argued in this dissertation that the application of knowledge is in the domain of the possessor of knowledge who makes a decision that results in action. We can observe the results of the action through the IT systems. For example we can look to the

implementation of a new marketing program resulting from intelligence from the sales regions and interpretation of sales data or registering of new Patents (Reflections ™, Masterpiece ™.)

The Construction of Knowledge at WNA

The 'socially' constructed models more closely resemble the knowledge processes in the company. The information that was being communicated was highly contextual – both synchronous and asynchronous communications. There were multiple overlapping projects with differing and sometimes conflicting requirements. Information and processes were in a constant state of flux. For IT to reflect this construction of knowledge and align itself with the organization's changing objectives needed a flexible approach and not one where IT tries to suffocate a chaotic environment and enforce order. Instead IT accepted the chaotic environment as one that generated above average operational performance and implemented loose and flexible applications and technologies at an acceptable cost that were scalable and ultimately economically replaceable if different technologies were needed. No conclusions can be reached on the level of knowledge retention within the organization. It is likely that socially constructed theory of knowledge that is developed through experience, approximation and trial and error may influence the state of long-term knowledge retention within the organization. A more organically developed focus on knowledge creation may be more adaptable and better aligned to the organizations objectives. Codified acquired knowledge may be less adaptable, less contextual, become outdated and more easily forgotten.

However, there was no **single** technology or methodology to facilitate the creation, storage, transfer and application of knowledge but a complementary set of approaches using the appropriate technology for disseminating different types of tacit and explicit knowledge.

Recommendations

IT as the Orchestrator of Knowledge

If we accept de Gues' (26) view that intellectual and social assets will increasingly replace capital assets as the main creator of value in an organization then the role of IT and the managing of those assets will take on an increasingly pivotal role. The less successful IT functions will continue to cast themselves as the manager of knowledge who attempt to capture and control the access to explicit information. In contrast, the successful IT functions and organizations will be those who see themselves as

Orchestrators of Knowledge (McGee 2005). (57) The orchestrator will see his or her role to develop the company capabilities and facilitate the flow of tacit knowledge between individuals. The orchestrator will understand that it’s the company’s idiosyncrasies, that is, what is does differently, not what it does the same as its competitors, which adds value. The orchestrator will be aware that intra-company networks will make the traditional organizational boundary disappear and will be replaced by a complex set of relationships where competitors are sometimes collaborators, customers or suppliers. The response of the orchestrator will be to build a loose set of integrated and IT capabilities based on open architectures such as intranets, messaging systems, inter-company and inter-dependent application interfaces. To provide legitimacy and acceptance of the tools the IT function will devolve as much responsibility and autonomy to the creators of knowledge to maximize abstraction and act as stewards protecting the intellectual capital and managing the relationships and the information within the relationships.

As we started the dissertation Charles Wheeler succinctly and correctly predicted that Japan would not turn communist but, then again, relatively few would have predicted that China would transform itself into a pseudo-capitalist society without giving up the tenets of communism and eschewing democracy. Similarly, authors who have dismissed the concept of knowledge management based upon semantically incongruity risk missing the contribution that IT provides as the mortar that *‘glues’* the tacit and explicit knowledge bricks together.

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