Information Systems Rollout for Knowledge Management at the ABS

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Abstract

This paper presents the case of the Australian Bureau of Statistics (the ABS) as a knowledge- and information-intensive organisation and focuses on the introduction, running and upgrading of a critical systems and technology change through the ABS' knowledge management Initiative (KMI). Twenty five (25) individuals from the ABS responded to questions about their understanding of the systems and technology, knowledge management and the KMI implemented throughout the ABS. This story is filtered through the lens of the Sensemaking framework of knowledge in organisations. Through this it is seen that the strategic methodology used for rollout was successful, and the new information systems used are valued and effective, but that there is a residual resentment for the abolition of alternative software for workers' use.

Keywords
Knowledge management; collaborative technology; information systems, information systems rollout; IS implementation and change; Sensemaking; Sensemaking framework; Australian Bureau of Statistics; Lotus Notes.

INTRODUCTION

As a government organisation that collects, collates and publishes statistics about Australia, the Australian Bureau of Statistics (ABS) is an information- and knowledge-intensive organisation. As a knowledge-intensive organisation, the ABS has developed a strong Knowledge Management Initiative (KMI) to ensure that the internal organisational processes support this information and knowledge focus. The ABS KMI is strategically focused and computing technology is used extensively to meet strategic goals. To accomplish better collaboration techniques for information and knowledge sharing within the ABS, Lotus Notes was installed as a collaborative technical platform. The installation and continual updating of the Lotus Notes platform has increased knowledge sharing and information access as desired, but to accomplish this it was found necessary to eliminate alternative software programs such as word processors. Although the knowledge workers appreciate the collaborative software, they resent the lack of alternative software.

METHODOLOGY

During a four-year PhD study, semi-structured interviews were conducted with twenty five members of the ABS from entry-level positions through to senior Executives within the National Headquarters and three State Offices. The focus of the interviews was the participants' understanding of the KM practices within the ABS and resultant information systems changes, their role in the KMI and the value of the KMI to their work. The data gathered from these interviews underwent first order, second order and meta-analysis.

First order analysis is used in an iterative process of four phases for the processing of raw data towards findings or interpretations through "identifying significant patterns and constructing a framework" (Patton 1990:373). In the first phase, coding was the simple allocation of themes to pieces of data from interview transcripts as a first process of conceptualising the data within the context of the study. (Bryman & Burgess, 1994). In the second phase the list of first phase codes was organised into a more coherent format through assigning topical headings to groups of 'interpretive' codes (Miles & Huberman, 1994, p.57) to begin reducing the volume of data and organising it into recognisable patterns and identifiable themes. The second iteration 'revising codes' (Miles & Huberman, 1994, p. 61) and recoding the data with 'pattern' codes (p. 57) identified themes and consistent patterns. This left a fairly loose groupings of similar topics rather than tightly defined themes but had a coherence that permitted the next phase of coding. For the third phase the concepts underlying the Sensemaking framework were applied to the themes and coding patterns, creating additional codes and revising others. This process created too large a selection of codes, themes and patterns and was reduced in a fourth iteration to a list of thematic codes divided into a short list of primary codes and a longer list of secondary codes. This fourth phase of coding then shaped the approach for the second order analysis.
Second order analysis engaged the Sensemaking framework of knowledge in organisations (Jerram, 2005) based on Cecez-Kecmanovic's Sensemaking model (Cecez-Kecmanovic, 2004, 2000; Cecez-Kecmanovic & Jerram, 2002) which was built from works by Weick (1995), Wiley (1994) and Ryle (1949) and on Tsoukas' theory of the organisation as a distributed system (Tsoukas, 1996). The understanding that individuals socially negotiate their conceptualisation of the world and their knowledge means that understanding the processes of Sensemaking by which they come to their understandings of their world, their knowledge and their workplace will elucidate better the processes by which they can be assisted to know, understand and function in their work (Weick, 1995; Tsoukas & Vladimirou, 2001, 2000; Cecez-Kecmanovic, 2000; Cecez-Kecmanovic & Jerram, 2002; Dervin, 1999). The Sensemaking Framework of Knowledge in Organisations (Jerram, 2005) permits these understandings and insights to be analysed on four different levels.

At the first level, individuals make sense of the world according to their own insights, history and disposition. This is the intra-subjective or individual level. When two or more individuals come together, however, they socially negotiate and mediate their understandings and the nature of their knowledge is changed. This is the inter-subjective or social interaction level. In profound cases, the nature of socially mediated knowledge becomes a new phenomenon, greater than the sum of its parts, called collective knowledge (Weick & Roberts, 1995). However, in an organisation it is necessary to organise and structure the knowledge, work and work practices to make it possible for many different people to function together in a structured and methodical way. To accomplish this, organisations structure norms, rules, policies and specified practices to form a generic-subjective or organisational knowledge level of Sensemaking in which all people in the organisation can be expected to understand the same things in the same way and function similarly. As a result of all these activities at all three levels, and underlying all three other levels is the cultural understanding of "how we do things around here" that dictates through assumptions and background understandings the extra-subjective or cultural level of Sensemaking in the organisation. With such different formulations determining the thinking and approach taken to knowledge or practice, how an individual thinks, knows and acts within an organisation will be highly dependent upon their role in the organisation and the situational climate in which that knowledge or practice is occurring. For instance, a middle manager that receives an organisational edict to change a work practice such as a new OH&S policy may respond at an individual or social level with indignation and frustration that "they" are messing up the workday. The same individual, when functioning as a member of the OH&S committee might very well help frame and disseminate that edict, working from an organisational knowledge level of understanding to meet the organisation's needs. The difference when making sense of events from an intra- or inter-subjective perspective or when making sense of the same event from a generic-subjective perspective is often significant, and the source of many of the conflicts and tensions inherent to organisational work. The complexity of multi-layered understandings that is enabled by a Sensemaking approach that can consider, not only the issues and understandings at each of the four levels but also identify the differences, tensions and conflicts arising between the different levels, was the primary reason that Sensemaking was chosen as the principal means of analysis for this project. Analysis was undertaken at each of the four levels, and then focused at the engagement that occurs between levels of understanding or Sensemaking within the organisation.

In this study, the Sensemaking framework of knowledge in organisations was applied to the previously coded data from the responses of the participants in the ABS to their organisation's KMI and information systems changes and were analysed according to the participants' expressed views on subjects such as strategic planning, technology, trust and credibility - themes that arose from the first order analysis patterned coding. At all four levels questions were asked, such as: what are the intra- and inter-subjective understandings expressed in this area; how do these differ from the generic-subjective understandings expressed; is there confluence or conflict in the different Sensemaking perspectives on this issue; how are these similarities and differences reflected? From these, a multi-level perspective was gained allowing identification of individual and organisational perspectives and their holistic relationships. The process of analysis and synthesis between the four Sensemaking levels and the issues identified by first analysis coding was a reflexive process that led to meta-analysis, or the constant examination and re-working of the Sensemaking framework through application.

CASE

In 1992 the then Chief Information Officer (CIO) of the ABS, under direction from the Chief Executive Officer (CEO), created a list of strategic needs of the ABS to improve knowledge management and office systems performance in specific areas.

We had in our mind a vision of an organisation where everybody could collaborate, share information, and there wouldn't be any isolated silos or groups. And we went looking for the product and found it. Lotus Notes (Exec #H1 KMI).
Lotus Notes® was chosen for strategic reasons but the acquisition of Notes® and the capacities it provided stimulated more ideas for strategic uses which led to the creation of the Knowledge Management Initiative (KMI) under the auspices of the Technical Services Division (TSD). Although a range of approaches to knowledge management have been undertaken since the inception of the KMI, the focus has remained on supporting strategic knowledge management needs and the primary methodology has continued to be one of technological assistance for collaboration and knowledge sharing. Since 1992, the Lotus Notes platform has continually been updated (and supplemented with non-Lotus proprietary software) with new technological upgrades and rollouts occurring regularly over the years. One policy developed since the acquisition of this platform has been the concentration on a full Lotus collaborative environment and consequently the elimination of non-Lotus programmes. Tensions and conflicts have arisen in the ABS in response to the systems changes and technology implemented for knowledge management strategic purposes regarding the lack of a 'proper office suite'.

The elimination of desktop word processors in the ABS was a strategic change undertaken for organisational purposes to facilitate (and enforce) collaborative work practices and knowledge sharing and capture throughout the organisation.

We removed the distraction of a word processor, where people were more interested in formatting than the information content, in many cases... saying 'no, you author your content into here'... They now did their work in what we call a KM environment, so it wasn't like they had to go to some special place to create information or knowledge. It was just part and parcel of where they worked (Senior Exec #H2).

It was a strategic decision that has, demonstrably, been effective. The CIO and the KMI team believe it has facilitated a knowledge management environment that is an embedded "part and parcel of where they work" rather than a knowledge management project 'tacked on' to what people are doing. It has saved time, money and effort in the elimination of "lone cowboys reinventing the wheel" (Exec #H4). In the past there had been many occurrences of duplicated effort as individuals all created an application or conducted work in the privacy of their own pc that someone (or several someones) had already created elsewhere.

It is indicative of the need of many individuals to create and personalise programs and workspaces that, even after the elimination of the word processor and the introduction of Lotus Notes® and the collaborative work areas, the problems of redundancy and would reoccur.

They'd say, "oh, we can make Notes do this", so a lot of little applications sprang up. At one stage we had at least 9 [one per office] and probably more, room booking systems. All written in Lotus Notes, all written differently - independently - some of them cloned from each other... a lot of reinventing wheels... (Exec #H2 KMI).

Consequently much of the facility for independent application development or customisation of desktops was removed. The ABS management and KMI team wanted to encourage and develop the innovation but remove the redundancy and wasted time and effort that were expended in so much duplication of effort. They also wanted to eliminate the loss of created knowledge when innovations were hidden in personal desktops and not shared with and fostered by the organisation.

There's another organisation that runs the same platforms that we do but has nowhere near the degree of innovation. Their CEO wants to have a field where there are hundreds of little flowers popping up everywhere and he describes it as 'germinating ideas'. But what happens is that all their ideas - the 'flowers' bloom and then they wilt and they die. Because there's no ability for the person to get that information - no data capture (Exec #H1 KMI).

The necessity for data capture of the innovative ideas and developments as well as the elimination of duplicated effort, are the principal drivers behind both the elimination of office suites, and particularly word processing capacity, on individual desktops and the reduction in freedom of personal application building in Lotus Notes®. The KMI team identifies the collaborative work environment and elimination of private desk space for individual (unshared) innovation and development as an important component of the effectiveness and success of the KMI.

Many of the knowledge workers who use the collaborative spaces (workgroup data-bases) also express appreciation for the enhancement of their collaborative knowledge environment. One knowledge worker who expressed herself at having been dismayed upon her original encounter with the KM environment said that now "I can't imagine life without it" (Knowledge Worker #S5). Another couple of persons stated that Lotus Notes® were 'easy'. Nevertheless, a majority of the knowledge workers interviewed expressed ambivalence or antagonism for the lack of a word processor and office suite.

We don't have a word processor for example. And it is so frustrating trying to draft something without a word processor... having to use the Internet because Lotus is terrible as
a browser. Lotus 123 is terrible with anything to do with Excel… (Knowledge Worker #A7).

The complaints were not (usually) against using the workgroup databases that were, for the most part, accepted as valuable for others if not themselves.

A particularly fascinating aspect of this complaint is the fact that each worker does have an area within Lotus Notes® that is called their 'personal holdings' - in other words an area in which they can write, work, record and email in private. These were almost never mentioned. Personal holdings provide privacy, or a non-shared area for work but privacy is not particularly the issue. The complaints were specifically about the lack of word processing facilities and the difficulties of interfacing with a predominantly Microsoft world outside the Lotus-based ABS. Very few personnel have permission to acquire a rare ABS 'license' to use either Microsoft Word or Excel for their work and they have to present a very strong argument to justify the acquisition. Sometimes the focus of complaint was on the inadequacy of Notes, other times on the frustration of not having freedom of choice about which applications they used.

what I don't get is access to the decent tool for the job. Either because it won't work with Notes or it won't be entertained … In an ideal world, we will be able to use other tools, which we can't, because we've got Lotus Notes (Knowledge Worker #H10).

Sometimes the complaints were not specifically about lack of access to Microsoft products but against upgrades within Lotus Notes® that appear to have worked against the freedom to tailor the Notes® to personal preference or, sometimes, simply a reduction or change in preferred facilities.

We had an actual proper electronic catalogue on our workgroup database that had keywords and categories and locations, and everything in it… Notes 5 upgrade killed it. I want my catalogue back (Knowledge Worker #H11).

The most frustrating thing with our technology platform is when we start feeling like they've got it right, they'll change it. Every two, three years, they'll come through and they'll revamp something. Something that worked before; something that isn't working; things that you used to be able to do; things you can't do…So that's more frustrating (Knowledge Worker #A20).

Ironically, these last complaints were shared by the TSD themselves who held Lotus responsible for the unhappier upgrades. One such complaint that was repeated in several departments was the loss of a desktop workspace through a Lotus upgrade.

Lotus - they really stuffed that up. They just didn't think through the workspace and how the customers would make the transition to the new arrangements...(Senior Exec #H2).

Because the ABS, as such a long-standing customer of Lotus Notes®, often shares in the development of new Lotus software there is often confusion amongst ABS personnel who assume that the ABS TSD is responsible for Lotus' errors. In fact, the TSD are frequently responsible for ameliorating such problems rather than creation of the original problem. Despite the antagonism and the yearning for lack of office suites and Word Processor capability amongst many of the knowledge workers the implementation of the deliberately collaborative environment has worked and effectively provides shared workspaces for innovation and knowledge sharing. "I was one of the ones that complained bitterly (laughter) about not having it. But after having been here three years, you certainly appreciate the reason for it..." (Knowledge Worker #A5 TSD).

Although many non-TSD personnel suspect that TSD and KMI decisions were technology-driven, the leadership in both the TSD and the KMI recognise that strategy was the foundation upon which to build knowledge management just as service and support of core business functions were the goal of knowledge management, information systems and technological services.

The ABS already had an established written culture with willingness to document and a friendly environment with a willingness to help one another. What the KMI-introduced technology has accomplished within this culture is the additional willingness to share information and co-create knowledge in the collaborative environment of the Lotus Notes® Workgroup Databases. There is a strong technological support base for both information and knowledge management and sharing with a well-developed Lotus Notes® Workgroup Database environment to support the KMI. The technology and the strategy initiatives that drive the technology are both appreciated and resented within the organisation. Many advantages accrue to the technologically supported KM environment that personnel recognise and appreciate. These, however, are balanced by the necessary compensations, such as loss of a normal office suite, that are part of the cost of the collaborative Notes® environment. Despite such resentments the KMI and the technological environment used to support the KMI for
core business purposes are perceived as a success both internally within the ABS and externally by other organisations. Improvements are still (and always) sought but there is a confidence within the ABS that their KMI is a powerful example of how strategically planned and technologically supported knowledge management methodology can be implemented successfully.

**TENSIONS AND CONFLICTS ARISING FROM THE KMI TECHNOLOGY**

Technology is a critical factor in any discussion of the ABS KMI. Most members of the TSD and the KMI focus much of the credit for the success of the KMI on the technology they have provided. Strategic technology choices, powerful technology platforms and careful technology upgrades are all seen to be the critical factors that have created the successful knowledge management environment for which the ABS is renowned. Similarly, however, most conflict within the ABS focuses on the technology.

The one consistent and widespread source of discontent or conflict in the ABS was centred on the lack of a 'normal office suite'. Particular complaints were the lack of Microsoft access and capabilities and the continual removal of desktop customising capacities with each new Lotus® upgrade. The Microsoft-specific debate has several issues: the lack of a 'decent word processor', the weakness of the web browser (which has now been addressed with the introduction of Internet Explorer) and the frustration of dealing with Lotus Spreadsheets when interacting with external agencies that use Excel. At an executive level, a strategic decision was made to enforce generic-subjective work practices that facilitate knowledge sharing and document it in an electronically collaborative process that is transparent and 'capturable'. This serves many organisational purposes. The use of workgroup databases captures the previously undocumented processes of knowledge co-creation and permits rapid and easy information access from creation to production for the entire organisation. Information management is served as well as knowledge management. At a social interaction level the workgroup databases enhanced collaborative work for local and geographically-dispersed teams. On an individual level, however, there are contradictory effects. The individual's ability to collaborate with colleagues is facilitated by the introduction of Lotus Notes® whilst there is a widespread perception that their own work is debilitated by the lack of capacity to tailor tools to their personal needs or at least employ 'adequate tools for the job'.

The tension here is specifically between the generic-subjective level and the individual intra-subjective level. At first the issue could be understood as one of functionality. However, dissatisfaction attributed by individuals to the elimination of the word processor and its functionality may have been conflated with individuals' need for personal control to tailor their immediate work environments. These are separate issues that need to be distinguished, for each have different implications for organisational action.

At the individual level, there are those knowledge workers who claim that they struggle with their lack of "a decent office suite" (Knowledge Worker #H1). Yet several members of the Executive expressed their ability to perform all the functions that knowledge workers complained were inaccessible to them on Lotus Notes®. How then can sense be made of these conflicting viewpoints? Either the executives fail to understand the work needs of the knowledge workers and therefore are mistaken in assuming that the necessary functions are available to all individuals or the executives are correct about the functionality of the program and the individual knowledge workers are unaware of the range of functions available to them. If the functionality which the individuals identify as needed but absent through the loss of an office suite are actually available to them on the Lotus® platform then training that identifies those facilities and empowers the individuals to use them might do much to redress the individuals' grievances and the organisation's losses. The ABS has an extensive training program but as this has not been specifically geared to address this particular issue this possibility for training to address these tensions has yet to be explored.

Another frustration with limited functionality was illustrated in relation to the catalogue of keywords and the 'upgrade' that changed the desktop interface. Senior Executives considered this as a problem originating beyond the ABS' control in the Lotus® upgrade. From an executive point of view generic-subjective complaints about lack of functionality and work effectiveness need to be considered and evaluated. If inadequate tools genuinely hamper workers' productivity then both time and resources are being wasted. The removal of the office suite was designed to improve efficiency of time and resource usage, not to be detrimental to productivity.

However, the tension between two Sensemaking levels, the individual intra-subjective and the generic-subjective level, is underscored by elimination of the word processor. The desire for personal control to tailor the immediate desktop work environment continues to be an issue for many at an intra-subjective level. Yet this 'experimentation' and 'tweaking' that may lead to new processes and products are mostly incompatible with the system as required by the generic-subjective and strategic goals as they also lead to 'reinventing the wheel' by 'lone cowboys'. The need for creativity and innovation to take place in workgroup databases is an organisational
need to capture data, information and knowledge as it is created and stored and not to allow it to be lost or untapped in personal work spaces as well as a need to ensure collaborative co-creation of knowledge. The need for personal space to play, experiment and express oneself is a conflicting need on the part of knowledge workers who stated their requirement to build a supportive desktop environment to feel free to function creatively and expressively. "I remember our previous version where you were allowed to change the colours and stuff of Memos and you can't do that any more" (Knowledge Worker #H3). There is inherent conflict here in that freedom to tailor the immediate environment also means the freedom to create in isolation, potentially losing knowledge sharing, knowledge co-creation and opportunities for knowledge 'capture'; the recognition, codification, storage and distribution of valuable new knowledge. Yet the inability to create a personally intuitive, supportive and workable workspace can inhibit the creativity of the knowledge worker who is the source and wellspring of the knowledge creation processes in collaborative spaces. This issue needs to be balanced against the knowledge that all personnel have 'personal holdings': desktop and server space where they can, indeed, create and work in privacy, as personal holdings are not shared work spaces. Yet these personal holdings seem to be rarely used and were rarely commented upon by staff. Those staff members who complained about the KMI technology's lack of word processing and other capacities and against the Lotus® upgrades that removed desktop customisation control did not perceive their personal holdings to be germane to the problem. Thus privacy would appear not to be an issue in this struggle between individual intra-subjective and organisational generic-subjective needs in this case.

STRATEGIC KMI

A critical factor in the success of the KMI as an initiative to support the organisation's core functions is that the strategies underlying the initiative are harmonious with and supportive of the strategies laid down as foundations at generic-subjective level. The knowledge management Mission Statement is almost a verbatim duplicate of the organisation's Mission Statement. It does, in fact, state that the Mission of the KMI is to support the Mission of the ABS. The understanding that "we work for them, they don't work for us" is a critical concept in the ability to design, develop and maintain a KM initiative that will support core business functions rather than become a purpose in itself. This understanding is clearly demonstrated in the KM Initiative and in the attitudes of the staff members responsible for the KM program. The harmony of strategic planning and design for the generic-subjective level from executive to divisional and departmental level reflects, again, a harmonious extra-subjective culture as well as careful strategic design at the structural level that takes into account the inter- and intra-group level and reciprocal courtesy as intra- and inter-group levels conduct themselves in harmony with organisational policy. Even the friction and conflict that is aroused by the staff dissatisfaction with certain technological limitations imposed at the generic-subjective level by the Executive does not seem to disadvantageously affect the production of core business processes.

The one area in which trust is lacking inter-group is the suspicion expressed by several departments against the TSD. There is less or no suspicion among those individuals and groups where there is an awareness of strategic planning and the value of the KMI strategies to the core business processes affected in the individual's or group's division. Where strategy is not visible or not particularly relevant to the division or group then the KMI policies and their consequences are regarded with distrust and resentment. In some cases this is a simple lack of inter-group communications and clarification by the TSD or the KMI with resentful groups or individuals might reasonably be expected to resolve the tension. In most such cases, however, it is recognised by the TSD that the policies and technologies that facilitate the core business processes for the majority of individuals and groups within the organisation will, in fact, be challenging for, or have little to offer, to other individuals and groups. While the TSD seek to ameliorate these drawbacks the strategic understanding is that this is an unfortunate but realistic cost to the effectiveness of the strategic implementation. At this point trust is placed in the extra-subjective cultural environment and the inter-group inter-subjective relationships that the overriding culture of trust, sharing and helpfulness will lessen resistance and the value gained by the majority will be appreciated not only by the majority but also by the minority who do not gain from it.

Overall, it would appear that much of the success of the ABS KMI is due to the degree of harmony between the vision and strategic goals of the different levels of the organisation. The organisation creates, implements and maintains executive policies at the generic-subjective level that are compatible with the extra-subjective organisational culture and that facilitate the social interaction level within which the majority of ABS staff work. Longevity of careers in the ABS means that almost all executives, and certainly the senior personnel, have been in the ABS and immersed in the ABS culture for many years creating a leadership that governs the generic-subjective and drives new growths and policy in sympathy with the ongoing environment and climate of the organisation. Major decisions are planned strategically in line with the ABS Mission Statement. The Mission Statement links directly to the core business processes of the organisation and is known and subscribed to throughout the organisation. Information systems and technology are used strategically and dynamically to implement change and facilitate core business processes. As one of the key drivers to the KMI success, technology is also the source of the major conflicts and tensions within the organisation. Most conflict arises...
between individual (intra-subjective) preferences and organisational structure (generic-subjective need). Although the organisation seeks to ameliorate negative effects on staff and improve the working environment by eliminating sources of conflict, the sources of discontent, such as lack of an office suite or customisable desktops for individuals, are seen by executives and by the KMI as a small price to pay for the benefits of the technological environment created for the organisation as a whole.

**CONCLUSION**

A major implication for knowledge management that arises from this research is the understanding that most tensions in organisations appear to reside between the understandings created at the executive level for generic-subjective purposes and the sense made of them at employee levels. It is in these frictions between Sensemaking approaches that resistance to change and systems implementation failures most occur (Cecez-Kecmanovic, 2000; Cecez-Kecmanovic & Jerram, 2001, 2002; Lyytinen & Hirschheim, 1987). Most organisational planning, particularly in areas such as information systems changes, is done by executive leadership with the thinking, goals and understandings typical of the generic-subjective level of Sensemaking producing what is seen as desirable organisational knowledge. Systems changes can, through use of the Sensemaking theory, be planned with a balanced understanding of the needs of the other three levels of Sensemaking in the organisation to utilise and develop collective knowledge and individual knowledge and to draw upon the cultural knowledge of the organisation to make balanced decisions. By investigating needs and understandings held at all Sensemaking levels whilst planning outcomes, processes and consequences for systems changes, such Sensemaking-theory-informed and balanced planning can not only prevent many of the unintended consequences (Orlikowski, 1992) that can arise from information systems changes but can also protect against much of the usual resistance to change and the high percentage of systems failures endemic in modern organisations (Checkland & Holwell, 1998; Wilson & Howcroft, 2000; Lyytinen & Hirschheim, 1987). The insights into knowledge workers and the Sensemaking activities in which they engage provide new understandings about the manner in which knowledge management methodology can be applied to better address the needs of knowledge workers and of the organisation, to improve knowledge sharing and knowledge creation (Zyngier, Burstein & Rodriguez, 2003; Thomas, Clark & Gioia, 1993; Tissen, Andriessen & Deprez, 1998). Thus a knowledge management methodology based upon the four level Sensemaking model of knowledge in organisations is a comprehensive and balanced methodology, working from a solid theoretical foundation, and leading to specific understandings that allow concrete and pragmatic solutions to knowledge management problems.

Further implications arise from the study regarding the development of knowledge management methodology and practice. This study demonstrates the need for purposeful knowledge management methodology in organisational approaches to information systems changes and also demonstrates that using the Sensemaking framework and methodology when approaching knowledge management issues thus develops new understandings of the embeddedness of technology in these processes. These findings draw attention to organisational vulnerability arising from technological changes and offer insights into better approaches to managing such change.

Implications for KM practice arise from the understanding of the organisation as a distributed knowledge system (Tsoukas, 1996, 2003) as this awareness reshapes understanding of the location of knowledge and therefore the necessary approach to knowledge management that occurs in an organisation. Current knowledge management methodologies often focus on the technology and consider knowledge workers unimportant in the functioning of the information systems that are the technological foundation of their KM Initiative (Burton-Jones, 1999). This study demonstrates the dangers of such an approach and raises the need for organisations to consider strategically designed people-centric methodologies that recognise that the knowledge worker is the key component to organisational success if that success is in any way linked to knowledge, knowledge sharing, innovation or creativity.

The study draws attention to the tension that has yet to be resolved successfully in organisational environments between the individual knowledge worker's need for a flexible creative environment and the collective need of collaborative knowledge workers to have a flexible, creative and harmonious shared work environment against the organisation's need to organise, standardise and regularise. There is also tension in the individual's and group's intra-subjective and inter-subjective needs for freedom of creativity and clear boundaries within which to work, and guidelines and policies for direction. The intra- and inter-level tensions created by these conflicting needs must be addressed by organisations that are serious about promoting knowledge creation and sharing for innovation within the organisational setting. The study highlights the need for organisations to seek answers to these challenges within their own cultural setting. Solutions to knowledge management methodological challenges must be compatible with the organisational culture or extra-subjective level of understanding just as the culture needs to be conducive to knowledge management methodology for effective implementation to take place (Weick, 1995; Cecez-Kecmanovic, 2000; Cecez-Kecmanovic & Jerram, 2001, 2002). At this stage the needs have been highlighted but there are more questions than answers. Much research needs to be done before...
answers can be found to this complex serious of interrelated questions such as how to balance internal tensions and inter-level tensions and how to integrate cultural considerations into knowledge management methodology, or change an inappropriate culture to become a more conducive culture for knowledge management approaches. There is a critical need to shift understanding and methodology from techno-centric to people-centric and from tactically-planned to strategically-planned methodologies which will result in considerable changes in pragmatic methods and designs for knowledge management initiatives and practices. The parallel need to resolve intra- and inter-level tensions is important for knowledge management methodology but first must be addressed by extensive future research.

The implications for KM practice that arise from this study go beyond that of information systems change. The focus of the empirical studies in this thesis was on information systems change and the investigation of knowledge management methodology was concerned primarily with such kind of change. However, the nature of Sensemaking theory as an analytical tool: that it offers a breadth of understanding ranging from culture through social structure, social interaction to individual Sensemaking and a depth of specificity able to provide detailed understandings at and between each of the four levels, has implications of much wider use than knowledge management methodology in organisations.

Using Sensemaking theory to analyse the knowledge management methodology applied in a systems and technology change highlighted the need for, and critical elements of, strategic planning in the organisations involved. One of the strengths exhibited by the Sensemaking theory through its use in this thesis is the manner in which it identifies and draws in overlapping concerns and disciplines. Using Sensemaking theory to analyse the knowledge management approach applied in information systems changes also highlighted many important implications for systems change and information systems management beyond the immediate concerns of knowledge management methodology. Should a study be made specifically focusing the lens of Sensemaking theory upon learning more deeply about managing information systems, or upon organisational change, for instance, much could be gained by the analysis achieved at four levels of Sensemaking within these domains of investigation.

Further time needs to be spent looking specifically, through a Sensemaking lens, at a broader picture of systems and technology change than the knowledge management approach. Within the knowledge management domain much work remains to be done on developing understandings of how to reduce the natural tensions inherent in the conflict between the normative needs of the generic-subjective level of organisations and the intra- and inter-subjective needs of the individuals and groups who work within the organisation. Organisations need to reconcile the conflict between knowledge workers' needs to express individual creativity if they are to be innovative and creative for organisational purposes against the need for organisational norms and standardisation at the generic-subjective level. Industry has been urgently calling for answers to this question and Sensemaking theory offers a potentially fruitful means of conducting research into this area of need. The role of knowledge management in culture change is another issue of constant debate and need in industry circles and through Sensemaking methodology further research can be conducted into this question, offering a new approach and potentially new answers. Similar challenges on each of the four levels can be investigated offering new insights through the use of a new theoretical lens of understanding. The application of Sensemaking theory to every aspect of knowledge management methodology and practice offers a wealth of new research possibilities.

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