

## **Developing an enterprise wide knowledge warehouse: Challenge of optimal designs in the media industry**

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### **ABSTRACT:**

It has been common practice among organisations to develop standard operating procedures to gain advantages like standardisation, ensure continuity, and deal with contingency needs. Over time, processual perspectives of activity within organisations have enabled appreciation of such practices through what is commonly referred to as organisational knowledge. With recent advances in both recognition of 'knowledge' as a form of asset within the organisation, as well as the fact that 'management' of such assets requires some sort of a strategy, it is increasingly popular to have strategies to derive optimal benefits. Many organisations keen on leveraging competitive advantage, are therefore involved in designing intranet-based repositories that would both allow sharing as well as recycle experiences to ensure success in future ventures. Whilst the process of knowledge development can be unique to the context, practical dimensions of development may be considerably different from those suggested by established theory. The present paper firstly reviews different frameworks that have come to be recognised as being effective in categorising organisational knowledge. Secondly, in the light of experiences of both authors in developing an interactive knowledge warehouse, the present paper discusses usefulness of these frameworks in estimating and categorising enterprise wide shareable knowledge. Prevalence of non-disclosure and confidentiality conditions would mean that the mentioned organisation would need to remain anonymous. For the purposes of the present paper, the chosen organisation would be referred to as Kadrosi.

### **Keywords:**

Knowledge modelling, knowledge warehouse, knowledge frameworks, knowledge categorisation, organisational knowledge, enterprise wide knowledge sharing, processual knowledge

# **Developing an enterprise wide knowledge warehouse: Challenge of optimal designs in the media industry**

## **1. INTRODUCTION**

Momentous developments in technology, products and services over the last few years have persuaded commercial organisations with a web presence, to reconsider their strategies to be able to survive and compete amidst unpredictable market conditions. With the advent of an ever-increasing variety of business models, facilitated by the Internet, emphasis of product development is gradually moving away towards an environment where service industries are likely to play a more dominating role (Westland and Clark 1999). Somehow such a proliferation of ventures has also influenced companies within the small and medium enterprise sector to look more carefully at their service offerings. Competence in bidding for new projects is directly related to sharing of previously acquired experiences among employees. In 2003, the chief executive officer of Intel, went on record, by saying that businesses will cease to exist if they do not have a World Wide Web presence. At the same time a closer look will reveal (cf. Saloner and Spence 2002, Timmers 1999, Elliot 2002) that mere presence is not such a big challenge after all. Through the web, sustenance of business and expansion of client base are areas that companies need to work on a continual basis. Some of such expansion is quite clearly dependent on assessing emergent opportunities. Others are based on ensuring that existing clients are sufficiently content with levels of available services. On the one hand, knowledge about emergent opportunities may be derived through new information, gleaned through market data. On the other, use of anecdotal client information could ensure fulfilment of expectations in relation to past experiences.

Whilst recent dot-com failures have signalled the downfall of several large companies, many relatively smaller organisations, have managed to attract business that would have hitherto gone to their larger rivals. Given such a shift in the direction of business, smaller organisations have tried to maximise their potential through a variety of measures. Storing information in formats that are re-usable has been a more traditional means to ensure that organisations reduce redundancy and are able to learn from past experiences (Ruggles 1998). But this hasn't necessarily meant that the organisation will eventually succeed in maximising ensuing advantages by re-using data. A transition into knowledge use probably requires both a different kind of experience as well as expectation mindset of involved actors. With the advent of substantial improvements in technology, storage per se has not been a problematic issue, anymore. The rate at which relevance disappears from stored information seems to be an abiding complexity for organisations, keen on maximising advantages through stored information. In other words, speed with which data becomes obsolete makes the whole process of sustained knowledge use quite complicated (cf. Quinn 1992, Reich 1992, Drucker 1993, Nonaka and Takeuchi 1995, Teece 1998, Zack 1999, Lam 2000). Hence, judgement would need to be exercised when information or data is being considered for storage as to its net worth to the organisation, in future.

The present paper is intended to firstly review types of knowledge as identified in the emergent literature on knowledge management. Secondly the present paper would consider adopted processes of converting tacit into explicit knowledge within a media company based in Manchester, UK. Both of these two objectives of the paper would be carried out with reference to experiences of both authors in developing an interactive knowledge warehouse for a media company called Kadrosi. The British Government's department of trade and

industry (dti) has funded the development of the mentioned interactive knowledge warehouse project. As a just completed project, conditions of confidentiality would require the use of a pseudonym instead of the actual name for the mentioned media company.

Like a data warehouse a knowledge warehouse is also usually the result of an IT infrastructure project. In line with Duncan (1995), a knowledge warehouse may be defined as a set of shared IT resources that can be interrogated by members of an organisation to enable present and future business applications. Unlike a data warehouse that tends to support business processes (Ross et al. 1996) a knowledge warehouse is primarily targeted to strategic enhancement of capacity and to a lesser degree some basic needs like development of bids and pitches. Wixom and Watson (2001) in the context of success factors for data warehousing talk about the need for a correspondence between data quality and system quality. At Kadrosi, the IT infrastructure was of a fairly advanced standard in that all users of the knowledge warehouse were IT literate, consequently they did not expect output of 'clean data' as can be envisaged after undergoing reconciliation in a traditional data warehouse implementation. Mitra et al (2005) in their study in developing knowledge tools for an electronics component manufacturing plant found that formal and informal practices in training tended to be internalised by employees as they became habituated in using these tools. The context of Kadrosi is probably even more serious, given the amount of creativity that is necessary for employees of the organisation at the operational level.

## **2. KNOWLEDGE FRAMEWORKS:**

With the growing recognition among organisations of harnessing advantages by leveraging existent knowledge assets within its workforce, a few research frameworks have become accepted as being standards in understanding and developing capacity. Research into understanding knowledge development may be categorised as being part of a couple of distinct approaches. Whereas the structuralist perspective concerns an understanding where knowledge is treated as being resident within people and organisations, the processual approach has developed through recognising that knowledge is socially constructed and is embedded in practice (Newell et al. 2002).

For instance, Nonaka (1994) and Spender (1998) have developed frameworks to understand processes by which knowledge is created and used within organisations. Nonaka's (1994) framework is based on the premise that individual cognition is essential to the knowledge creation process. According to Nonaka (1994) knowledge creation can only occur at the level of the individual. Socialisation, externalisation, internalisation and combination are the four mechanisms according to Nonaka (1994) through which knowledge get created at the individual level, which is the realm where knowledge creation can occur. Exchange between individuals through socialisation is likely to create new tacit knowledge. Interaction of members within an organisation and those outside may be lead to externalisation that in turn may be able to create new explicit knowledge. Direction of knowledge creation through externalisation is aimed at the outer world to the interacting organisation. Explicit knowledge that exists in the outside world to the organisational context on the other hand may be able to be internalised by another simultaneous range of interactions by individual employees. Unattached knowledge creation where explicit formats are used to create further explicit knowledge is part of a process of combination where other processes may be subsumed. The distinctive aspect of Nonaka's (1994) framework is that knowledge is unlikely to exist among

employees within an organisation meaning the same thing to everybody. Every individual employee would have slightly different understanding of institutional knowledge.

Spender (1996, 1998) differs from Nonaka (1994) in highlighting a difference between individual and social knowledge. According to Spender's (1998) framework there exist contrasts and likely interactions between an individual's understanding of knowledge, which is possessed and the collective knowledge on which explicit knowledge is actually built upon. Unlike Nonaka (1994), Spender (1998) has distinguished between what constitutes individual explicit knowledge and what defines social or organisational knowledge. Again Spender (1998) has gone on to say that there may be some kind of an agreement among individuals within an organisation as to what constitutes explicit organisational knowledge. Conscious, automatic, objectified and collective are the different formats according to Spender (1996) through which knowledge may be created within an organisation. Whereas conscious and automatic are individual explicit and implicit mechanisms, objectified and collective refer to social means of acquiring knowledge according to Spender's (1996) framework. Social knowledge as a collective within an organisation is highly beneficial to ensure strategic advantages in comparison to other competitors within the same sector. Spender's argument (1998) lends support to the notion that core competencies of an organisation are crucial in bolstering strategic advantages in an aggressively competitive business environment. A different line of literature on 'communities of practice' (cf. Brown and Duguid 1991) seems to have been emerging that is quite similar to Spender's (1998) framework where social understanding of knowledge plays a vital role.

Blackler (1995) has argued that there are in fact, five types of knowledge in embrained, embodied, encultured, embedded and encoded knowledge that may exist within an organisation. In Blackler (1995) framework, types of knowledge creation are either dependent on individual or collective effort. Embrained knowledge that is dependent on individual cognitive abilities and conceptual skills is similar to Nonaka's (1994) notion of tacit knowledge on the other hand, encultured knowledge is dependent on the processes of achieving a shared understanding through the development of organisational cultures is similar to Spender's notion of collective knowledge. Embedded knowledge is quite similar to what is commonly understood as standard operating procedures in that they are synonymous and resident within systemic rules of an organisation. For instance, routines may be clearly publicised and made explicit through formal policies and procedures within organisations or informally tacit, in the minds of all workers. Essentially therefore, Blackler (1995) has tried to suggest a framework where particular kinds of knowledge dominate in particular kinds of organisations. Such a framework is both quite different from both Nonaka (1994) and Spender's (1996) frameworks as well as being nearer approximations of the real world. Traditional bureaucratised organisations, according to Blackler (1995) will rely on embedded knowledge found in rules and routines, on the other hand, more innovative and dynamic organisations would rely more on encultured knowledge if they are communication intensive or embrained knowledge if they are dependent on knowledge, skills and expertise of individual employees. Blackler's (1995) framework is therefore more meaningful in the context of the present paper as it clearly suggests that the type of knowledge that dominates the firm's activities ought to determine the way in which it is managed.

Beyond the frameworks mentioned above is the realm of the processual perspective of knowledge that has simultaneously become more meaningful as management of knowledge

moves away from first principles within organisations. A primary distinguishing feature of the processual perspective, stems from its emphasis on processes and practices of knowing in order to understand what knowledge is. Process perspectives are derived through the appreciation of knowledge being socially constructed rather than being a static asset that is resident in people and organisations. Among the frameworks mentioned above, Spender (1996) is one that has recognised the dynamic issues of knowledge creation. It tries to avoid the issue of absolute knowledge or notion of truth and in its place reinforces the importance of context where practice determines knowledge rather than trying to orient understanding through a static or objective mindset. Intrinsic to the process perspective is the fact that the process of knowing is as important as knowledge itself. The link between the two is very strong.

In more recent times the processual perspective has been qualified by contributions from a variety of scholars including Cook and Brown (1999) and Newell et al. (2002) where dimensions that were hitherto taken for granted have been questioned. For instance, Cook and Brown (1999) argue that not everything that people do are based on what they know rather it is both part of group action as well as part of the knowing process. Newell et al. (2002) argue that a substantial part of an individual's knowledge will always remain tacit. Such tacit knowledge exists as conscious experience and behaviour rooted in processes of knowing and action. Table 1 below has been used to delineate the principal dimensions of the two perspectives.

Table 1: *Comparison of structural and processual approaches to classify knowledge*

| <b>Characteristic</b> | <b>Structural</b>  | <b>Processual</b>  |
|-----------------------|--|--|
| Nature                | Discrete cognitive entity that people and organisations possess            | Rooted in practice, action and social relationships                                      |
| Format                | Objective and static   | Dynamic where process of knowing is as important as knowledge                            |
| Level                 | Individual and collective level  | Originates through the interplay between individual and the collective levels            |
| Activity relationship | Different types of knowledge dominates in different types of organisations | Organisations are characterised by different types of knowledge and practices of knowing |
| Origin                | Created via specific social processes                                      | Knowing occurs via social processes  |

Source: Adapted from Newell et al. (2002)

It is clear from table 1 above that knowledge creation may be understood through a range of dimensions like nature, format, level, activity relationship and origin. These characteristics enable us to appreciate the basic distinction between the static and the dynamic formats of knowledge and how these might be captured within organisations. At a time when organisations are gradually becoming more knowledge intensive, i.e. every worker is becoming a knowledge worker as well as the fact that many organisations need to diminish costs it is likely that there would be a transition of traditional bureaucratic firms to become

more innovative and modern in the way that they use knowledge. Whilst application of rules, regulations and procedures might continue to be the principal characteristic of certain traditional organisations, media companies like Kadrosi will certainly be driven by more innovative and modern ways of working where knowledge is resident in the skills and expertise of the employees. Kadrosi being a strategic marketing company is involved with the promotion of products and services of a variety of client organisations that have included purely commercial organisations like Intel, Dell and Lever Faberge as well as non-governmental organisations like Amnesty International and FairTrade. Whilst it is routine for Kadrosi to develop web based campaigns for its clients yet it is unique in trying to develop a strategic tool like an interactive knowledge warehouse to bolster competitive advantage within the sector that it operates in.

Given the fact that Blackler's (1995) framework is the most amenable to variable formats of knowledge use, it was felt that it would be the most appropriate in using it to classify work within Kadrosi. Although a substantial amount of research has been (cf. Blackler 1995, Tsoukas 1996, Lam 1997, Nonaka 2001) directed to the development of ways and means by which tacit knowledge can be made explicit yet it is clear from studies that context would need to play an important role in determining the distinction and then establishing a connection between the tacit and the explicit. Essentially there are two complementary issues for a business's quest to lead within a particular industrial sector. The first concerns the creation of knowledge and the second is to do with the sharing and transfer of it. For instance, Blackler (1995) argues that knowledge may be found to exist in various different formats. A table below has been used to enunciate different formats that Blackler (1995) identified, corresponding forms as discerned within Kadrosi have also been shown alongside.

| <b>Types of knowledge</b> | <b>Generic format</b>  | <b>As obtained within Kadrosi</b>  |
|---------------------------|--|--|
| Embrained                 | Individual conceptual skills or cognitive abilities  | The skill of graphic design, content management, creation of pitches, etc.   |
| Embodied                  | Demonstrated through certain bodily and/or technical skills  | The role of skilled coders and technical specialists   |
| Encultured                | Refers to the development of shared understanding at different levels like groups, organisations and societies | Understanding developed within specialist task forces focussing on individual domains like email campaigns, organisational procedure             |
| Embedded                  | Taken-for-granted routines and interactions that could enable shared action for a team                         | Activities like developing web pages that may have acquired a certain uniqueness within Kadrosi as being dependent on templates and style-sheets |
| Encoded                   | Explicit knowledge as representations available in books, computer databases, or websites                      | The company website of Kadrosi, databases within Kadrosi that contain project information  |

Table 2: *Categories of knowledge*

Source: Adapted from Walsham (2001)

It is clear from table 2 above that there may be several gradations through which types of knowledge may be categorised. Some of these may theoretically be quite clear yet in practical terms may be found to have overlaps. For instance, it might involve a significant amount of complexity to distinguish between embrained, encultured and embedded knowledge. In general, it is commonplace to come across situations where cognitive abilities developed by individuals have actually contributed to the type of shared understanding that might be prevalent within groups and organisations. For instance, in the case of Kadrosi, a new coder working on a project on a repeat account may only attain knowledge of how to code for that client through shared understanding with the project team.

A knowledge store unlike other physical stores is primarily different in that it is directed to delineate context rather than maintain unconnected pieces of data. Whilst a physical library may contain books, journals, CDs and manuals, a knowledge store would require the embodiment of experiences and methods used. It is clear therefore that developing a physical library can be a simple objective where after infrastructure for the holding of material is created, inventory of archived material like books, journals and the like can easily be used to populate it. To some extent such a physical repository might provide a starting point to firstly take stock and arrange existent inventory and secondly to promote the idea that circulation of relevant material might be feasible when employees see a visible artefact where information sources are available. In the context of the present paper it must be pointed out that both a physical as well as an intranet-based repository was planned and developed. Through such a phased approach it was possible to monitor uptake and popularity of the initiative within Kadrosi. Whereas usual data warehouses might be updated by a single person over fixed intervals, an interactive knowledge warehouse would be open to multiple update mechanisms as well as the fact that it would also cater to a diversity of knowledge needs of workers at Kadrosi.

### **3. METHODS:**

The present paper is based on the experiences of both authors involved in a 24-month long teaching company project to develop an 'interactive knowledge warehouse', funded by the Department of Trade and Industry (dti) of the British government. Whilst the first author was involved with ensuring the overall academic input to the project, the second author worked as the Kadrosi based teaching company associate. The latter was directly responsible for the operational growth of the artefact. The entire development spanned over two years, i.e., between November 2001 and December 2003. A series of phases with consequent assessments at the end of each phase was the normative structure through which the teaching company scheme was driven. Teaching company schemes have now been renamed as Knowledge Transfer Partnerships (KTPs).

The knowledge warehouse project had a specific outcome designated at inception, i.e. the creation of an interactive knowledge warehouse. Within such a context, the research method conformed to an action research orientation. Following Baskerville (1999), it may be said that the setting in which the project was undertaken, went on to conform to expectations of an ideal domain in which action research may be applied. Firstly, both the authors were actively

involved in the work with clear expectations of developing the knowledge warehouse that would benefit Kadrosi as well as themselves. Secondly, the knowledge obtained was immediately applicable initially within Kadrosi and subsequently in client organisations where Kadrosi was involved in developing bespoke knowledge warehouses. Also the authors worked throughout the 24 month project period using conceptual frameworks of established knowledge theories developed by among others Nonaka (1994), Spender (1998) and Blackler (1995). Thirdly, the project was cyclical and iterative, linking theory and applying it to practical work within Kadrosi.

Like the Straub and Welke (1998) action research study, a series of monthly interventions like educational sessions on estimating the range of expertise within Kadrosi were held during the second six-month period of the 24 month project. Normally groups identified in figure 2 of this paper would have somebody presenting the expertise within Kadrosi. A range of people would be present in the audience like the two authors, the managing and commercial directors, the company supervisor and all other expertise personnel within Kadrosi. A second set of seminars were conducted to elaborate on the questions within questionnaires for feedback, and to raise awareness of the knowledge warehouse in general before the physical model was created. In other words these seminar type events were also another mechanism to generate feedback and thus delineate expectations of users of the knowledge warehouse. Feedback generation on probable capabilities on knowledge warehouse was also carried out by the second author during the second and third half year segment of the project. Normally a questionnaire would be sent to the concerned staff and then the second author would meet to discuss answers to questions before compiling them together in segmented reports.

An unintended development at the start of the project that turned out to be an advantage was the fact that Kadrosi was involved in restructuring its business and base it more on individual performance enhancement and expertise. Whereas the initial idea was to have different expert groups coming together on building parts of the knowledge warehouse, with every member of the organisation being treated as an expert in a particular area, there was a different approach that needed to be used to understand firstly implications of sharing knowledge and secondly promoting usage of the knowledge warehouse. Initially the idea was to have reliance on expert groups involved in the development of knowledge in specific areas, like email marketing, online advertising, mobile promotions, laws and regulations, customer relationship management, and research. Task forces in an attempt to bolster development, dissemination and targeting of particular business interests within Kadrosi specifically targeted individual domains of expertise. The second envisaged advantage that influenced design of clusters was the interaction between different task forces to ensure that employees shared knowledge gained through experiences over time.

Although initially, there was a drive to develop the artefact using latest software that was available yet it must be said that little was clear in the minds of both the managers of Kadrosi as well as the academic supervisor in the first author for the present paper. It was clear that Kadrosi felt that they needed some kind of a tool through which productivity of the company could be enhanced. Also there was an implicit belief that through the project of the interactive knowledge warehouse, it might be possible to use unused documents to the advantage of Kadrosi. The academic supervisor, in the first author for the present paper, at that stage had felt that what would be required is some kind of a rather flexible database that would both



allow people to enter data as well as embed behaviour of objects that was going to be necessary to cater to a range of requirements of Kadrosi.

At one end of the spectrum of expectations, the idea of developing an interactive knowledge warehouse was simply to increase visibility of past experiences. So that employees involved with creating new bids were able to review past successes and failures in similar project activities. By such reviews it was felt that employees would be able to discern potential and appropriately increase chances of success. Further to this particular goal of creating a pool of resources from where competitor information could be effectively used, there were several goals that got added to the pool of expectations with the passage of time. These included:

- Knowledge sharing at an enterprise level
- Acquiring expertise in building repositories for clients
- Transforming culture of employees
- Making every employee an expert in a particular domain of activity

At the outset the aim of creating an intranet-based knowledge warehouse seemed a distant objective. This was so because it was unclear as to what would be the limits of knowledge that such a warehouse would hold. At that stage it was being envisaged that all activities of employees needed to be represented within the data warehouse. In such a scheme of things, apart from the challenge of inputting a vast and varied range of material that in itself would need some kind of vetting, to ensure relevance and meaning in the wider context. Secondly, relevance of stored material would need careful monitoring, as knowledge that is meaningful at the organisational level might not be very useful at the level of the individual professional. The latter would expectedly volunteer knowledge firstly that is relevant to maintain professional expertise levels. Secondly, knowledge that will not in any way take away 'trade secrets' so that individual employees may lose value in the job market of the media domain by surrendering any unique competencies.

Bearing these issues in mind, it was clear that embedding incentives within the knowledge capture process would be central for individuals to pass on professional knowledge. Such incentives would primarily contribute to trust development. The strategy therefore, for knowledge capture for the warehouse was to convey to individuals that by sharing information in the building of the knowledge warehouse, the resulting artefact would firstly be meaningful in what it contained and secondly such an artefact could add value to their activities by providing pointers and tips for at least quality assurance purposes, if not for other advantages. However, as we will see the individual dimension was quite a second order issue as the structure and remit of what was to be part of the knowledge warehouse were more important to figure out. In line with the work of Hansen, Nohria and Tierney (1999) it was clear that the individual dimension would be connected to the personalisation strategy that an organisation might require to implement knowledge management.

Essentially therefore, the task at hand, taking into account goals and expectations of the project were phased out as follows:

|           |   |
|-----------|---|
| Phase I   | Develop a physical store containing all documentation currently available within Kadrosi. Such documentation would include magazines and journals subscribed to by the company. All videos and software accumulated over time. Technical journals, manuals and catalogues.  |
| Phase II  | Develop a categorisation strategy to classify knowledge through extensive consultation with all 30 employees of Kadrosi. Review any relevant strategies of competitors involved in developing similar artefacts. Consider strategies used by large data repositories like university based libraries and internet based databases. Review any software that may be used to develop the knowledge warehouse. |
| Phase III | Extend and build meaningful knowledge sharing capabilities by enriching material held in relation to individual expertise base within Kadrosi.  |
| Phase IV  | Develop expertise within Kadrosi to build and develop similar artefacts for clients as well as maximise profitability of current activities of Kadrosi.   |
| Phase V   | Facilitate culture change by making trust dependent on advantages of sharing and connecting profitability of activities of Kadrosi as a whole.  |

Table 3: Sequence of implementation of knowledge warehouse

At the conclusion of the project in December 2003, we had achieved all of the goals set out for phase IV as shown in table 3 above. The next phase was part of both implementation over time as well as how group culture would shape values like sharing along with how regularly material within the knowledge warehouse was updated and kept relevant.

Being a commercial company in quite a competitive sector of business, it must be pointed out that following progression of different phases was not easy as regularly new business demands would divert resources within Kadrosi. For instance, interviewing employees to incorporate feedback was a constant challenge as individuals working to deadlines of other company goals found it hard to talk to us and sit down with demonstration of the prototypes. A steering group within Kadrosi involving the industrial supervisor, managing director and commercial director regularly had difficulty in meeting up as they were all tied up with more problems of meeting up as they were all tied up with more pressing short term commercial concerns. In terms of technical resources, programming and coding was also from time to time diverted to fulfil other needs of Kadrosi. In the process validation and ratification of progress at the mature end and basic technical development at the initial levels were held up during different stages of the project.

### **3.1 Significance of the physical (non-electronic) version of knowledge store:**

After putting shelving and other furniture to house documentation, and other material in place, most documentation and along with reports, manuals, disks and tapes were housed by the research associate involved with the implementation of the plan on the ground within the present study. A categorisation strategy was in place whereby all journals were alphabetically serialised and displayed through available display capable storage space. Other documentation like manuals for software and any technical material were made suitably visible. For instance, any journals of the advertising industry that Kadrosi subscribed to were placed using a serially ordered sequence across all display furniture like shelves. However, the important issue of use by employees of Kadrosi of such a physical store was a bigger challenge. To facilitate this process, a form was designed with initials of employees of Kadrosi in boxes to be ticked off when material was read by particular individuals. It was through such a

mechanism that a log could be created of the use of material available through the physical store. The idea of developing a physical store underpinned the dimension of seeing how the computer based knowledge warehouse may look like – implications may range from challenges of classifying data to the dimension of what may be relevant to employees and in the process contribute to knowledge oriented capacity building within Kadrosi.

In the end, the activity of populating shelves with journals and other material was down to a specific person in the research associate. Such a dependency on periodic categorisation meant that there were resources that needed to be regularly directed to maintenance and sustenance of the physical knowledge store. The second dimension that required close monitoring was to do with the transfer of electronic media to the printed media. For instance, if a particular employee was subscribing to a discussion list like ‘mad.co.uk’, he or she would be receiving periodic mailings. The latter would then need to be printed and made available through shelves for individual employees to circulate among themselves. Such a transfer required the willingness and co-operation of different employees to make individually received information corporately available.

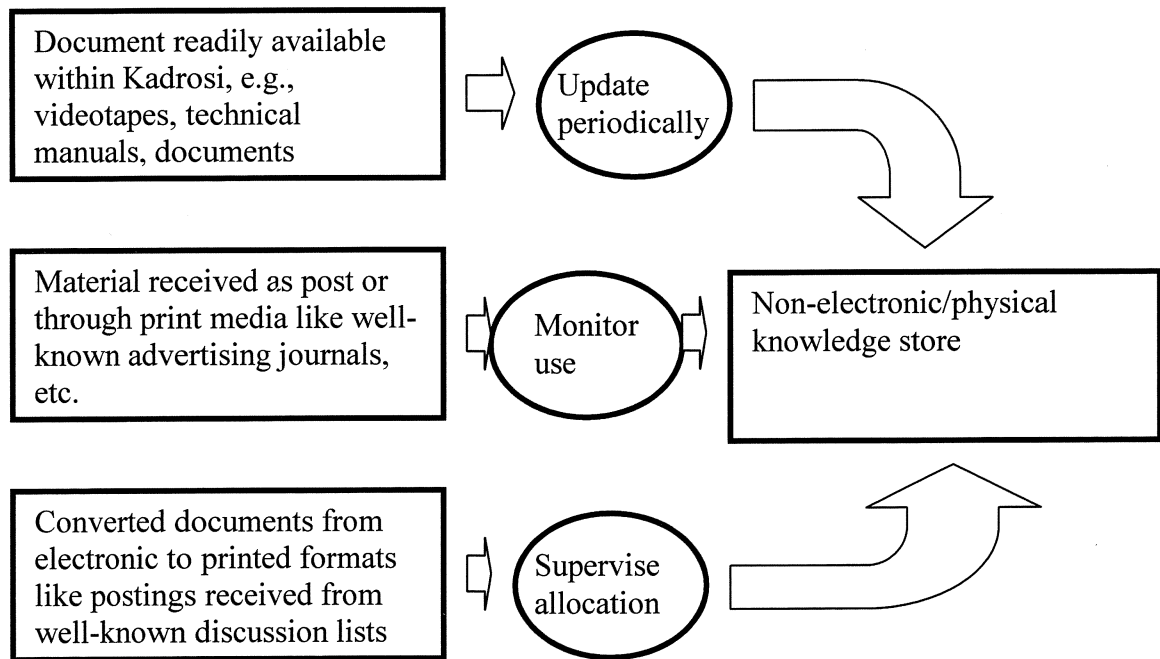


Figure 1: Activity map of developing physical knowledge repository

A couple of needs of the physical knowledge repository in the end proved to be too resource intensive to expect rapid uptake and broad facility to envisage what may be expected in relation to a computer based resource. Firstly, the research associate involved with the development of the knowledge warehouse had to be constantly reviewing all journals and subscribed publications that routinely entered Kadrosi. Otherwise, by implication, material available would not be useful to the employees. Taking hard copies to be included into the repository also meant a substantial amount of interaction with all other staff on a regular basis. In a seriously competitive environment, the latter was quite a demanding proposition. Secondly, most staff was tied up with various projects at all times during the financial year. In

this context, it was quite a high demand for them to read journals and magazines out of sheer interest in particular areas. In essence therefore, it could be concluded that without a dedicated individual who would periodically update material held in the repository both the objective of having up-to-date material that was shareable as well as the process of ensuring that publications got fed into the system were difficult to be successfully supported within Kadrosi.

#### **4. DATA INTEGRATION INTO KNOWLEDGE WAREHOUSE:**

Businesses like those based in the insurance industry, medical, legal and engineering professions are increasingly dependent on retrospective data, warehoused in different formats. Checking of records, providing quotations for prospective work, reviewing histories of individual patients and clients are the type of operational roles that data warehousing has been playing within dynamic business situations. Such a role of provision of information is certainly a crucial one, considering the short time spans within which decisions need to be arrived at. In the case of Kadrosi, we were concerned about the fact that strategic advantage involved consideration of both - past and contemporary data. Strategic direction is usually hard to discern in domains where mainly operational data and general information are being considered. Stenmark (2001) concludes that our interests as experts and professionals are an example of part of our tacit knowledge. Stenmark (2001) also goes on to prove that IT may be used to address knowledge that has not been made explicit. Firstly data needs to be contextualised and secondly, expectations from future prospects would need to be weighed against current business standing within the concerned sector/industry. Both of these functions are difficult to be carried out using traditional data warehousing approaches. Therefore, a dimension of the long term would need to be incorporated to arrive at strategic targets considering past experiences. In the context of Kadrosi, it was felt that this dimension could be fulfilled by the effective use of knowledge.

In simple terms, there appeared to be three formats of knowledge that were common within Kadrosi. Firstly there was knowledge that all employees within it as well as some who were outside it were aware of. Such knowledge could be referred to as explicit knowledge. Secondly, it was common within an innovative and modern organisation like Kadrosi to have employees who were involved with creative work to be able to develop intuitive as well as professional knowledge insights into work processes that they were responsible for. This category of knowledge was shared at the discretion of the individual member within the organisation. This was the most common type of tacit knowledge that came to occupy an important position in the final choice of the way the work on the interactive knowledge warehouse project developed over time. Thirdly, workflows within the organisation over time generated an understanding of appropriateness within the media industry in general and Kadrosi in particular. Such knowledge was most commonly the type of embodied and embedded knowledge that were evident within Kadrosi.

In an endeavour to optimise outputs of its employees, Kadrosi had begun around late 2001, to reorganise its work force of about 30 employees into specialist clusters concentrating on individual areas to increase chances of success at bidding for new projects. These clusters as briefly touched upon earlier, were also known as task forces. Primarily Kadrosi had a couple of dimensions in mind when designing these task forces. The first was the delineation of individual domains of expertise as in task forces created to specifically look into the development, dissemination and targeting of particular business interests. The task force idea

acquired clarity with the creation of nine task forces to look into, web production, mobile marketing, email and viral marketing, tickets and voucher promotions, online advertising, Interactive TV campaigns, Research and consultancy practices, and Electronic payment practices. The second dimension that influenced design of clusters was the interaction between these different task forces to ensure that employees shared knowledge gained through experiences over time. A diagrammatic representation (figure 2) of the envisaged infrastructure at this stage might be useful to appreciate expectations from the knowledge warehouse. It must be borne in mind here that individuals could be members of more than one task force and that interactivity between task forces was quite vital in the overall scheme of things within Kadrosi.

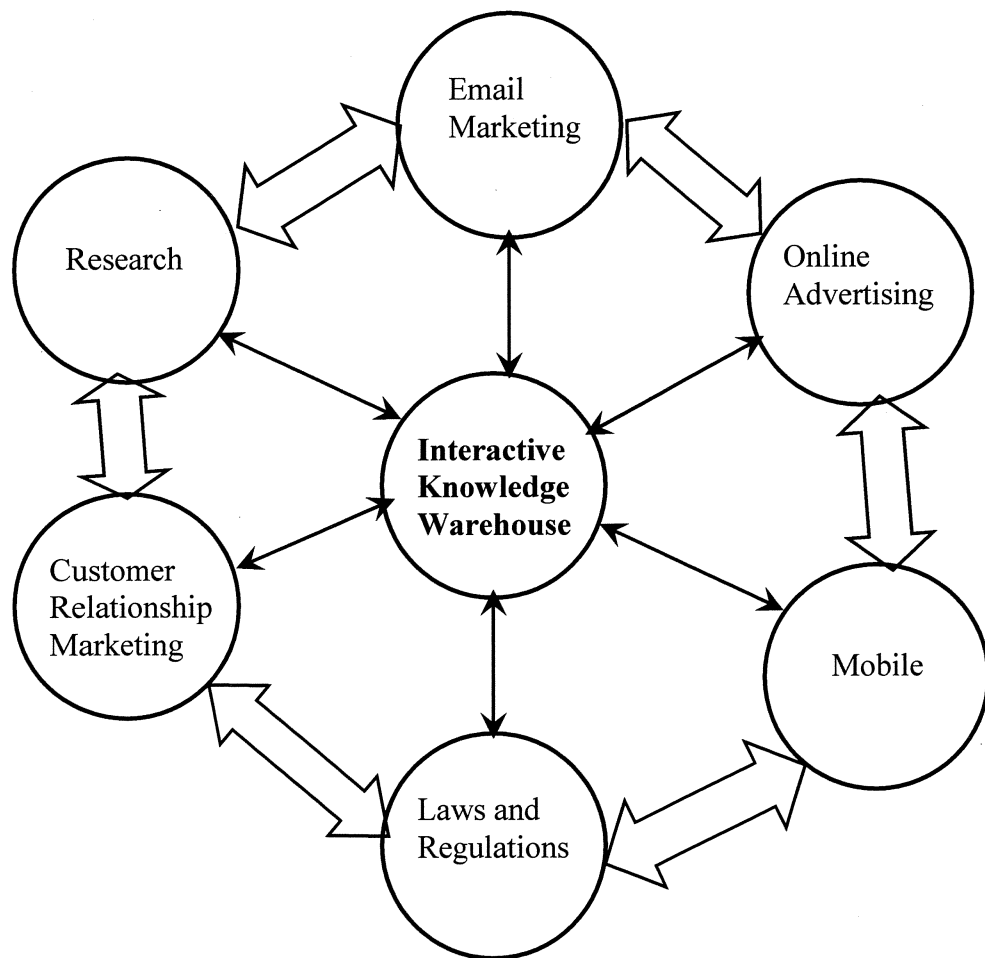


Figure 2: Initial model of knowledge warehouse

The diagram in figure 2 above illustrates the initial schema on which the knowledge model within Kadrosi was founded. It is clear from the diagram in figure 2 that both the initial objectives of interactivity between task forces on different topics, viz. Research, Email marketing, Online advertising, Mobile, Laws and Regulations, and CRM as well as developing focused repositories on individual specialist areas would have been feasible within the above model. The circle in the centre, showing interactive knowledge warehouse actually includes the different categories under which knowledge was being stored. The six categories under which knowledge was being captured came about through filtering and putting together

more than a hundred topics under which data was held within Kadrosi. The six categories shown in figure 2 were not exhaustive but were capable of demonstrating a basic skeletal structure through which the important issue of categorisation was first approached.

The six topic areas mentioned in figure 2 would contain different artefacts like films, documents, pitches, video clips, discussion list messages, email messages from strategic players and the like. In the initial stages the plan was to develop a knowledge warehouse that would indicate location of the artefact to be found within Kadrosi. The knowledge warehouse is now fully operational and is hosted on the intranet facility of Kadrosi. With growth in usage of the warehouse it is planned that all artefacts now currently displayed would eventually be directly accessible.

Ever since the beginning of the research project it was gradually becoming clear that a link would have to be established between the work of the employees at Kadrosi and the use of the knowledge available within the intended warehouse. Otherwise, employees would find it mainly bureaucratic to input knowledge that they have had access to as a professional. To deal with this issue a series of feedback sessions were organised that reflected what were expected in that employees wanted to use the system where they could find something that was going to be useful to carry out their current activities. In other words, to successfully build the knowledge warehouse, with the voluntary surrender of knowledge from employees, the latter would need to trust the system. Research in inter-organisational information systems carried out by Kumar et al. (1998) indicates that some demonstrable benefit needs to accrue for the employee to be able to trust the system. It thus became important to establish how individual employees of Kadrosi could benefit from use of the knowledge warehouse to be willing to voluntarily surrender knowledge that may form a corporate resource. Kadrosi being an organisation involved in the creation of strategic media solutions could not be said to have had the need to have specific roles in the deployment of the intranet on which the knowledge warehouse would be based.

## **5. FLEXIBILITY OF KNOWLEDGE WAREHOUSE:**

Pomerol et al. (2002) in their research on operational knowledge representation have found that operational practices are difficult to model because they are numerous besides being implicit within a community of practice with links between one and another. More importantly, Pomerol et al. (2002) contended that there is variation in the context in which these operational practices apply. In the Kadrosi case, this was quite valid as profitability and productivity of the bid development process was the primary objective of the knowledge warehouse. The created artefact sufficiently represented the bid development process that was the main plank on which profitability of Kadrosi's business depended.

At a stage when the development of the knowledge warehouse had reached a point where a design was expected, various formats were being considered. Sufficient representation of the different states in which knowledge could exist was one issue that needed to be seriously considered. In other words, for the knowledge warehouse to be useful, both the detail as well as interactivity of knowledge indicators needed to be made available to the employees of Kadrosi. Admittedly, the detail would also need to be modelled. Here again, emergence of knowledge from that held within the organisation was something that needed to encompass behaviour and states of existence to sufficiently enable interactivity. In this context, the

dynamic of change over time, flexibility and extensibility were all aspects that such modelling would need to sufficiently capture and represent.

Among the options that were available, entity relationship modelling was given significant consideration. However, several factors deterred adoption of the entity relationship model. The static nature of classifying data in layers, meant that alterations at a later stage would be inconvenient. Representation of many to many relationships with numerous derived entities was also another worry for the entity model. Use of primary and secondary keys to ensure uniqueness was also found to be unwieldy within a complex real time scenario. A simultaneous issue of knowledge existence in different states was also important to be captured within the model. Representation of subtle elements like formats of existence and more importantly behaviour was problematic within the entity model. Given these concerns of dynamism and flexibility as well as the need for adapting to web based infrastructure within Kadrosi, the object oriented model was found to be most appropriate for further development of the knowledge warehouse. To illustrate the application of the object model, a cross section of sample data is being presented in the following table 3.

Table 3 indicates the advantages of using the object model through which both issues of generalisation as well as specialisation are adequately captured. The class and super class design at one end of the model was capable of accommodating flexibility of representing task force/expertise focus within Kadrosi. The use of the class structure also provided the advantages of extending the model to expand or collapse at different levels, depending on the type of knowledge that got integrated into the warehouse. Specificity of individual items within the model shown in table 3 may have been captured through the use of objects and identifiers. Finally both representations of behaviour as well as states of existence made the object model eminently appropriate within the context of Kadrosi's knowledge warehouse needs.

Table 3: *Cross section of the object model*

| <b>Superclass</b> | <b>Class</b>          | <b>Object</b>                                    | <b>Identifier</b>   | <b>Behaviour</b>   | <b>States</b>   |
|-------------------|-----------------------|--|---------------------|--|---|
| Email Marketing   | Email message         | Sample   | Period stamp        | Read, send, receive, forward                               | Hard copy, email, rich text format                            |
|                   | Electronic Newsletter | <a href="http://www.mad.co.uk">www.mad.co.uk</a> | Date of publication | Read, send, receive, discuss, copy                         | Email, hard copy, website                                     |
|                   | Resource              | Partner  | Xpedite             | Contact, receive, send, manage, deliver content, negotiate | Email, hard copy, word document, viral, website, presentation |

|  |  |  |                |  |                                 |
|--|--|--|----------------|--|---------------------------------|
|  |  |  | Digital impact | Contact, receive, send, manage, deliver content, negotiate | Email, hard copy, word document |
|--|--|--|----------------|--|---------------------------------|

Source: Adapted from research data collected within Kadrosi

After the object model was chosen and demonstrated to be robust enough to project management staff at Kadrosi it was clear that such a model could be the foundation of the warehouse. Another simultaneous argument that informed choice was the suitability of the object model to adapt to web based developments. Despite the suitability of the object model as shown in table 3 above, extensive testing of modelling was not possible as time needed to be allocated for storyboarding the other front end of the application. Despite the technical nature of the object model that is shown in table 3 above, it must be pointed out that the variations that were developed to arrive at the above table structure enabled better understanding of the knowledge warehouse and its different states in the future.

#### **6. KNOWLEDGE DIMENSIONS AND STATES:**

Bearing in mind the discussion earlier in the paper on frameworks of knowledge representation, it would be useful to compare experiences of authors in actually deriving the model that eventually was implemented within Kadrosi. Blackler's (1995) framework was the one that came nearest to estimating what happened during implementation of the knowledge warehouse. In a commercial environment somehow a combination of factors tends to decide whether a framework is going to be the most appropriate one. Mere flexibility or superior design is not reason enough for its use within development of facilities.

When the software engineers at Kadrosi were trying out interface development, a few options were closely examined. Initially the plan was to buy off-the-shelf knowledge management software that could fit into Kadrosi without any alterations. Prohibitive cost and limited flexibility meant that such options could not be taken forward. Almost in tandem, there was Microsoft's Sharepoint that was being tested within Kadrosi as software that could be used for maintaining and administering its intranet infrastructure. After prolonged testing it was found to be unsuitable. However, the engineering team retained the basic design of Sharepoint within the solution that was being envisaged at that time. A little later, the engineering team within Kadrosi was working on development of an intranet solution for a major multinational computer hardware manufacturer in the USA. The type of requirements that this particular multinational had and the retained frame of Sharepoint enabled the team to develop a unique design that got to be implemented as the final prototype for the knowledge warehouse. So in a way the object-oriented design was what got implemented but in a more unconscious way.

From the perspective of the design of the knowledge warehouse, after considering a few alternatives like prevalent designs of the library storage systems, the authors recommended the use of a system that would more closely tie up with the central gaps that existed in Kadrosi's areas of development and growth that was planned. The authors referred to these areas of improvement as knowledge gaps. There were six such gap areas that could have



numerous sub-categories. These sub-categories under the 'knowledge gaps' formed what came to be known as knowledge spaces. Whilst knowledge gaps were restricted the six areas spaces could be infinitely extended. The intersection of gaps and spaces produced a factual piece of retrievable information that the users at Kadrosi could use<sup>1</sup>.

The diagram in figure 3 below captures six areas that formed the principal knowledge gaps on which the entire knowledge warehouse now works within Kadrosi.

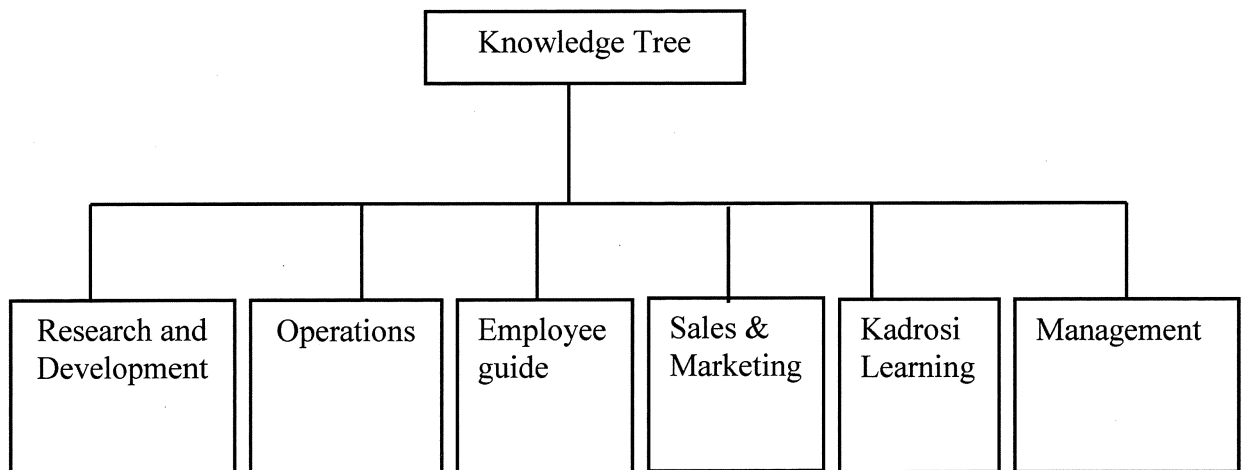


Figure 3: Structure of current knowledge tree

The diagram in figure 3 clearly demonstrates how the new structure has become competent to handle different kinds of knowledge that may be saved within Kadrosi. Obviously the application has very recently been inaugurated within Kadrosi and continued support of the management team as well as the greater build up of documents and other material within it is going to provide an avenue to see how the knowledge warehouse can actually make a difference to the competitive advantage of Kadrosi.

If there is one challenge that stood out among all others in the development of the knowledge warehouse, it was the creation of the categorisation structure that went through the largest amount of iterations and modifications. Whilst initially, the objective was to develop a warehouse that would include all kinds of information, later with the orientation of the mission statement and the identification of principle areas where it was deemed necessary for Kadrosi to make progress – the structure became more manageable. Despite such simplification, a great deal of deliberation and interactive sessions, generating feedback were necessary to arrive at the obtaining structure of the knowledge warehouse.

The categorisation challenge was complicated partly due to the need for embedding dynamic growth capabilities. Designing something static including every knowledge function was probably feasible within a three month period, however, developing something with a flexible capability to expand in the future with addition of different kinds of meta data was quite complicated. In essence to arrive at the rationale of knowledge spaces and knowledge gaps

required a wide variety of research permutations before the design was acceptable to all stakeholders of the project.

## **7. DISCUSSION:**

Within the Information Systems community an indifference to the existence of knowledge management as a subject of research along with a countervailing following of its practice seems to co-exist. It is clear that much of the generalizability of knowledge management stems from looking at existent knowledge within organisations through a new lens (Lee and Baskerville 2003). Coerced by dynamic alterations to business environments, organisations are today trying to rediscover strengths that may have been overlooked as being unimportant. The Kadrosi content was no different. In many ways Kadrosi's task was to find out what it knew as Sieloff (1999) in the context of HP put it, 'If only HP knew what HP knows', (pg. 47). So within such a context of discovering what it knew amidst a continual pressure of commercial activity, Kadrosi experimented with the development of the knowledge warehouse. What began as an experiment to enable Kadrosi develop a tool to leverage competitive advantage eventually translated into an organisational product expertise that Kadrosi could put to use to develop similar artefacts for its clients.

In using 'action research' as the method to develop the investigative dimensions of the study, authors were not free to pick and choose' the problem that they wished to investigate. So from such a perspective, the study may be said to be an opportunistic ploy to develop research in the first place (cf. Baskerville 1999, Avison et al 2001). Despite such a limitation, action research enabled direct response to Kadrosi's needs and provided a rich research environment for the authors through which importance of knowledge sharing within a competitive business environment was tested.

The knowledge warehouse project demonstrated that frameworks are only as good as they make organisations more conscious of what is available within them. The context of a modern organisation like Kadrosi, already has some intrinsic advantages that make such awareness a reality. For instance, Kadrosi had an open office environment where all employees were co-located in different desks across the same office work space. Managers of projects would usually walk around and be accessible all the time. Sharing and a high trust culture where employees socialised after office hours also meant that knowledge sharing was not going to be such a difficult transition after all.

Development of the knowledge warehouse provided a common platform whereby enterprise level knowledge sharing was feasible. Gradual modification of Kadrosi's organisation meant that professionals like graphic designers would provide support through outsourced supply. Given such a context, knowledge sharing would be a necessity rather than a hobby of the curious or the meticulous. Walsham (2001a) points out that homogeneity of knowledge does not enable constructive organisational learning. In this sense, the knowledge warehouse would enable learning from variety in practice and could theoretically lead to knowledge translators (Brown and Duguid 1998) who would be able to frame interests of Kadrosi in terms of client community perspectives. With the creation of a new mission statement of Kadrosi every employee was reckoned to be an expert in a particular field of professional activity within Kadrosi. Partly this was true even before the project began as most employees come into Kadrosi as professionals anyway. However, whether culture of employees would further

change to further facilitate the creation of a conscious knowledge based organisation remains to be seen.

The present paper set out to review types of theories that have commonly been used to understand knowledge management and then look at the type of experiences that the authors had in developing a knowledge warehouse within a media company. The paper discovered various somewhat inevitable aspects that have ensured that a large part of knowledge management remained philosophical and theoretical. The present paper found that Blackler's (1995) categorisation of knowledge probably comes nearest to anything that is widely available in the modern organisation. In so far as the experiences of the authors in implementing a knowledge management system was concerned a range of different skills eventually enabled production of the artefact that was being aimed for. In terms of Lee and Baskerville's (2003) paper, outcomes of the present research would fall in the third quadrant of type TE generalizability. Established theoretical frameworks were reviewed and empirical findings demonstrated that a limited fit could be attained in the new setting of a dynamic knowledge creating environment. Processual knowledge therefore in a media enterprise has a significant innovative dimension. Concurring with Snowden (2003), the present study found that innovation would be both an objective as well as the basis of exploring challenges of knowledge sharing in processual contexts.

When the project had begun, cultural change of workers in terms of knowledge sharing practices was a stated objective. Alavi and Leidner (2001) developed a detailed research agenda for knowledge management systems. However, as noted by Shaw and Edwards (2005), they did not consider willingness to use such a system. For Kadrosi to be successful the knowledge warehouse has to be used, willingness to use the warehouse by non-supportive employees is the type of culture change that was an aim of the project. Culture change remains a second order objective and there remains a distance to go before anything concrete may be said to have been achieved by the project. As Stenmark (2003) found there needs to be a kind of attitude of the top management to ensure that a suitable uptake of intranets took place within the company. In so far as the artefact that was produced it is clear that no straight line or linear path could have led the development that in the end the project team did. So theories of knowledge management enable a different level of abstraction that has little to do with the world of practice. In the end a combination of traditional skills and understanding is actually what produces something that may be used by a dynamic organisation like Kadrosi.

## **8. CONCLUSION:**

There were several important findings of the project at Kadrosi and consequently they made a contribution to knowledge. Firstly, it was found that in an organisation like Kadrosi that is involved in different sectors and areas of knowledge work it is best to connect knowledge codification from a need perspective. After identifying principal areas of growth of Kadrosi through its mission statement, categories of knowledge could be created that could then be uniquely identified through knowledge spaces and knowledge gaps within the knowledge tree. So had the project gone on to classify every component of knowledge that Kadrosi dealt with, the project could not have seen closure within its stipulated two year time frame.

Secondly, in a project where such a substantial amount of feedback needs to be incorporated, all the people of the organisation need to be involved in one way or another. Being a 30

employee organisation, in Kadrosi this was suitably achieved. Also the trust dimension tends to get highlighted within the development of any knowledge based application. Employees are not going to volunteer in passing on their trade related information if they are unable to see some benefit to their work. This establishment of a trust factor is quite important in being able to appropriately represent useful knowledge. Miranda and Saunders (2003) through their research have explored information sharing as an objective to enable social construction of meaning, instead of the traditional goal of decision making. The knowledge warehouse project was typically aimed at enabling Kadrosi to achieve greater productivity and profitability. Coakes et al. (2004) argue that process knowledge is different from tacit or explicit knowledge due to its domain specificity. The knowledge warehouse at Kadrosi showed that meaningful knowledge sharing is directly related to process knowledge.

Thirdly, despite different approaches used in developing the initial structure of the knowledge warehouse, it is clear that classification or categorisation of knowledge is one of the most complicated issues in knowledge management (cf. Galup et al 2003). For the Kadrosi case, audience of ensuing outputs and the six priority areas within the mission statement enabled development of a structure. The use of knowledge spaces and knowledge gaps was motivated by the need for creating uniqueness in the retrieval of knowledge objects from the knowledge warehouse. The idea of ensuring sufficient interactivity was also something that required leaving documents in their original formats. The knowledge warehouse project clearly demonstrated that classification or categorisation of knowledge would need to be uniquely created for any similar knowledge application in other organisations. In this context Pomerol et al.'s (2002) work would be able to point out the need for sufficiently incorporating the contextual dimension and the dynamics of context.

In sum, it might be said that the study having been conducted in only one organisation reduces generalisability, however, it increased correspondence to reality (Hidding 1998 in Lee and Baskerville 2003). Such a single organisation study cannot be expected to provide generalisability of empirical results to other organisations (Lee and Baskerville 2003), rather the purpose was to test and expand on established theory. Overall it must be said that Kadrosi was successful in achieving closure in the work because of a strong technical backup team. Despite the conceptual design and storyboarding of the different facets of the project yet actually translating the ideas into a usable intranet based facility needed substantial coding support. At Kadrosi this was readily available and hence the eventual black boxing. Any project like the knowledge warehouse development requires support of sponsors. Kadrosi was no different. The managing director and the commercial director were themselves directly involved with the day-to-day progress of the project. This turned out to be crucial in ensuring that the quality of feedback and participation of other employees of Kadrosi could be sustained. Such a dimension of support and affiliation of important players within an organisation is going to be significant in similar projects.

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<sup>1</sup> For a more detailed understanding of knowledge spaces and gaps idea please refer to the categorisation structure found in Appendix 1.



