

# **Knowledge Management in Telework Context**

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## **Abstract**

In general, teleworkers can be profiled as knowledge workers, and therefore, the performance of a telework arrangement depends largely on the knowledge of the workers. However, since telework distances workers from their organisation and co-workers, there can be some problems in organisational memory and knowledge management. The exchange of knowledge, especially tacit knowledge, requires a great deal of face-to-face contacts, such as meetings, training sessions, and apprenticeships. In a telework environment, this social interaction and vital face-to-face communication is limited and transfer of individual tacit knowledge may not take place effectively among members within the organisation. In this paper, the problems of knowledge management in telework is discussed and extensive use of communication media and group building among teleworkers through informal communication using communication media to minimise those problems are proposed.

**Keywords:** Organizational memory, Knowledge creation, Telework, and Virtual workplace.

## **Introduction**

Strategic management has increasingly been challenged by competitors and regulators forcing managers to reduce cost and address environment and social problems. This new competitiveness has evolved for a number of reasons such as globalisation of markets, the deregulation of many industries, and rapid technological changes. To face these challenges, organisations adopt corporate-wide cost cutting initiatives, including the reduction of office real estate expenses by eliminating the prospect of a personal office or permanent workspace for many workers.

These changes have led to a new style of work environment called telework arrangement which is a distributed organisational structure where people work away from the conventional office. This arrangement has proven to be an effective way for organisations to meet the challenges of the modern world. Apart from its ability to improve competitiveness and business strategy, it can be used as a means for reducing traffic congestion and air pollution, developing the local economy, and providing job opportunities for the disabled. Due to the above reasons, the concept of telework has received a great deal of attention in recent years from researchers, scholars, and practitioners around the world. However, previous telework research has been limited to a few areas (Higa & Shin, 1996). Most of those studies have addressed only the areas such as a worker related issues and job related issues.

Teleworkers and potential teleworkers are white-collar workers, not blue-collar workers. In other words, all of them are knowledge workers, and performance of a telework arrangement depends largely on the knowledge of the teleworkers. Further, today's business environment requires a knowledge network or a combination of knowledge to face severe competition. This forces organisations to

have a more systematic approach to knowledge sharing in order to quickly leverage, grow, and expand (Holtshouse, 1998). Organisations with telework arrangements are not an exception to this. They too need to have groups of people working together with knowledge and information moving throughout the organisation to stay competitive with their fast moving rivals. According to Jarvenpaa & Ives (1994), organisations with telework arrangements require empowered knowledge workers, continuous re-skilling, personalised human resource practices, and a well-designed organisational memory to face the competition. In these circumstances, organisational memory and knowledge management are paramount in the telework environment. However, despite the importance of organisational memory and knowledge management, previous research has not taken the lead in developing conceptual and theoretical models of organisational memory and knowledge management in telework.

In this paper, we discuss in detail the implication of telework and associated problems on organisational memory and knowledge management and make some suggestions to minimise the potential problems.

### **Organizational Memory**

Memory is the power of process for reproducing or recalling what has been learned and retained, especially through associative mechanisms (White, 1990). Without memory there is no individual, organisation or community. Memory is essential for learning, sense making and communication. Individual memory reflects knowledge of events that have been personally experienced (episodic memory), factual knowledge (semantic memory) as well as the skills that have been learned to use (procedural memory). Individual members' actions may lead to organisational interactions with the world, which results in outcomes that are interpreted by people and shared among members, creating organisational memory in the form of shared beliefs, values, assumptions, norms and behaviours (Shinkula, 1990). However, organisational memory is not simply the sum of the memories of organisational members, because memory is associated with individuals while organisational memory includes shared interpretation among the individuals in an organisation (Persson, 1997).

Organisational memory is generally regarded as a resource that can be used to enhance organisational decision-making. Walsh & Ungson (1991) define organisational memory as "stored information from an organisation's history that can be brought to bear on present decisions". Yates (1990) define organisational memory as a device that allows organisations to store and retrieve knowledge of facts, process, or experiences. Organisation memory contains not only information but also knowledge (Stein & Zwass, 1995). It is a generic concept that can be used to define the information and knowledge known by the organisation and the process, by which such information is acquired, stored, maintained, and retrieved by organisation members. The concept includes technical, functional, and social aspects of the work, the work and the workplace. Organisational memory includes things which can be conveyed by written records (e.g., corporate manuals, databases, filing systems, etc.) and things which cannot be conveyed by written records (e.g., experiences, know-how, etc.). Similarly as individual knowledge, organisational memory is the power within organisations with which to provide information for the optimisation of resources, reduction of costs and effective and efficient decision making.

It is believed that organisational memory is a very important factor in the success of an organisation's operations because it influences the performance of the organisation (Walsh & Ungson, 1991 and Stein & Zwass, 1995). Therefore, bad memory management could affect the performance of the organisation significantly. Organisation memory should be connected and retrievable for every single individual in an organisation when the need arises. If memory exists and is unconnected, it does little to aid the organisation's performance (Croasdel, Paradise & Courtney, 1997). However, it does not mean that always there should be electronic connections for organisational memory. In fact, some research has suggested that it is a mistake to think about a knowledge network only in terms of technology (Yates, 1990). They have suggested that the most important factor in managing knowledge is in the way a company organises its units and people, human links, not its electronic links.

The differences in the performance of an organisation can be largely due to two different factors: a unit's centrality in the corporate network and the type of relationship it maintains with other units (Hansen, 1998). To gain access to knowledge and information, managers tend to focus on direct relationships with other units that have relevant experience (Yates, 1990). However, direct relationships are costly to maintain, require a lot of meetings and management attention. While establishing some direct links are important, building an entire knowledge network around them would be unwise and uneconomical. To optimise the flow of knowledge, it is necessary to have not only direct links but also indirect links with other units. These informal links help to create a common cognitive ground among employees and thus facilitate the flow of knowledge freely among units.

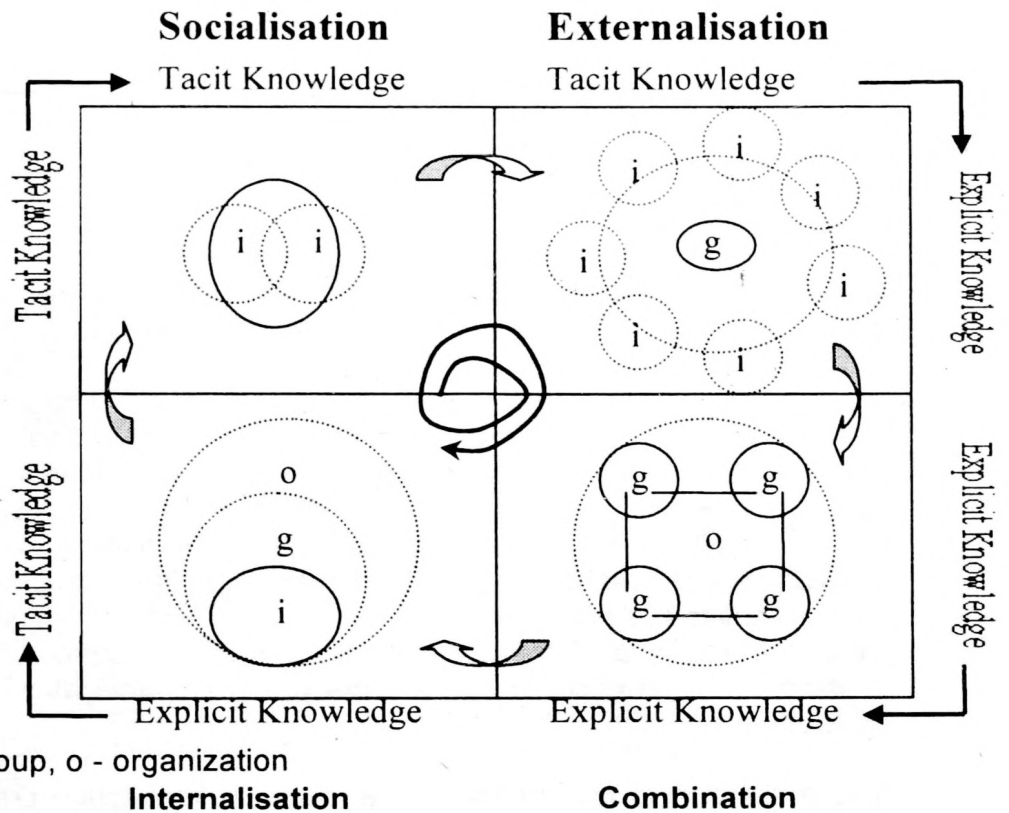
It is a mistake to equate knowledge and information (Brown & Duguid, 1998). Knowledge is something different from information and is not capable of the sorts of friction-free movement usually attributed to information. There are two types of knowledge: explicit knowledge and tacit knowledge. Explicit knowledge needs little interpretation and can therefore be communicated quickly and easily in words and numbers (Nonaka & Konno, 1998): Research reports, specifications, simple software codes, and the likes are examples of knowledge that tends to be explicit. In contrast, tacit knowledge is highly personal and hard to formalise making it difficult to share with others (Nonaka & Konno, 1998 and Nonaka, 1991). It requires a high degree of interpretation and cannot be communicated quickly and easily. Subjective insights, scientific expertise, intuitions, and operational know-how fall into the tacit knowledge category. Because tacit knowledge differs from explicit knowledge, different kinds of transfer mechanisms are needed to exchange tacit knowledge and explicit knowledge. For example, sharing of tacit knowledge requires strong links such as face-to-face contacts. In contrast, exchange of explicit knowledge can be done through weak links such as information networks.

### **Knowledge Creation in Telework**

Management must realise that knowledge needs to be nurtured, supported, and enhanced to be competitive in the present business world. Knowledge is manageable only if the dynamism of knowledge creation is embraced and fostered by management (Nonaka & Konno, 1998). The creation of organisational knowledge requires the sharing and dissemination of individual experiences (Inkpen, 1996). Organisational knowledge creation represents a

process where knowledge held by individuals are amplified and internalised to be used as part of an organisational knowledge base. According to Nonaka & Konno (1998) knowledge creation is a four-step spiralling process of interactions between explicit and tacit knowledge. Figure 1 shows the characteristics of the four steps in the knowledge creation process.

Figure 1: Spiral Evolution of Knowledge Conversion and Self-transcending Process



Source: Nonaka, Ikujiro and Konno, Noboru (1998) 'The Concept of "Ba": Building a Foundation for Knowledge Creation', California management Review, Vol. 40, No. 3.

**Socialisation**

Socialisation is the process of sharing tacit knowledge between individuals. In a traditional work arrangement tacit knowledge is exchanged through activities such as observation, practice and imitation rather than through written or verbal instructions. Therefore, being together, spending time with co-workers, and living in the same environment help the transmission of tacit knowledge from one individual to another individual. For example, long years of participation in organisational activities with experienced workers allow new recruits to acquire the tacit knowledge of experienced workers by observing, imitating and practising the work done by senior workers. Hence, frequent dialog and face-to-face communication are very important in the socialisation process making physical proximity a vital factor in tacit knowledge exchange. In a telework environment, this vital face-to-face interaction for socialisation is limited. Therefore, teleworkers, especially telecommuters may have some problems in exchanging

tacit knowledge thereby making it difficult to create tacit knowledge from existing tacit knowledge. To overcome this problem one solution that could be adopted is limiting the telecommuting for 2 or 3 days per week where socialisation is required to transfer the knowledge.

However, due to changes in settings, lack of face-to-face contact may not affect all types of telework arrangements. For instance, teleworkers in a satellite office environment may not have any difficulty of meeting co-workers face-to-face and the knowledge creation process through socialisation will take place. Further, teleworkers working at telework centres and tele-cottages have opportunities not only to interact with their co-workers but also to interact with people from various organisations who have different experience, which can broaden the socialisation process. Hansen (1998) found that informal contact with workers is as important as formal contact in the knowledge network, thus, we can assume that the environment in telework centres and tele-cottages may lead to different type of knowledge creation through socialisation.

### **Externalisation**

Externalisation requires the expression of tacit knowledge into comprehensible forms that can be understood by others. Externalisation of tacit knowledge is very important for any type of work arrangement, as it is the initial step of knowledge creation and innovative idea generation. Unless tacit knowledge is externalised, innovative ideas of the mind cannot be put in the form of a technical specification. However, converting tacit knowledge into explicit knowledge is not an easy task. Even under the traditional office environment where workers have many opportunities for face-to-face interaction, it takes a long time and lot of effort to convert tacit knowledge into explicit knowledge. Nonaka & Konno (1998) explain how a software developer from Matsushita Electric Company spent about one year in the Osaka International Hotel to learn the correct method of the bread making process to come up with the product specification for a bread-making machine.

Externalisation is one of the critical steps in knowledge creation as it requires active involvement and personal commitments. Physical proximity and face-to-face dialogue are the key to conversion and transfer of tacit knowledge into explicit knowledge. Lack of face-to-face interaction in telework is likely to make this process difficult for certain types of telework arrangements. For example, as in the case of socialisation, satellite office workers and workers at telework centres and tele-cottages may not have too much difficulty in the externalisation process compared to the traditional single office environment. But in contrast, telecommuters and mobile workers may tend to think that they do not need to transfer their tacit knowledge into explicit knowledge, as there is no one around to learn from them. However, well-organised Organisational Memory Information Systems (OMIS) which contain knowledge of teleworkers may force them to transfer the tacit knowledge into explicit knowledge. Because, unless knowledge is externalised, it cannot be integrated into the OMIS. This can be boosted by having some method to reward teleworkers for putting their knowledge into the OMIS (Morrison, 1997).

## **Combination**

Combination involves the conversion of explicit knowledge into more complex sets of explicit knowledge. In this stage, systemisation of existing explicit knowledge is done through categorisation, sorting, adding, multiplication, and etc. This process leads to the generation of new explicit knowledge. According to Nonaka & Konno (1998) the combination process is done in three phases. Phase one is capturing and integrating new knowledge. This involves collecting externalised knowledge from inside and outside the organisation and combining such data using the operations mentioned above. This process does not necessarily need face-to-face interactions among members. Therefore, in a telework environment there may not be any difficulty of combining existing explicit knowledge into new explicit knowledge. When accessing straightforward explicit knowledge, what is needed most is the ability to quickly search in a lot of places. Weak links such as e-mail and computer networks are ideal to facilitate this (Cliff, 1998).

One of the influential factors behind telework is information technology, which enables communication between different locations, providing online access to vast amounts of information. Therefore, the extensive use of IT tools such as computers and the Internet in teleworking will increase the amount of explicit knowledge that can be acquired leading to the generation of more knowledge compared to the conventional office environment. The second phase involves the dissemination of explicit knowledge directly through a transferring process. This transferring process may use any form of communication method such as a presentation, meeting, computer network; etc. In the information age, the use of online-network, groupware, online documentation, and databases has been enhancing this transferring process. Therefore, the dissemination of explicit knowledge will take place among teleworkers as it had in the single office environment. The third phase of the combination process is the editing or processing of explicit knowledge to suit the requirements of individuals. This happens at an individual level and does not differ between teleworkers and traditional office workers.

## **Internalisation**

Internalisation is the process of converting newly created explicit knowledge into the organisation's tacit knowledge. This requires individuals to identify the knowledge relevant to their work and to self-learn through practice and experiment by using the newly created explicit knowledge (Nonaka, 1991). This process hardly requires face-to-face interactions and social contact. Therefore, the internalisation process can take place in a telework environment without much difficulty. However, there will be different types of internalisation processes depending on the types of telework arrangements. For example, satellite office workers have a similar office environment to the traditional office environment and the conversion process of explicit knowledge to explicit knowledge is likely to be similar. In contrast, the conversion process of explicit knowledge into tacit knowledge in mobile working and telecommuting will be different compared to centre based teleworking. According to Jarvenpaa & Ives (1994), knowledge workers in a network environment should be "empowered". They also proposed that knowledge workers in a network environment should know how to use information (explicit knowledge) in a better way compared to traditional office

workers. As telecommuters and mobile workers are empowered and know the use of information in an effective manner, they are likely to learn more through practice and experiments with the use of new explicit knowledge. In particular, mobile workers are likely to learn a lot as they have frequent contacts with their clients. This frequent contact gives the opportunity to get quick feedback directly from the client enhancing the internalisation process.

## **IT for Knowledge Management in Telework**

### **Distributed Team Building for Knowledge Management**

It is a well-known fact that team development is very important for a group to work effectively. Thus, a majority of managers are attempting to develop a high level of teamwork within their group (Lee, 1986). In the competitive business world, teleworkers cannot work alone, and they too should have a high level of teamwork to maintain competitiveness. According to Thomas (1986), the most important factor in team building is to develop co-operative units by promoting a common point of view and common language. By doing this, workers can be motivated to share their knowledge and information, which lead to new knowledge creation and organisational memory building. A widely proposed method is using a high level of social interaction among workers. However, in a telework environment, social interactions such as coffee break talks, which help to enhance interpersonal relationships, do not exist. This lack of social interaction reduces the knowledge creation and organisational memory building. Further, if a distributed team is not well built up, a common point of view is not properly generated or commonly accepted, members can hardly collaborate with each other to accomplish a task together (Huang, Wei, Bostrom, Lim, & Watson, 1998). Therefore, team building in telework becomes an important factor not only in organisational memory building and knowledge management, but also for the effectiveness and productivity of the work.

Established organizations have their formal communication channels within departments as well as across departments. Formal communications channels are used for official communications. In addition to formal communication channels, organizations have informal communication channels between different groups. Huang, Wei, Bostrom, Lim, & Watson (1998) proposed in detail how informal communication among distributed group members through communication media can be used to build teams in a distributed environment. The objective of their proposed method is to promote shared views and team goals among all members through communication media. Ocker, Fjermestand, Hiltz & Johnson (1998) found that use of various communication media together is much more effective than the use of one media in group work in a distributed environment. According to Locke & Latham (1990), shared team goals and views can motivate a team to conduct a dialogue. Dialogue, whether it is face-to-face or through electronic communication media, improves the knowledge and information sharing among members. When knowledge and information are shared, there is an overlapping of knowledge and information among members. This overlapping of knowledge and information is very important because it encourages frequent dialogue and communication and helps to create a common cognitive ground facilitating the transfer of tacit knowledge (Nonaka, 1991). Further, overlapping of information helps workers to understand what co-workers are struggling to articulate and thereby motivates them to externalise their knowledge. This spreads new explicit knowledge among members, and when

new explicit knowledge is spread, it can be easily internalised making new tacit knowledge. From the above discussion we can assume that establishing a good informal communication method among teleworkers would enhance mutual understanding and finally lead to the creation of new knowledge.

### **Organisational Memory Information Systems (OMIS) for Telework**

Today, factors such as global competition changing the organisational structure, massive layoffs of middle managers, and the emergence of telework are causing organisations to lose valuable experiential knowledge that exists only in the memories of individual workers. As a result, researchers and practitioners are becoming interested in finding ways that information technology can be used to create Organisational Memory Information Systems (OMIS) that can capture present information and knowledge and make it available to support future processes and decisions. OMIS may capture information items that are well suited to computer storage (e.g., data documents, standard rules and procedures) as well as items that are difficult to capture and codify (e.g., recollections of specific processes and rationales, interpretation about values, structures and roles). These items may be used to describe past events or tasks or to prescribe guidelines for addressing future tasks. Generally, OMIS is expected to enhance lower-level learning in all type of organisations, especially organisations which have loosely structured teams (Stein & Zwass, 1995).

Elofson, Beranek & Thomas (1997) proposed a system using intelligent agents in a multi-agent environment to enhance organisational memory and organisational learning. Their proposed architecture would automatically accumulate and classify organisational expertise. Weiser & Morrison (1998) proposed a project memory system that would be useful to team members actively working on a project. Their system provides a central repository and access point for project communication and documentation. According to Nonaka (1991) when there is different information among members, they can no longer interact on equal terms, which hamper the interpretation of new knowledge. Therefore, providing teleworkers with access to all information in an indiscriminate manner using an OMIS would enhance new knowledge creation. Further, this would minimise the repetition of work done by fellow teleworkers in the past due to lack of awareness that similar problems or tasks have been addressed in the past. Further, in telework, these OMIS can be used to augment the interaction between knowledge seekers and information providers. For example, in a telework environment, knowledge/information held by others can be used only when they are obtained through communication. For that, an information seeker should know who holds what information/knowledge and having a directory of people with their expertise would lead to higher level of organisational effectiveness and learning (Croasdell, Paradise, & Courtney, 1997). However, tacit knowledge is much more difficult to build into an information system and most of the available OMIS provides little support for acquisition of tacit knowledge. Therefore, further research is needed to investigate how IT technologies such as intelligent agents, voice-mail, video images, etc. can be incorporated into OMISs to support tacit knowledge.



## Discussion

Organisations only store a small fraction of their knowledge in storage media that is shared and freely accessible (Walsh & Ungson, 1991). In other words, a significant portion of the organisational memory resides within human memory. The sharing of this large portion of memory among teleworkers is a very important task for the success of a telework program. From the two knowledge types available, explicit knowledge can be expressed in words and numbers and shared in the form of data. It needs little interpretation and can therefore be communicated quickly and easily using weak links such as a computer network, email, the Internet, etc. In contrast, tacit knowledge requires a high degree of interpretation and cannot be communicated quickly and easily. The exchange of tacit knowledge requires a greater deal of face-to-face contact such as meetings, training sessions, apprenticeships, and the likes. However, this vital face-to-face contact is limited in a telework environment and some of the steps mentioned in the knowledge creation process may not occur in an appropriate manner. If this is the case, we can assume that the performance of teleworkers may deteriorate with time. Yet, we will not be able to see the deterioration of performance in the short run as teleworkers already have the acquired knowledge while they were in the traditional single office environment. However, we are yet to see whether any deterioration of performance takes place in the long run or if the extra explicit knowledge attainable through IT compensates for the loss of tacit knowledge of teleworkers. Further, it is unlikely that communication technology will be able to substitute for face-to-face communication entirely in the near future. If some deterioration in the performance of teleworkers can be seen in the long run, it is desirable to create opportunities that increase face-to-face interactions among teleworkers. Periodic conferences, frequent project-review-meetings, and the likes would foster a culture encouraging frequent informal interpersonal contacts.

One of the organisational information processes is the interpretation of the external environment. The environment is a major influential factor of the organisational structure and internal processes (Daft & Lengel, 1986). Some types of telework arrangements such as mobile working give workers greater opportunities to interact with the environment. Hence, workers who perform this type of teleworking may have more opportunities to learn from the environment compared to traditional office workers. Further, due to the extensive use of IT in telework, teleworkers can gather a huge amount of information. This will enhance some of the steps in knowledge creation process such as combination and internalisation. Even though individual teleworkers benefit from continual learning from the external environment, those benefits do not automatically accumulate to the organisation as a whole. Careful management is necessary to maintain the relative power of the individual knowledge worker and management, otherwise power could shift in the direction of the knowledge worker (Jarvenpaa & Ives, 1994). Therefore, to ensure organisational learning and the balance of power, it requires a well-defined OMIS, so that management will be able to know up-to-date details of all knowledge workers who work outside their office, their skills and expertise. However, building a good OMIS is not an easy task. To build a very good OMIS, teleworkers should be willing to give other knowledge workers broad access to their work. In other words, teleworkers must be willing to put their information/knowledge into the OMIS. But, traditional organisations are designed to protect and control information. Individual workers are rewarded for what they know rather than what the worker contributes to others' learning and the overall organisational memory (Jarvenpaa & Ives, 1994). Therefore, creating the right values and norms regarding information sharing becomes one of the

main tasks in building OMIS, not only for telework organisations, but also for other organisations as well. Morrison (1997) has suggested making a reward-penalty system to motivate workers to put their information and knowledge into the OMIS. Kouwenhoven (1998) suggested appointing a knowledge steward to facilitate knowledge sharing among members. However, these methods haven't been thoroughly tested so far and further research is necessary to evaluate the effectiveness of these methods in real settings.

## Conclusions

This paper discusses organizational memory and knowledge management in telework with an emphasis on the importance of communication and OMIS. Organizational memory has become increasingly important due to the recognition that organizational knowledge is a key factor to organizational effectiveness, efficiency, and competitiveness. The core competitiveness of the telework arrangement too depends on the knowledge of the workers. In this paper, we discuss how teleworking affects organizational memory and knowledge management and explain the potential problems. Usefulness of informal communication through communication media among teleworkers for group building and the importance of OMIS in telework are explained.

The discussions in this paper explore various future research topics. An empirical study investigating how knowledge management and information sharing problems affect teleworkers' performance would be a valuable contribution to the field. Studying whether any media can replicate vital face-to-face communication in telework for knowledge creation will immensely help the telework community.

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