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Information Technology Support for the Creation and Transfer of Tacit Knowledge in Organizations

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Introduction

Research on tacit knowledge in organizations is hampered by weak conceptualization, a confusion of levels, and a lack of empirical studies. Also, the important question of how information technology can support the creation and transfer of tacit knowledge in organizations has been neglected.

This paper briefly reviews existing research on tacit knowledge, and presents an alternative model to study the ways in which information technology can support the creation and transfer of tacit knowledge in organizations. The model focuses on individuals alone, in dyads, and in teams. Five roles for individuals (experimenter, teller, teacher, listener, and learner) are identified that show how tacit knowledge that is required for a task can be created and transferred.

Tacit knowledge

Over the past five years tacit knowledge -also known as implicit knowledge or knowledge that is difficult to articulate- has received increased attention in the organizational literature. Tacit knowledge plays an essential role in organizations, because explicit knowledge has to be internalized, made tacit, before it can be used in any kind of organizational activity. Most of the knowledge within organizations exists in this internalized, tacit form. At the same time, by its very nature tacit knowledge is difficult to transfer from one individual to another, and this implies that an essential part of an organization's knowledge cannot easily be distributed and shared within the organization. Successful organizations will be able to quickly internalize new knowledge into tacit form so that it can be applied to essential activities. At the same time such companies will promote and support the transfer of tacit knowledge between individuals. Outside the organizational context there is a more mature body of work on tacit knowledge in for instance the fields of knowledge acquisition, individual cognition, and education (see e.g. Reber, 1993).

One of the main drivers of the recent interest in tacit knowledge in organizations is the work by Ikujiro Nonaka who, in collaborations with a number of researchers developed a theory of organizational knowledge creation that describes the interactions between tacit and explicit knowledge. One of the key contributions of Nonaka and his colleagues is that they have made clear how important it is for organizations to manage and leverage their tacit knowledge (Hedlund and Nonaka, 1993; Nonaka, 1994; Nonaka et al., 1994; Nonaka and Takeuchi, 1995). Other key research on tacit knowledge in organizations has been initiated by Wagner and Sternberg (1987), who developed an instrument to create an inventory of tacit knowledge in managers, and linked tacit knowledge to managerial success.

The philosopher Polanyi (1958, 1966) was the first to discuss and develop the concept of tacit knowledge. In his view, individuals can know more than they can tell, they have knowledge that they cannot easily make explicit, and this knowledge is commonly referred to as tacit knowledge. Although many researchers built on Polanyi's work, it appears that there is no conceptual or empirical work on the ways in which information technology can support the creation and transfer of tacit knowledge in organizations. The application of information technology for organizational knowledge creation is mostly focused on explicit knowledge.

In addition to this, the development of a theoretical perspective that can guide the application of information technology for tacit knowledge creation and transfer is hampered by two main problems: weak conceptualization and a lack of empirical work. Definitions of tacit knowledge vary greatly and do not always have a clear source. For example, Nonaka uses multiple definitions and descriptions for tacit knowledge that deviate from Polanyi's work, without indicating how and why his conceptualization of tacit knowledge is different.

When Polanyi first conceptualized tacit knowledge, he saw it as existing exclusively in individuals. However, recent research has made it clear that a team of interacting individuals can have key knowledge that transcends the knowledge that each of them has individually. Nonaka is one of the researchers who recognizes this new understanding and he discusses the expansion of knowledge from individual up to inter-organizational levels. But it is not clear how the knowledge and the individuals interact to create tacit knowledge at higher levels.

For the purposes of this paper, tacit knowledge is defined as knowledge that is difficult to transfer between individuals, and that exists within individuals and in the interactions between individuals. This definition differs from Polanyi's perspective who limits tacit knowledge to knowledge that cannot at all be articulated. Also, in contrast to Nonaka's work, the locus of tacit knowledge at levels higher than the individual is not within the group, the organization, or the inter-organizational level itself, but instead is in the interactions between individuals.

The empirical problems are likely a result of the conceptualization problems. It appears that very few empirical studies exist that deal with tacit knowledge in organizations. There is one empirical study by Nonaka et al. (1994) on knowledge conversion processes, and there is work by Wagner (1987) and his followers that -like Nonaka et al.- uses a survey instrument to measure managerial perceptions concerning the existence of tacit knowledge. None of the studies investigate the actual processes that create tacit knowledge. There is a strong need for empirical studies that operationalize, test, integrate, and further extend the conceptual work on tacit knowledge that has so far been done.

From Polanyi's work (1958, 1966) it can be derived that tacit knowledge is acquired and maintained through experience. This experience can be either obtained through repeatedly performing a task in a similar way, or through experimentation with new approaches to complete a task. New tacit knowledge is acquired when a familiar task is performed in a new way, or when a new task is performed through experimentation. Explicit knowledge, on the other hand, is knowledge that we can easily articulate in words.

	Tacit Knowledge	Explicit Knowledge
Individual alone as		
Experimenter	*Creation*	*Possible Creation*
Individual in a dyad as		
Teller		*Transfer*
Teacher	*Transfer, Possible Creation*	*Possible Creation Possible Transfer*
Listener		*Creation*
Learner	*Creation*	*Possible Creation*
Individual in a team in		
Any of the five roles	*Possible Creation Possible Transfer*	*Possible Creation Possible Transfer*

Table 1. Knowledge Outcomes for Different Individual Roles

Tacit Knowledge Roles for Individuals

Table 1 shows the ways in which an individual can create and transfer tacit knowledge within three different social environments: alone, as part of a dyad, or as part of a team. Across these environments a total of five roles exist that the individual can have in the transfer and creation of tacit knowledge. The first column of the table shows the different roles, the second column indicates if within these roles an individual can create or transfer tacit knowledge. Although the focus is on tacit knowledge, the third column shows if explicit knowledge is likely to also be created or transferred.

An individual on her own can create tacit knowledge by trying different ways of performing a task. The individual as **experimenter** can be guided by explicit knowledge concerning the task (internalization), or can rely on tacit knowledge that pertains to similar tasks. Although the focus is on the creation of tacit knowledge, explicit knowledge may be created as a by-product of the experimentation.

An individual can have tacit knowledge that another individual needs for a task but does not have. The sharing of this tacit knowledge between two individuals leads to four possible roles that an individual can take. The first role is that of the individual as **teller**. The individual is the sender of tacit knowledge, but is able to articulate this knowledge in explicit form. It suffices to tell the knowledge to the other person in the dyad (who will be listening, and can then internalize the knowledge). In the second case the knowledge can not easily be articulated, and the individual becomes a **teacher**, who has to make sure that the other person obtains the tacit knowledge through experience. This is what Nonaka refers to as socialization. As a result of the teaching efforts, the teacher will possibly create new tacit and explicit knowledge, and will likely transfer the newly obtained explicit knowledge.

The third role is the individual as **listener**, the receiver in the dyad with the individual as teller. The knowledge that is to be shared is tacit, but because it could be articulated, it is transferred in explicit form. The listener will receive the explicit knowledge and remember it in explicit form. Because the listener did not previously have the explicit knowledge, she is seen as having created the explicit knowledge. The listener, after receiving the explicit knowledge, will have to internalize the knowledge through experimentation.

The individual as **learner** cooperates with the teacher to obtain tacit knowledge. The learner experiments with the task for which the knowledge is required, guided by the teacher, and by any explicit knowledge that the teacher may tell. This experimentation leads to the creation of tacit knowledge within the learner. As the learner creates the tacit knowledge, she may through improved understanding create explicit knowledge as a by-product.

When a team of individuals works together to perform a task, the individuals in that team can take any of the 5 roles that are discussed above. The tacit knowledge that the team as a whole needs will partly already be in the individuals, and the remainder will have to be created as the task is being performed. This tacit knowledge will pertain both to tasks that each of the individuals have to perform on their own, and to tasks that they have to perform in interactions with other members of the team.

Information Technology Support

Traditionally, information technology support has focused on the creation, storage and retrieval of explicit knowledge. Tacit knowledge requires different support, and information technology should facilitate knowledge creation and transfer by individuals in each of the 5 roles, whether they are alone, in a dyad, or in a team. The experimenter can be helped by technology that can store experiences, make knowledge explicit, or that simulates a task. The teller can be supported by relatively simple communication and storage facilities to transfer the knowledge not only now, but to also make it available for future listeners. The listener will be helped by these same technologies, because she will be able to go back to what the teller transferred. Finally, the teacher and the learner need the communication and storage technologies as well as more advanced technologies to create shared workspaces that facilitate interaction between the teacher and the learner.

The precise nature of the information technologies that can support the creation and transfer of tacit knowledge will have to follow from empirical studies of current and planned information technology support, as well as from experimentation with existing and new technologies. The six roles that have been identified in this paper form a framework that can guide such research.

References available upon request from first author or at http://www-rcf.usc.edu/~raven/aispaper.