

## **A Framework Supporting Knowledge Sharing in Organizations**

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**Abstract:** This paper focuses on a framework for supporting knowledge sharing in organizations through computer support. Results from three ethnographic field studies of organizational knowledge in three kinds of settings show that sharing of knowledge, or finding things out, is a highly contingent matter. There is no single solution to support this. Instead, a combination of communication tools, awareness applications and information management solutions provide a suitable framework for knowledge sharing. One of the field studies also included an evaluation of a number of light-weight prototypes developed based on the three areas focused on in the framework. The results from the evaluation indicate that the framework is suitable for the purpose of supporting knowledge sharing.

**Key Words:** Knowledge sharing, framework, ethnographic studies, communication, awareness, information management

**Category:** J.4

### **1 Introduction**

Individuals' knowledge and skills are considered as valuable assets in many organizations. As a consequence, the interest in supporting the management of knowledge in organizations, especially with computer based tools, has increased during the last decade. In the early 1990s focus was on trying to store people's knowledge in an attempt to provide a facility for others to reuse a person's knowledge without disturbing that person (e.g. [Conklin and Begeman1988]). However, a number of problems were identified with such systems [Bannon and Kuutti1996] and focus shifted to systems providing references to others having the knowledge asked for (see, e.g., [McDonald and Ackerman2000]).

It has been suggested that contacts and collaboration between people and how these are distributed over the day are important aspects of knowledge sharing [Fisher and Dourish2004]. Accordingly, research within knowledge management today focuses on areas such as awareness (e.g. [Dourish and Belotti1992]), social networks (see, e.g., [Garton et al.1999]) and communities of practice (see, e.g., [Lave and Wenger1991]). The MILK system [Agostini et al.2003] is an example of an innovative knowledge management solution based on these ideas.

This paper presents a framework for discussing technical aspects that are important to consider when designing computer support for knowledge sharing in an organization. The framework is based on findings from ethnographic field

studies in three different settings, where focus was on identifying how people act as they try to find things out. Three prototypes have been developed within the framework and evaluated as part of one of the field studies.

## 2 Three ethnographic studies

During the last decade a number of ethnographic field studies focusing on knowledge sharing in different organisational settings have been reported in the literature (see, e.g., [Fitzpatrick2003]). Over the years the author has conducted three such studies focusing on how the members of an organisation share information and knowledge. The first and third studies were shorter in duration (two and six months), while the second study lasted for a couple of years. The first study was conducted at one department within a world wide telecommunication company and the two others were conducted within medium sized consultancy firms, one focusing on information technology and business modelling, and the other on mechatronic, hardware and software solutions.

In the analysis of the results from the studies four major questions came in focus: 1) What actions do people take as they try to find things out? 2) How does the situation affect the way a person searches for knowledge? 3) What tools do people use in order to facilitate knowledge sharing? and 4) What technologies can be used to support people in finding things out?

When asking others a number of different approaches were identified. The most important source of knowledge appears to be local colleagues. Managers as well as other kinds of key personnel also serve as a common source of knowledge. People not only build social networks within the organization, they also use external people in order to find things out. In neither of the studies we have identified any barriers to sharing information that is related to a reciprocity of favours or on face saving grounds. The only barriers we could see were related to money and time. Other studies report of different behaviours, where members are more possessive about their knowledge and hesitate to share it with others (see, e.g., [Orlikowski1992]).

All three studies show that there is a clear ordering in how members find things out, but exactly what actions they take at different moments depend on the context of the problem and on the situation. Most questions that occur during an ordinary working day are related to the project, and people working in the same project are typically located nearby. Therefore, people tend to keep questions local by asking people nearby. Managers are often busy and even unavailable, but people tend to ask managers anyway because they have a broad knowledge and a large social network. Managers thus provide a mean for setting questions in a context and/or pointing to others who can give an answer. Certain persons who have left the organization can also be an important source of

knowledge. They have, so to say, earned a persisting reputation as being able to answer questions. In other words, asking others is a highly situated matter that depends on the context of the problem and on who is available at the moment. As a consequence, knowledge management systems cannot be based upon fixed rules on how people preferably should act as they try to find things out (cf. [McDonald and Ackerman2000]). Such rules simply do not appear to exist.

A number of tools were used within the three organisations studied in order to find things out, e.g., mobile phones, e-mail, chat systems, and purpose specific information systems. It is important to note that searching for knowledge through written documentation worked in conjunction with people's background knowledge, e.g., knowledge about the problem domain (cf. [Pycock and Bowers1996]).

It is clear from the studies that supporting knowledge sharing in organisations is dependant on both technical and social means. Focusing on the technical support for knowledge sharing a number of issues were identified in the analysis of the observations as important to consider: how to support communication between individuals, how to support awareness of others' availability and activities, and how to make already existing written documentation searchable. These three issues are also focused on in the framework.

Apart from a technical focus on supporting knowledge sharing a number of social aspects were identified as well. For example, the office ecology provides for supporting awareness of others' activities and availability, e.g., through an open landscape office where people have the possibility to see and hear their colleagues "in the corner of their eyes" (cf. [Heath and Luff1991]). Formal as well as social meetings and activities provide means for people to learn from each other, e.g., about projects, activities and personal interests. Supporting people in building networks where people trust each other and experience a mutual sharing of knowledge is another important organizational issue.

### **3 The framework**

Our studies show that the sharing of knowledge is a highly contingent matter [Groth and Bowers2001]. A combination of communication tools, awareness applications and information management solutions should provide a suitable framework for knowledge sharing.

#### **3.1 Communication between people**

When we need to communicate with others the reason for the desired communication affects how we choose to communicate. We might need an instant reply and therefore choose a synchronous tool before an asynchronous. We might need to pose a question to a group of people and therefore choose a tool that enhances group communication. A third aspect of communication tools is that the

location from where it is used can be either predictable or unpredictable. If the location is predictable then a suitable communication tool may be chosen based on that information.

One important consideration has to do with platform independence, i.e., running the same communication application from desktop and mobile platforms. Today, there exist a number of communication tools that are available on different kinds of desktop platforms. However, few communication tools are available on both desktop and mobile platforms. E-mail, e.g., provides this facility.

Another important aspect is that people might become too available, i.e., people may be annoyed by being interrupted too often. This implicates that communication tools, at least if they are synchronous, need to deal with how available a person is for different kinds of users. For example, while working intensely with a project problem a person may be available for other project members and managers, but not for persons outside the project.

Hence, aspects to consider regarding communication tools are concerned with time (synchronous or asynchronous), audience (one-to-one or one-to-many), location (predictable or unpredictable), platform (dependent or independent), and availability (context specific or not).

### **3.2 Awareness of others' activities and availability**

Within the organizations studied awareness of others' activities and availability was identified as being important when supporting knowledge sharing. Providing awareness information is often combined with privacy aspects which need to be dealt with. A second aspect concerns the risk that people may become too available, which may lead to annoying interruptions (see above). A challenging but interesting aspect to consider in both communication tools and awareness applications is how to provide for a selective availability to interruptions based on the context of the communicated problem and the context of the work task.

Another aspect regarding awareness applications is that the information can either be presented as it is, leaving it up to the user to interpret where the person is and when he or she will be available again. A different approach would be to use algorithms to compile a presentation, based on a number of different sources, that would be the most likely interpretation. A side effect with detailed awareness information is that it gives people a chance to plan how to proceed when finding things out if they can't find the person asked for.

Hence, aspects to consider regarding awareness tools are concerned with privacy issues (who should see what information), availability (context specific or not), and presentation (as it is or a compilation).

### 3.3 Information management

Written documentation plays an important role in many organizations. For the purpose of supporting knowledge sharing in an organization, written documentation can be of help. In our studies, information of specific interest were previous customers and technologies used in other projects. This kind of information would typically serve as references to other persons to talk to. However, this is not to say that things should get documented in order to support knowledge sharing. Things should be documented for well-defined reasons, and *reused* for the purpose of supporting knowledge sharing. Neither of our studies have shown any motivation for supplying specific information only for a knowledge management purpose.

If reuse is an important purpose of written documentation then there must exist well functioning search facilities. There are a number of alternatives that can be suitable, depending on how detailed the searches should be. The simplest alternative to provide search facilities would be to use a Google on the local disc. Google provides quite sophisticated search mechanisms that give quite good results from searches in unstructured written documentation. A somewhat more complex alternative would be to use ontologies to structure the search among unstructured written documentation. The added work of creating the ontologies may be reasonable if the searches provides a better result than the Google search. A third alternative, even more complex, is to use metadata. The use of XML to mark up important parts of a text document most likely provides for even better search results than the use of ontologies. Which technology to use depends on the effort that can be afforded on the search facilities and on how good search results that are necessary.

Hence, aspects to consider regarding information management solutions are reuse of already existing information, search facilities (based on, e.g., Google, ontologies, or metadata), what efforts that are available and what search results that are necessary.

### 3.4 The prototypes

Three prototypes were developed and evaluated in the third study. The first prototype, focusing on communication between individuals, used an already existing notification system (Elvin [Fitzpatrick et al.2002]) as a base for a mobile application running on a smart phone. Elvin supports communication that is synchronous as well as asynchronous, and one-to-one as well as one-to-many. The mobile Elvin client enhanced communication between people providing the same tool both from desktop computers and mobile devices, thereby adding platform independent communication.

The second prototype, focusing on awareness of others' availability and activities, was based on bluetooth technology available in mobile phones and desktop

computers to detect people's location within the office premises. The location detection prototype provided means for people to find out about others' whereabouts, or rather, where their mobile phone happens to be located at the moment. The prototype also considered privacy aspects by making it possible for the users to decide by themselves who should be able to see their information.

The third prototype, focusing on information management solutions, was based on combining different information sources into one single point for searching. The information prototype focused on making already existing information available and searchable using information management technologies such as metadata. This prototype was a simple demonstration of the ideas of how the information could be searched for.

The prototypes are not to be seen as singular tools that support knowledge sharing. Rather, they function in combination with each other. For example, the location detection prototype can be used when searching in the information prototype to arrange the presentation by people's availability.

A movie, exemplifying different scenarios, based on examples from the field studies, where the prototypes were used, was used in a focus group discussion. Three main issues were raised during the evaluation of the prototypes. First, people feel that they are sometimes too available and that the amount of interruptions during an ordinary working day can be annoying. Indeed, all interruptions may not be annoying (cf. [Rouncefield et al.1994]). It depends on both what activity the interrupted person is involved in and on what the interruption is about. Second, the one who would benefit most from the location detection prototype would be the receptionist, who, in her task of directing phone calls and visitors to people, constantly kept track of people's activities and availability. Third, the information prototype was the one which was considered to add most value to the members' ordinary work situation. They could relate to situations where searching for specific information about customers or technologies would be valuable.

#### **4 Light-weight vs. heavy weight technologies**

Another aspect of knowledge sharing in organisations is that of using light-weight or heavy-weight applications. No formal definition of light-weight or heavy-weight exists, but it has to do with the ease or complexity of using the application. In fact, an application could be said to be heavy-weight if other alternatives are preferred. A light-weight application may have the problem of not adding any value, while a heavy-weight application may have the problem of not reaching the critical mass of users.

Within the three studies we identified behaviours supporting the use of light-weight technologies. When trying to find things out, turning to a computer

application would typically be one of the last resorts because it is easier and quicker to ask people sitting nearby. A heavy-weight application would probably be even less used than a light-weight application.

## 5 Conclusions

The framework supporting knowledge sharing presented in this paper is based on the results from three different ethnographic field studies. The results from the field studies point to the variability in what actions people take as they try to find things out. Who they ask is a highly contingent matter depending on who is available at the moment and what the problem is about.

The framework proposes the use of communication tools, of awareness applications and of information management, working in conjunction with each other, when supporting knowledge sharing. The paper also discusses how the complexity of the computer support may be of importance. A design based on heavy-weight technologies may fail because of its complexity of using it.

It is important to note that a toolbox of applications that support knowledge sharing, suitable for use in several organizations, most likely is difficult to design and build. What applications people find usable depends on the routines at work, social factors as well as other applications used within the organization. Still, it is most likely that support for communication, awareness and information management will be important parts of a toolbox designed to support information and knowledge sharing in any organization.

The future work focuses on using ontologies when searching through unstructured written information and on the use of mobile phones with bluetooth to provide for awareness information.

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