KNOWLEDGE SHARING THROUGH WORKSPACE NETWORKS

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ABSTRACT

Distributed organizations must provide ways for individuals to share their increasingly specialized knowledge to improve the quality of the organization's products and services. The paper will outline activities that characterize knowledge sharing processes and how to facilitate them through information technology. It will distinguish between prescriptive and emergent processes, suggesting that facilitation for knowledge sharing must emphasize emergent processes. It will then define what is needed to support such processes and describe ways of doing so using workspace networks.

Keywords

Workspaces, Knowledge Sharing

1 INTRODUCTION

Knowledge development and sharing is becoming increasingly important in many organizations. It is now recognized that ways must be found to use highly specialized tacit knowledge (Grant, 1995) to help create new innovative services and products to give organizations additional competitive advantage (Riggins, 1998). Globalization is one driving factor for knowledge sharing, as it requires people with expertise to cooperate at a distance to solve problems or create new products. Similarly most distributed organization must draw on expertise of a number of people to solve client problems, as for example occurs in help desk situations. Still another driving factor is where knowledge must be distributed to large groups of people such as in teaching. The processes followed in all these cases are generically similar.

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Specialized knowledge is first distributed, followed by necessary explanations and narrative to enable people to make sense of it, and then interpret the knowledge in their own contexts.

Support for sense making and interpretation is not a simple objective for computer networks, which to date have mostly supported prescriptive processes. Although there are well defined activities in sense making and interpretation, many doubt that these activities can be supported with prescriptive processes. It is thus clear that computer support for knowledge sharing must go beyond the prescriptive processes found in most applications and provide the ability for processes to dynamically emerge as peoples understanding of a particular situation grows.

The paper first defines the requirements that must be met by computer systems to support the emergent processes that characterize knowledge sharing. The paper then describes how such requirements can be met using workspace networks. These networks provide both the commands that allow processes to emerge, and the generalized services that can be customized to knowledge sharing activities. A workspace model will be defined including commands, which allow users to install services suited for particular knowledge sharing activities and define norms for using these services. The paper will then describe a prototype that is being developed on the WWW using Java programming to support such workspaces.

It should also be pointed out that the paper is not proposing that all knowledge sharing take place at a distance through asynchronous computer moderated support. It is almost certain that in any environment face to face communication will be needed especially to resolve sensitive detailed issues. The paper will, however, concentrate on ways that face to face work can be minimized with structures that support a greater variety of computer supported interactions appropriate to knowledge sharing and the maintenance of records that make face to face meetings more productive.

2 KNOWLEDGE SHARING PROCESSES

Knowledge sharing is still not a universally defined term. In many cases it is seen as giving people access to the most relevant documents for their particular task. This paper goes beyond access to information but also sees knowledge sharing as using existing information to create new knowledge or reframe it to meet some goal. In this context knowledge sharing must combine the explicit information held in documents with the specialized tacit knowledge possessed by individuals (Grant, 1995). The types of generic work found in this wider definition includes:

- Experience transfer and organizational learning,
- Keeping track of process knowledge and using it to find the best plan to achieve stated goals,
- Building up collaborative knowledge, applicable to business networking, where users with different expertise combine their knowledge to create new products and services, and
- Developing transactional knowledge, that is knowledge about the location knowledge both internal and external.

In such contexts, users must often create additional knowledge to that found explicitly in documents. They must combine the explicit knowledge found in documents with their personal knowledge. It is also possible that such combination is insufficient to complete the task, in which case users must go outside the system to find additional expertise. As tasks become more knowledge intensive, so does the need to place increasing emphasis on such external support. Should the need for external support become the major task component, as can happen in knowledge intensive organizations, then traditional computer support systems can fall into disrepute.

2.1 What are knowledge sharing activities?

Knowledge sharing processes are here defined as being composed of generic activities that are combined into processes and adapted to a particular need. Such generic activities include ways to:

- establish common ground,
- quickly adapt to different terminologies in distributed systems in order to make sense of available documents and information,
- form shared perspectives (Boland and Tenkasi, 1995) even when different terminologies are used,
- interpret and transfer knowledge between 'thought worlds'. For example, interpreting marketing information to determine the technical sophistication of products to suit the market (Dougherty, 1992). One thus has to make sure that knowledge embedded in use cases is correctly interpreted in constructing event trace diagrams.

2.2 Combining Activities into Processes

A number of writers have described knowledge sharing processes made up of generic activities. Most of these distinguish between explicitly stored knowledge and tacit knowledge, that is, knowledge held by people. They also emphasize the importance of integrating tacit and explicit knowledge. As an example, Nonaka (1995) describes the way knowledge is communicated and transformed through tacit and explicit forms (Nonaka, 1995). This process is illustrated in Figure 1.

Here the initial step is known as socialization where people informally exchange information, at the same time becoming familiar with terminology and different viewpoints. During externalization, people begin to formalize or apply this knowledge into concrete forms. This is then followed by internalization, where such explicit forms are again discussed, that is converted to tacit forms, primarily for evaluation.

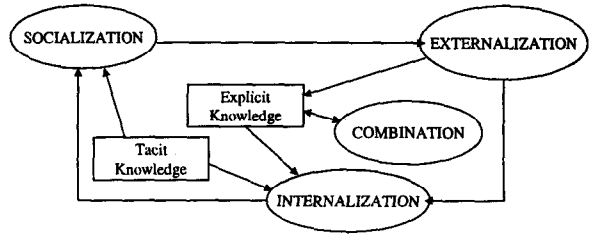

Figure 1 - Process of knowledge Formation

Boland and Tenkasi (1995) propose a knowledge development process shown in Figure 2. Here the process follows a number of activities each with one goal. Thus the first activity is a definition of organizational values followed by a narrative description of some new idea. Often new terminology is introduced here and new terms must be explained. Then there is the interpretation, or making sense, of the idea within the organizational context, followed by evaluation to compare the idea against organizational values. Each of these activities may include different participants, with different responsibilities. Thus for example managers may have key roles in defining values, whereas key experts may take major roles in leading discussions about some emerging knowledge area and in its interpretation. This illustrates the additional need for support of governance structures to ensure that knowledge development follows accepted practices within the existing organizational culture.

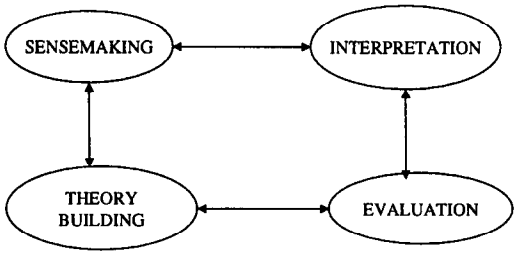

Figure 2 – Knowledge development processes

Our proposal is to identify the common aspects to provide generic activities, which can be easily and dynamically adapted to a variety of processes to support a large range of knowledge sharing needs.

2.3 Knowledge sharing processes - an emergent approach

Perhaps the most significant aspect of knowledge sharing processes is that they cannot be prescribed to follow a number of steps. Instead the steps emerge as knowledge evolves and it is up to the users to agree on successive process steps during process execution. Each step in turn is composed of the activities described in the previous section. Thus processes emerge by creating new steps and then composing the steps out of the knowledge sharing activities as needed. Users in this context have a goal - perhaps to set the bounds of their collaboration in a business activity. For example, when creating a new product the steps will include (Kuczmarski, 1997) conceptualization, business evaluation, prototype testing and so on. As shown in Figure4, each step can include a variety of knowledge sharing activities, initiated whenever needed. In addition all steps share memory to maintain mutual awareness about their activities.

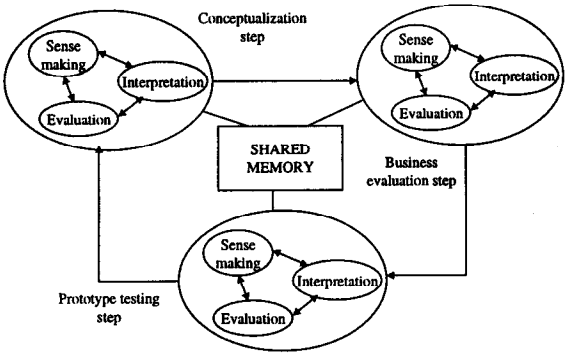

Figure 3 - An emergent process

In such an emergent process the users move from one activity to another as needed and the transitions between the activities within a step and between steps themselves cannot be anticipated. Thus, one can begin with sense making then continue with some interpretation. Similarly transitions between steps cannot be predicted. Thus there may be some product conceptualization, followed by business evaluation, and then a return can be made to further conceptualization. After a while some more sense making takes place, followed by interpretation and perhaps some initial evaluation.

2.4 The Importance of Governance

It is also realized that knowledge sharing processes cannot be totally open but must follow chosen governance (Jones, et.al. 1997) rules. These rules must satisfy a number needs. One is to ensure that processes fit in with organizational culture. The other is to encourage effective knowledge development, through communication patterns conducive for knowledge development. A third is to support the flexible creation of multi-functional teams to ensure that the best available experts fully participate in the process.

2.5 Requirements

To support emergent processes, users must be able to easily set up workspaces for new activities or add additional activities to a workspace thus allowing processes to emerge. Such systems are required to:

Bring together all knowledge relevant to a particular goal,
Provide support for a variety of governance structures,
Allow the flexible assembly of multi-function teams,
Support the basic activities of sensemaking, interpretation and evaluation,
Integrate the basic activities into processes,
Allow processes to be dynamically changed.

In addition there are the more general concepts found in any work process to establish a common understanding and maintain awareness. These include establishing common terminologies, managing milestones, dealing with unexpected problems and surprises or supporting change. In the collaborative environments found in distributed work it is also necessary to maintain awareness through making it easy for existing users to keep track of developments, or new users to quickly develop knowledge of current discourse state.

3 WORKSPACE NETWORKS

Our research centers on finding ways to support emergent knowledge sharing processes. We make a distinction between specific and general support systems. Specific implementations are generally built to support one application and often deal with only a subset of knowledge sharing activities. Specific implementations usually support prescriptive processes and require intervention by a web designer to change the process. A general implementation is thus needed to support emergent processes. General support systems can be adapted to a variety of applications.

An example of a specific application is shown in Figure 4. It describes a system provided for use in a teaching

environment that involves a large number of students and primarily supports the sensemaking activity. The discourse structure here is subdivided into blocks, where each block deals with a specific issue.

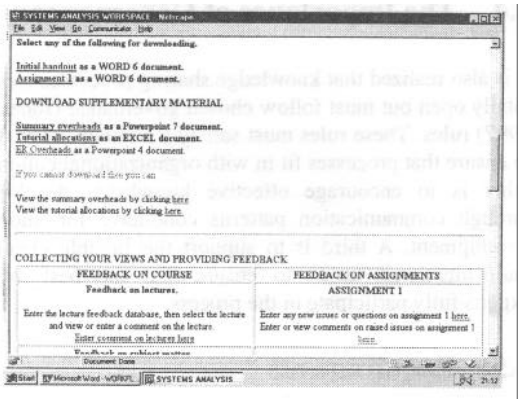

Figure 4 - A specific implementation

We have used this in the teaching of large classes with considerable success. All questions and answers are continually available to students with everyone having the same information and understanding of commonly perceived issues.

3.1 Going to General Systems

The remainder of the paper briefly describes a general system, here called a workspace network, which we are developing to support knowledge sharing activities and dynamically composing them into processes. More detailed description can be found from the references. Workspace networks go beyond the traditional predefined processes and directly support the emergent processes that characterize knowledge sharing. They support the assembly of documents and multi-function teams, as well as governance through workspace roles that are empowered with abilities to execute selected actions. Collaborative process activities are supported by the most suitable discourse structures.

Process emergence is supported by providing building blocks that can be easily brought together to create a process. These building blocks are specified in terms of fundamental terms or concepts. The core concepts used to define workspaces are the role, actor, interaction and artifact (Hawryszkiewycz, 1997). The role defines a responsibility within a workspace whereas an actor, or participant, is the physical entity that carries out the responsibility. An interaction defines how roles work together to carry out tasks. An artifact is an object used in the interaction. Workspaces themselves can be seen as higher level constructs composed of the core concepts (Hawryszkiewycz and DeMoor, 1998).

3.2 Common access to information

The workspace interface is illustrated in Figure 5. As an example, it shows a workspace to evaluate an idea in an innovation process (Kuczmarski, 1997). The boxes shown in the interface are selected from the workspace menu and describe the major objects participating in the workspace. There is a box for the information about the idea and organizational strategy, as well as boxes for the roles, people and actions assembled to evaluate the idea. The workspace thus brings together all objects needed in the evaluation.

A workspace includes access to explicit information through documents whereas tacit information is primarily gathered through discussion systems. Documents can be formal documents, such as organizational rules, or they can the more informal information often found in knowledge sharing - stories used to explain situations, peoples viewpoints, cultural issues and so on. Support of governance and flexible team structures is provided through roles, each of which can access selected documents and participate in selected discussions. Participants can be invited into workspaces and assigned to roles to support the flexible construction of teams and their organization consistently with governance structures. Figure 5 shows a list of participants, who can be selected and assigned to the role. Each participant can take at most one role in a given workspace.

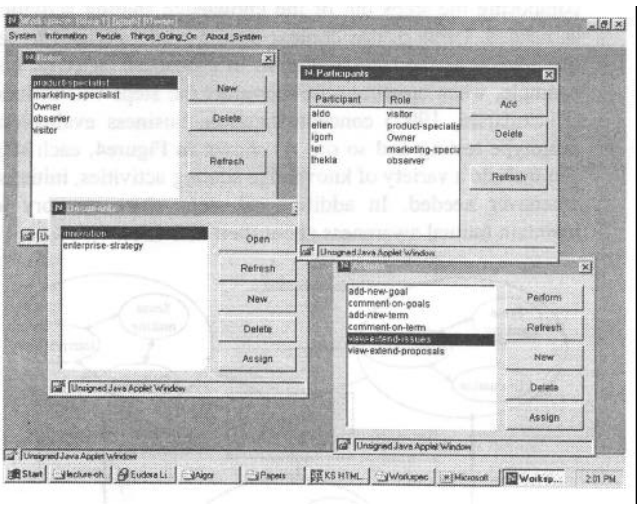

Figure 5 - A Workspace Interface

The action box shows the activities supported in the workspace. Thus there is a discussion service concerned with the idea goals. There is another service to help people define a common terminology. Each service provides each role with different commands and includes a discourse service to support the discussion discourse. A workspace may include any number of such services, which can be added dynamically to the workspace as needs arise.

3.3 Defining Governance Structures

Governance can be defined in two ways. One is through allocating roles only selected menu commands. Thus for example observer roles may not be allowed to themselves add documents but only comment on them. Then there are the specific actions and discussions in which selected roles can participate. Access to documents and actions is defined through the assign command found in the documents and actions boxes in Figure 5.

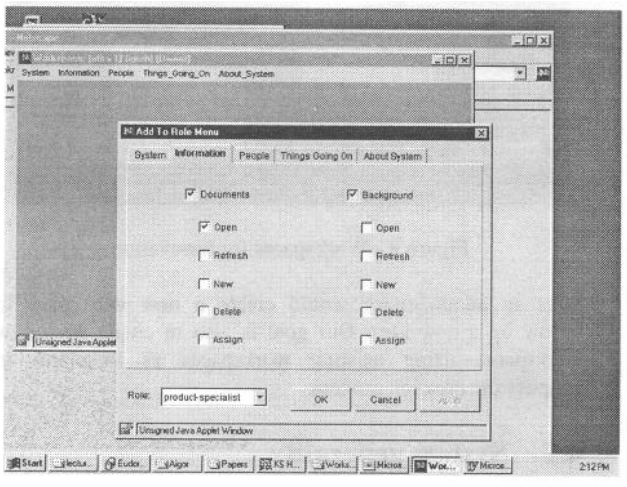

Figure 6 - Creating a role menu

Figure 6 illustrates the interface provided to assign menu selections to roles. This interface is initially available to the workspace owner but can be made available to the selected role. It shows the role 'product-specialist' being given the ability to open documents.

In general most roles are only allowed to participate in carrying out actions and discussions and creation of documents. Abilities to create new roles, actions or discussions are often restricted to few selected roles.

3.4 Discourse Services

Knowledge sharing activities are supported by discourse forums. As shown in Figure 7, each forum can include any number of discourse blocks. Workspace owners can set up a forum and define any number of discourses within the forum. One discourse service primarily supports one knowledge sharing activity - for example a discussion database for sensemaking, a bulletin board for identifying surprises, or a workflow system for managing milestones. However, the system goes beyond simply setting up such services but enables the workspace owner to establish governance structures by finely defining the responsibilities of participants in each service. To do this, the service is first installed. Then actions allowed for each service are defined. These actions are then assigned to particular roles. This enables governance rules to be specified in terms permitted actions. Such discourse blocks can have different statement types, with rules on how the statement types can be combined to realize the discourse goal.

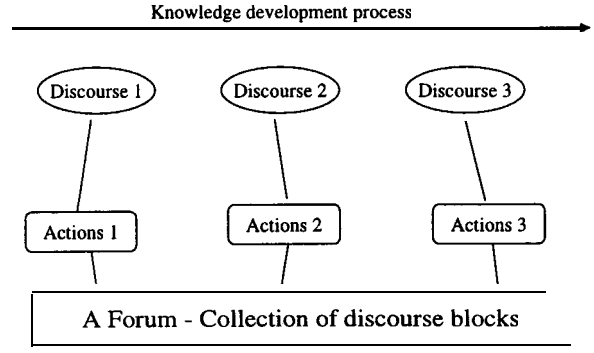

Figure 7 - A Discourse Structure

The simplest discourse is one of explanation where there are simply questions followed by answers. The goal, however, is to go beyond this and support a wider variety of discourse. For example, more complex structures allow positions to be defined and evaluated against set criteria. Thus for example, various screens can be defined in the innovation process, with participants establishing positions for each evaluation criterion.

One of the more important aspects is providing the ability to set up the discourse structures dynamically. The menus shown in Figure 8 are provided for this purpose. Here the owner can create a discourse block of one of the available types and define the names to be used in the discourse actions. These actions can then be assigned to selected roles. Thus for example actions for a discussion forum include the start of a discussion, raising an issue and so on.

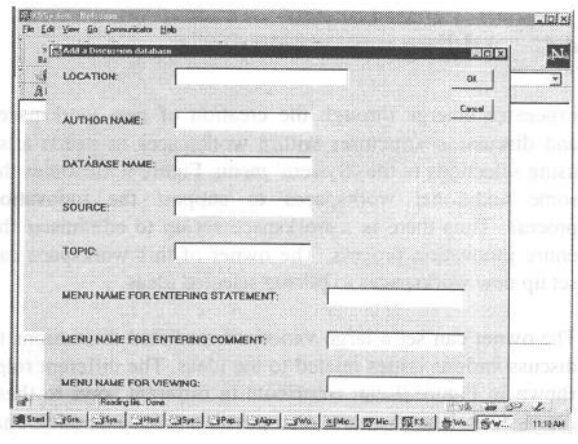

Figure 8 - Setting up discussions

We are looking at ways of extending discourse blocks into generalized forms to support the status information available with workspaces.

4 PROCESS EMERGENCE

Workspace systems support dynamic process emergence. As a first guideline a workspace can correspond to a process step. The process step can then be composed of any number of knowledge sharing activities. Emergence can take place through changes in individual workspaces, that is ways of organizing the activities within a step, or through the creation of new workspaces, that is new process steps, as needs arise. There may be an initial number of workspaces set up followed by new workspaces and services as needs arise. Thus a typical initial scenario may be to create a new workspace, whenever a new subgoal is identified, by using the following workspace composition steps.

Step 1 - Create a workspace.
Step 2 - Add artifacts that contain supportive explicit information to the workspace,
Step 3 - Create actions for the workspace,
Step 4 - Set up knowledge sharing activities as discourse services and define their actions,
Step 5 - Define roles within the workspace and assign actions to the roles,
Step 6 - Assign participants to roles.

Thus a workspace can start with a number of input artifacts and produce a set of output artifacts. Any a number of interactions that involve set of roles can then set up. One guideline here is to include an initiator or goal setting states roles to initiate the work and define its goals. Executor roles can then be defined to carry out the work, together with evaluator roles, who moderate the process including deciding when to terminate it. The three role types form one early basis for addressing quality. They include review processes that are now almost a standard in any quality assurance process.

4.1 Adding new workspaces

Processes emerge through the creation of new workspaces and discussion structures within workspaces as needs arise using selections in the 'System' menu. Figure 9 illustrates the some additional workspaces to support the innovation process. Thus there is a workspace set up to administer the entire innovation process. The owner of this workspace can set up new workspaces to pursue selected ideas.

The owner can set a large variety of mediated discussions to discuss various issues related to the ideas. The different roles shown in Figure 9 can contribute in different ways to these discussions. It is of course also possible to include additional roles, such as for example, external reviewers and provide them with the ability to comment on specific discussions. Discussions and actions can be shared between workspaces to maintain awareness across the whole system.

New workspaces can be created using the 'System' menu. Roles are then defined for each workspace, actions assigned to the roles and participants assigned to the roles.

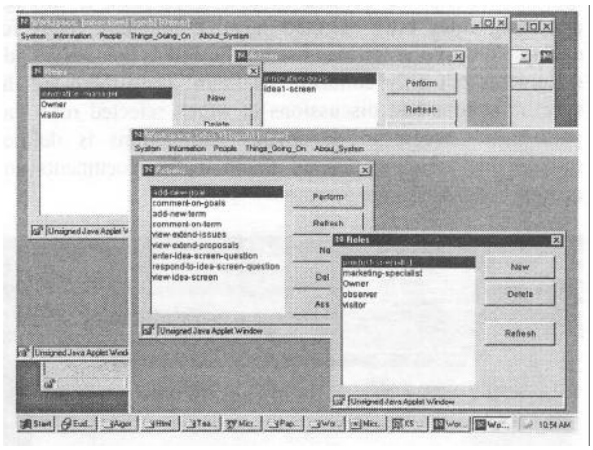

Figure 9 - Workspaces for innovation

Thus an administrator would create a new workspace to follow up a new idea. Our goal is also to create such new workspaces using existing workspaces as templates to simplify the creation process.

4.2 System generality

The previous sections have illustrated how workspace networks satisfy the requirements of knowledge sharing using one particular example. The system is general in the sense that it can be used to support other processes. For example, in teaching there is one workspace for subject development. This is used to develop a subject curriculum together with exercises or case studies. There are a number of workspaces to support class or tutorial sessions. The curriculum material is provided through the document interface. Roles here would include students, tutors and the subject coordinator. Each role has different abilities. For example, students can ask questions, and tutors reply to the questions. Additional workspaces can also be created for students groups or individual students for personal support.

5 ACKNOWLEDGMENT

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6 CONCLUSION

The paper has shown ways that can be used to support knowledge sharing within enterprises. It defined the requirements needed to support knowledge sharing using information technology. These stressed the need to support emergent processes that can be dynamically composed from

knowledge sharing activities. It then showed that such support can be provided using workspace networks.

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