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**Towards integrated learning and working:
discussion of work/learning progress**

Introduction

The aim of this contribution is to stimulate the dialogue about the support and the added value of the new technologies in the current efforts to facilitate learning as part of working. The purpose of these efforts is to reduce classroom training to a minimum for reasons of safety and other pragmatic objections. These efforts favour the formation of a learning organisation, a transformation which in itself can be seen as a solution to improving companies' services and products as a result of the production process. This production process is in itself the reason for the necessity of becoming a learning organisation because of the growing knowledge load factor and increasing problem complexity at each level of the production process. On the other hand, rapid changes in the world outside, such as consumer interests and demands, quality standards and new technologies, require a flexible response by the organisation owing to the necessary changes in the company organisation itself as well as in the competences of its employees. Such flexibility makes great demands on the way company members share and construct knowledge in the process of working and learning together. This flexibility also presupposes the value of translating business, work and industrial problems into learning questions. Solutions to these issues are to be found in changes at all company levels, e.g. management and production actors around the person(s) concerned are relevant problems. In that sense networked expertise, learning and working are becoming more and more important, especially for companies whose performances are built on co-ordinated co-operation between their autonomous subsidiaries, such as Netherlands Railways and the Dutch police. Building networked expertise supports a flexible response to the problems these holding companies are confronted with internally and the changes that occur in the market (BOLHUIS & SIMONS, 1999). The managers of these holding companies therefore have to go beyond stimulating collaboration among employees. They have to endeavour to bring about a transformation towards a learning organisation by stimulating their workers to share and develop knowledge together. This objective should focus on stimulating the ability to learn individually, in groups and through the organisation as a whole, in networks. The learning potential of these networks has become a matter of interest and social and cultural aspects of learning have become important to understanding and fostering learning (ENGESTRÖM, 1999; NONAKA & TAKEUCHI, 1997; WENGER, 1998). In organisations workers tend to form networks of expertise to facilitate individual learning and collaboration and to discuss work-related problems together (MCDERMOTT, 1999). Sometimes these networks transform into communities of practice. In a community of practice (COP), participants who share a common interest in the field they work in come together to help each other out, solve problems and share and create knowledge

collaboratively. Over time these mutual interactions and relationships build up a shared body of knowledge and a sense of identity. They constitute an informal, social structure initiated by members and reflecting their collective learning (WENGER, 1998).

In more formal learning routes involving the transformation to a learning organisation the tendency is to phase out the practice of sending people on courses given outside the workplace in favor of organizing learning as close to the workplace and as integrated in employees' work as possible (VAN DER KROGT, 1995). This might be realised by making use of the above-mentioned informal social structures initiated by employees. As long ago as the early seventies REVANS argued for action learning by organising learning as close to work-related problems as possible. He suggested organising learning teams to work on real organizational problems and structuring the experience in such a way that both useful solutions to these problems emerge and substantial learning occurs for participants (VAILL, 1996). So the employees are recognized as an important resource to the organization. According to WENGER (1999) people in organizations form communities of practice by helping out each other and discussing the latest developments. These communities of practice are bound by a shared practice related to a set of problems. From a point of implementation it is important to search for more or less 'natural' opportunities with an implicit high potential for learning and change, opportunities whereby learning effort can be improved by explicitly harnessing and enabling the learning potential of these work situations, e.g. formal and informal social structures in the work context.

In this paper we first discuss an experience in which we try to create learning as close as possible to the workplace and use the social structure of the 'discussion of progress' as a learning tool in the context of the learning route for becoming an assistant conductor.

Secondly we focus on the support provided by a groupware system in the process of creating an online community of practice in the context of a network expertise group formed around the problem of identifying and describing general work processes used in the field of criminal investigation in the Dutch police organisation. In the latter case we used Knowledge Forum as a knowledge-building e-environment.

Our central questions in these two experiences are: Do workers appreciate the possibility of knowledge sharing, learning from and with each other? How promising is groupware in supporting these kinds of communities of practice in organisations?

First experience

A new position with Dutch Railways: The Assistant conductor

Dutch Railways introduced a new position in 2000, that of Assistant conductor. Here is given a brief summary of the reasons for this new position. On the one hand there were the arrangements in the area of social safety that were made between the Board of Directors of Dutch Railways and the social partners, and on the other the acute shortage of chief guards. Such a shortage means that trains cannot run, because they do not meet safety standards.

Because recruitment did not provide enough staff, a solution was sought in the form of a new, less onerous, position. Recruitment for the new position would yield better results because:

- the requirements for the position were noticeably lower than those for a chief guard
- the name Assistant conductor looked as though it would do well in the labour market and was attractive.

What does an Assistant conductor do? In broad terms, an Assistant conductor has the following four tasks:

- checking access;
- assisting in the event of incidents and disasters;
- checking aboard the train;
- assisting departures.

➤ **checking access**

The task of 'checking access' comes under the heading of social safety. The greatest amount of aggression on trains is caused by passengers without a valid ticket. By checking tickets at the beginning of the journey, the likelihood of aggression on the train is reduced considerably. This task is always carried out in groups.

➤ **assisting in the event of incidents and disasters**

In carrying out the task of 'assisting in the event of incidents and disasters', the Assistant conductor provides a service to passengers. For example, he or she shows passengers the way to replacement transport should trains be unable to run because of an accident. This task is always carried out in groups.

➤ **checking aboard the train**

The task of 'checking aboard the train' means checking passengers' tickets. This task can be carried out in groups or in pairs.

➤ **assisting departures**

The last task is that of departure assistant. This is linked to the acute shortage of chief guards. For reasons of safety, a train with more than seven train sets may only depart if it has two chief guards. The creation of the position of Assistant conductor means that one chief guard can be replaced by an Assistant conductor, enabling two trains to run.

To carry out his or her tasks, an Assistant conductor must be able to work together with others and be capable of switching between the various tasks.

Here is a summary of the reasons for the position of Assistant conductor and a description of it. To be able to do the job, the new target group will have to be trained. The most important features of the training are:

- a mixture of training and education, work experience days and work days;
- task orientation;

- orientation towards working in a team;
- learning during training.

➤ **A mixture of training and education, work experience days and working days**

The basic principle for this mixture is Kolb's learning cycle. Discovery, learning, application, and so forth. The course is oriented towards acquiring and applying knowledge and skills.

➤ **Task orientation**

It has to be possible to deploy the target group quickly. This can be realised through task-oriented training. Another benefit of task-oriented training is that it is easy for the target group to get a clear idea of it. Trainees soon get an idea of what is expected of them, and they also quickly get an experience of success. If you learn in a short time something you can put into practice, that motivates you for the remainder of the learning process.

➤ **Orientation towards working together**

A major part of the position is working together. The Assistant conductor does not work alone, but always under the direction of a chief guard or in a team with fellow Assistant conductors. Being able to work well in a team is an important factor for success in the position.

➤ **Briefing and debriefing**

During the training, there are fixed times for reflection, which we call briefing and debriefing. The choice of these times depends on the work itself. This model is also used in the real work situation. The briefing and debriefing model has been given a fixed place in the training from the point of view of linking it to the work situation. I shall go into more detail later about the briefing and debriefing model used. Working according to this model links with the concept of a 'community of practice'. The term 'knowledge construction' is used. People construct new knowledge together through communicating and sharing knowledge.

I shall now deal with the *briefing and debriefing* training item. During the briefing, the trainer and the Assistant conductors examine which assignments or tasks are planned for that day. The trainer discusses the assignments and finds out whether there are any points requiring particular attention. What is expected is expressed at both individual and group levels. The trainees are also divided into pairs. Who is working with whom today?

After carrying out the assignments or the work, everyone meets at the agreed time for the debriefing. The debriefing covers the assignments or work carried out that day, as arranged at the briefing. The supervisor plays an important part here. He or she is the process supervisor and starts the debriefing off, closes it, and makes sure that everyone has their say.

What happens in a debriefing?

The discussion is oriented towards sharing knowledge and experience, and thus towards learning from each other.

What is discussed are the assignments or the work covered in the briefing. Everyone has carried out the same assignments or work. Individual learning experiences are discussed in the group, which leads to collective skill experience.

Learning from each other takes place in a secure environment in which everyone is equal. The above demonstrates the characteristics of a 'community of practice'.

What is so special about the briefing and debriefing model?

We are convinced that the briefing and debriefing model enables employees to learn how to learn. They are provided with a moment to reflect, in which they can stop working and share with others their experience of what went well and what went less well. Individual learning experiences are enriched by a collaborative learning situation containing a 'negotiating and sharing of knowledge experience'. As a result, employees find out that learning from each other and thereby complementing each other can be an enriching experience for the individual acquisition of skills and knowledge that are required for the work. If an employee does not know how to tackle a problem in practice, then an employee at the same level can relate his or her experience. Working according to this collective learning model also affects the quality of working as a team. You have to collaborate in order to achieve a result by sharing experiences and learning from each other. People therefore learn from the moment they start their employment to talk about their work and to learn from each other in a familiar work discussion situation.

What do briefing and debriefing produce?

Talking about work during work is accepted. It is possible to give each other feedback about doing the job, either as a compliment or pointing out something that needs to be addressed, with the aim of changing behaviour. Briefing and debriefing contribute to cultural change in a learning organisation.

Second experience

In our second experience we tried to create an online community of practice. In large organizations like the Dutch police force online communities have an advantage in bringing people together independent of time, space and local cultures. Computer supported collaborative learning (CSCL) makes it possible for people to participate in communities of practice and work at their own pace and in their own time. A program that supports this kind of collaboration is Web Knowledge Forum. Web Knowledge Forum is a discussion program designed to form a learning, knowledge-building community over the Internet. It's a product of the Computer Supported Intentional Learning Environments (CSILE) family, developed at the Ontario Institute for Studies in Education (OISE) to support the collaborative construction of knowledge (SCARDAMALIA & BEREITER, 1992). The participants operate in a shared workspace in which they read and write notes. A note is a contribution that can contain text, pictures and links to documents, html pages or other notes in the shared knowledge workspace. Working with this program stimulates the participants to talk about the subject, read relevant

resource materials, pose questions, offer theories, conduct experiments and work together to make sense of new ideas. Individual understanding is driven by the dual need to be familiar with the knowledge of others and to advance that knowledge (HEWITT & SCARDAMALIA, 1998). By working together participants develop greater competence in a particular subject area, using what group members already know as an important component and co-constructing plans of action to extend that knowledge (HEWITT & SCARDAMALIA, 1998). The creation of knowledge therefore is seen as a social product.

Originally this program was designed for use in the classroom to support the construction of knowledge in a social context. The aim in the development was to support a new kind of environment that will make it possible for schools to function as knowledge building communities (SCARDAMALIA & BEREITER, 1992). Within knowledge building communities the focus is on knowledge construction. It's a knowledge-centred community of practice.

The problem we face is how to facilitate the creation and support of communities of practice in organisations that work in a Web-based environment and make knowledge building the core of their activity. In the first place there has to be identified a 'real' and meaningful problem that exists in the organisation. A problem that is owned by the participants and in the solution of which they are willing to put effort. Second, the members of the organisation who feel interested in this problem have to form a community in which they can participate on a voluntary and functional basis. In this paper we focus on Knowledge Forum's potential for serving as a meeting place for such communities. A place where participants can work together, undertake collaborative learning activities and share knowledge for the purpose of deepening their expertise in the problem to be solved.

Our question is: Can groupware, e.g. Knowledge Forum, serve as a tool to support communities of practice in an organisation?

We focus on the role of the worker as a learner in an unstructured process of discussion of meaning in an online community of practice.

The study

This study was conducted to gain experience with participants who were engaged in an online learning community. The community consisted of eight participants who voluntarily worked in the community. They responded to a letter that was sent by the Approach of Criminal Investigation in Police Education (ABRIO) to several police departments explaining the problem that needed solving. The problem was about how to identify and describe general work processes used in the field of criminal investigation. As a whole the participants formed a heterogeneous group (policymakers, criminal investigators and experts).

During a period of two months they worked together using Web Knowledge Forum. Together with the ABRIO we organised a meeting to explain how to work with Web Knowledge Forum and to provide more details about the problem they had to work on. After this session

the workers continued the discussion via the Internet by sharing information and expertise together. There was much uncertainty about how to identify work processes, so the participants agreed to start with an open discussion on the subject of 'work processes', instead of following a structured plan of action to tackle the problem. Knowledge Forum played a central role in supporting the discussion because all the written contributions are stored as notes in a shared database available to all the participants. The discussion was divided into certain subjects called views, in which the participants contributed a note or comment on a note they had read by writing a build-on note.

Instruments

The way people participated and interacted with each other supplies information about the activities of such a community. Web Knowledge Forum is provided with an analytic toolkit (ATK) that analyses the activities of the members of the community in the database. It creates log files for all the users, recording how many times they have read, written or edited a note, how many notes are linked to each other and how many build-ons have been made.

Web-Knowledge Forum is designed to facilitate cognitive and metacognitive activities by providing opportunities to give your opinion, to give a comment, or by making suggestions or providing new information, by creating links to several internet documents, by uploading files or by combining existing information already available in the database. Because of these possibilities it is important to know more about the nature of the content of the material the community has created together and what kind of activities the participants undertake. Are they trying to advance their knowledge? Veldhuis-Diermanse (1999) developed a coding scheme to gain information about the content of the written notes based on the constructivist view of learning in an educational setting. This coding scheme is still in a design stage and it is the first time this scheme is applied to an organizational community. A Cohens Kappa interrater reliability of 0,85 between two independent raters was satisfactory. This coding scheme consists of three main categories: 1 Cognitive activities, 2 Metacognitive activities, and 3 Affective activities.

1 Cognitive activities: According to VERMUNT (in: VELDHUIS-DIERMANSE, 1999), cognitive activities are used to process and acquire insight into the information being discussed. VELDHUIS-DIERMANSE recognised three subcategories of cognitive activities: 1 debating, in which the emphasis is on arguing; 2 using external information and experiences, in which the emphasis is on referring to information found in sources other than the database or based on earlier experiences; and 3 linking or repeating internal information, in which the emphasis is on referring to information found in the shared database.

2 Metacognitive activities: VELDHUIS-DIERMANSE (1999) describes metacognitive activities as activities undertaken to regulate each other's learning process or to regulate the goals and direction of the discussion.

3 Affective activities are used to cope with feelings occurring during the discussion among the participants and may lead to a state of mind influencing the discussion positively, negatively or neutrally (VELDHUIS-DIERMANSE, 1999).

For more detailed information about the construction of the coding scheme read the article written by VELDHUIS-DIERMANSE (1999).

At the end of the study we gave the participants a questionnaire to obtain information about their experiences working with Knowledge Forum.

Results

Participation and collaboration measures based on work done in Knowledge Forum

The log files generated by ATK gives a description of the activities that has taken place in the database (Tab. 1). The participants contributed 98 notes in the database. That's an average of 12,25 notes per participant. 56% percent of the notes have been read. This means the amount of notes that have been opened by the participants. So this might exaggerate the actual reading that has been done. 83% percent of these notes are linked, also called build-on. The log-file only records the activities of the participants, a build-on activity therefore does not have to be content related. Table 1 shows that there are substantial differences between the participants, both in writing and reading. Notice that build-on notes are also a part of the written notes.

	Written	Build-on	Read
N	8	8	8
Mean	12,2	10,7	232,6
Std. Deviation	9,5	8,8	147,5
Minimum	1,0	1,0	113,0
Maximum	30,0	26,0	552,0

Table 1. Participation in the database

The content analysis of the notes reflects the following cognitive and metacognitive activities (Fig. 1).

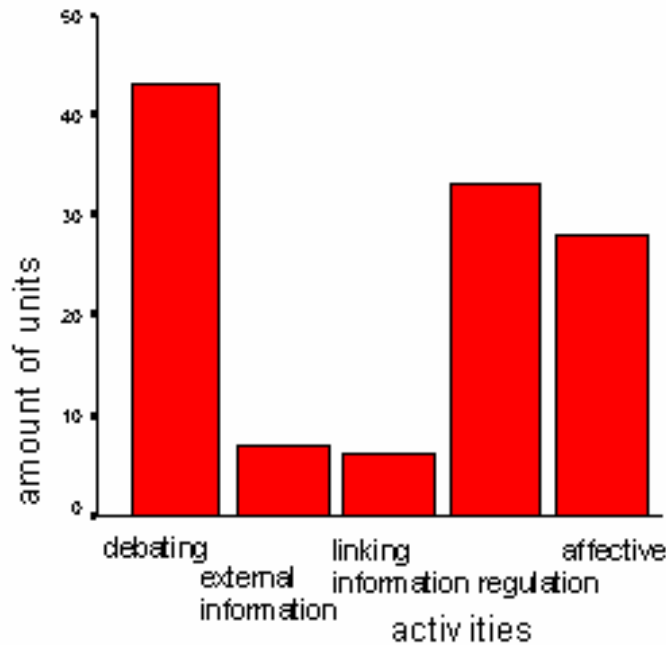


Figure1. Activities in the database

These results indicate that the participants discuss a lot about the subject. The participants present a lot of ideas of their own and start debating about that in the community. The participants do not bring in much new information; only seven times they referred to information that can be found outside the database (e.g. book pages). Also they did not make many content related references to the contributions of other participants in the database (linking information). Although, according to the ATK 83 % of the notes are linked. This difference is explained by the fact that the coding scheme refers to actual written comments to other contributions in the database. The participants show quite a lot of regulative activities, but in fact two participants are responsible for 66% of the regulative activities. There are quite a lot of affective contributions in the database. The explanation for it is that this way of working was new to them and therefore they were regularly asking for feedback and gave a lot of general reactions to the other participants.

Participants' experience of working/learning and sharing knowledge and expertise in a digital space

The questionnaire provided information about the way participants worked with Web-Knowledge Forum, five out of eight were returned. 60% of the participants agreed on the question if they were collaboratively building new knowledge about 'work-processes', but they pointed out that they need to grow more into building upon the ideas of others. Also they mentioned that there was a lot of confusion about the concepts being used and that they need to clarify the goal of their study, to give more direction to the discussion. 80% of the participants indicated that they were satisfied with the opportunities, provided by the program, to discuss the subject together. The participants (80%) notified to have enough information to be able to take part in the discussion. Answers to the question, what they do if they lack certain information, are searching for relevant information, consulting colleagues at

work, and trying to stimulate the other participants to explain certain issues. Results of the question about what they thought of the quality of the written notes, varies from good to reasonable. In general the quality is good but the discussion became more silent later on. "There is too little structure to guide our discussion, the notes contain valuable information but what does it bring to us?" 40% of the participants indicated that there was too less coordination during the discussion. 60% of the participants pointed out that a more structured or goal directed approach is necessary. They argue that this will help them to achieve agreement and build on to that

Discussion and conclusion

Expanding the social structure of the 'discussion of progress' as a learning tool in the context of the learning route for becoming an assistant conductor worked quite well. Participants were enthusiastic and it provided all kinds of opportunities to give each other feedback about doing the job, either as a compliment or pointing out something that needs to be addressed, with the aim of changing behaviour. Briefing and debriefing contribute to cultural change in a learning organisation.

The use of groupware in communities of practice in organisations seems promising. The workers appreciate the possibility of knowledge sharing, but more structure and support to direct the knowledge building activities of the community as a whole are needed. To structure the discussion of meaning the participants need to make a learning agenda, express their goals and divide certain tasks and responsibilities (e.g. content co-ordinator, someone who keeps the community together or invites new participants when needed, technical assistance). In that sense a lot can be learned from classroom experiences with computer supported collaborative learning and knowledge building (DE JONG, VELDHUIS-DIERMANSE & LUTGENS, 2002; HAKKARAINEN, LIPPONEN & JÄRVELÄ, 2002; WOODRUFF, 2002; STAHL, 2002).

In general we can conclude that working contexts offer opportunities for stimulating and facilitating the development of content bounded communities evolving from communities of practice into knowledge building communities. E-learning as groupware like Knowledge Forum where not the discussion but the negotiation of knowledge and meaning is focussed can support this kind of learning in working contexts. Making use of existing opportunities in the working contexts by enhancing the learning potential they have in combination with new technology is a promising approach in order to bring the learning organization into practice. A learning organization in which novice have the opportunity to get introduced in the know how and skills of their work in a fraternal network and where they collaborative with seniors are facilitated in their knowledge building and knowledge productivity in their profession. Especially in that process from explicating, understanding en negotiating of unshared knowledge towards knowledge creation i.e. new insights which improves performances, is extremely important for people and companies functioning.

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