

**Knowledge development at the interface of research, policy
and practice – support for knowledge development within the
CEDEFOP Research Arena (CEDRA)**

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Abstract: This paper outlines the underpinning theory and technology supporting processes of knowledge development within the CEDEFOP Research Arena (CEDRA). The support for dispersed communities of practice has been developed using web-based collaboration and knowledge sharing tools. These provide a comprehensive telematic platform for interactive and focused knowledge sharing and transformation for practitioners, policy makers, and researchers interested in vocational education and training in Europe. Note some details of how these tools work in practice, in the context of careers guidance, is given in the linked paper of Brown, Attwell and Bimrose (2000).

INTRODUCTION

Previously Brown & Attwell (1999) produced an overview of how computer-mediated collaboration and knowledge transformation processes can support a community of practice of Vocational Education and Training Researchers in Europe. The first task here is to focus upon how the theoretical framework developed to explain processes of organisational knowledge creation (Nonaka & Takeuchi, 1995; Nonaka & Konno, 1998) was adapted to provide a theoretical underpinning for the design of the CEDEFOP Research Arena (CEDRA). For the CEDRA telematic platform we are using a social model of knowledge creation, and the key process for genuine knowledge transformation to occur is that knowledge has to move from the individual level into wider communities of interaction that cross organisational boundaries. Nonaka & Konno (1998) use the idea of *ba* as shared spaces for emerging relationships that provide a platform for advancing individual and/or collective knowledge and of generating collaborative processes that enable the transformation of that knowledge to other contexts. In this framework if knowledge is separated from *ba* – space for interaction and relationships – it becomes merely information.

Information can reside in networks through associated papers, but knowledge resides in the relationships of the *ba*, because it allows possibilities for collaboration to transcend particular perspectives. In the field of vocational education and training, for example, information on the use of key qualifications in practice remains underused in practice precisely because it remains as information – few opportunities are given for practitioners to transform this into practical individual and collective knowledge. Within a telematic environment it is possible to get contributions from a range of perspectives. It has great potential, although in many computer-mediated communication (CMC) environments that potential is not always realised. This may

be because the analytically rational world of ‘pure’ CMC environments may be too ‘cold’ for many people: they need a richer form of engagement. Nonaka & Takeuchi’s (1995) SECI model (of socialisation, externalisation, combination and internalisation) as a spiral of dynamic knowledge conversions gives insight into why this lack of engagement may occur (see figure 1).

Figure 1: Adaptation of Nonaka & Konno’s (1998) four Characterisation of Ba

Socialisation Originating Ba (Space for socialisation: face to face interactions)	Externalisation Interacting Ba (Space for active reflection)
Internalisation Exercising Ba (Space for conversion of explicit knowledge to tacit knowledge of individuals and groups)	Combination Cyber Ba (Space for combining new forms of knowledge with existing information)

Note: Continuous spirals occur through SECI process.

Nonaka & Konno (1998) point to the need for an originating *ba* (or space for socialisation) where individuals can share feelings, emotions, experiences and mental models. This is necessary not only to generate initial commitment (the value of which has long been recognised), but also because genuine knowledge transformation also requires a “magic synthesis” of rationality and intuition that requires a greater depth of human engagement than just thinking. Their model is implemented within CEDRA in the following way:

Socialisation (through originating *ba*):

A number of meetings have been held in different parts of Europe in order to allow some of those involved in a dispersed community of practice to understand the principles behind the development of CEDRA and to discuss some of the substantive issues highlighted in the different Research Resource Bases.

Externalisation (through interacting *ba*):

This will involve the set up of thematic groups, comprising individuals with a mix of backgrounds, knowledge and capabilities. Individuals will then be able to share their own models, ideas and understandings, and through processes of reflection and analysis, seek to generate some common understandings of the group’s particular themes. Through focused interaction tacit knowledge could be made explicit and some new understandings of ‘knowledge’ created, upon themes such as learning organisations, continuing professional development in VET, and key qualifications.

Combination (through cyber *ba*)

Each group’s ideas (and explicit knowledge) are then presented in the telematic environment, where their ideas are combined with existing information and knowledge drawn from the rich evidence environment in a process of knowledge transformation. Other members of the learning community will be encouraged to contribute to and engage with this process.

Internalisation (through exercising *ba*)

The exercising *ba* is a shared space in the telematic environment to facilitate the conversion of the (newly generated) explicit knowledge into the tacit knowledge of individuals and groups. This will involve active consideration of how to apply that knowledge in different contexts and the use of strategies to support the knowledge

conversion process. An example of this would be through consideration of how particular cases could be adapted in order to be applied in other settings.

CEDRA will facilitate the spiralling of knowledge creation and transformation through continuing SECI cycles on different themes. The dynamic structure of the telematic environment will also allow material and ideas to be rapidly transferred between themes. The essence of the *ba* of the learning community as a whole is that it will not involve a static accumulation of different materials, documents and information, but rather it will possess the dynamism to continually create new knowledge. Within this vision the role of the telematic platform of CEDRA is to provide a rich virtual knowledge environment to support the processes of collaboration and knowledge creation and transformation in European VET research and development.

SUPPORTING KNOWLEDGE DEVELOPMENT THROUGH CEDRA

CEDRA does not focus simply upon computer mediated communication. It seeks to enhance and facilitate processes of knowledge development within the wider community of practice. CEDRA will continue with meetings and seminars, and will support dissemination through more traditional print media as well as developing CMC and ICT based systems and processes. CEDRA emphasises too the importance of developing spaces for the exchange of information, and establishes links or gateways to other sources of information, including material from a variety of organisations with an interest in policy, practice, training or research in vocational education and training.

The material to be presented in CEDRA telematic platform is being converted into structured XML resources using a specially designed editor. The aims of this conversion are to allow additional layers of meaning to be added to documents and other materials, in order to enable discussion and knowledge transformation processes based on the materials to occur at a fine grained level and to make meanings more explicit. We do not intend that 'documents' should apply simply to written papers. Given that one of the key aims of CEDRA is to develop knowledge through sharing of ideas and meanings, we believe that there is the need to exchange and co-operatively create a wide range of materials. The materials we are using include edited transcripts of practitioner testimony, group discussions on key issues, and case studies of problems found in practice. Where we are working with research or policy 'papers' or 'documents' we seek to break these down into smaller components (or 'chunks') that contain key ideas or meanings. A component may, for example, express a hypothesis, advance a concept, contradict other findings, illustrate a key point or advance new thinking.

The editor also allows authors to construct and develop new relations between ideas contained in text, or to external papers and work. The richer format of description is added through a document type definition – or 'schema' - that can be defined for each 'kind' of resource. Different schemas might include a case study, an evaluation report, a portfolio or a comparison. The editor uses eXtended Markup Language (XML) code. This is a flexible language, designed to allow open standards to be defined by communities of practice themselves, and to allow interchange through the World Wide Web. Unlike the standard Hypertext Mark-up Language (HTML) used by most Web sites, XML allows software to 'know about' the content of a document as well

as its appearance and layout. The XML representation of the resources can be rendered in different ways to allow different ways of 'viewing' content and interacting with it. The first render being developed provides a Web interface. Whilst documents may be viewed in a traditional way, different navigation options allow the user to access smaller components and to reorganise views of parts or the whole resource base. This will be of particular value as the resources grow. Key-word searches and scrolling of documents at the moment allow only limited access to ideas, compared to the much wider range of ways of searching and representing material afforded by our navigational tools.

Another key feature is the ability to access other texts through embedded icons and roll over items. This may for instance provide information on the background to a reference, or details of a glossary item or details of a linked idea or access to a footnote. Most powerful is the ability to access and add annotation to the text, and to annotate the annotation. Instead of having a separate list server or email client for discussions about an idea or case study the discourse can be embedded in the document itself. Going one step further, it may be that the discourse emerges around the annotation and that then becomes a major document in its own right. A record of the discourse is readily available as part of the site itself. There is no need for participants to join a formal group or painstakingly try to keep up to date with lengthy communications.

In its focus on discourse through shared annotation as a major means of communication, CEDRA is building on older academic practices of knowledge development. Documents cease to be statically presented but take on a 'social life' through a process of interpretation and disputation. The process of knowledge transformation may be particularly potent in an interdisciplinary field such as careers guidance. Knowledge may be transformed through a process of re-contextualisation to different settings and boundary crossing between different academic traditions. The fine-grained semantics that the editing tools seek to supply should facilitate these processes. A focus on practice is a central theme of CEDRA, in order to encourage the development of knowledge, that makes use of the processes of '*knowing*' that Brown and Duguid (1996) see as crucial in the development of new knowledge. The key problem unmasked by the attempt at extensive computer-mediated collaboration by teacher training institutions across Europe in the REM project (Owen and Liber, 1998) is how to facilitate discourse and interaction. Unfortunately, most university or project web sites centre on disseminating the outcomes of research rather than on facilitating debate about practice.

How can this focus on practice be developed? CEDRA will attempt to link with students, trainers, practitioners and policy makers as well as researchers. Encouragement will be given to making links to practice, especially through links with research and development projects. Acts of reflection performed during development can be more important than the products of the work for developing knowledge from practice. The provision of a good user interface is critical. At least in its early developmental or experimental phase, CEDRA will draw upon face to face discussions and events to tie into a series of 'events' using virtual technologies. These could take the form of on-line seminars or debates. The key criteria are that they are well prepared, time bound and moderated. Whilst the use of the tools outlined here might mark a first step, further investigation is needed into the design of interfaces for Continuing Professional Development for dispersed communities of practice. At the

same time as developing CEDRA as a focus for knowledge sharing and development, it is important to study its use and to continue explorations and research into the broader processes of knowledge development in communities of practice. The evaluation of the use of collaborative technologies in supporting communities of practice is vital if lessons learned on this project are to be generalised. There has been considerable interest in the role of technology in the support of collaborative and communicative work and learning. These have been seen, for instance, in the context of work flows (Winograd & Flores, 1987), as collaborators around living documents (Brown & Duguid, 1996) or as socio-cultural activity systems (Engeström & Cole, 1993). These ideas have been applied to education (for example, Guile & Hayton, 1999), where they have generated both strong opposition (Robbins & Webster, 1999) and major supporters for the use of collaborating technologies as learning tools (Mason, 1998). In general, however, practice has not always lived up to the potential (Hilz, 1985), so critical scrutiny formatively and summatively is vital in considering the degree of success of the innovative use of telematic tools proposed in this project.

Perkins and Newman (1996) point out that while there are often virtuosos in such milieux, there are also those who are only there by virtue of registration and not by their engagement. The issue of what is and what is not effective for some in these on-line collaborative situations needs to be addressed if we are to develop some generalisation of the processes of the use of technology in the support of communities of practice. We will therefore evaluate the processes of collaboration and learning supported by the technology. We will study the community of practice in its socio-cultural setting to uncover some of the reasons, issues and problems that make the use of these technologies successful or unsuccessful. This is intended to be a formative and iterative approach as the management of the system will change in reaction to the evaluation. We will adapt methodologies of systems design that are firmly based on socio-cultural activity theory (Engeström and Cole, 1993). Kapetelinen and Nardi (1997) have produced guidance that will be incorporated into the evaluation approach.

Kapetelinen and Nardi's checklist, for the application of activity theory to human computer systems design, is a conceptual tool for identifying the most important factors influencing the use of computer technologies in a particular setting. The process from their perspective follows a clear sequence. The first phase involves starting from observational data to indicate potential problems, then formulating requests for further analysis, and providing some suggestions on how the "problem" can be solved. In the second phase an Activity Checklist, that can be used iteratively, is introduced. The general structure of the Checklist corresponds to the four main perspectives on the use of the technology to be evaluated:

- focus on the structure of the user's activities - that is the extent to which the technology facilitates and constrains attaining the user's goals and the impact of the technology on provoking or resolving conflicts between different goals;
- focus on the structure of environment - that is the integration of technology to support a community of practice with requirements, tools, resources, and social norms of the environment;
- focus on the structure and dynamics of interaction - that is internal vs. external components of activity and support of their mutual transformations with the use of systems to support and build communities of practice;
- focus on development - that is the developmental transformation of all the above components as a whole.

CONCLUSION

The knowledge transformation activities of CEDRA will involve a mix of real and virtual encounters, leading to a spiral of knowledge creation and transformation on different themes. The dynamic structure of the telematic environment will also allow material and ideas to be rapidly transferred between themes. The essence of CEDRA is that it will not involve a static accumulation of different materials, but rather it will possess the dynamism to continually create new knowledge. Within this vision the role of the telematic platform is to provide a rich virtual knowledge environment to support the processes of collaboration and knowledge creation and transformation to support research and development of vocational education and training in Europe.

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