Developing a European Institute for Teachers and Trainers in Vocational Education and Training: Common Information Spaces for Knowledge Sharing and Development

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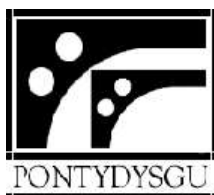**Tel: + 44(0)2476 523512**

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1. Introduction

The Leonardo da Vinci EURPROF project identified new roles for teachers and trainers in vocational education and training in Europe. The roles were based on an analysis of needs for skills and knowledge as a result of economic and social changes. On the one hand the need for increased flexibility, for transferable skills and for continuing learning is leading to new forms of initial vocational education and training, and especially to the reappraisal of the role of work based learning. On the other hand the growing internationalisation of economies, the ever deepening implementation of new technologies in the production process and the adoption of new forms of work organisation are leading many companies to reassess their strategies for education and training and human resource development. The advent of the information or knowledge based economy is leading companies to seek to develop new organisational cultures that not only support the acquisition, sharing and management of the knowledge that currently resides in communities of practice (Brown and Duguid, 1991). The creation and application of new knowledge is seen as central for the improvement of business practice and processes and for innovation. EUROPROF noted the coming together of the traditionally separate role of vocational education and training and Human Resource Development.[1]

The original aim of EUROPROF was the development of a European Masters Degree for VET teachers and trainers. This aim was subsequently amended in the light of the research findings. Firstly, it became apparent that the focus on initial teacher and trainer education was too narrow. What was needed was a Framework for Continuing Professional Development. The core commitments that underpin such a framework are listed in a section. Secondly, the idea of a top down European masters Degree was unrealistic, given the different legislative frameworks, cultures and stage of development in the European Member States. Hence rather than try to develop a common degree the EUROPROF partners instead agreed a series of common corner stones which could underpin and inform development innovation in different institutional settings in Europe. The process was described as collaborative mutual learning. Rather than seeing innovation as a top down development based on countries and sectors adopting new programmes for the education of VET professionals a new understanding emerged based

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[1] This analysis has since been confirmed by work undertaken through the London University led TSER project on "Work Experience as an Educational Strategy" and the CEDEFOP sponsored CIRETOQ project on VET and HRD in Multi National Companies.

on the need for interaction, shared meaning and mutual learning between pockets of innovative practice. Practice was seen as the springboard for new knowledge and the role of research was to accompany developments in practice.

Given the isolation of innovative practice opportunities for discourse and sharing between different experiments and centres was needed. Also necessary was an extended discourse between researchers and practitioners involved in developing new forms of education for VET professionals and policy makers and planners, including regional and national authorities and agencies, and social partners – employers, trade unions and representatives of teachers. These were therefore the broad tasks that the EUROPROF project bequeathed to the EUROFRAME project that started in September 1999.

EUROFRAME then set itself the following targets:

- To develop models of collaborative processes with communities of practice. The models developed should be transferable to other communities of practice and therefore of considerable value in developing new models for continuing vocational education and training and for developing rich learning experiences within enterprises.

- To produce a detailed reporting of the knowledge, skills, processes and practices involved in the continuing professional development of VET professionals. Once more this outcome can serve as a model for those designing training and learning processes for occupational expertise, thus serving as a tool for the development of new CPD programmes and qualifications.

- To disseminate widely the model Framework for the Continuing Professional Development of VET professionals in Europe. This could be used as a basis for future development of learning programmes and qualifications for VET professionals in European Member States.

- To identify exemplar progression paths and routes for VET professionals in gaining expertise will serve as a development tool for the implementation of the framework and for developing flexibility and transnational transparency and mobility for VET teachers and trainers.

- To disseminate new qualifications developed as part of a European Framework for Continuing Professional Development as exemplars in developing a fuller framework.

The ultimate aim of the EUROFRAME project is to explore the establishment of a European Institute for the Education of VET professionals. That institute needs to be built on innovative practice in different Member States. This paper explores ways of building collaboration. That collaboration, in order to focus on practice should include teachers and trainers, researcher and students. It should if possible be open to interrogation by policy makers and planners. Given the dispersed nature of the practice, Information and Communication Technologies can play a potentially valuable role, particularly if the decision is taken to create a Virtual Institute (or Network). In this paper we will reiterate the commitments that underpin a Framework for Continuing Professional Development

for VET professionals. We will also explore the possibilities for developing collaboration in dispersed communities of practice through the use of ICT. That section will draw on work undertaken for CEDEFOP through the TELEVET and CEDRA projects. Finally, we will propose some steps that can be undertaken through the EUROFRAME project. This will in the first instance be based on work undertaken through a project on Careers Guidance co-ordinated by the University of East London (Brown et al, forthcoming).

2. Computer Mediated Communication and Continuing Professional Development

Professionals in dynamic communities of practice are engaged in the active construction of new forms of knowledge and this knowledge creation is based upon processes of collaboration between professionals. It is possible to guide practitioners (learners) through the processes of collaboration by adopting model workflows for particular types of collaborative tasks. Collaborative (workflow) tools can help participants (learners) structure their interaction and provide a means of managing processes of learning while working. It should be possible to map the workflows for learning and 'conversation' patterns prevalent in different communities of practice; and develop models of the collaborative processes by which participants engage in the active development of their own communities of practice and in the transformation and construction of knowledge.

The use of enhanced computer-mediated communications (CMC) support, with 'tailored' collaboration and communication tools could play an increasingly important role in ensuring the continuing professional development of professional communities of practice is reflective, forward-looking, dynamic and dialogical. One way forward could be to develop collaborative (workflow) tools, capable of being implemented in communications software environments, which can be used by professionals to help them manage processes of learning while working, and in facilitating the creation, sharing and dissemination of new forms of knowledge. Such ideas could be of value to European institutions, with interests in research and development, in considering how they could make effective use of enhanced CMC support, particularly in the creation, sharing and dissemination of new forms of knowledge.

2.1 Building a Foundation for Knowledge Creation
Nonaka and Konno (1998) examined the basis and conditions for knowledge creation and they drew attention to the importance of developing collaborative relationships. They used the idea of *Ba* as a shared space for emerging relationships. They believed that what differentiated *ba* from ordinary human interaction is the concept of knowledge creation. *Ba* provides a platform for advancing individual and/or collective knowledge. The key role of *ba* is therefore as a shared space that serves as a foundation for knowledge creation.

If knowledge is separated from *ba*, it turns into information, which can then be communicated independently from *ba*. Information resides in media and networks. It is tangible. In contrast, knowledge resides in *ba*. It is intangible. To participate in a *ba*

means to get involved and transcend one's own limited perspective or boundary. This exploration is necessary in order to profit from the "magic synthesis" of rationality and intuition that produces creativity. Within an organisation, then, one can both experience transcendence in *ba* and yet remain analytically rational, achieving the best of both worlds (Nonaka and Konno, 1998).

Ba is also conceived as the frame (made up of the borders of space and time) in which knowledge is activated as a resource for creation. This links to the SECI Model idea of knowledge creation as a spiralling process of interactions between explicit and tacit knowledge (Nonaka and Takeuchi, 1995). *Ba* therefore offers an integrating conceptual metaphor for the SECI model of dynamic knowledge conversions.

2.2   Knowledge Creation and the Characteristics of the Four Types of *Ba*
There are four types of *ba* that correspond to the four stages of the SECI model. Each category describes a *ba* especially suited to each of the four knowledge conversion modes. These *ba* offer platforms for specific steps in the knowledge spiral process. the combinations of processes are shown in Figure 1. Each *ba* supports a particular conversion process and thereby each *ba* speeds up the process of knowledge creation.

Figure 1   The Four Characteristics of *Ba*
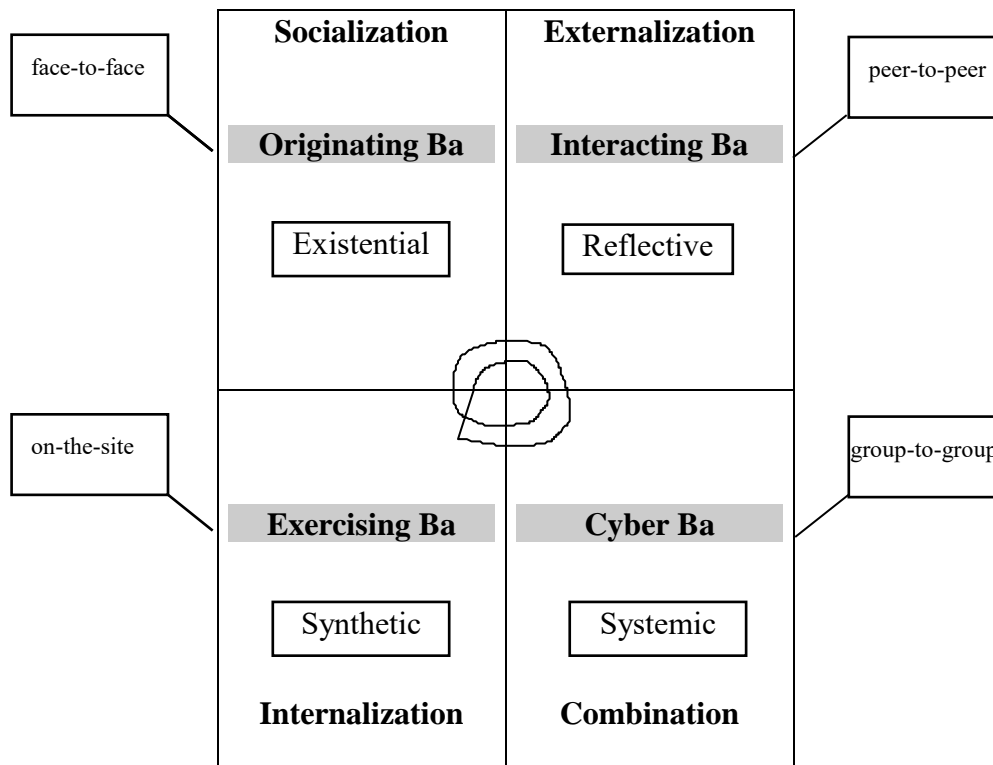
Originating ba is the world where individuals share feelings, emotions, experiences, and mental models. Originating *ba* is the primary *ba* from which the knowledge-creation

process begins and represents the socialisation phase. The *interacting ba* is more consciously constructed, as compared to originating *ba*. Selecting people with the right mix of specific knowledge and capabilities for a project team, taskforce, or cross-functional team is critical. Through dialogue, individual's mental models and skills are converted into common terms and concepts. Two processes operate in concert: individuals share the mental model of others, but also reflect and analyse their own. Interacting *ba* is the place where tacit knowledge is made explicit, thus it represents the externalisation process. Dialogue is key for such conversions; and the extensive use of metaphors is one of the conversion skills required (Nonaka and Konno, 1998).

Cyber ba is a place of interaction in a virtual world instead of real space and time; and it represents the combination phase. Here, the combining of new explicit knowledge with existing information and knowledge generates and systematizes explicit knowledge throughout the organisation. *Exercising ba* supports the internalization phase. Exercising *ba* facilitate the conversion of explicit knowledge to tacit knowledge. Learning by continuous self-refinement through off the job training or peripheral and active participation is stressed (Lave and Wenger, 1991). The organization's *ba* is not just the accumulation of different materials or information, rather it possesses the dynamism to continually create new knowledge through a cycle of converting tacit knowledge into explicit knowledge and then reconverting it into tacit knowledge (Nonaka and Konno, 1998).

Where for Nonaka and Konno (1998) it is the role of top management to act as the providers of *ba* for knowledge creation, we see a role for the development of a virtual knowledge environment as a means to support knowledge creation and transformation in the European VET research community. The CEDEFOP Research Arena could have a part to play in creating conditions in which to support the processes of knowledge *emergence*.

2.3   Knowledge Development and Continuing Professional Development

The taxonomies of knowledge development and utilisation we have outlined here pose profound consequences for the development of practice and systems for the continuing professional development of researchers, teachers and trainers. It is not enough to introduce new technologies within traditional settings for academic exchange and for professional updating of trainers. Pedagogic processes, and computer based information systems need to support the processes that lead to the development and use of new knowledge. In this way ICT based applications can support innovation. But for this to happen we need a deeper understanding of the ways in which individuals and communities of practice communicate and the ways in which communication leads to knowledge development.

We have written elsewhere of the fundamental commitments for continuing professional development required of researchers, teachers and trainers for vocational education and training (Brown, 1997a, Attwell, 1997). This section of the paper gives a summary of those commitments to developing practice, developing expertise and developing a

research capability. The Continuing Professional Development (CPD) of VET professionals needs to be reflective, forward-looking and dynamic. It needs to equip professionals with the ability to support the development of skills, knowledge and understanding of others as well as of themselves, in a commitment to lifelong learning, as well as seeking to accommodate requirements for complexity and flexibility. Such a task is only achievable with a commitment to continuing professional development within a culture which acknowledges the importance of developing practice, expertise and a research capability in an inter-related way (Brown, 1997a), so as to be able to support the generation of new forms of knowledge (Engeström, 1995).

The Continuing Professional Development of professional communities of practice needs to incorporate current concerns, but also have the ability to look beyond these, and this is possible only if, as Ellström (1997) argues, practitioners develop a broad developmental and interactive view of occupational competence. This would complement a focus upon the significance of work-related knowledge and work process knowledge in the Continuing Professional Development of professional communities of practice (Attwell, 1997; Attwell et al, 1997).

Developing practice

Initial competence as a professional is often associated with the ability to 'survive' and gradually assume a full position within particular 'communities of practice' (Lave, 1991). However, practitioners need to have a continuing commitment to explore, reflect upon and improve their professional practice (Schön, 1983; 1987). This in turn means that practitioners have to develop the understanding, skills and knowledge necessary to evaluate and review their professional practice, recognising that such practice often takes place in complex and dynamic contexts.

Developing expertise

The initial key to going beyond competent practice lies in the ability to transfer skills, knowledge and understanding from one context to another (Eraut, 1994). So Continuing Professional Development has to be able to support this process, including through helping practitioners to perform effectively when they work with colleagues and in groups with different kinds of expertise (Engeström, 1995).

Another aspect of developing expertise lies in the ability of the professional to handle the complexity and inter-relatedness of issues. There is clearly not a precise moment when one can identify a shift from 'competent practitioner' to 'expert', not least because it requires a degree of self-acknowledgement as well as recognition by others (Brown, 1997b). Expertise rather lies at the conjunction of research, theory and practice, such that the practitioner can be considered 'reflective', not only upon action, but also upon 'reflection in action'. In order to develop expertise it is important for practitioners to develop their research skills and be able to apply them to their professional practice. In an important sense then expertise is itself partly generated through research.

It should also be noted that understanding and, if appropriate, application of theory has a role to play within developing expertise. While the value of practical theory or 'theorising' in the sense of reflecting upon his or her own practice is central to the process of becoming an experienced professional (Schön, 1987), this on its own is insufficient. Rather because it is locked into current modes of practice, it is important that 'theoretical learning' is also developed (Guile and Young, 1996). Theoretical learning provides the concepts for analysing the problems that arise for professionals at work and for making explicit the assumptions underlying existing practice (Guile and Young, 1996). This conceptual knowledge can then be used to underpin reflection upon practice at a deeper level than just 'theorising' practice. Such conceptual knowledge can have both explanatory power and be applied to (changes in) practice. It therefore complements the development of practical learning, based upon reflection on practice. Crucially, however, the development and application of theoretical learning also facilitates a forward-looking perspective: enabling thinking about how practice might be developed in future.

Developing a research capability

Teaching and nursing are recent examples of professions where there have been explicit attempts to move more towards making these research-based professions, where practice is not only informed by research, but new knowledge about practice is capable of being generated by the professionals themselves. This entails explicit recognition that practitioners have a key role to play in how new knowledge is generated and applied in practice (Engeström, 1995). Further this could be linked with an attempt to create wider communities of practice that embrace research as a guide to both policy and action (Brown, 1997a).

The ability to design and carry out authoritative research into aspects of professional practice individually or as part of a team is an integral part of practitioners developing a research capability. However, possession of research skills will also be valuable in helping professionals analyse, interpret, evaluate and, if appropriate, apply the research findings of others. .

Inter-relationships in continuing professional development

Professional knowledge can itself regarded as a personal synthesis of received occupational knowledge and situational understandings, derived from experimental learning, which are capable of being further transformed through a process of critical reflection (Hammond and Collins, 1991). As expertise develops, and new contexts are utilised in the performance of practice, so the processes of research, review and reflection can lead to the creation of new forms of knowledge (Engeström, 1995). Continuing professional development can play a role in making these processes explicit such that others too can share in the developmental process. Hence Continuing Professional Development has at its core a number of inter-related commitments. The most obvious is a commitment to personal development. The others include:

- exploration of, reflection upon and improvement of professional practice.

- development of skills, knowledge and understanding (of critical reflection) necessary to evaluate and review professional practice.

- need to understand processes of change (as practice increasingly takes place in complex and dynamic contexts).

- ability to create new knowledge.

- development of theoretical knowledge to underpin and complement reflection upon practice.

- study of the interplay between theory and practice.

- need to be able to transfer skills, knowledge and understanding from one context to another.

- the generation of expertise through research.

- ability to handle complexity and inter-connectedness of issues (including through the formulation of mental models, schemas or networks).

- development of contextualised understandings.

- translation of understanding into action, as appropriate.

- further development of communication skills.

- attempt to create a wider community of practice that embraces research as a guide to both policy and action.

- ability to design and carry out authoritative research into aspects of professional practice.

- ability to analyse, interpret, evaluate and, if appropriate, apply the research findings of others.

The next section of the paper will examine the potential of computer based information and communication systems to support the development of new knowledge through continuing professional development. It is our concern that the use of ICTs is seen as a tool to support processes of communication, discourse and exchange. Information systems and databases as such will not create new knowledge. It is the process of reflection and discourse utilising that information that generates and transforms knowledge

3.   Networks, communication and interactions

The TELEVET project had the objective of evaluating the potential use of ICT based media for developing knowledge within communities of practice. In order to undertake this task it was necessary to understand the social and pedagogic uses of media. It was

useful to consider social network data on interactions via different media within collaborative networks between VET researchers. Consider, for example, the use made of:

- e-mail

- telephone

- computer conferences

- Computer based Information Systems (e.g. REM).

It may be useful to reflect upon whether within European VET Research Networks a small number of people are used as key communication nodes. These focal actors may then link many others who are not involved in such intensive communications. For example, just contacting a limited number of key actors could give you extensive coverage if they subsequently passed information on to their networks. It should also be remembered that we are advocating the use of ICT tools in support of other means of communication. This is line with recent investigations that have shown that "media filled different niches in collaborative work patterns of distributed groups" (Haythornthwaite, 1999).

What then are the issues we should consider when looking at the collaborative work patterns of distributed work groups. Possible issues relate to:

- Exposure to ideas and experiences of others

- Need to maintain an evidence base

- Conferences

- Project meetings

- Convenience / ease of use

- Dangers of information overload

- Group support: what support is required? (Much commercial software is organised around taking decisions. This overlooks many areas where the main focus is **not** upon taking decisions!)

Other potential uses for ICT based systems include help with brainstorming, help with negotiating, help with learning, and engagement with policy networks and dissemination. ICT based systems may provide for a greater order of transparency and access to the papers and materials (as currently is provided for in the REM European VET Research folders). A further consideration when designing work-flow tools is during what phase of activity is a particular type of collaboration helpful? In the initial phase the computer-based systems can help orientate people within a group and 'topic'; they may also be of

value in building consensus within project groups through providing transparency; even if there are many passive participants.

Computer based conferencing tools may assist in bringing people together: often key people are already engaged in some collaborative work and may be reluctant to engage in further travel, but they be able to continue a virtual dialogue, which holds the prospect of others joining. A second key purpose for using tools is in the sharing of information and knowledge management, including the acquisition, creation, distribution and use of knowledge. Researchers have traditionally interacted with subject matter through shared and cumulative annotation of documents and artefacts. Possible functions for the use of ICT based systems could include support for:

- development, editing and modification of documents

- sharing of documents

- information retrieval

- searchable text

- shared annotation

- classification and re-classification of texts and parts of texts (including through the use of XML documents)

- knowledge development / transformation.

However, the importance of forgetting should also be noted as part of the process of coping in an information-rich world. Much evidence and research is related to particular contexts and times: even if it was once very valuable it may not of continuing interest. It may be appropriate to archive such material, rather than seeking to maintain a comprehensive resource, the size of which could be daunting for prospective users.

Knowledge can be seen as meaningful information once it has been put into a context, but it is also important to acknowledge that information emerges only **after** we have **knowledge.** Users of an ICT based information system for VET will develop and use information in particular contexts and learning environments. Thus the systems we are trying to develop are not about the transmission of correct information; rather the focus is upon how to **facilitate distributed groups in knowledge transformation.**

Taking these considerations together the needs of VET researchers, teachers and trainers can be seen in terms of the need for 'spaces' to facilitate:

- access to knowledge from different sources

- collaboration

- collaborative inquiry

- openness: to allow participation of others

- opportunities to disseminate

- reflection

- help with personal and group knowledge building

It should be noted that the development of such 'cyber spaces' does not replace the need for more traditional forms of communication – for meetings, seminars, books and journals. For example, consider this view from someone at IBM's R and D labs:

> "computers don't support conversation well, particularly asynchronous conversations among groups. Such conversations often lack coherence, tending towards drift, dissolution, or chaos"
>
> (Erickson, p59, HICSS 32 proceedings, 1999).

But, on the other hand, CMC does offer persistence: conversations may be searched, annotated, restructured and recontextualised. The present REM system also allows participation (asynchronously) of those unable to attend conferences and network meetings. An information and communication technology based system can enhance the quality of discourse and assist the development and transformation of knowledge in conjunction with traditional forms of information sharing.

The ideas arising from the original REM project were seen as particularly appropriate to support the CPD of the VET research community because of:

- the need to collaborate at a distance because particular groups of practitioners are dispersed over a wide geographic area and/or do not have the necessary time to attend (many) face to face sessions

- the need to collaborate in order to support innovation and transfer of good practice

- the need to develop a shared and growing knowledge base

- the recognition that a virtual dimension to their community of practice would add considerable value to their own continuing professional development (CPD).

One metaphor for what the REM project sought to establish is the concept of a Virtual Community of Practice (Owen and Liber, 1998), with emphases upon transfer of good practice, supporting the creation, sharing and dissemination of new knowledge. As well as offering opportunities for training and CPD, this would also provide a social space, under the direct control of the participants, which allows other forms of collaboration and development to flower. The use of specially tailored tools to facilitate CMC in support of CPD in a variety of communities of practice should ideally be a supplement to, and not a replacement of, other forms of CPD. Additionally, as there is a rapidly changing

technological base that can be applied to meet the needs of collaboration within and between individuals and organisations, so attention needs to be given to a system for analysing patterns of collaboration and the way collaborative systems are implemented. The REM project had a deep-rooted commitment to understanding the nature of collaborative learning. It is also important to remember that REM started as a project whose pedagogic model of collaborative learning lead technological development rather than vice versa (Owen and Liber, 1998).

All communities of practice are involved in discourses about practice. Additionally, however, networks making use of enhanced CMC support could utilise tools which enable participants to have structured `conversations' about the development of practice. They could therefore play a pivotal role in:

- the creation, sharing and dissemination of collective knowledge and

- learning and managing knowledge development and transfer so as to support innovation and creativity in different occupational and organisational contexts.

This approach could enhance the learning capability of individuals, organisations and networks and provide them with the tools and infrastructure to realise that capability to improve their learning effectiveness (Owen and Liber, 1998). The REM project therefore gave considerable impetus to the search for collaborative research environments to support European VET research. Our conclusion to this study is that for the use of European VET Research, there are two clear systems requirements. These could be conceived as the need for:

a.   a space for collaboration

b.   a space for knowledge transformation

4.   EUROFRAME and the creation of Common Information Spaces

The creation of a 'common information space' could form the first major step towards developing a European Institute or Network under the auspices of EUROFRAME. The information space would serve a number of different purposes:

♦ A place for exchange of information about new curricula and curriculum innovation

♦ A repository of materials for Continuing Professional Development

♦ An interface zone between students, teachers, researchers and policy makers and planners

♦ A virtual learning space (or classroom) for VET professionals

Although such a space would use Internet technologies it would need to be much more than a Web site and email list. The key problem as we have seen with the REM project is facilitating discourse and interaction. In terms of knowledge development, be it research

findings on the education of VET professionals or professional knowledge for teachers and trainers themselves, a focus on practice is vital. Practice should lie at the heart of any development. Unfortunately most university or project web sites centre on disseminating the outcomes of research rather than on practice.

How can this focus on practice be developed? Firstly different groups of students, teachers and researchers in different partner institutions should take responsibility for designing 'practice oriented' web content. Given the growing importance of ICT for learning this could serve both as CPD for the teachers and part of the learning programme for students. Secondly the EUROFRAME programme should organise a series of 'events' using virtual technologies. These could take the form of on-line seminars, or of debates. The key factor is they should be well prepared, time bound and moderated.

Whilst these might mark a first step further investigation is needed into the design of interfaces for CPD for dispersed communities of practice. It is proposed that a full report be prepared for the June project meeting with the aim to design and develop the 'space' over the summer months, and pilot the work in autumn 2000.

5. Possibilities of using national material as exemplars of the use of common VET information spaces

One of the key things it might be useful for us to find out is how people collaborate when using common information spaces. A community of practice, by its very nature, depends upon collaboration about professional practice, learning and development (Lave, 1991; Brown, 1997b). This collaboration will be dependent upon extensive sharing of knowledge and information. Additionally, VET practice itself involves practitioners in collaboration with colleagues in using a variety of common information spaces that may be company-specific, local, regional or national. This type of collaborative work is dependent upon the construction of common information spaces, even if participants from different backgrounds do not use this label (compare the experiences of the very different groups involved in the Finnish EUROFRAME project). What is happening in such examples is that such universal processes are more explicit than in many other settings, as the processes involved in learning to become a VET professional are so clearly shaped by actions and interactions within social worlds (Strauss, 1993). This should mean that it should be possible to build upon these understandings such that the idea of a computer-supported information space as a support for those learning to become VET professionals is readily accepted, at least in principle.

Additional effort is usually required to put information held in common to practical use in particular contexts and there is a tension relating to how much detailed information should be provided in common information spaces. Where greater detail, including commentary and interpretation (and information about the context) is transmitted with the substantive information this can be particularly useful if people are not sharing a physical work context. On the other hand, as expectations about submitting more contextual information rises this may act as a potential barrier to people contributing material. (Again it would be interesting to look at the Finnish experiences in this light – we had the feeling that the experiences were often very much richer than they appeared when written

up in English.) One way this may be resolved is where practitioners share similar, but remote, contexts, they may be able to package just sufficient information about the context to make the substantive information understandable for other experienced practitioners. This too highlights the importance of feedback from practitioners about how well the common information space does allow a shared interpretation of actions, events and information (Schmidt and Bannon, 1992).

Bannon and Bødker (1997) argue that the construction of a common information space needs to consider how multiple interests may be temporarily reconciled; how information can be coupled with material on local contexts when being submitted and then be transformed so as to be capable of being applied in other contexts of use; and how information can maintain its open and malleable character in a variety of contexts. We believe that the fact that our proposed virtual learning environment will allow multiple representations of the material held in the common information space does mean that different groups would be able to construct their own representations that address their particular requirements as they define them for themselves. For example, policy-makers, managers, practitioners, trainers and researchers may all want certain aspects of their information spaces presented in different ways, even if they want to share representations of other aspects.

This approach would also allow for separate countries, regions, training institutions or even companies to build information spaces tailored to their own requirements. This accords with the views of Clement and Wagner (1995) on facilitating the fragmentation and regionalisation of communication spaces, and the need to pay attention to boundary management and, particularly, to who falls within and outside the space for different types of communication. Indeed the technical facilities of our proposed system will allow participants to vary the boundaries to the their own communication space. This means that, for example, the focus could be varied to match changing personal circumstances, depending upon the extent an individual was faced with pressing concerns at work or was about to engage in CPD activities and so on.

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