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ABSTRACT

This paper outlines how information and communication technologies are being used for knowledge development of a dispersed community of practice of careers guidance practitioners. The project seeking to achieve this is in the process of developing prototype web-based collaboration and knowledge sharing tools. These will be used in order to provide a comprehensive telematic platform for interactive and focused knowledge sharing and transformation for Careers Guidance students, tutors, practitioners, policy makers, and training organisations as collaborative participants in a dynamic community of practice.

The knowledge transformation activities will involve a mix of real and virtual encounters, and lead to a spiralling 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 the learning community 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 enhance careers guidance practice as a key service to education and training.

Keywords: Careers guidance; information technology; knowledge transformation.

1. Introduction: setting project aims and objectives in context

One aim of a major European-funded ADAPT project is to seek to support the development of a learning community to enhance careers guidance practice as a key service to education and training in the United Kingdom. The focus upon enhancing careers guidance practice is particularly apposite at this time because the massive and continuing changes in policy and practice in this area have left policy-makers, practitioners, trainers, students and researchers without a coherent view of how careers guidance will develop in the medium term. This presents an excellent opportunity to engage all players in a search for new understandings of the contextualisation, enrichment and renewal of Careers Guidance as a key service to education and training.

A second reason for focusing upon the development of a learning community based upon careers guidance practice is because the training of careers guidance practitioners is also being extensively reshaped. This has profound implications for initial training and continuing professional development (CPD) programmes. The processes of teaching, learning, knowledge development and utilisation will all need to be reshaped. The project is working with training providers in England, Scotland and Wales to develop an imaginative way of linking processes of knowledge acquisition, development, transformation and creation with approaches to tackling the core problems of Careers Guidance practice.

The different groups mentioned above sometimes interact at conferences, seminars or carers guidance 'fairs'. However, the Careers Research Network established under the ADAPT project is the first attempt to bring together all parties with an interest in research and development of careers guidance practice. This bringing together of representatives of a dispersed community of practice has proved very worthwhile, but something in addition to face to face meetings is required to turn this into a more inclusive learning community. The ADAPT project is in the process of developing prototype web-based collaboration and knowledge sharing tools to support the network. The intention is to provide a comprehensive telematic platform (or Guidance Arena) for interactive and focused knowledge sharing and transformation for Careers Guidance students, tutors, practitioners, policy makers, and training organisations as collaborative participants in a dynamic community of practice.

2. Relationship of previous research to project theoretical framework and methodology

The project is dependent upon the integration of ideas from three strands of previous research. First, when seeking to develop a learning community to enhance careers guidance practice we believe the relevant unit of analysis is careers guidance practice within particular social, cultural, historic and political contexts. This fits with Engeström and Cole's (1993) notions of cultural historic activity theory [1]. Second, our view of how knowledge creation and transformation processes, grounded in practice, can be facilitated is developed from the work of Nonaka and Takeuchi (1995) and Nonaka & Konno (1998) [2,3]. Third, the investigation of the pedagogical aspects of the innovative use of telematic tools to support a professional community of practice will draw upon Kaptelinen and Nardi's (1997) activity methodology as the basis for the enquiry [4].

3. Analysis and development of careers guidance practice is to be considered within particular social, cultural historic and political contexts

The design of technological support for the development of communities of practice calls for the use of highly innovative design methodologies that take into account the social, cultural, historic and political context that any change is to be located (Engestrom and Cole, 1993 [1]: see figure 1).
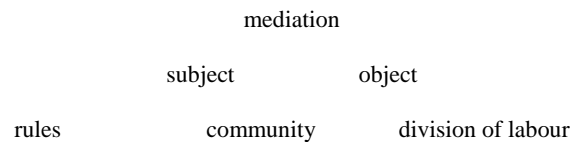
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mediation

subject   object

rules   community   division of labour

Figure 1: activity system

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note i: each factor is influenced by each adjacent factor irrespective of level

note ii: the whole system is dynamic and changes over time

Applying Engeström and Cole's (1993) activity theory framework [1] to our study of careers guidance practice would give the following:

- Subject: careers guidance practitioners (goal-directed actions; beliefs; ideas; mental models);
- Object: careers guidance practice (patterns of behaviour; relations with clients);
- Mediation: socio-cultural ideas about guidance practice (tools; theories; approaches; historical traces and cultural meanings associated with careers, occupations and identities);
- Rules: changing frameworks for regulation of practice (focus of guidance practice; statutory entitlements; service targets);
- Community: extent to which value systems are shared (ideas about 'good practice', meeting targets, nature of professionalism);
- Division of labour: between practitioners, specialists and assistants (roles and relationships).

The 'value added' of applying cultural historic activity theory to the enhancement of careers guidance practice is that it gives a much richer framework for searching for new understandings of the attempts at the contextualisation, enrichment and renewal of careers guidance. It can be used to highlight the value of analysis of the consequent effects elsewhere in the system of changes in one part of the system. In particular, this framework can help participants and researchers in the learning network to generate questions for discussion. For example: what are the consequences for ideas of professionalism of proposed changes to the recognised vocational qualification?; what values do practitioners place upon innovative practice?; to what extent can an individual change practice and who else has to be involved?; how much is critical reflection valued in the system? Such questions can help ensure that the complexity and inter-relationships between issues are addressed when considering the renewal of careers guidance as a key service to education and training.

4. Knowledge Transformation

Brown & Attwell (1999) have produced an overview of how computer-mediated collaboration and knowledge transformation processes can support a community of practice (in that case of Vocational Education and Training Researchers in Europe) [5]. The task here is to focus upon how the theoretical framework developed to explain processes of organisational knowledge creation [2, 3] can be adapted to provide a theoretical underpinning for our project. In this case knowledge transformation for a learning community to enhance careers guidance practice will involve a mix of real and virtual encounters. 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 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 [3]. 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 for possibilities for collaboration to transcend particular perspectives. In the field of careers guidance, for example, much labour market information (LMI) 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 whole 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 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 [2] (see figure 2).

Figure 2: Adaptation of Nonaka & Konno's (1998) four Characterisation of Ba [3]

Socialisation
Originating Ba
(Space for socialisation: face to face interactions)

Externalisation
Interacting Ba
(Space for active reflection)

Combination
Cyber Ba
(Space for combining new forms of knowledge with existing information)

Internalisation
Exercising Ba
(Space for conversion of explicit knowledge to tacit knowledge
of individuals and groups)

Continuous spirals occur through SECI process.

Nonaka & Konno [3] 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.

The SECI model will be implemented in our project in the following way:

Socialisation (through originating *ba*):
Three Careers Research Network meetings, together with smaller dissemination meetings, have been held in different parts of the country, involving over three hundred members of the proposed learning community. The purpose of these meetings has been to provide an 'open forum' (of face to face meetings) to allow for integration of new members (and reinforcement of existing members) of the learning community. Events will continue to involve a mix of plenary sessions and workshop sessions (with particular encouragement being given to presentations by practitioners).

Externalisation (through interacting *ba*):
This has involved the set up of thematic groups, comprising individuals with a mix of backgrounds, knowledge and capabilities. Individuals 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 is made explicit and some new understandings of 'knowledge' are created. Each thematic group will typically comprise 6 – 8 people and the first thematic group focused upon the role of personal advisers in giving guidance and support to those in danger of social exclusion.

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. Ideally at least two members of the group will be expected to facilitate the systematisation of this explicit knowledge for the learning community as a whole.

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 the way models of supervision and support for personal advisers could be adapted for different local contexts and patterns of inter-agency collaboration.

The project will involve the spiralling of knowledge creation and transformation through continuing SECI cycles on the 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 (Guidance Arena) is to provide a rich virtual knowledge environment to support the processes of collaboration and knowledge creation and transformation in the learning community developed to enhance careers guidance practice as a key service to education and training.

5. The investigation of the innovative use of telematic tools in supporting a professional community of practice

We are attempting to align pedagogic processes and a web-based knowledge environment to support the processes that lead to the development and use of new knowledge in an innovative way. 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. 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. 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 [6]. Continuing professional development can play a role in making these processes explicit such that others too can share in the developmental process.

The evaluation of the use of collaborative technologies in supporting communities of practice is vital if lessons learned on this project are to 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 and the language of work flows [7], as collaborators around living documents [8] or as socio-cultural activity systems [1]. These ideas have been applied to education (see, for example, Guile and Hayton [9]), where they have generated both strong opposition [10] and major supporters for the use of collaborating technologies as learning tools [11]. In general, however, practice has not always lived up to the potential [12], so critical scrutiny in both a formative and summative sense 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 [13]. 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 [1]. Kapetelinen and Nardi (1997) have produced guidance that will be incorporated into the evaluation approach [4].

Kaptelinen 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 [4]. 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 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.

This will be undertaken as an iterative activity. We have significant collaboration technologies available to us and we can learn a lot from their use. We also have the ability to prototype changes and introduce them into the users' environment.

6. Broader research questions

As well as a commitment to the practical utility of the system being developed, we also intend to investigate some broader research questions. These questions include:
- is it possible to develop and sustain a learning community to enhance careers guidance practice as a key service to education and training;
- is it possible to provide a comprehensive telematic platform for collaboration, including interactive and focused knowledge sharing and transformation for the Careers Guidance community of practice;
- what are the pedagogical aspects of the innovative use of telematic tools to support a professional community of practice that influence how a learning community develops?

7. Technical development:

The basic infrastructure of the prototype telematic platform was developed in June 2000. A simple Web authoring interface allows users to render and annotate documents. This means all users will be able to produce structured documents. The prototype communication and knowledge transformation tools have been produced through intensive collaboration with practitioners.

The Careers Research Network, however, does not focus simply upon computer mediated communication. It seeks to enhance and facilitate processes of knowledge development within the wider community of practice. The Network 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. The Guidance Arena 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 careers guidance.

The material to be presented in the Guidance Arena 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 the Guidance Arena 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 thorough 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 though shared annotation as a major means of communication, the Guidance Arena 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 the Guidance Arena, in order to encourage the development of knowledge, that makes use of the processes of '*knowing*' that Brown and Duguid [8] 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 is how to facilitate discourse and interaction [14]. 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? The Guidance Arena 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 training programmes 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, the Guidance Arena will draw upon face to face discussions and Careers Guidance Network 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 the Guidance Arena as a focus for knowledge

sharing and development, it is also important to study its use and to continue explorations and research into the broader processes of knowledge development in communities of practice. The knowledge transformation tools will allow for the contextualisation, 'tailoring' and enrichment of research results through further processes of knowledge transformation and creation. Further technical development, refinement, monitoring and reviews of the electronic architecture (including the tools for knowledge transformation and collaboration) will occur throughout the lifetime of the project.

8. Production of documents and materials as part of knowledge creation and transformation processes

The telematic platform for interactive and focused knowledge sharing and transformation shall involve eleven central strands. All material will be coded in XML, allowing for varying representations of material drawn from the different strands. The strands will not remain as discrete areas rather material will be dynamically created on a thematic basis. The eleven strands are:

Introduction to the site:
material relating to the purpose of the site; aims, objectives and project description; invitation to collaboration; opportunity for general comments

Material from direct practitioner experience:
this could relate to identification of core problems of guidance practice; 'good practice'; project work; critical reflection upon experience; implementation of special programmes; use of 'tailored' tools; evaluating practice; how new system of personal advisors is operating in practice

Material relating to policy development and implementation:
key elements of policies; commentary, analysis and discussion; range of stakeholder perspectives; development of evidence-based policy; policy and programme evaluation; development and implementation of the new Connexions Service

Reference material:
labour market information, analysis, forecasts and intelligence; skills observatory; education, training and employment pathways;

Research material:
on guidance practice (interviewing; group-work; ethics) and related issues (social exclusion; refugees; labour market transitions; identity formation processes; completion rates in education and training; equal opportunities). Research findings will be drawn from pure and applied research. Practitioner research will be particularly encouraged.

Training material:
changing contexts and curricula for training; training exercises; video material on interviewing; 'good practice' exemplars; moderated discussions; assignments

Tools:
supporting the development, testing and evaluation of tools and materials for use in careers guidance

Signposting material:
reference to other sites and sources of information

Student material:
project work; assignments; sharing of experiences; developing expertise

Evidence of continuing professional development:
evidence of reflection upon practice; professional model of regular supervisory practice; portfolio creation

Evaluation material:
responses to use of telematic tools and environment; links to practice; critical reflection; dynamics of interaction; continuing feedback.

9. Collaborative environment

The environment has to be used interactively and collaboratively if it is to be a genuine *ba* or shared space for knowledge transformation. The interactivity within the rich evidence environment comes from the ability to:

- (jointly) develop, edit and modify materials;
- share annotation on material (annotation will be available alongside the material, not simply as a 'thread' as with existing CMC systems);
- facilitate the sharing of experience;
- promote discussion, sharing and active collaboration;
- offer virtual (and real) spaces for debate and collaboration;
- support action research;

- offer active support and moderation;
- offer support to particular interest groups (e.g. managers; those assembling evidence of continuing professional development; students etc.);
- contribute to a forum for discussion of attempts to tackle complex problems in authentic contexts.

10. Conclusions

The process of building a Guidance Arena comprising a rich knowledge environment (accessible to all through the web), that uses telematic tools for collaboration and knowledge development, is still in the early stages of development. The intention is that this should act as an essential support for supporting a dispersed community of practice engaged in careers guidance. We are interested in extending our collaboration, and we would particularly welcome the involvement of those who are interested in the substantive issues of careers guidance practice or in how to offer virtual support to dispersed communities of practice.

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