Introduction

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Biographical notes: David Griffiths is a Reader in Elearning at the Institute for Educational Cybernetics, the University of Bolton in the UK. His background is in the arts and in education, and he has taught at all levels from primary through to adults, spending much of his working life in Spain. For the past 15 years he has worked on various aspects of technology and education as a developer, researcher and project manager. In recent years he has published extensively on IMS Learning Design (IMS LD). He was the Coordinator of the UNFOLD project, which ran communities of practice for those working with IMS LD, and currently leads the contribution of the Institute for Educational Cybernetics to the TENCompetence project.

Professor Rob Koper is the Dean of the Educational Technology Expertise Centre (OTEC) of the Open University of the Netherlands, the centre that is responsible for research and education into methods and technologies to facilitate learning in various contexts. This includes research into effective instructional design methods, cognitive load theory, learning networks, learner support methods and technologies, competence development and assessment, ubiquitous and mobile learning, serious games and virtual labs. He has published over 200 publications in scientific journals and books. He was responsible for the development of Educational Modelling Language (EML), and edited its release as the open IMS LD specification. He leads or participates in a variety of EU-funded R&D projects, such as the TENCompetence Integrated Project. His research focus is on self-organised distributed learning networks, including personal competence development.

Professor Oleg Liber is the Director of the Institute for Educational Cybernetics at the University of Bolton and Director of the national JISC Centre for Educational Technology and Interoperability Standards (CETIS). He has been involved in pioneering projects in educational technology for 25 years,

including in recent years the first peer-to-peer learning application (Colloquia) and RELOAD, the learning object and activity development system. He was responsible for and a coauthor of two influential reports for JISC: 'A framework for the pedagogical evaluation of eLearning tools' and the 'Personal Learning Environments Reference model'. His research interests are in the cybernetics of educational organisations and systems, and the transformational effect of technology.

This special issue of the *International Journal of Learning Technology* builds on an Open Workshop organised by the TENCompetence project on the theme *Service Oriented Approaches and Lifelong Competence Development Infrastructures*. The workshop took place at the G-Mex Manchester International Conference Centre, UK, on 11 and 12 January 2007. The proceedings of the workshop have been published online under a Creative Commons licence (Griffiths *et al*., 2007),[1] and the best papers were invited to contribute to this special issue. TENCompetence[2] is an integrated project funded by the EU 6th Framework Programme, which runs for four years from December 2005, with the aim of developing a European, open-source infrastructure to support the lifelong development of competences.

1   Providing support for lifelong competence development

There has been considerable debate about the concept of competence, and there is an extensive literature on the appropriate pedagogies for competence development. The ambition of TENCompetence, however, is much wider than the introduction of competence-based approaches in traditional teaching situations. Rather it offers technical and organisational models for a new relationship between citizens, providers of learning and skills, and organisations such as employers and professional organisations. In order to do this, TENCompetence distinguishes three broad areas of activity in which individuals, groups and organisations need to be able to interact with an infrastructure for lifelong competence:

1   assessment of the knowledge, skills, *etc*., that are attained through nonformal and informal learning during work and life

2   accreditation of this type of learning and providing a kind of assurance that people who are accredited can (with a large probability) function effectively in a new situation (like a new job, managing a project, *etc*.)

3   provision of individualised learning solutions for those who:

  • want to keep up to date in their existing function or job

  • are studying for a new function or job or improving their current job level

  • are reflecting on their current competences, to identify functions and jobs within reach or to help define new learning goals

- want to improve their proficiency level for a specific competence

- want to find support on a nontrivial learning problem

- want to explore the possibilities in a new field and help define new learning goals.

The definition of competence adopted by the TENCompetence project is based on that of Cheetham and Chivers' (2005) *Professions, Competence and Informal Learning*. From this perspective a competence is the necessary ability of an actor to cope with problems, events or tasks in a situation (niche), *e.g.*, job, hobby, market or sport. It may be ascribed to individuals, teams and organisations. It is highly situational, and is a latent attribute (not directly observable and applied to future activities).

With regard to this latter attribute, while it is clear that when a learner achieves a new competence this must be related to neural changes in the brain, it is also true that we are unable to observe or analyse these phenomena at the neural level. Even if this were possible, there is no reason to suppose that a specific brain structure would map onto a specific competence manifested by the learner, as this is a combination of many cognitive functions. It is because of this that the process of defining competences is inevitably social, and Cheetham and Chivers describe how the specific labels we give to competences are determined in a community of practice, or (in more general terms) by the participants who are regular actors in that particular situation.

This has many implications, for example the competence profiles for the same profession may vary from community to community even though the required behaviours are exactly the same. For instance, the competence profiles for dentists in Bulgaria may be completely different from the ones defined in Holland or the UK, even if the tasks, instruments and patients are largely identical. Another consequence of this stance is that it may be unwise to try to identify global competence profiles for professions (other than some minimal set of indicators), but rather that profiles from different communities should be mapped onto each other. An exception to this is those professions where legislation imposes the uniformity of an international framework, for example in air traffic control.

Competences are also situated in communities for practical reasons of collaboration and employment, which require socially situated statements about people's abilities, in terms of their knowledge, skills, competences or understanding. At one extreme these statements may be framed as formal qualifications, and at the other they may be informal comments about colleagues over a cup of coffee.

In line with these observations, and with the Cheetham and Chivers analysis, the position taken by TENCompetence is that the identification of learning in a person is always a matter of someone saying something about someone else (or themselves). One way of framing the contribution of the project, and the goal of the workshop which led to this special issue, is as the provision of an open infrastructure for these conversations (understood in the widest sense, including the exchange of documents), enabling them to be related to each other and to competence development opportunities.

This is no easy task, because of the need to bridge social and organisational contexts, such as higher education, human resources management, professional organisations and knowledge management systems. Moreover, the structure used to facilitate these conversations should not constrain competence development processes or the learning and teaching activities which support them.

We distinguish four levels at which competence-related documents and descriptions need to be exchanged, and these articulate the infrastructure provided:

1   structures through which competence definitions and profiles are defined and shared

2   learning opportunities and activities through which competences can be developed

3   competence development paths

4   competence development networks through which to navigate the maze of competence paths.

Individuals, groups and organisations interact by creating, adapting and sharing interactions at all four of these levels, providing the means with which to describe and participate in a multiplicity of overlapping structures and to create a rich picture of the various dimensions of the competence environment within which they operate, and their progress through it.

This richness, however, creates in turn a new set of problems. Competence structures have often been restricted in the past to hermetically sealed worlds. It has not generally been possible, for example, for individuals, groups or organisations to use one system to adapt and represent an open set of evolving and alternative competence profiles and competence development activities. The users have always had to deal with this variety themselves, partly by limiting the attention which they pay many of the alternatives (either through ignorance or design), and partly by memorising or representing their various competence development activities and managing them by whatever means they have at their disposal.

2   The Personal Competence Manager

By creating an infrastructure for representing more diverse and overlapping competence development structures, TENCompetence runs the risk of making users' lives unsustainable by asking them to handle even greater variety. Thus it is essential to provide support for users in this task. Given the strategy of supporting multiple descriptions and conversations about competences, it would not be coherent to provide a single centralised service to provide this support, with personalised analysis of users' competence development objectives and activities. It makes more sense to situate this support at the point where the variety has to be managed, that is to say, to provide tools with which the individual can manage his/her own competence development objectives and activities. This approach closely follows that proposed by Johnson and Liber (2008) in their discussion of the Personal Learning Environment, a concept which has been the focus of considerable discussion in the UK and elsewhere. Accordingly, TENCompetence has developed a Personal Competence Manager which enables individuals to plan their competence development and to participate in the development of competence development structures and descriptions with other users. The client/server system which has been developed is available for download on SourceForge.

It is, of course, true that many competences and professions need to be regulated to differing degrees at the level of the organisation, the state and the European or global level. The integration of competence development activities at the personal level does not preclude this, as it is envisioned that communities of users can subscribe to accepted

standards for competence attainment certified by the competent authorities, and indeed that the tools provided can also support groups in the development of such certified descriptions and paths to their attainment.

3   The papers in this special issue

The papers in this special issue were delivered in the workshop because in one way or another they contribute towards realising this vision of an open infrastructure for Lifelong Competence Development. To achieve this, contributions are needed from a wide range of researchers working in areas such as computer science, professional development, knowledge management, competence-based approaches, assessment models, pedagogy and learning design, and personal development activities of all sorts. In view of this, we are pleased to have papers on a wide range of relevant topics in this issue.

The papers may be divided into pairs:

- The first two papers report on aspects of the technical implementation of services.

- The second two papers draw out the implications for the Lifelong Competence Development of, on the one hand, industrial techniques for implementing personal recommender systems, and on the other an educational intervention in the MANSLE project.

- The final two papers conduct conceptual analyses of social interaction in networks of Lifelong Competence Development which have been carried out within the TENCompetence project, and which are informing work in the project.

The provision of an open infrastructure for Lifelong Competence Development raises significant questions relating to implementation. It is therefore appropriate that the first paper in this issue reflects on the development process required for the creation of software components that are to be implemented in applications and offered as constituents of a component or service framework. 'Establishing a development process for composite applications in the work-based learning and competency management domain', by Dexter *et al*. draws on the authors experience in the deployment of an open-source back-end component named Horus. This has been provided to the community as a web Service, to support mapping between a structured curriculum and the intended learning outcomes of learning events, allowing students to plan and manage their own learning. The paper discusses the capability of a development team to provide sustainable services that may be assembled into multiple composite applications, and the key importance of managing this process if it is to be successful. This paper describes the planned, and to date, part-way implemented process and its rationale.

The second paper, 'Using the Learning Design Language to model activities supported by services', by Martel and Vignollet, also makes a contribution to the use of services. In this case, however, the focus is on services for learners to be used within learning designs. It has been recognised for some time that the issue of interoperability of services is a key one for learning design, as recognised by Olivier and Tattersall (2005) with regard to IMS Learning Design:

> "The key issue that needs to be addressed is how to add services in such a way that key learning designs that use them still retain a reasonable degree of portability across different LD-compliant platforms. If all the above services were included, could any system be expected to be compliant? Or should the specification stick to the lowest common denominator for services…?"

Martel and Vignollet provide an original perspective on this problem, and describe how they developed Learning Design Language as a means for defining learning activities which use services. While the work reported is not compliant with IMS Learning Design, the ambition is that several languages could coexist and transformations from one to another could be defined. Within the TENCompetence project, parallel work is being carried out on this problem, as outlined in Wilson *et al.* (2007).

The third paper, 'Persona, identity and competence: issues of control in teaching and learning with personal technology', by Johnson, explores the use of the Personal Learning Environment, a concept which is closely related to the TENCompetence Personal Competence Manager. Johnson builds on the theoretical work of Maturana and Varela to distinguish the concepts of 'persona' and 'identity'. This is then applied to a case study from the MANSLE project, in which learners engaged in online communities, leading to the definition of a generative model for learners' achievement and patterns of activity.

The fourth paper, 'Personal recommender systems for learners in lifelong learning networks: the requirements, techniques and model', by Drachsler *et al.*, takes as its starting point the need to provide learners with support in navigating the wide range of options open to them in Lifelong Competence Development. The authors observe that recommender systems are at present little used for this purpose, although a range of techniques is successfully employed in recommender systems in other contexts. They examine the ways in which these could be applied in Lifelong Competence Development, applying the criteria of their ability to take into account learning goals, prior knowledge, learner characteristics, learner groups, rating, learning paths and learning strategies. They conclude that hybrid memory-based recommendation techniques could provide the most accurate recommendations, and present an initial class model of such a personal recommender system.

The fifth paper, 'Enhancing social interaction in competence development networks: a conceptual framework', by Angehrn *et al.*, addresses a key challenge for Lifelong Competence Development, that of enhancing social interaction through value-added connections among online community members engaged in knowledge exchange. The authors explore three specific connection-enhancing features and dynamics, *i.e.*, network visualisation and navigation tools, connection agents and games, which they propose are necessary to gradually 'connect' users – to themselves, to the user community, to relevant knowledge assets in the system and to the system itself – as well as increase their motivation and capability to act as active members of a knowledge exchange network. Examples are provided of prototypes developed at INSEAD, and usage scenarios provided to illustrate their use in Lifelong Competence Development. Further prototype development along these lines of investigation is being carried out within TENCompetence.

The sixth and final paper is '*Ad hoc* transient communities: towards fostering knowledge sharing in learning networks', by Berlanga *et al*. The starting point for this paper is the observation that knowledge sharing occurs not only through established long-lasting communities, but also through communities which exist to fulfil a particular

request and for a limited period of time only. The authors term these 'ad hoc transient communities', and the paper describes the characteristics, behaviour and policies that enable these communities to foster knowledge sharing in Learning Networks. This is elucidated through the presentation of a use case related to the TENCompetence Personal Competence Manager.

The papers in this special issue provide an indication of the breadth of research interests which meet in TENCompetence, and of the range and insight of the papers presented at the Manchester Open Workshop. We would like to thank all those involved in the organisation of the workshop, the reviewers of the papers and the editor of IJLT, Lorna Uden, for her help in creating this special issue.

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Notes

1   Available at http://hdl.handle.net/1820/1023.

2   For more information see http://www.tencompetence.org/.