Lifelong learning in a network

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Abstract

In our knowledge-based society learning will no longer exclusively be tied to the traditional educational institutions, but becomes lifelong. E-learning has enabled the establishment of networks of distributed collaborating learners, teachers and institutions. Lifelong learning in a network is quite different, because the student doesn't belong to one institute and the roles of persons are no longer fixed. At the Open University of the Netherlands we are developing a set of models (a 'learning network'), technologies and open specifications in order to support networked learning. It will be related to the MSc-programme we are developing in collaboration with Sydney University and Florida State University.

Introduction

The need for better provision for lifelong learning in society is broadly recognised and is expressed in national and international policy documents. For example, the Commission of the European Communities (2000) states in its memorandum on Lifelong Learning: 'Lifelong Learning is no longer just one aspect of education and training; it must become the guiding principle for provision and participation across the full continuum of learning contexts'. Lifelong learning will ultimately provide a major service catering for the needs and demands of industry and society as a whole (Tuijnman, 1992; Ragget, 1996; Schuetze, 2000). The concept of lifelong learning refers to the activities people perform throughout their life to improve their knowledge, skills and competence in a particular field, given some personal, societal or employment related motives (Aspin & Chapman, 2000; Field, 2001; Griffin, 1999).

To achieve these aims of lifelong learning, educational institutions and other organisations must offer facilities that meet the needs of learners at various levels of competence throughout their lives. People must be able to use lifelong learning facilities to upgrade their knowledge, skills and competence in a discipline as required. They can also contribute to the facilities by sharing knowledge and supporting other learners. Lifelong learners are not merely the consumers of learning content, but can also be produce learning content that is of use for other learners (Fischer & Ostwald, 2002).

The use of ICT networks is crucial for the realization of the lifelong learning agenda, especially the establishment of so-called Learning Networks for lifelong learning (Koper &

Sloep, 2003). A Learning Network for Lifelong Learning (LN) is a network of distributed persons and organisations who create, share, support and study learning resources ('units of learning') in a specific knowledge domain. These networks support the seamless, ubiquitous access to learning facilities at work, at home and in schools and universities.

The requirements placed on learning technologies to support lifelong learning differ considerably from those placed on technologies to support particular fragments of a learning lifetime. The time scales involved in lifelong learning, together with its multi-institutional and episodic nature are not reflected in today's mainstream learning technologies and their associated architectures.

In this paper we start by focussing on specific characteristics of lifelong learning that have to be taken into account. Four main issues will be described which have implications for the design of networks for lifelong learning. Next, we provide a formal representation of a learning network, including a short description of the main concepts, and we spend a few words to several pilot implementations that have been created and experimented with. Then, we will discuss how a learning network might be developed, taking as an example the master programme we are developing in collaboration with Sydney University and Florida State University. Finally, we present some conclusions and discuss some problems with respect to learning within a learning network.

Learning networks for lifelong learning

There are several specific characteristics of lifelong learning that have to be taken into account when developing ICT networks for lifelong learners. The major characteristics of lifelong learning are already contained in the phrase itself: it is 'lifelong' (from cradle to grave) and puts 'learning' (and not instruction) centre-stage. Knowledge and competences grow during life in different fields, and learning facilities should provide the possibility to support the lifelong building of knowledge and competencies at different levels of proficiency in a given field. This has several implications, which we now explore.

First of all, putting the learner centre-stage means that the learner is responsible for his/her own learning processes and not a teacher or an institute (see also Shuell, 1992; Longworth, 2003). Lifelong learners are self-directed (Brockett & Hiemstra, 1991; Candy, 1991), and can perform different learning activities in different contexts at the same time. For instance, on the same day a person can have a job-related training course at work, learn a new language in the evening from a teacher in the neighbourhood, read texts and search the Internet for information. For learners to be self-directed, they must be in a position to oversee what is available and determine how this matches their needs, preferences, prior-knowledge and current situation. One of the basic requirements is to be able to search for adequate learning facilities and to plan adequate learning paths to these and other facilities.

Second, learners are typically engaged in a variety of formal and informal learning activities during their lifetime. This implies that the provision of lifelong learning facilities cannot be a task for a single institute, but has to be seen as the collection of learning facilities that are provided worldwide by different providers in a specific field and over

time. Lifelong learners need a single point of *mobile access* to the distributed information about the offerings and, to avoid overload, learners should be *supported* in selecting the most suitable solution given their needs, prior-knowledge and current situation. Ideally, information about learning facilities should be amenable to automatic processing, thereby facilitating Learning Brokerages (Hämäläinen, Whinston & Vishik, 1996; Whelan, 1998) able to intermediate between learners and learning providers to identify the most appropriate steps to be taken at any point in a learning lifetime.

Third, the participants in an LN in any given field have different levels of competence, varying from novices to top-experts, from practitioners to researchers and developers. Traditionally the heterogeneity of students has been reduced as far as possible by providing clear entry requirements and using cohorts of groups that are considered homogeneous. In lifelong learning, the door is opened to exploiting the heterogeneity of learners by setting up learning communities in which novices collaborate with more experienced people. Such an approach is described by Lave and Wenger (1991), where novices are positioned in a more peripheral role and experts in a more central role when solving a problem jointly.

Fourth, it is necessary to maintain a record of an individual's growth in competency in a persistent and standard way to ensure that learners can search for new learning facilities that fit and extends their current knowledge. One approach currently receiving much interest is the definition and use of portable ePortfolios. These portfolios are owned by the learners themselves and are used and updated over a life-time, across informal and formal education and training (Mason, 2004; Treuer & Jenson, 2003).

To meet these requirements, educational institutions and other learning providers must offer flexible lifelong learning facilities that meet the needs of learners at various levels of competence throughout their lives. People must be able to use lifelong learning facilities to upgrade their knowledge, skills and competence in a discipline as required. They can also contribute to the facilities by sharing knowledge and supporting other learners. We call these network facilities for lifelong learners LNs (see Koper et al, in press; Koper & Sloep, 2003). These networks support seamless, ubiquitous access to learning facilities at work, at home and in schools and universities. Learning resources from providers such as schools, companies, libraries and the learners themselves can be made available from a single point of access and learners can be helped in performing tasks more efficiently through support from software agents (Jennings & Wooldridge, 1996). The use of ICT networks implies the development of new ways of organising learning facilities that go beyond course and programme-centric models and envision a learner-centred, learner-controlled model of distributed lifelong learning.

Representation of a learning network

We can represent the formal structure of an LN (Figure 1) as a graph in disciplinary domain D, with ANs as its nodes {a1,…,ai}. The nodes of the graph represent the available learning events, called Activity Nodes (ANs). An AN can be anything that is available to support learning, such as a course, a workshop, a conference, a lesson, an internet learning resource, etc. Providers and learners can create new ANs, can adapt

existing ANs or can delete ANs. In a Learning Network, ANs are described with their metadata (title, objective, etc.) together with a link or reference to the actual AN.

An LN typically represents a large and ever-changing set of ANs that provide learning opportunities for lifelong learners ('actors') from different providers, at different levels of expertise within the specific disciplinary domain.

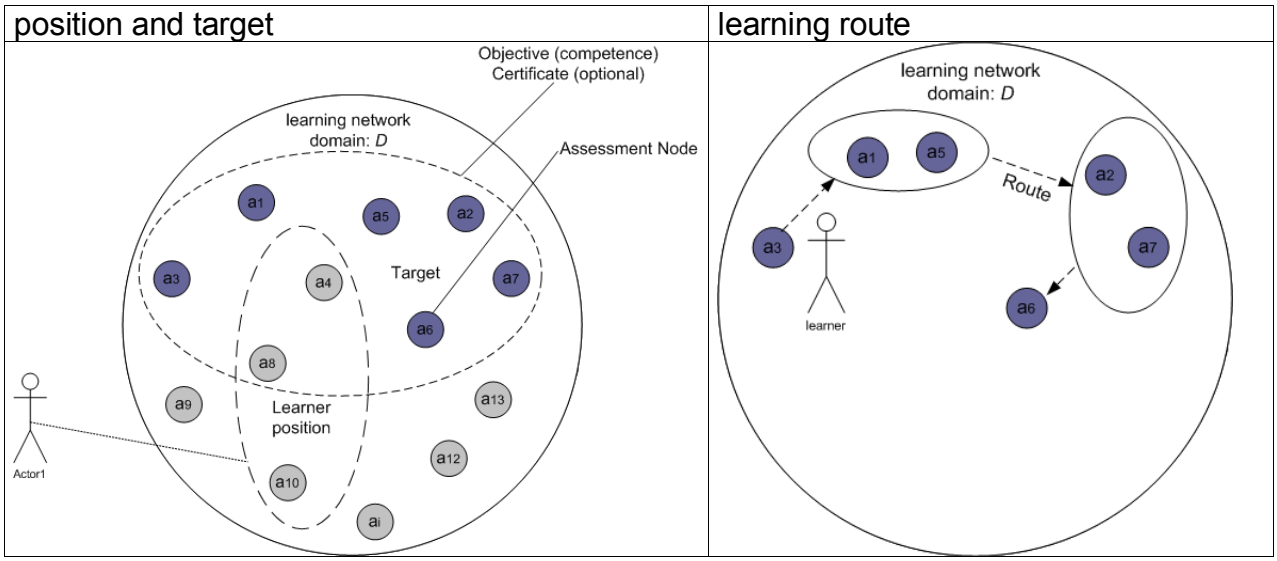

Figure 1: Learning network in domain D with activity nodes {a1,…,a13}

When using the LN, actors travel from AN to AN. The path of ANs completed sequentially over time by an individual actor is called a learning track. A track represents the actual behaviour of actors. Paths through a Learning Network that are planned beforehand are called routes (see Figure 1). In traditional education, teachers or instructional designers are responsible for this route planning (e.g. curriculum planning). In lifelong learning, a different approach may be followed. Learning tracks can be shared between the participants in an LN. This can be a single track or an analysis of the aggregated,

collective tracks from a set of participants to determine the most successful routes. This data is expected to help actors 'navigate' in the LN.

Another concept in an LN is the learner's position in the LN (in Figure 1, the set {a4, a8, a10}). This is defined as the set of ANs marked as completed in the LN, based on the actors portfolio. This does not necessarily mean that the actor completed the concrete ANs, but covers situations in which the objectives associated with the ANs are already met by the actor (e.g. as a result of exemptions arising from previous study or work experience).

A target is any set of ANs that is sufficient to reach a particular level of competence or expertise in the domain (in Figure 1 the set {a1, …, a8}). These targets and connected competency levels may be self-defined (e.g. step-by-step) or are predefined in the network. When creating an LN conforming to a predefined competency framework (e.g. European Language Levels/CEFRL, 2001), it is a requirement that every AN indicates its prerequisites and learning objectives in terms of the framework.

A target can be associated with one or more formal assessments to certify knowledge or a competency. This can either involve an additional, specific kind of AN, or can be integrated into one or more ANs. The difference between the set of target nodes and the set of position nodes defines the set of ANs that a learner has to perform to reach the target. Figure 1 shows this to-do list as the set {a1, a2, a3, a5, a6, a7}. Given this list, a sequence of learning steps can be established, by deciding on the order in which the ANs are taken (e.g., first a3, then a1 and a5 simultaneously, then a2 and a7 simultaneously, and finally a6; see Figure 1). This decision can be based on the tracks of other successful

and comparable learners in the LN. A learner can also follow a more exploratory route or can change routes on demand. Ultimately this will also create a track that can be shared.

First implementations

Several pilot implementations have been created and experimented with. The results of some are published in journals (e.g. Koper et al., 2005, Hummel et al., 2005). The first implementation was an implementation in the peer-to-peer system Groove (Groove, 2005) . The platform was arranged as a learning network and used for the (experimental) professional training of e-learning experts. The results are reported in Koper et al. (in press). The second implementation has been done for the project Learning Networks for Learning Design (LN4LD), that aimed at setting-up a learning network for professionals interested in e-learning standards, more specifically the IMS Learning Design Specification (LD, 2003; an open standard to represent units of learning in an interoperable and machine interpretable way). This implementation has been reported in Koper & Tattersall (2004). At the moment we run a third implementation for the EU UNFOLD project (2005) that is a slightly changed version of the second one (the portal has been replaced by a joint UNFOLD portal).

The central question of all pilot implementations is twofold. First, to ensure that the architecture is implementable and second, to examine whether the resulting LN meets its functional requirements. The first question can be answered positively - we were able to set up an infrastructure (the last ones completely based on Open Source components). It

is too early to evaluate the results of the second aim. This will be done in future publications.

Developing a learning network: from distributed learning to distributed education

The situation we are in nowadays is still a traditional one: lifelong learning is provided by educational institutes, mainly in the open and distance learning context. Besides, within the ODL context, the focus is still on providing a standard curriculum, e.g. a masterprogramme, an almost completely prescribed sequence of courses to be taken, supply oriented, with limited flexibility in terms of alternative learning routes and hardly taking into account past performances of learners. Therefore, an interesting question is how to migrate from this traditional approach to a more network-based way of lifelong learning. In this section we would like to sketch a route that could be followed by Open and Distance Learning (ODL) institutes to arrive at lifelong learning in a network. The example will be the MSc-programme that is coconstructed by the Centre for Research on Computer-Supported Learning and Cognition in the School of Development and Learning of Sydney University, the Department of Instructional Systems and the Learning Systems Institute of Florida State University and the Educational Technology Expertise Centre of the OUNL. This could become a learning network in the field of educational sciences, but is yet far from that. We will take the perspective of the OUNL, the originator of the programme.

The MSc-programme ‘Active learning’ is very recently developed at the OUNL, based on an integrated e-learning approach (Jochems, Koper & Van Merriënboer, 2004). Students who enter this programme are lifelong learners; their ages range from 25 to 60, they all have a job in education (teacher or trainer, educational advisor or counsellor, educational policymaker or developer, etc.), they are part-time students with a limited amount of time available for their study because of a job and family, they are not so much interested in educational theories, but want to focus on competencies that are useful for their job, they are very familiar with educational practice and a lot of educational problems and want to become better equipped in tackling those problems. Developing such a programme is rather time-consuming and expensive. In order to reduce costs and time-to-market we looked for partners who would like to cooperate by sharing and exchanging instructional materials or by codeveloping courses, taking into account the specific expertises of the institutes involved. In this way Sydney University and Florida State University became interested. Although this initiative was mainly taken for practical reasons, very soon the idea of a learning network was introduced as a long term perspective.

The first step towards a learning network in our approach is exchanging materials and students: in essence making resources (learning activities) available for students of the three institutes involved leading to some kind of a joint community, but in the traditional sense of education. The network can be enlarged by adding learning activities, developed by one of the participating partners, but could also grow by allowing new partners to join and to add their learning resources and students. A new partner of course should have added value in one respect or another, e.g. high quality, resources in another field of expertise, etc. This situation is still one of distributed learning within

'traditional' ODL, because each of the institutes involved is still responsible for the programme, a more or less prescribed sequence of courses offered with specified test and assessment procedures.

The next step is a joint set of learning resources, to be used by students who enter via one of the participating institutes. In this situation students are allowed to take - within certain restrictions – the learning resources they like in order to arrive at a degree. This is traditional because it is still the institute that is organizing education and that is setting all kinds of constraints. It is more or less the situation of a joint degree having advantages like a better offer to the students (richer choice, higher quality, lower price), but it is still not networked learning.

The third step is to create a real learning network for lifelong learners in the sense of a vast collection of learning opportunities that allows learners to travel the route they prefer. This is the model of the lifelong learner, who takes a specific learning activity depending on the needs perceived and than might consider to take another learning activity. The costs depend on the services the learner wants which might include personal coaching, assessment, navigation and routing support, etc. In line with the description of a learning network provided earlier, this network should have four characteristics.

- It is not a programme, but a vast collection of learning resources (formal and informal). For this reason it seems unlikely that networked learning will play an important role in traditional, face-to-face higher education, because this is still focusing on programmes. Open and distance learning seems to provide a better starting point.

- It is self-directed which means that the learner is responsible for the learning and not the institute. But the learner might need support, assistance, guidance, etc. which could be provided by higher education institutes. So it is up to the student to decide how to learn and to decide what kind of assistance (s)he needs.
- Learners are learning in rather rapidly changing communities that also can vary with respect to expertise. Moving from one learning activity to another one in a network means participating in a new learning communities which is the opposite of classroom-based learning.
- Finally, the learner should keep a record of his learning results and not the institute.

A vast collection of learning resources can also be used in the traditional manner in terms of a programme. The advantage is that institutes by sharing resources can reduce their costs and at the same time offer a richer choice to their students. Lifelong learning in a network however asks for a rather radical switch, because a combination seems not possible.

Conclusion and discussion

We have presented a framework for the design of a distributed network to support future lifelong learning based on self-organization principles and technologies such as LD, agents and ICT networks. In order to explore how to implement the requirements, we created a simulation programme, built pilot implementations and used these in practice.

The study of LNs is still in its exploratory phase. A great deal of future research and development work remains to been done to refine the framework, improve the implementation and evaluate the effectiveness and usability of the facilities in practice. We will perform further work in feedback for navigation, learner positioning, calculation of learning routes based on positions and targets, suitable reward systems and the use of software agents.

We have speculated on the way we might arrive at a real learning network, starting form a traditional higher education position. An open issue however is whether we are able to create effective learning opportunities in a distributed setting. Research at our institute has shown that learning in distributed communities might be problematic from a number of perspectives. From a social point of view a distributed learning environment might be rather poor, indicating that creating a sound social climate as a basis for effective collaboration is difficult and asks for additional measures (Kreijns, Kirschner & Jochems, 2003). We also found out that coordination of group work is much more difficult in a distributed setting as compared to face-to-face collaboration. Although measures can be taken by introducing functional roles (Strijbos et al., 2004*)* and by providing reflection cues stimulating learners to reflect on their working processes and collaboration (Dewiyanti, Brand-Gruwel & Jochems, in press), the effect of these measures on group performance is modest. Therefore, not only coaching and guidance seem important for succesful learning in an network, but also adequate support for effective collaboration in distributed communities.

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