Life-long learning in virtual learning organisations:
Designing virtual learning environments

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Abstract: Life-long learning is an instrument for knowledge workers to stay up-to-date in an innovative economy. So far higher education has not been very successful in realising life-long learning. A possibly helpful educational concept is the 'virtual learning organisation'. The newly founded Dutch Digital University, for example, has taken this concept on board. The virtual learning organisation, however, is a 'container' concept. Key questions are: what constitutes a virtual learning organisation and how can it be constructed in different domains? In this paper the virtual learning organisation is seen as an extension of the normal work situation of the knowledge worker. A model is presented for knowledge work and career development in such innovative organisations that have been used in practice to construct a successful virtual learning organisation.

Key words: knowledge worker, life-long learning, learning environment, higher education, virtual organisation, information and communication technology (ICT)

1. INTRODUCTION

Life-long learning (LLL) or 'Education Permanente' has been on the (political) agenda for some time. A recent publication (2001) of the Organisation for Economic Development in Europe (OECD) may serve as an example of this. This publication starts with the following quote: "Lifelong learning will be essential for everyone as we move into the 21e century and has to be made accessible to all", the conclusion of an OECD meeting of Ministers of Education in 1996.

Why is life-long learning so much the focus of attention? In developed countries the demand for educated personnel is increasing because of a more

knowledge-intensive economy. Supply is not in balance with demand. In the Netherlands, for example, in 2003 a shortage of 200,000 higher educated workers is expected (SER, 1999) developing into an expected shortage of 400,000 in 2007. Life-long learning promises a reduction of this shortage, helping people to re-enter the labour market or to change jobs. But life-long learning also plays a role in the transition from initial education to working life: "A spreading of education over a wider period of working life is ... becoming a reality. In some countries we can see this emerging quite clearly ..." (OECD, 2000).

2.   KNOWLEDGE WORK

Knowledge workers are found in innovative businesses and organisations. Work in these places is organised in non-traditional ways and professionals work in a different way. Organisational structures suited for efficient, standard, large-scale throughput (old economy) change to structures facilitating flexible, custom-tailored, small-scale, high quality production or servicing (new economy) (van Weert, 1993). These new structures aim to satisfy a personal, demand-driven market and are reflected in organisational concepts such as 'Just-In-Time'. They are geared towards teamwork, flexibility and quality. Information and communication technology (ICT) is omnipresent and empowers the individual to act as expert in many areas. It also offers flexibility in time and place in support of teamwork. Work is result oriented and the professionals are accountable for results: team and organisation form a meritocracy. To keep up with demands and competition these innovative businesses create new knowledge in their domain. A knowledge worker therefore is also a knowledge creator.

But also other "competencies" play a role: such as working in a multi-disciplinary team and multi-disciplinary problem-solving. Knowledge workers develop a knowledge career, whatever discipline they are specialised in, moving from executive to strategic roles.

3.   VIRTUAL LEARNING ORGANISATIONS

Life-long learning is not – as some surmise - going to an educational institution your working life long. In life-long learning working and learning come together. Virtual learning organisations can be environments for this, providing an extension of the work environment.

There are several typologies of virtual organisations available. In 'Organisations going virtual' (Metselaar and van Dael, 1999) the following typology, developed by Campbell (1997), is presented:
a) Internal virtual organisation;
b) Virtual organisation;
c) Dynamic virtual organisation;
d) Web enterprise or agile organisation.

This last type of ICT-supported organisation (d) is a temporary network of experts working in a specific field or on a specific topic. ".. a spatially dispersed and temporarily flexible cultural community, the reproduction of which is dependent upon learning and innovation of its constituents" (McLouhglin and Jackson, 1997). Knowledge management and the sharing of information among partners are essential elements for an agile organisation (Metselaar and van Dael, 1999). Applications of ICT in virtual organisations are: local and wide area networks, electronic data interchange, the internet, intranets, workflow management systems, knowledge-based technology, and other applications of artificial intelligence, such as intelligent agents (McLoughlin and Jackson, 1997).

3.1 Authenticity

Let us assume that the virtual learning organisation is a didactic concept to be realised in an institution of higher education. Authenticity will in that case be an issue. The ideal starting point for a virtual learning organisation is a factual ICT-rich business or organisational setting that allows professional competencies to be developed in actual business or organisational contexts. If, for one reason or another, artificial elements are introduced, the learning situation develops into the direction of simulation and/or gaming, and critical authenticity may be lost. For example, in educational institutions there is a natural tendency to put control in the hands of the teacher. However, in a virtual learning organisation a student should be a knowledge worker controlling his own work and results are reviewed against quality criteria, as is common in real life. Such an approach leaves the student more room for role identification and role differentiation, typical of knowledge workers.

3.2 Examples of virtual learning organisations

The recent initiative of the Dutch Digital University aims to implement virtual learning organisations in various domains. This ICT-supported university is an initiative of 10 Dutch institutions of higher education (traditional universities and universities for professional development). The Dutch Minister of Education supports the initiative. One of the aims of this

initiative is to facilitate and support a transformation of higher education from supply-driven to demand-driven education. In this new education students actively learn, with interest and motivation, taking responsibility for their own learning. The Dutch Digital University has started several projects to facilitate this (Dutch Digital University, 2000) one of which is a project on virtual companies and virtual project spaces. This project builds on the experience developed in earlier examples of virtual learning organisations in the Netherlands, such as 'GiPHouse' (see van Weert, 1995) and 'OTO' (see Crutzen, at www.ou.nl/open/otonet).

4.   THE LEARNING ORGANISATION: WORKING AND LEARNING COME TOGETHER

To be able to build authentic virtual learning organisations a model is needed of how a knowledge worker functions in practice in an innovative organisation. The model presented in this paper is a further development of the model that was used to create GiPHouse as an innovative software house (van Weert and Jongepier, 1995). Knowledge is defined as a dynamic concept: knowledge is only knowledge when it can be applied. It is the application of a mix of:
– Know what or know about (information);
– Know how (skills);
– Know why (insight).

4.1   Knowledge work includes learning

In innovative organisations knowledge work shows the following characteristics:
a) Internal knowledge resources are exploited and combined by working in teams;
b) Internal knowledge is complemented with outside resources, such as information or expert advice;
c) Established methods (in the domain) are used to get results;
d) Knowledge work produces both products or services and new knowledge (learning).
To be able to keep up with innovation and competition both the organisation and the knowledge worker need to:
a) Actively ensure quality, both of the working process and the results;
b) Develop knowledge at an individual level (competence development = learning);

c) Develop knowledge at a team and organisational level (= team learning and learning organisation).

5. MODELLING KNOWLEDGE WORK

5.1 Knowledge workers use knowledge resources

The quickest way to create new knowledge is to share knowledge and participate in a (multi-disciplinary) team. But one can also build 'on the shoulders of others' and use information or expert knowledge that is available elsewhere.

5.2 Knowledge workers use methods to get results

Knowledge workers deal with new problems that need new knowledge to solve. To be able to do so, a method can be followed that has proven to be useful. Common characteristics of such methods are that:
1. The problem is analysed and the desired result specified;
2. Activities are planned that lead to the result;
3. The plan is put into motion and results are produced.
In many areas professional methods are available to guide the knowledge worker in innovative work. The typical example in a software house is the case where a large information system has to be developed for an organisation. Various development methods, for example, based on prototyping or object orientation, are available to guide knowledge workers.
Knowledge workers produce two types of results:
New knowledge about problems and how to deal with these problems, at individual, team and organisational level;
1. Products or services.
In the case of a software house, for example, knowledge is built up about the effective use of specific development methods (new knowledge) while information systems are produced (product).

5.3 Knowledge workers gain insight by accounting for their actions and results

Knowledge workers do innovative work. It therefore is not easy to see whether their work and their results have quality. The only way to ensure quality is to let the professionals themselves convincingly show that quality: they are the ones who should know their business. In practice professionals

make quality tangible by reviewing work and results against criteria or standards. The trick in innovative work is to use criteria that are more or less generic in nature and can be applied in many cases. Reviewing is the answering of 'Why' questions:

– Why is this a 'rewarding' problem, both for customer and organisation?
– Why is the plan to tackle the problem a 'good plan': why will it work and why will it produce the desired results?
– Why are the results produced by this process of the 'right quality'?
– Why is the new knowledge 'of value'?
– Why is the process of production and development efficient and effective (or does it need interventions to do better)?

In the case of a software house, standards will be available that can be used in answering the above questions. Software developers often get pre-work training to get used to the prevailing standards in their organisation.

Reviews against criteria or standards lead to review interventions that aim to better the process and the results. From a knowledge point of view there is an interesting "by-product" of the reviewing process: development of insight by the knowledge workers. This insight, on an individual level and a team level, allows for better application of information and skills.

5.4   The basic model of knowledge work

The ingredients identified in Sections 5.1, 5.2 and 5.3 melted together describe the basic process of knowledge work which can be presented in tabular form (Table 1). A team of professionals (knowledge workers) is in a process that moves from problem via plan to result (product or service) and knowledge. The review process that the team engages in produces interventions and insight (i.e. a specific component of knowledge). To be able to review, the team uses reviewing standards.

Team of professionals	From problem to results	Knowledge development	*Reviewing standards*
	Problem		*Problem standards*
	Plan		*Method*
	Result		*Result standards*
Process			*Process standards*
		Knowledge	*Information standards*
Review			*Review standards*
		Insight	*Competence standards*
	Interventions		*Intervention standards*

Table 1. Knowledge work: reviewing against standards

5.5 Knowledge at the organisational level

Knowledge workers produce knowledge at different levels:
– Individual level;
– Team level.

But the whole process can be repeated in a recursive way across all the teams in the business or organisation. Here knowledge is produced at:
– Business or organisational level.

Knowledge at the organisational level results in meta-criteria or meta-standards that apply to all projects undertaken by the organisation. These meta-criteria or meta-standards form the basis for the assessment of the results of knowledge workers by the management.

6. THE CAREER OF A KNOWLEDGE WORKER

The career of a knowledge worker typically develops as follows:
1. Reproductive work (starting position);
2. Executive work, executing tasks;
3. Tactical work, solving problems;
4. Strategic work, dealing with (problem) situations.

7. CONSTRUCTION OF A VIRTUAL LEARNING ORGANISATION

Virtual learning organisations can be realised in any domain where innovative ICT-rich organisations or businesses are at work. They can be constructed around projects and with work structures reflecting organisations in practice. The virtual learning organisation is defined by its meta-standards with respect to problem, method, result, process, information, review, competence and interventions (Section 5.5). Students develop a career in this learning organisation (Section 6). In their work they follow the basic model of knowledge work (Section 5.4) in which reviews control the quality of the resulting products or services, of the competence (individual level) and knowledge development (team and organisational level).

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BIOGRAPHY

Tom J. van Weert since September 1998 has been the managing director of Cetis, the Expert Centre for Innovation and Educational Technology of the Hogeschool van Utrecht, University of Professional Education and Applied Science, The Netherlands. Before that time he was director of the School of Informatics (Computer Science) of the Faculty of Mathematics and Informatics of the University of Nijmegen, The Netherlands. He has been active on IFIP Working Groups on Secondary Education and Higher Education, and is a member of IFIP Technical Committee 3.