Integrating personal learning and working environments

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Preface

This review paper part of a series of papers commissioned by the Institute for Employment Research at the University of Warwick under the title of 'Beyond Current Horizons – Working and Employment Challenge'. In turn, in forms part of a larger programme of work under the banner of Beyond Current Horizons that is being managed by FutureLab on behalf of the UK Department for Schools, Children and Families. The brief was to cover:

- The main trends and issues in the area concerned;

- Any possible discontinuities looking forward to 2025 and beyond;

- Uncertainties and any big tensions;

- Conclusions on what the key issues will be in the future and initial reflections on any general implications for education.

Given the wide ranging nature of the brief, this paper largely confines itself to trends and issues in the UK, although where appropriate examples from other countries in Europe are introduced.

We realise that in an age of growing globalisation the future of work and learning in the UK cannot be separated from developments elsewhere and that developments in other parts of the world may present a different momentum and trajectory from that in the UK. Thus, when reading this report, please bear in mind the limitations in our approach.

1. Introduction - Back to the Future

If we are to understand the possible future of personal learning and working environments, we need to examine not only present trends but also the past development of learning and work. In other words, we need to try to understand why we got to where we are today and what have been the main drivers of the development of out present learning and working environments. This introductory section explores some of the main factors behind the emergence of our present learning and working environments

The rise of the schooling system

Education and work environments were not traditionally separated. Prior to the industrial revolution in the UK in the mid 19th century and the subsequent introduction of mass education, for all but a small elite the community and work were the main localities of learning. Children tended to follow their parents occupation, with on-the job learning to acquire occupational competence.

At the same time, in the handicrafts and in a number of other trades, the apprenticeship system, based on the medieval guilds, prevailed, with apprentices following a three or four year period of indenture, before being able to practice as skilled workers.

Although learning and working environments were not separated, it can be argued that at least in the early phase of the industrial revolution the level of skills required was limited. Manufacturing depended on the availability of a mass labour force to fuel the factories which resulted in rapid urbanisation. But at the same time there was a growing need for a higher level of education within the workforce (Goody, 1977).

The introduction of compulsory schooling was based on a centrally defined curriculum designed to provide students the skills and knowledge required for employment in an industrial society. The organization (and often the appearance) was based on that of the factory, with monitors, set work periods, a stream of bells to signal the beginning and end of lessons etc. (Woodbury, 1991).

In the UK, as in other advanced capitalist countries, there has been an ongoing trend towards raising the school leaving age to deal with perceived needs for higher levels of skills and knowledge within the economy. Despite various programmes to provide more vocational education within the schooling system and the introduction of short period of work experience, the world of education through schooling and the world of work have remained largely separate.

One major hypothesis to be explored in this paper is the idea that the 'industrial model' of schooling is becoming dysfunctional and that personal learning and working environments may converge in the coming decade.

Academic knowledge and vocational skills

It is interesting to note that the divide between learning and working experienced in the rise of schooling systems after the industrial revolution, is also reflected in the earlier post-Renaissance division between academic knowledge (brain work) and vocational skill (hand work) (Rauner, 1998). The the use of new technologies may render such distinctions redundant. Indeed, the disciplinary knowledge structure which also evolved from the Renaissance looks increasingly under threat today.

Taylorism and the organization of work

Of course it is not only education structures and institutions which can be traced back to the 19th century industrial revolution but also forms of work organization. The first industrial revolution was characterized by the development of the factory system of manufacturing, with mass production and a Tayloristic division of labour. In the late 20th Century, companies began to adopt new more 'flexible' (both internal and external) types of work organisation reflected in new forms of a workforce management strategies, which became known as 'human resource management' strategies (see Sparrow and Hiltrop, 1994 and Miles and Snow, 1998) in response to a decrease in markets for mass-produced goods and a significant increase in demand for more customised goods and the growing globalisation of world trade, According to Nyhan (2001) "These theories of 'human resource management' entailed the abandonment of centralized bureaucratic work production strategies (although excluding centralised financial control) according to which everyone had a clearly designed function, suited to an age of sustained mass-production, and the implementation of a new organic workforce model which devolved wider responsibilities (both vertically and horizontally) to employees." This entailed putting a heavy emphasis on 'human resource development' practices such as team building, multi-skilling, work-based learning in order to promote greater degrees of functional flexibility. (OECD, 1999).

Although the term 'Post-Taylorism' appeared in management literature, it has been argued that the interest by the management and academic community in these concepts is perhaps more due to their attractive presentation by management gurus rather than solid research evidence (OECD, 1999)

Economic Ideology

At the time of writing, newspapers and other news services are transfixed by the collapse of the world banking system and the slide into global economic recession. The events around the banking collapse have probably signalled the end of the dominant neo-liberal economic ideology of the second half of the 20th century. Neo-liberalism essentially preached the primacy of markets as a mechanism of fostering economic growth and competition and providing employment. Government

intervention should only occur in cases of market failure. The degree to which different countries adopted neo-liberal policies varied. It is notable that in those countries most amenable to free-market liberalism – the USA and the UK – there was a rapid growth in differences in wealth and an increase in working hours.

With the banking crisis and movements towards recession there has been a rapid return to Keynsian economic policies and a seemingly re-found public appetite for regulation if not nationalization of key services and industries.

Such changes are important for this paper in a number of respects. Firstly the likelihood of a creeping privatization of education would appear to be unlikely in the foreseeable future. Secondly it is more likely that governments could be persuaded to intervene and to regulate both in economic development and in the organization of work.

Globalisation

Whilst the mantra of globalisation has been invoked by governments and employers to justify all manner of changes in learning and in working ranging from cuts in pay and employment to the adoption of a common structure for higher level qualifications across Europe, this does not mean that globalization itself is not a very real phenomenon and one which will have an important role in shaping the future of personal learning and working environments. Globalisation refers to the global movements of capital and the associated free movement of manufacturing and services – and hence employment – between different countries and continents. Whilst of course there has been movement of goods and services between countries since the first industrial revolution and trading between countries prior to that – today's economies are increasingly interlocked and interdependent as the present day banking crisis has shown.

A new Industrial Revolution

Unlike a recession, there is no official measure nor indeed definition of what constitutes an industrial revolution. Instead it is a descriptive term used by historians and associated with various phases of economic, technical and social change. I have previously argued that the present period of economic and social development in society should be viewed as a period of industrial revolution (and I have little doubt that it will be by future historians) (Attwell, forthcoming). The industrial revolution is based on the rapid development and deployment of digital technologies, resulting in profound changes in how we learn, how we work and how we live. Whole industries are being created and destroyed; occupations become redundant whilst new occupations are born. The ensuing changes to patterns of employment and of skills demand are leading to large scale population movements.

It is very hard to predict future technology development. So rapid is present development, that the seemingly fantastical may become a reality in only a few years. I am sitting writing this at Schipol airport, whilst returning home from a European project meeting in Barcelona. It may well be that in a few years there will be no need for me to physically attend such a meeting, but that instead my avatar will attend to meet with the other avatars of project partners. This paper will focus closely on potential technologies of the future and their possible impact on personal learning and working environments.

Gestalltung (social shaping)

Whilst it may be hard to predict the path of technology emergence, we believe that the implementation and use of technology can be shaped by human agency and that process of what German sociologists call 'Gestalltung' or social shaping and the choices in how we choose to use technologies are central to the future of personal learning and working environments.

Of course it is not only technology itself which will shape and in turn be shaped in the future development of personal learning and working environments but also the different economic ideologies and our understanding of the role of institutions in developing knowledge. In this introduction we have tried to look at some of the main influences which have shaped the present configuration of such environments, in the next section we will look at some of the main trends and issues in future development.

2. Work: Integrating personal learning and working environments - main trends and issues

Evidence from a number of European projects would suggest that learning is increasingly being integrated in the work process. However, research in this area can only provide a partial picture of trends.

Within initial vocational education and training in the UK, the move towards competence based qualifications has placed an increased focus on the assessment of authentic work tasks. There is also a trend towards increasing the number of apprenticeship places. In Germany, there have been moves towards integrating the company part of the Dual System of apprenticeship and move training out of training workshops and into the workplace (Grollman and Wittig). This is both because it is seen as a more effective means of learning and also because it may reduce the cost of apprenticeships through allowing apprentices to undertake more productive work.

Lifelong learning

The European Union and national governments have promoted the idea of lifelong learning. Continuing learning is seen as necessary to update skills and knowledge and increase productivity. In some countries, like the UK, this has been linked to a discourse of employability: that individuals are themselves responsible for ensuring they have the competences required for employment by industry. Whilst continuing education and training was traditionally focused on course, seminar and workshop based programmes, there is some evidence to suggest more learning is now located within the workplace.

In some organizations this is formalised, especially at a team level. In a Romanian cement factory the team leader is responsible for training the team staff and there are regular formal learning sessions in the workplace with individual assessment of workers (Balica, 2007). Other enterprises have established open learning areas to encourage workers to undertake further training and learning (Scottish Office). Some employers have subsidized employee participation in external courses, regardless of subject, in the belief that participation in learning will help in professional development. Many employers have established staff appraisal programmes with regular reviews of personal learning objectives.

It is difficult to assess how wide ranging such initiatives are. A survey of over 100 small and medium enterprises in six European countries found few examples of participation in formal learning – either in or out of the workplace (Attwell, 2007). It may be that sector and occupation are particularly important. For computer programmers continuous updating of knowledge is seen as a requirement. But in low skilled jobs and in workplaces little affected by changing technology, there may be little incentive for learning, either on the part of the worker or the employer. Research also suggests that employers may be reluctant to provide learning opportunities for fear that employees will leave if they achieve higher competences and qualifications and the cost of training is frequently raised as a barrier to the provision of learning opportunities (Attwell, 2003).

Informal learning

One marked trend is towards greater awareness of the potential of informal learning in the workplace and of learning through reflection on practice. This is reflected in a number of different

ways. There have been various initiatives to promote accreditation of prior learning although such programmes have met with limited success. However reflection on learning has been incorporated into team meetings and in some – mostly professional occupations such as medicine and teaching – is becoming part of a formal employment requirement. There is also a growing trend towards introducing e-Portfolios as a means of documenting and reflecting on continuing learning – both formal and informal within the workplace (Buchberger, Hilzensauer and Hornung-Prähauser, 2008).

Changing technologies are likely to have a large impact in this area. Firstly, microprocessors are increasingly embedded within machines and tools within the workplace. Such microprocessors can not only provide access to sophisticated documentary information, but will also presumably be context aware and able to provide just in time learning related to work tasks and processes. Secondly mobile devices, including advanced mobile phones, and cheap sub laptop computers provide access to ubiquitous internet based communication. Google is already probably the worlds number one source of information and learning. In many jobs, the answer to overcoming a problem is to search Google and often there are videos freely available on Your Tube providing detailed instructions on how to carry out a particular task.

Communities of Practice and Learning Organisations

If one trend is increasing learning within the workplace and through the work process, another is recourse to informal learning through dispersed communities of practice.

The European study of elearning in SMEs found extensive use of computers in day-to-day business operations and evidence of the extensive use of ICT for informal learning (Attwell, 2007). Most informal learning appeared be learner driven, rather than planned in conjunction with others in the enterprise, and was problem motivated, although some learners were motivated by their own interest rather than in response to any specific problem. In many cases ICT was being used as part of this informal learning. The main means of ICT based learning was Google key word searches. Managers were often unaware of this learning, although they were frequently aware of the problem which inspired it (ibid).

There were considerable differences in the use of ICT for informal learning between different enterprises. It would be tempting to ascribe these differences to age, sector, size or occupation but it is hard to discern such causal factors from the case studies undertaken.

The major causal relationship which appeared was the link between work organisation and the use of ICT for learning. ICT was most frequently used for learning in those enterprises with flatter hierarchies and more devolved decision talking responsibilities and in which employees had greater autonomy in the organisation of their own work. Interestingly, these enterprises also tended to have a more experienced workforce and low turnover of employees (ibid).

Conversely, hierarchical work organisations tended to have the least use of ICT for learning. In some cases only managers and administrative staff in these enterprises had access to computers and the internet. There was no evidence of any organised support or informal learning – either face to face in the workplace or on-line. However, in some enterprises the learning acquired was discussed with peers as part of everyday collaboration and team work.

Although it could be said that much activity was information seeking the study suggested that activities were:

• Purposeful

• Heavily influenced by context

• Often resulted in changes in behaviour

• Were sequenced in terms of developing a personal knowledge base

• Problem driven or driven by personal interest

• Social – in that they often involved recourse to shared community knowledge bases through the internet and / or shared with others in the workplace.

• Increasing access to internet based technologies are likely to increase such informal learning.

There are important implications of such findings. The study showed learning was more likely to take place in organisations with less hierarchical structures and where workers had more responsibility for their own work. This links to work undertaken by researchers looking at learning organisations. Barry Nyhan (Nyhan et al, 2003) states "one of the keys to promoting learning organisations is to organise work in such a way that it is promotes human development. In other words it is about building workplace environments in which people are motivated to think for themselves so that through their everyday work experiences, they develop new competences and gain new understanding and insights. Thus, people are learning from their work - they are learning as they work."

He goes on to say: "This entails building organisations in which people have what can be termed 'developmental work tasks'. These are challenging tasks that 'compel' people to stretch their potential and muster up new resources to manage demanding situations. In carrying out 'developmental work tasks' people are 'developing themselves' and are thus engaged in what can be termed 'developmental learning'."

In other words integrating personal learning and working will require both the conscious design of the working environment for learning and the design of developmental tasks. Research tends to suggest this is more likely to take place in organisations with a strong project culture.

Occupational profiles

Whilst occupational profiles have previously tended to be designed form a viewpoint of occupational tasks, it may be that learning potential will be an important future focus. A number of projects in Germany have redesigned broader occupational profiles with both the potential for enhanced work based learning but also increased flexibility to move beyond existing occupational competences to increase productivity and deal with future technology innovation (Rauner, 2007). However there are counter trends towards increased high levels specialism in particular occupations

The role of trainers

There are also profound implications for the role and training of trainers. Whilst ten years ago trainers were a clearly delineated and identifiable occupational group, the European Commission funded TT-Plus project has found that the training function has spread to include many who would not describe themselves as trainers (Attwell, Grollman and Luebke, 2008). This includes managers, team leaders and skilled workers who may have some responsibility for learning and training as part of their job and also learning consultant and ICT based learning designers who may work in conjunction with enterprises. Traditional programmes for training trainers have focused on full time professional trainers. The TTPlus project is calling for ongoing programmes to provide support for continuing professional development, based on peer group learning and accreditation. It is also interesting to note that whilst vocational teachers and trainers have tended to be regarded as undertaking similar work, the move towards greater integration of learning and working may mean the work of trainers is becoming increasingly differentiated from that of teachers.

In terms of role, with increasing online learning materials and the move towards more work based learning, trainers are spending less time in classroom based didactic instruction and more time in providing guidance and support for individual learners. Such a change is challenging for some trainers, as is the increased use of technology for learning.

Structuring learning

A further important issue is that of the structuring and content of learning experiences. Structure and content has been traditionally externally defined by experts in the form of curricula or teaching programme (Cormier, 2008). With a greater integration of learning and working, the learners are structuring their own learning within a work based environment.

There is a question as to how learners are able to incorporate learning within personal knowledge frameworks or structures. Because learning is motivated by problem solving or personal interest, it is far more closely related to practice than the education acquired through formal courses and is often episodic. The immediate context of applying the learning may be an aid to incorporating and scaffolding new learning within a personal knowledge schema. On the other hand the learning acquired is not sequenced in the same way as learning acquired from formal education and training.

From curricula to personal learning pathways

One way to view such tendencies is a move away from formal curriculum as related to its Latin origins and meaning as a race along a predefined course toward the original meaning of the word learning as a pathway (Attwell and Hughes, 2008).

Thus learning and working become integrated not through a formal course based structure but through the development of individual learning pathways. This change is reflected in recent thinking amongst researchers in e-learning.

Personal Learning Environments

Although socio-cultural theories of knowledge acquisition stress the importance of collaborative learning and 'learning communities' (Hung, D. 2002) but Agostini et al. (2003) complain about the lack of support offered by many virtual learning environments (VLEs) for emerging communities of interest and the need to link with official organisational structures within which individuals are working. Ideally, VLEs should link knowledge assets with people, communities and informal knowledge (Agostini et al, 2003) and support the development of social networks for learning (Fischer, 1995). The idea of a personal learning space is taken further by Razavi and Iverson (2006) who suggest integrating weblogs, ePortfolios, and social networking functionality in this environment both for enhanced e-learning and knowledge management, and for developing communities of practice.

Based on these ideas of collaborative learning and social networks within communities of practice, the notion of PLEs is being put forward as a new approach to the development of e-learning tools (Wilson et al, 2006) that are no longer focused on integrated learning platforms such as VLEs. In contrast, these PLEs are made-up of a collection of loosely coupled tools, including Web 2.0 technologies, used for working, learning, reflection and collaboration with others. PLEs can be seen as the spaces in which people interact and communicate and whose ultimate result is learning and the development of collective know-how. A PLE can use social software for informal learning which is learner driven, problem-based and motivated by interest – not as a process triggered by a single learning provider, but as a continuing activity. The 'Learning in Process' project (Schmidt, 2005) and the APOSDLE project (Lindstaedt, and Mayer, 2006) have attempted to develop embedded, or work-integrated, learning support where learning opportunities (learning objects, documents, checklists and also colleagues) are recommended based on a virtual understanding of

the learner's context.

However, while these development activities acknowledge the importance of collaboration, community engagement and of embedding learning into working and living processes, they have not so far addressed the linkage of individual learning processes and the further development of both individual and collective understanding as the knowledge and learning processes mature (Attwell. Barnes, Bimrose and Brown, 2008). In order to achieve that transition (to what we term a 'community of innovation'), processes of reflection and formative assessment have a critical role to play.

Personal Learning Environments are by definition individual. However it is possible to provide tools and services to support individuals in developing their own environment. In looking at the needs of careers guidance advisors for learning Attwell. Barnes, Bimrose and Brown, (2008) say a PLE should be based on a set of tools to allow personal access to resources from multiple sources, and to support knowledge creation and communication. Based on an initial scoping of knowledge development needs, an initial list of possible functions for a PLE have been suggested, including: access/search for information and knowledge; aggregate and scaffold by combining information and knowledge; manipulate, rearrange and repurpose knowledge artefacts; analyse information to develop knowledge; reflect, question, challenge, seek clarification, form and defend opinions; present ideas, learning and knowledge in different ways and for different purposes; represent the underpinning knowledge structures of different artefacts and support the dynamic re-rendering of such structures; share by supporting individuals in their learning and knowledge; networking by creating a collaborative learning environment.

Whilst PLEs may be represented as technology, including applications and services, more important is the idea of supporting individual and group based learning in multiple contexts and of promoting learner autonomy and control.

Personal Learning Environments offer both the framework and the technologies to integrate personal learning and working.

Digital Mobile devices

The latest technological advancements as well as the progressive reduction in the cost of digital media are having a profound impact on different sectors of society. Even though more and cheaper possibilities of connectivity (the wider access to broadband and wireless) is an important factor, it is the micro technologies and mobile possibilities currently available that are likely to have a major impact on society. It is also influencing the way employers conduct their business and the new demands of employability. As physical mobility is growing more common, so the adoption of mobile connectivity is progressively developing. A new platform for learning is hence taking shape. The recent inclusion of internet connectivity in mobile devices, as well as the wider availability of wifi in public areas is proving to be effective and influential in the way people communicate and spontaneously broadcast themselves in various formats (from pictures, to text or video). A new culture of multilateral sharing and learning is evolving this way. The development of sophisticated handheld and portable communication tools and their direct link to the connected world make us believe this is an emerging approach for learning and working, and for life in general, which will complement other approaches already in place.

Most personal technology and artifacts are mobile, or have been reduced to a size and weight which can be carried. These days, phones can carry more information than any stack of paper or book individuals used to carry in their business cases. The new smart phones not only accommodate digital files, they also enable the creation, storage and reproduction of photos, sound and video files; not to mention their immediate publishing features.

All of this is already having an impact on how individuals are enabled in representing their learning almost as it happens. Most learning is accidental and occurs often unexpectedly. The new mobile devices are providing a rich platform that will help individuals bridge their presence between different learning contexts and thus provide them with the flexibility and the opportunities to focus on their personal learning environment in a meaningful, personalized and immediate way.

The location of work

Thus far we have focused on integrating learning and working within the work process. But there are a number of further trends which should be considered. The first is home working. New technologies allow dispersed collaborative work for many tasks and there would seem little doubt that home based work is increasing as is a mixture of home based work with periodic attendance at the workplace. Environmental concerns and the increasing shortage of oil would seem likely to add pressure for this trend to continue. Certainly video conferencing is already replacing many meetings which would have formerly been conducted face to face.

However, once more, there are caveats. Home based work seems to be largely concentrated on a limited number of professional occupations such as media workers, consultants, researchers, designers etc. In many occupations the nature of the work still requires presence at a particular workplace – for instance in construction and craft work or in manufacturing. But, even here work may become dispersed. Advanced diagnostic interfaces and computer based control systems can allow management of advanced systems and processes at a distance. Such a development is likely to lead to more dispersed communities of practice for learning, rather than learning being acquired through enterprises or physical organisations. There also remains the issue of the social nature of work. Home based work can lead to social isolation. Whether the (geographical) community or the family can substitute for work communities is an issue which could repay more research. It is also interesting to speculate on how dispersed teams may function in practice. Evidence form European projects bringing partners together from six or seven countries and only meeting face to face occasionally, suggests this is not unproblematic!

Motivation and the ideology of learning and work

In this section of the paper we have postulated a growing together or integration of work and learning. This has profound ideological implications. Whilst it is possible to measure output on a production line and to reward workers accordingly, the measurement of learning is far more problematic. The integration of learning and work requires motivation. Common sense would suggest extrinsic motivation will be of limited value in encouraging learning through work. Indeed in those occupation with highest level of integration at present, anecdotal evidence suggests high levels of intrinsic motivation. This in turn suggests that work will have to be both stimulating and rewarding. It also suggests a high degree of autonomy in undertaking work and a personal identification with work. In this regard, the findings of the ICT and SME project are interesting in that they suggest the main motivation for learning was personal interest (Attwell, 2007). Encouraging personal interest could be critical to integration of work and learning and might lead to higher levels of innovation and productivity. However learning takes time, even when integrated in work systems, and managers may see such time as non-productive in meeting immediate work targets and maximizing productivity. To that extent, the answers may be more about the ideology of how we choose to organize work within society than a technical or economically rationalist development. Some countries, such as France, have introduced regulation to provide greater learning opportunities at work.

3. Work: Integrating personal learning and working environments - future discontinuities

Whilst the previous section has proposed a relatively optimistic scenario for the integration of personal learning and working environments there are a number of discontinuities which may

counter the trends described previously or which may impact in different areas of society.

Globalisation and human resource development

Globalisation has seen the creation of an increasingly open world employment market. Aided by technology, many jobs can now be moved from one country to another. Telephone call centres may be located on a different continent than the customers they are advising. If there is no regulation, jobs may become increasingly precarious with workers competing for employment. Whilst skills and knowledge may be one factor in encouraging inward investment, often it would appear employment is merely located to the lowest cost location. Given that salaries are a considerable part of cost, then this means to the lowest wage economy and that with most limited workers rights. It is hard to see how learning can be integrated with working in such a situation. Governments and regional authorities are more concerned to ensure the existence of a pre-trained workforce to encourage investment in employment than they are to work with companies to develop work based learning opportunities. In this situation, employers can off-load the cost of training and learning to the state.

Regulation offers one way out of this and the recent banking crisis has revealed the problems of an unfettered market economy. Of course, some companies do take learning seriously, both as an issue of social ethics but also because they believe a stable and well trained workforce will result in better profitability. However, other companies have adopted 'human resource management' policies determined by the situational context in the external market environment (Nyhan, 2003).This entails adapting human resource policies to fit in with the corporate business strategy. Companies 'up-skill' or 'down-skill' as the market demands. Brought to its logical conclusion, human resources are a contingent, instrumental factor with no inherent value in their own right. Accordingly 'human resource development' as a distinct activity may or may not be a part of the 'human resource management' policy, but based on the principle of 'external flexibility', human resource stocks can be renewed more effectively through a process of short-term 'project-based' recruitment, outsourcing products and services, downsizing staff etc. (ibid).The concept of 'business process engineering' (see Hammer and Champy, 1993) entailing an over-night reshaping of one's organisation with an emphasis on cost-cutting and downsizing the number of employees, offers a way of implementing this form of 'human resource management'. Such a policy is essentially a continuation of Taylorism in a neo liberal form. Once more there would seem to be little space for integrating personal learning and working environments when access to learning opportunities is strictly limited according to cost.

Thus there is a discontinuity between the idea of integrating personal learning and working environments and the business strategies of many companies, a discontinuity which is fuelled by present policies and trends towards globalisation.

How we learn and the schooling system

A series of reports have shown how young people use computers not just for consuming information but for creating and sharing knowledge (Lenhart and Madden, 2005). Such a development has been facilitated by the emergence of Web 2.0 or more precisely by social software. Whilst platforms may change as one social networking site goes out of fashion and another emerges, there seems little doubt that social networking in one form or another is here to stay.

It is difficult to make a call on future technologies. Semantic web applications may make information search and retrieval simpler and the development of Multi User Virtual Environments may make learning more of an immersive experience. However, the major change is that learners have become practitioners.

Such developments pose a serious challenge to the future of our education and training systems .

Institutions (and teachers) no longer have a monopoly on learning. Knowledge and learning can come from many different sources – from media providers, from enterprises and from peer networks. Whilst traditionally knowledge has been produced by experts, the use of the internet is providing a flourishing of community based knowledge (Cormier, 2008). Wikipedia, developed by a community of users, has become one of the most consulted (White, 2007) (and best loved) sources of knowledge. Curricula have also been developed by an experts. With such a move to community knowledge development, it seems likely that curriculum too may become an emergent property of communities (Cormier, 2008) rather than of the expert driven schooling system,

With the availability of multiple knowledge sources, and the way young people are using computers for learning, school or a schooling system looks increasingly dysfunctional (Attwell, forthcoming). Whilst primary schools may serve a purpose in providing a social environment and allowing development of literacy and numeracy, the aim of secondary schooling is becoming hard to fathom, with most countries implementing rapid reform programmes. Indeed, the reaction of schools to social software has at best been ambiguous and often hostile (ibid). Despite the fact that many young people carry around a powerful multi media enabled miniature computer, in the form of a mobile phone, which they use regularly for information and knowledge exchange, most schools insist such devices are turned off! Many young people shun the walled garden of institutional Virtual Learning Environments, designed primarily for managing learning, and prefer to share their knowledge with peers though social networking environments such as Facebook. Even at a professional level social network based Linked In site is increasingly the place for sharing of business and professional contacts. It has been suggested by some commentators that the future role of the universities, apart from research, is as accreditation bodies, with a limited role for teaching and learning (Wiley, 2008).

Once more, there are different possibilities. Whilst for some time the privatization of education has seemed possible, the recent banking crisis and loss of confidence in market solutions makes this much less likely. There is renewed interest in Ivan Illich's (2007) call for deschooling society with learning being integrated in society and the community and an abandonment of a separate institutionalized education system. Interestingly, Illich writing in an age before Personal Computers, envisaged a postcard and database system to link and network peer group learners.

Others have called for reschooling of society with education and schooling being extended beyond its present limited target groups (Trevitte and Eskow, 2007).

If learning and working are to be integrated it is shard to see how this can happen with our present organization of institutionalized education.

Upskilling, down skilling and learning rich working environments

In this paper we have looked at the potential of technology and computers for learning. Some commentators, for instance Andrew Keen (2007), have an opposite view seeing computers as "dumbing down society". Whilst this may be an extreme view, there is not an inevitability that advanced technology will lead to knowledge rich and learning rich jobs.

Whilst the use of technology may led to more complex work processes and more knowledge rich work, automation can also led to deskilling. With fast changing technologies and employment, it is hard to have an overview of present trends. Governments talk of the knowledge society and the need for higher levels of skills and knowledge. Whether this is actually happening is another question.

Technology has been widely used to replace jobs in some sectors. The first wave of technology replacement was in manufacturing - for instance with the use of robots in car manufacturing followed by a second wave in administration e.g. in the banking industry. It would appear that such

reduction in employment opportunities was

It may be that there are choices to be made in how we shape technology. Some commentators have suggested different patterns of technology development and implementation between countries and continents. Studies of computerized interfaces for machine tools, suggest that whist in Germany interfaces were developed to provide more control and autonomy for skilled workers, in the USA interfaces and control systems were developed to automate processes and remove operator autonomy (Ito and Ruth, 1998).

Whilst Artificial Intelligence remains a dream, robots are increasingly able to perform complex tasks. How we choose to use and deploy such robots is another issue which requires urgent attention.

There is also an intriguing question which was raised in an interview undertaken for this paper. With increasing access to context relevant and just in time documentation, do we need to know so much. Instead of developing learning will we instead just rely on documents or artefacts to tell us what to do?

The idea of integrating personal learning and working environments is largely predicated on the provision of learning rich working environments. If society chooses to use technology to downskill jobs then this would become a major discontinuity.

Inequalities

The integration of personal learning and working is also predicated on access to resources. However, whilst technology has advanced over the past twenty years, so to has inequality with widening gaps in income, not just between the richer and poorer countries in the world, but also within countries (Jaumotte, Lall, Papageorgiou, and Topalova, 2007).

Such inequalities are not limited to income but also include inequalities of status, inequalities in access to technology and inequalities in access to knowledge based work.

Research into access to continuing education and training has long suggested those most qualified were gaining more resources than those less qualified. Equally those in higher paid and higher status employment such as managers where much more likely to gain access to further e-learning opportunities (Attwell, 2003).

Despite a suggestion that younger workers more comfortable with computer technologies would be those most likely to use ICT technologies of informal learning, the ICT and SME project found this not to be the case (Attwell, 2007). It was most likely to be older, better qualified, more experienced and more senior employees who would interact with peer groups and communities of practice through the internet. This appeared to be because they had more autonomy in their work and tended to be in more knowledge rich and learning rich jobs. So, even at the level of informal learning and internet based learning inequalities are being perpetuated.

Whilst the digital divide remains a discourse at an academic and political level, there appear to be few real initiatives to overcome it. Indeed, it is doubtful whether the digital divide can be overcome on its own, without actions to address the more fundamental inequalities in society. Whilst access to learning may be postulated as a way of overcoming inequalities, those very inequalities may prevent such a development. Without action to tackle inequalities, integrating learning and working may only be available to the 'haves' in society and be denied to the 'have nots'.

4. Work: Integrating personal learning and working environments - Uncertainties and tensions

Over the years learning has been confused with the outcomes of formal, institutionalized teaching and training (Illch, 1970). However, contemporaneous research (Cross, 2007) suggests most learning happens accidentally, and most frequently in informal scenarios, often through work and leisure activities. Many individuals acknowledge that 'reality learning' begins when they start their working life. However, national educational bodies have paid only limited attention to informal learning. National curricula all around Europe have been targeted with numerous reforms, in an effort to promote the prestige of schooling. Nevertheless, the key issue that would potentially develop an autonomous knowledge-based society is lacking - the curricular freedom to meet learners' needs. School, in its role of educating or training, has always reserved for itself the activity of regulating, standardizing, restraining or keeping knowledge within limited boundaries prescribed by a curriculum often out of focus with the current reality.

Even though in the last decade efforts has been made to foster curricular innovation , especially through the introduction of ICT, it is our belief that this will not succeed with the mere introduction of new technologies inside the classroom. A classroom will always be the territory of the teacher, not of the learner, and therefore will never help foster personal learning in a continuous effort, let alone combining it with a work environment. A new learning, not teaching, policy, requires not the re-adaptation, but rather the design of a brand-new curriculum, where teachers' roles and their preparation are newly defined, and new learning spaces are also provided. It is curious to notice that as it stands now, school is mainly thought as for teachers and is not targeted at their main and exclusive costumer: the learners, and their needs. This per se is the antithesis of what happens in the 'real world'.

Today's learning needs are more than ever directly related to metacognition skills, even if learners do not realize it. In the changing world we live in, schools which are still attempting to teach their audience as a way of preparing them for the future will fail their main goal. On the other hand, those who focus on granting their learners the skills and the know-how they need to keep up in their field and re-orientate their practice to suit the competences required in an unpredictable tomorrow will have a greater chance to succeed.

For this change to happen, however, institutions will have to establish close cooperative relationships with the world that they have until now tried to distance themselves from, and which is still regarded by learners as an 'outsider'. The work sectors and daily life activity, in general, need to be embedded in the learning process from the very beginning of the teenager /adult learning process. This will, of course, imply a major change for the role of the individual as an active learner, who is directly involved with the outcomes and process of their knowing, as opposed to a passive responsibility as a knowledge receptor. This also implies a shift in the activity of educators from knowledge prescribers to knowing advisors, from teachers to mentors, from owners of the 'truth' to co-workers and co-learners. In this sense, training and education will be combined into something more meaningful to the individual: integrated personal learning based on the reality of experience.

Reality Learning

As noted by Buckley and Caple (2004), training is a "planned and systematic effort to modify and develop knowledge/skill/attitude through learning experience", whereas education is the "process and a series of activities which aim at enabling an individual to assimilate and develop knowledge, skills, values and understanding that are not simply related to a narrow field of activity but allow a broad range of problems to be defined, analyzed and solved."

Both definitions in a way support the distinction we attempted to start portraying above, training associated with practice and education with a more theoretical understanding of a broader reality. Nonetheless, it is our understanding that the preparation of the individual for a constantly changing

society needs to approach their training and education as an integrated unity where practice and theory, work and school are combined as an integral personalized unit. And the same above cited authors provide an answer with their understanding of learning which, in their views, consists of a "process whereby individuals acquire knowledge, skills, attitudes through experience, reflection, study and instruction". In other words, today's professional world cannot divide the two pillars of improvement and innovation based on practice and the individuals' constant reflective observation of a society in progressive transformation and redefinition of its demands. In this sense, the future of tomorrow is hard to guess, but the future of today can hardly be ignored. It relies more and more on the individual perception and consequent willingness to pursue further development, as at the same time it urges education and practice to be integrated. It also implies a new culture of active and autonomous collective learning to be encouraged, valued and recognized in and outside the workplace.

In a way it implies revisiting Schneider' s proposal of cooperative learning with the idea of not alternating institutional education with glimpses of real life, but embedding both as unseparated constituents of an ongoing, real and situated learning reality based on performance, exchange of practices and reflection on that same activity.

This will mean a massive change in schools and the change from a teaching to a learning curriculum (Lave and Wenger) based on situated learning contexts offered by the placement of the individual in relevant working scenarios and learning opportunities. Such provision will necessarily also imply the establishment of cooperative relationships and strong collaborative involvement of staff from both schools and real life sectors.

In this sense the latest advancements of technology, with an emphasis on social software and web applications are already making a difference in how individuals learn and pursue further development in their areas of interest. When embedded in a new strategy where theory and work are bound with experience-based learning, the communication and information technologies will help enhance environments where the exchange of practice, communication of experiences and weaving of new ideas can take place.

Furthermore, it will eventually also promote the ongoing construction of one's digital professional profile, where the individuals learning activity and reflective outcomes will come together in a personalized space.

Access, data ownership and privacy

However the issue of formal schooling is not the only tension. Whilst technologies can facilitate and support the development of personal learning and working environments, these in turn require the freedom for individuals to develop networks and share ideas and knowledge. Many employers limit access to the internet to approved sites and are hostile to social networking which is seen both as time wasting and a potential risk for company data.

Furthermore there remains major issues over privacy and data ownership. A Personal Learning Environment implies personal ownership of data. Will employers allow this and how can we ensure personal data is secure. Where will data be stored and how can we ensure longevity of personal data? What is the relation between a Personal Learning Environment and an organizational learning environment? What data should be shared and who takes decisions and responsibility for this. And if we have ubiquitous connectivity and multiple mobile devices meaning we are all on line most of the time, how can we preserve personal privacy? What level of privacy should we have? Geospatial and contextually aware technologies can be used for monitoring activities as well as for learning. These are important societal issues. There would seem to be some differences in terms of national and cultural attitudes. But without a public and a resolution of these issues, there may be a backlash against the use of new technologies for learning and working.

Open knowledge, knowledge sharing and copyright

If personal privacy is one issue a second is that of knowledge ownership. Recent years have seen a growing move by universities to make knowledge openly available through the development of open knowledge initiatives. This has extended to journals. The widespread use of the Creative Commons licenses has also made reuse of learning materials easier. Despite this movement, the use of restrictive copyright regulations has been extended, particularly in the USA. In Europe, the European Commission has repeatedly attempted to extend copyright to include software. Furthermore, universities are under pressure to develop new sources of income and may see the outcomes of teaching and research as a potential source to be exploited. The idea of personal learning and working environments is largely predicated on open knowledge sharing. Prohibitive copyright regulations and the development of a 'knowledge market' would make difficult the realization of this idea.

How we use technologies

Changes in pedagogy and approaches to learning will allow us to bring personal Learning Environments and Personal working environments together. But this is also dependent on how we value and organise work. Learning rich working environments require conscious design. They also requires opportunities for individuals to shape the work environment for their learning and the potential for taking decisions over the organisation of their work. Once more, technology may offer many possibilities both at an individual level and at a cooperative level. However, technology can also be used in different ways, to reduce choice and flexibility in work, to automate processes and limit decision making and thus reduce learning opportunities.

Key issues for the future and initial reflections on the implications for education

Scenarios for the future of work and learning are dependent on wider issues than those included in this paper. But it s possible to present a series of possible futures, the resolution of which will determine how future personal learning and working environments evolve. These different statements for the future are not discrete and may overlap.

Possible Futures

1.The schooling system embraces pedagogic and technological change. Instead of the present massification of education, learners are encouraged and supported in developing personal learning pathways, supported by Personal Learning Environment toolkits. Informal learning is valued and the PLE brings together learning for formal learning programmes, form the home and from work.

2.The schooling system continues to be the subject of reform but fails to recognise the new ways individuals are using technology for learning. Formal education and informal learning become ever more separate. Whilst the education system is based on formal qualifications, employers increasingly look for evidence of what a potential employee can do. Learners develop their own e-Portfolio. As the education system becomes fragmented, learners increasingly turn to private online education and training providers.

3.A new model of open education emerges. Schools retain a role as accreditation providers, but learners develop their own learning pathways based on open online learning programmes. Trainers and developers are paid form accreditation fees by institutions.

4.As the education system fails to cope with changing society, new forms of education evolve based on learning in the community, both on face to face and on-line. Learning is ever more embedded within community and work structures and systems, and schools become community learning resource centres. Society is effectively deschooled.

5. The growing scarcity of employment, linked to increasing regulation, means that formal qualifications become the only accepted way to gain employment. Schools retain a monopoly on the provision of education learning to qualifications. There is a growing divide between those with formal qualifications and those without.

6. Technology to support learning is embedded in the workplace. Employers increasingly see the importance of learning for innovation and seek to develop learning rich work environments. Learning and working become part of the same process.

7. Privacy of data becomes a major issue. Workers increasingly refuse to participate in processes where they are forced to reveal personal data. Learning becomes a private activity to be undertaken in the home or with trusted friends.

8. Copyright laws are progressively extended. Technology is used to produce an online knowledge auction house. Whilst a minority benefit financially by selling their learning, knowledge become a scare commodity and cannot be accessed by many.

9. Open knowledge sharing models are increasingly adopted. There is widespread open sharing of artefacts and resources. Educational resources are abundant and cooperation and knowledge sharing leads to a rapid growth of small knowledge based enterprises.

10. Informal communities of practice, based on social networking technology, become acknowledged as the major source of learning. Such networks embrace both the educations systems and the workplace leading with seamless movements between working and learning.

11. Technology is used widely to replace employment with computerisation of processes and the increasing deployment of intelligent robots. Work becomes scarce. Whilst a small minority of workers require high skills to programme and develop robots, most employment is in those occupations where low wages and therefore cost of human labour inhibits the use of machines.

12. There is a growing political discourse over the purpose of work and who controls organisations. Work becomes seen as a social process, with workers control leading to the design of work environments from a humanistic viewpoint with rich learning opportunities.

We could continue this list almost endlessly. To us, some seem more desirable than others. Technology is a powerful driver of change. But ultimately the issue is how we shape technology and for what purpose we wish to use the different affordances of technology processes.

The ICT and SME project (Attwell, 2007) looked at workplaces where technology was being used for learning. It found that learning was more likely to take place in enterprises:

- Where employees had greatest freedom in the organisation of their work

- Where employees had the greatest opportunities for proposing and implementing changes in the way work was organised

- Where the nature and technologies being used were changing fastest

- Where ICT was most involved in the work process

- Where employees had most responsibility for the outcomes of their work

- Where team work was most important

- Where employees were integrated in communities of practice

- Where employees had opportunities to develop their own occupational profiles

- With networks with other enterprises

It was precisely in those organisations where workers had the most opportunity to co-shape their working environment that learning took place. It is highly likely that such factors will continue to determine the future development of personal learning and working environments.

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The Concept Of School As A Factory

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