The Politics of Networked learning

Organised by: Chris Jones

Is there a policy for networked learning?

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ABSTRACT

Networked learning is part of an emergent networked society. As such networked learning forms part of a wider debate concerning the nature of social processes, power and culture and their relationships with technology. The literature surrounding networked learning still reflects a technological determinist view. This paper takes issue with this view of the relationship between technology and social forms. The context of higher education has been changing alongside the introduction of new technologies into education. The paper looks at the United Kingdom as an example of the way in which political issues impact on networked learning. The paper tries to establish what choices are being made at the level of national governments by examining two large policy initiatives as examples of current policy.

Keywords

Networked learning, higher education, pedagogy, policy, politics.

INTRODUCTION

In 2000 David Blunkett the then British Minister of State for Education delivered a speech setting out his views on the future of higher education (Blunkett 2000). The overarching theme of his paper was globalisation but globalisation itself was presented as a consequence of new forms of communication (Bird and Nicholson 1998, Clegg and Steel 2002). Communication and Information Technologies (C&IT) were central to the vision of change:

> "In sum, higher education in this century will need to look very different to the system which evolved in the second half of the twentieth. It will typically be mixed mode - delivering through ICT and other learning at a distance, as well as face to face." (paragraph 78)

Networked learning is in this way portrayed as just one aspect of an emergent networked society (Castells 1996). As such networked learning is not simply discussed in educational terms but forms part of a wider set of debates concerning the nature of social processes, power and culture. With some notable exceptions networked learning is not discussed as a political choice involving issues of power and control. More typically it is debated as a technical issue, a question of efficiency (for exceptions see Noble 1998, Jones and Steeples 2002, Clegg and Steel 2002, Land and Bayne 2001). The literature surrounding networked learning still reflects technological determinist views that argue social change is a necessary consequence of the application of technology (Jones and Steeples 2002). The views of politicians find support from influential authors who continue to describe networked learning in ways that imply the use of networked technology will lead to definite educational outcomes (Bates 1999, Spender 2000). These outcomes include new organisational and management structures, virtual and e-universities, and particular forms of pedagogy that alter traditional relationships between students and staff. This paper takes issue with this view of the relationship between technology and social forms. In particular it questions the idea that there is any technological imperative determining the shape of networked learning.

The context of higher education has been changing alongside the introduction of new technologies into education. The very same technologies that provide the infrastructure of networked learning are implicated in the rapid social changes that have impacted on

higher education in recent years. Becher and Trowler (2001) have recently reviewed the changes in academic cultures using the geographic metaphors of landscapes, territories and topography. Mapping networked learning against this changing landscape reveals a strong connection. Higher education is affected by globalisation, massification, changes in the form of state regulation and changing economic relations with industry, the market and a developing managerialism. Networked learning has deep connections to each of these issues. Networked technologies are often the enablers of these changes and the changes are in turn commonly used to justify the further development and use of networked technologies in education. While the connections are indisputable it is at least arguable that the drivers for change are less likely to be the available technologies than the choices made by politicians and policy makers.

The paper looks at the United Kingdom as an example of the way in which political issues impact on networked learning. The UK government has promoted networked technologies using a variety of policy initiatives and since the Dearing Report in 1997 these initiatives have been informed by a 20 year vision for higher education. This paper raises the question of whether there is a policy for networked learning and how it relates to top level statements by politicians that suggest a determinist relationship between the technology and policy and pedagogical choices. By raising questions about the relationship between government policy and networked or e-learning, the paper tries to establish what choices are being made at the level of national governments. It tries to establish some basic outline of the policy framework for networked learning in the UK and examines some of the key policy initiatives post-Dearing. In particular the paper takes two large policy initiatives, the Learning and Teaching Support Network (LTSN) and the Distributed National Electronic Resource (DNER) as examples of current policy.

ThE NeTworked Learning, Society and Technology

The networked society suggests itself not simply as a description of the society we live in but also as an aim, a state of society to which we aspire. Networks in some ways hint at a resolution of the cold war bi-polar world that split societies in terms of their allegiance to either market capitalism or bureaucratic state regimes built on the Soviet model (Rhodes 1997). It is fitting that the politics of the Third Way place social inclusion at the heart of the political agenda and that current government priorities reflect that agenda in higher education (Giddens 1998). Speaking at Guildhall University in October 2001 Estelle Morris the current Secretary of State for Education set out the four priorities for Universities:

> Firstly, widening participation and unlocking the potential of the poorer sections of society. We do want to move ahead to achieve our target that half of the population will enter higher education by the time they reach the age of 30.

This key aim was related to changes in teaching later in the speech:

> " We want to encourage new forms of teaching and learning. We have together already launched the e-Universities project so that we can make sure the UK is at the centre of high quality higher education over the Internet."

The government agenda of increasing access to higher education implies a change in the nature of Universities. Teaching and learning has to change and C&IT is seen as a key aspect of that change.

Networks have a latent politics that are a politics of consensual change, of movement from active centers of power to scapes and flows in which power is distributed (Castells 1999). In networks it can be difficult to identify whom if anyone has command or control. John Law has noted that the network metaphor has become ubiquitous and that this may simply be a consequence of an emergence of new social forms. However he also noted that it is possible:

> "that we are in the process of *uncritically reproducing some kind of dominant ideology*. We are reproducing the ways in which the current orderings of the world like to represent themselves." (Law draft para No 1)

As such networked learning is part of a hegemonic discourse not simply in educational terms but as part of wider debates concerning the nature of social processes, power and culture. John Law notes that when we analyse in terms of networks, we help to perform networks into being. The danger he identifies is that when we write as network analysts we may be buying into and adding strength to a managerialist agenda.

networked learning and technology

The literature surrounding networked learning still reflects technological determinist views that argue social change is a necessary consequence of the application of technology (Jones and Steeples 2002). Influential authors continue to describe networked learning in ways that imply the use of networked technology will lead to definite educational outcomes (Bates 1999, Spender 2000). Writing about the impacts that the technology might have upon organisation and management Bates writes:

"If universities and colleges are successfully to adopt the use of technologies for teaching and learning, much more than minor adjustments in current practice will be required. Indeed the effective use of technology requires a revolution in thinking about teaching and learning" (Bates 1999 pxiii)

At the previous Networked Learning Conference the feminist author Dale Spender said the following when delivering her keynote address:

> "One point which needs to be emphasised is that the pressures that are building up in relation to universities, are not driven by any particular ideology (as yet); they are not the agendas of any specific individuals…….The process is technology driven. Just as steam and electricity changed the way we organised society,….we are now caught up in the digital revolution" (Spender 2000)

These two examples illustrate two different varieties of technological determinism but both find their reflection in the outlook of key politicians. The image of education they express indicates revolutionary change, an unusual sentiment for mainstream politics, and it is strongly informed by a technological determinist perspective. A recent example of this can be found in the speech made to the BETT Conference by Estelle Morris. This speech incorporated a vision of the School of the Future. While this speech was concerned largely with school rather than higher education it nonetheless indicated a worrying view of the relationship between technology and education.

> "When you look back at the development of our schools it has been very strangely evolutionary. One of the reasons for that is there has not been a development, there has not been an invention which has brought about a transformation which has signaled the revolution and if you look at health it was maybe antibiotics or it was maybe the discovery of DNA. If you look at transport it was maybe the internal combustion engine and once those discoveries were made, once those changes happened nothing was ever the same again. I think ICT is our DNA, it's our internal combustion engine it is the trigger that can introduce a revolution in how we teach and in how we learn" (Morris 2002)

The speech was concerned with 'seizing the time' and made a point of suggesting that this was a once and for all opportunity. In this sense it was a soft technological determinism the technology was portrayed as fixed and choices were constrained by that rather than being the outcome of social interaction or being open to political challenge.

The pedagogy of networked learning

It is not only at the macro level of policy, institutional change and politics that technological determinism applies it also affects the particular forms of pedagogy that alter traditional relationships between students and staff. Communities of practice have become a main point of reference in networked learning. Many of the themes of modern capitalist practice are also themes within the communities of practice approach even though this approach is identified with liberal approaches in education. Little of the critique of modern capital can be found in current educational literature and communities of practice remain largely uncontested (Gee 2000). The perspective that is associated with the term community of practice has become widespread. It has become part of what might be described as a new paradigm, though it is now so established that the word new might be unwarranted. There is evidence that amongst experienced practitioners of networked learning there is evidence of a well defined philosophy informing their practice (Jones et al 2000). A recent example set out in a table of Industrial Age vs. Knowledge Age learning practice can be found in an Open University course reader (Trilling and Hood 2001). The list includes the teacher as facilitator and co-learner, project-based real world learning, collaboration and community. These features are found in most if not all descriptions of a pedagogy that is closely linked to the introduction of C&IT in higher education. There are strong indications that these changes might be overhyped. Elsewhere I have noted how the requirement for assessment and accreditation affects the drive towards facilitation and the adoption of a more equalised role for the teacher in higher education (Jones 1999). Brown and Duguid (2000) go so far as to suggest that the core activity of the University is this feature, which they call warranting and credentialing and that the future shape of the University might be that of a DGB, a Degree Granting Body.

Policy and networked learning in the United kingdom

Networked learning in Higher Education in the United Kingdom is one part of a set of related policy initiatives. The overall picture to follow the revolution metaphor common to the commentators quoted above might be summed up in Mao's slogan from a speech in 1957 "Let a thousand flowers bloom, a hundred schools of thought contend." The question that I want to ask in this paper is what linkage is there between the evident overall position with regard to higher education policy and the actual working out of policy initiatives in practice. In order to do this I will take two examples from the overall policy landscape, the Learning and Teaching Support Network (LTSN http://www.ltsn.ac.uk) and the Distributed National Electronic Resource (DNER http://www.jisc.ac.uk/dner). Both are United Kingdom initiatives covering the higher education system in England, Scotland, Wales and Northern Ireland. The funding for the LTSN comes from the funding councils directly, the funding for the DNER through

the Joint Information Systems Committee (JISC)

The Learning and Teaching Support Network (LTSN)

The LTSN consists of a series of 24 Subject Centres located in a variety of host institutions in higher education, an Executive and a Generic Centre situated in York in close physical proximity to the Institute for Learning and Teaching. The LTSN was set up following a successful government initiative that was specifically aimed at the introduction of computer technologies into higher education, the Computers in Teaching Initiative (CTI). The LTSN is an example of the linking together of a number of strands of higher education policy. The LTSN is not a separate technology intervention, rather it focuses on the development of an integrated approach to teaching and learning that includes technology. It is distinct from the Institute of Learning and Teaching (ILT) the semi-corporate body set up by government in response to the Dearing Report as a professional body for higher education teachers. The LTSN's place in the overall policy landscape is that of critical friend to the emergent profession of higher education teachers. Explicitly focused on change, the LTSN aims to develop teaching and learning in an area that arguably had a historical focus on the discipline and more specifically on scholarship and research in discipline areas. The LTSN is *built* on a Subject Centred approach and its name explicitly situates it on the terrain of networks. The Learning and Teaching Support Network has a claim to credibility because it is genuinely a product of each Subject Centres' own particular development and the network reflects the structure and concerns of its constituents. In the words of one Subject Centre's Director:

> "The constituency thing is superb. I mean you could wipe out Subject Centres completely and just have the LTSN but then you'd find that half the academics on the ground wouldn't bother to get on board because it is not relevant to them, it is not relevant to their direct interests."

There is some supporting evidence for the view that subject and discipline areas have different identities, epistemologies and practices and that:

> "the ways in which particular groups of academics organise their professional lives are related in important ways to the intellectual tasks on which they are engaged" (Becher and Trowler 2001 p23).

Perhaps more importantly the same authors note that 'teaching and learning' has not been prominent historically in disciplinary identities, though they note that it is an emerging concern. In recent research for the Networked Learning in HE project I conducted a telephone survey of a sample of teaching staff across different disciplines and types of institutions. The survey showed widespread use of computers by teaching staff for teaching purposes but a lack of pedagogic training.

> 72% had no teaching qualification
>
> 18.7% had never received any training
>
> 72% had received some professional support
>
> Last training (1 day or more) 56.9% in 1998 or before, 25% reported training in 1996 or before and almost ten percent received training prior to 1992.
>
> 42.1% reported that they had received training that included technologies for teaching

The LTSN addresses this gap in professional development by helping to provide a source of subject specific advice and guidance. It is also claimed that academics will respond more positively to advice on teaching and learning provided by subject specific centres. The LTSN is then a policy initiative that occupies a specific niche that links together the development of pedagogy and technology with the aim of promoting teaching and learning on the terrain of the disciplinary specialist.

Origins of the approach

The system of Subject Centres and the overall policy of a subject based approach arose out of the review of CTI and TLTSN (Teaching and Learning Technology Support Network) (HEFCE 98/47). Appendix A of that report set out the rationale that lay behind the grouping of the 41 QAA subject areas into 23 centres. The final number of centres was 24, the same as the old CTI, but the subject areas were not coincident with CTI subject areas. The LTSN subjects included new subject areas that had not been represented in the CTI, especially in newly developing subject areas such as hospitality and tourism. The new subject areas and the bidding process for the LTSN Centres allowed the perception of 'elitism' that had arisen in relation to the CTI centres and their siting in old Universities to be addressed.

One of the key features of the LTSN is the diversity of the network. In part this arises from the difference between the subject areas. Some Subject Centres are faced by problems of scale. The centre most commonly mentioned in this regard is Health Sciences and Practice. Originally conceived of as "Subjects Allied to Medicine" this subject area includes nursing, sports medicine, midwifery,

pharmacy and physiotherapy. The web site for the Health Sciences and Practice Centre shows 25 lead subject areas supported by the centre. This example illustrates a centre with a large number of subjects covered, a wide diversity of subject types, from 'soft' subjects to ‘hard’ sciences and a complex set of relationships with other LTSN Subject Centres. Sheer scale impacts upon decisions made about the kind of relationship the Centre can have with its constituency. The Centre, for example, cannot visit all departments as some Centres have chosen to do, as the capacity in terms of staffing and cost is not available.

The Subject Centres were in place before the Executive and Generic Centre and had developed their own distinct styles independently. Policy as a consequence is interpreted at all levels in the network. The Executive is rightly responsive to national policy directions but the Subject Centres whilst dependent upon the funding councils for their continued existence have a relative independence in how to reflect policy initiatives. Management of the network is potentially difficult as the networked nature of the LTSN makes central direction problematic. This developmental history has definite consequences for the overall management of the Subject Centres. The approach of setting a top down set of requirements applying to every Subject Centre in order to establish a degree of uniformity could be applied. It might be thought necessary to do this to ensure particular aims, for example clarifying the LTSN brand and setting network requirements for reporting and standards for interoperability. An example of setting a common approach can be found in the LTSN document *Evidence of Success*:

> "The network needs to have common criteria for success which can inform the evaluation and development of individual Subject Centres and the network as a whole." (Point 8 01/20)

On the other hand it could be contrary to the very strengths that are claimed for a Subject Centred approach and the development of a successful network. The very strength of the network is in the claim that subjects and disciplines are more responsive to guidance developing from within the discipline and subject areas themselves. There will be a potential for conflicts between what may be perceived as the pragmatic drive for uniformity and the requirements of network development. This dilemma faced by the management of the LTSN raises questions about the way in which policy however well focused actually translates into day to day practice. The system of policy within the LTSN is necessarily loose coupled to national policy and beyond the network itself the national policy framework involves the interrelationship of several distinct initiatives.

The Distributed National Electronic Resource (DNER)

The DNER is an initiative funded by the Joint Information Systems Committee (JISC) that follows on from a series of interventions that aimed to develop what might be termed primary courseware (Goodyear and Jones forthcoming, Mayes and Neilson, 1996). The DNER is ‘a managed environment for accessing quality assured information resources on the Internet which are available from many sources. These resources include scholarly journals, monographs, textbooks, abstracts, manuscripts, maps, music scores, still images, geospatial images and other kinds of vector and numeric data, as well as moving picture and sound collections’ . The DNER follows from a number of earlier initiatives, the CTI and TLTP (Teaching and Learning Technology Programme) for example that included the aim of the creation of primary resources. The products of TLTP and their impact upon UK HE have been the focus of substantial evaluation studies (Anderson et al 2002, Anderson et al 1999). A conclusion from these studies was that:

> " significant barriers to wider uptake of C&IT into learning and teaching still exist. Technical infrastructure is now less important to most staff than the need for pedagogical support " (Anderson et al 1999 Executive Summary)

The implicit pedagogical beliefs of the courseware production teams were embedded in the courseware and this was amongst other factors implicated in the limited use made of the courseware by staff whose pedagogical beliefs and practices may not have been compatible with those of the courseware producers. The DNER aims to produce and/or improve access to primary resources but it is doing so with what appears to be a much more open sense of what might be possible pedagogical usages.

The comments here draw on initial work on the pedagogical evaluation of the DNER. In particular, it focuses on the work of some 35 projects, each of which is concerned with contributing new digital information resources for learning and teaching. Further details of this work can be found in Goodyear and Jones (forthcoming). The extract reproduced below is taken from the original proposal formulated by JISC for additional government funding and captures the core intention:

> "Over the past 5 years, the JISC has been successful in developing a portfolio of on-line digital information and data resources that are an important component of the DNER. These resources include bibliographic and research datasets, spatial and mapping data, digital still images and full text electronic journals. Moving images and sound archives will also become available on-line within the next few years.
>
> Although this data has been primarily used for research purposes, it is beginning to find a use in learning and teaching. However, this work has been slow and some additional funding would enable the JISC services to be used in totally different ways than originally envisaged. There is a strong

> requirement to improve the interaction between the people who are involved in the development of new learning environments and the national information systems and services being developed by the JISC.
>
> It is therefore proposed that an initiative be funded to integrate learning environments with the wider information landscape aimed at increasing the use of on-line electronic information and research datasets in the learning and teaching process." (, para 8).

Among the criteria to be used in selecting bids for funding was ‘impact on the learning and teaching environment in UK HE’ (ibid., para 97).

The projects were examined using two sources of information. A projects meeting held in London 18th and 19th of June 2001 were asked to complete a short task based on Vanetsky's History of the Future exercise (Nash et al 2000). Secondly the published project outlines were examined for their pedagogical purposes. These two somewhat different sources of information produced a picture that indicated a limited approach to teaching and learning beyond providing access. Our principal distinction was based upon the idea of ‘access’. That is, we divided the responses into (a) those which *only* talked about making new or better resources accessible to students, or about improving their access to such resources and (b) those which, in some way, went ‘beyond access’. In the exercise conducted at the project meeting less than half of the projects said anything which went beyond access. Looking at the project outlines, we found that only two of the projects provide more than a rudimentary account of how students’ learning would improve through use of project outcomes.

What does this outcome say about the DNER initiative and its relationship to the policy agenda in higher education? The DNER is concerned with developing infrastructure in the broadest sense. That is it is not simply concerned with the technical substrate, though indeed it is concerned with that at some levels. It is concerned with building the social standards and protocols that run alongside more technical aspects of infrastructure. The DNER then is at the technological end of a spectrum that is never wholly technical (Bowker 2001). Our interest lies in the fact that it is, if anything is, situated at the technological end of a spectrum and it might be expected to display features that would conform to the idea that technology alone triggers or determines change. The evidence such as it is shows that the features identified as a new paradigm associated with networked learning are almost entirely absent from the DNER teaching and learning projects. This is not to say that they are poor projects, far from it. Rather it is to point out that work concerned with implementing new technologies, explicitly concerned with access, does not lead to a natural adoption or even awareness of the pedagogical framework that is associated elsewhere with the technology.

Discussion And Conclusions

What do these examples of public policy tell us about how networked learning relates to wider political concerns. The views of politicians as expressed by senior government figures locate closely with the technological determinism that pervades much educational literature. The politicians as, to some degree at least, masters of the situation emphasise choice and take a soft-technological determinist position. On the other hand the two examples of policy in practice show just how complicated the picture becomes upon closer examination. The agencies that deliver politicians' visions develop policy in an emergent way. The LTSN is a policy initiative that relies upon remaining close to its constituency. To be effective that strand of the initiative is critical. Yet that requirement sets up a tension with the natural desire of the funding bodies and beyond them the government, to make such initiatives responsible for carrying through major items on the policy agenda.

The example of the DNER illustrates just how little technology determines. The pressures on projects funded by initiatives such as the DNER are towards meeting the criteria set for them by the funding bodies. It should be no surprise to find that projects set up to enhance teaching and learning are not fully acquainted with current educational thinking. Yet it contrasts with the rhetoric that informs government policy at the highest level. Teaching and learning in higher education are being pressed to change. In particular the agenda for increasing access will involve continued pressures to change teaching and learning practices in the near future. The mistake is to associate the changes demanded for political reasons related to social equality with those related to technology. Technology doesn't imply any set of required political outcomes. Social shaping of technology suggests that technologies themselves are subject to social pressures in the way that they are developed (MacKenzie and Wajcman 1999).

I do not wish to imply that technologies have no impact on social developments or public policy. Technologies embody and embed the decisions and practices of those who develop them and they reflect the choices of those who apply them at the point of use. They are tangible resources for action and whilst they can be used in novel and unsuspected ways they have a definite range of capacities. The point I am making is that the range of capacities that technologies have are constituted finally when they are mobilised in use, rather than being a simple list of characteristics that can be predetermined and described. The question that this paper asked was whether there was a policy for networked learning. It appears that there is but that it does not derive from networked learning or the technologies of networks. Rather the policy reflects a set of priorities associated with the politics of the Third Way and an uncritical attitude to modern capitalist practices and managerialism. The conclusion of this paper is that networked technologies are too

important to be left in the hands of such a stale agenda. Choices about how to use new technologies need to be infused with a more sharply critical edge. One that begins by asking what social interests are driving the agenda that hides behind the technology and that begins to map out alternative visions of technological possibilities more centred in the needs of education and learning.

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Flexibility as Myth? New Technologies and Post-Fordism in Higher Education

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ABSTRACT

This paper explores the notion of 'flexibility' within the university sector. Drawing on literature from industrial sociology, the authors highlight the apparent shift in higher education towards more flexible modes of delivery, which has been attributed to developments in new learning technologies. In the context of the UK government's widening participation programme and its lifelong learning agenda, a truly 'flexible' education is posited as being increasingly available to all. However, as in industrial sociology, where claims about 'flexible' post-Fordist production processes have been questioned, the authors suggest that the notion of flexibility within an educational context also requires further analysis. This paper therefore deconstructs a range of debates around flexibility. The authors suggest the need for a phenomenology of flexibility in order to ground conceptualisations of flexibility in the lifeworld. If the claims about flexibility in HE are wide of the mark, what exactly is happening to the university sector, and importantly, what are the implications for staff and students?

Keywords

Higher Education; Flexibility; Flexible Learning; Post-Fordism; Networked Learning.

INTRODUCTION

'Flexibility' as a term appears to have a particular capacity to bind together ideas from a number of discursive domains in a way homologous with its semantic meaning '*bend without breaking, pliable, manageable, versatile, subtle, complaisant'* Pocket Oxford Dictionary). One of the reasons that the idea of 'flexibility' appears so powerful is that it acts a floating signifier capable of binding together sets of discrete and often contradictory claims. It is in this sense that we have used the term myth in our title. The idea of flexibility, particularly when mediated though technology takes on magical or mythical properties in legitimating new practices. Flexibility is seen as an intrinsic property of the new media; combining ideas about immediacy, speed, and access in different locations, new technologies and network learning therefore appear to have the ability to compress the constraints of both space (place) and time. The advocacy of new media in education parallels Ball's (1998) argument about the market: *'advocacy of the market or commercial form for education as the 'solution' to education problems is a form of 'policy magic'*.

In this paper we want to chart some of these migrations of the meaning of flexibility, and consider their implications for our understanding of networked learning particularly in higher education. The first part of the paper charts the rise of the idea of 'flexibility' as a characteristic of labour markets in the move from 'Fordism' to 'Post-Fordism'. From the 1980s onwards social scientists have pointed to the weakness of the 'Post-Fordist' paradigm in characterising new labour practices. However the idea of flexibility, and the development of highly skilled knowledge workers, has formed a key plank in New Labour thinking about education.

The second section, therefore, looks at how debates about flexibility have entered into education and the crucial role attributed to new media in mediating flexibility. The arguments are confused because of the mobility of the concept. Firstly, higher education is positioned as meeting the needs of increasingly flexible, global, and technology driven markets (Blunkett, 2000). This argument gives new technologies a symbolic importance that is surplus to their capacity to enhance the learning experience. Involvement with new media is seen as an essential ingredient in the 'knowledge economy'. Secondly, higher education must meet the needs of students who demand more 'flexible' provision, again new media are critically positioned as enabling more flexible delivery. However, as with the arguments about flexibility of production, there is central contradiction. Many of the trends in higher education including the growth managerialism, increased audit, semesterisation and modularization make the delivery of education more pre-packaged and less flexible than ever. Gone are the days (in theory at least) when staff could respond to the concrete needs of the students in front of them and change the content, structure, pace and even time of meetings based on negotiation. Those traditions, which emphasised the social and liberatory purposes of education, have been strongest in adult education (Zukas & Malcolm, 2002). However, it is ironic at a time when the student body is more diverse, that the versions of flexibility adopted in higher education are derived from human capital theory, not from the traditions of student-centred critical pedagogy.

From this analysis of supply side logic and post-Fordism we put forward an argument for a phenomenology of flexibility in higher education to inform the ways in which networked learning is developed. In outline, our argument is that we have insufficient understanding of the meaning of flexibility in the lifeworlds of students or staff. We know from the feminist literature, for example, that many women workers, who appear as highly flexible from the employers point of view willing and able to work non-standard shift patterns, are in practice highly constrained in their own lives fitting work around others timetables and inflexible patterns of childcare. We also know that access to new technologies is mediated through relationships in the household. Even where appropriate technology is available in the home, women and girls may have unequal and, therefore, inflexible access to it. Place, space and time

are not descriptively given by virtue of technology; they are painstakingly constructed out of the meanings and practices of everyday life. In arguing for a phenomenology of flexibility we are, therefore, arguing the case for understanding learning and the use of new media in terms of the lifeworld, and for the need to problematise the meaning of flexibility rather than take its meaning for granted. It might well be that if we accessed this knowledge, the flexible meanings attributed to 'flexibility' would finally snap under their own contradictions and we could develop better concepts to underpin our understandings of networked learning.

SUPPLY SIDE LOGIC AND POST-FORDISM

Debates about the flexibility of labour are not new. Discussions about employment structures stem from the early 1980s, and industrial sociologist were among the first to point to the flaws in the 'flexibility' argument (see for example Pollert, 1988; Sabel, 1989; Amin & Robins, 1990; Hyman, 1991). However, the idea of flexibility as a panacea has a remarkable tenacity. Pollert's comment from the 1980s appears as pertinent now as then:

> *'flexibility' has been a handy legitimatory tool precisely because of its all-purpose resistance to precise definition. Production flexibility, technical flexibility, organisational flexibility, labour process flexibility, time, wage, financial, marketing flexibility – all these issues are presumed to have a connection, and this connection is implicitly understood to reside in the behaviour of labour. Such a slippage has allowed discussion of restructuring to veer away from global issues of capital structure, investment, exchange rates, trade relations, to the homely, and apparently more manageable 'problem' of labour'* (Pollert, 1988, p. 34).

The 'homely' concern with labour flexibility was the subject of protracted political battles during the 1980s and 1990s, as the Conservative Government in the UK abolished many of the legislative protections on labour and trade unions, while simultaneously manipulating the welfare system to encourage work over welfare. These local circumstances were not unique. Many of the 'flexibilities' listed by Pollert (1988) have been the subject of international trade liberalisation policies and national governments now claim that they cannot intervene to counteract the power of markets.

The recent neo-liberal phase of capitalist development came about as part of the collapse of the long post war boom and a growing consensus across the political spectrum of the importance of monetary discipline and a rejection of the core tenets of Keynesian demand management. In the economic crash in1974 industrial output on a world scale fell by 10% (Glyn & Harrison, 1980). In 1976 the rapidly falling pound forced the Labour Government to apply for a loan to the International Monetary Fund who as a condition specified large scale cuts in public spending. In the 1980s there was a major push to spread market competition across the globe. This was spearheaded politically by Margaret Thatcher and Ronald Reagan, but planned and theorised by influential think tanks including the Mont Pelerin Society in Geneva, founded in 1947 with Nozick, Hayek, and Friedman as founder members (Brown & Lauder, 2001). Other national think tanks also acted to influence strategies that would favour large-scale international capital and push for deregulation. The Trilateral Commission established in 1973 by David Rockerfeller then president of Chase Manhattan Bank advanced a programme of *'achieving a liberal integrated world system secure from protectionist disruption and domestic upheaval'* (quoted in Brown and Lauder, 2001, p. 124). There are now no restrictions on international financial transactions, which aided by advances in technology, flow almost instantaneously around the world. Moreover, remaining protectionist policies have been dismantled massively to the interest of the advanced world, particularly American capital. Domestically in the UK trade unions have been weakened, and welfare cuts ensured that the gap between rich and poor has dramatically widened (Brown & Lauder, 2001).

These developments have intensified the focus on flexibility of 'labour' in policy discourse, as other mechanisms of internal regulation have been surrendered. The view presented is that we are in a qualitatively different phase of capitalist development, which is irreversible and beyond control of national governments:

> *'an irresistible and rapid changing technology development, the diminishing role of the state, and the rearrangement of industrial production away from western economies to the newly industrialising economies and the corresponding growth of service industries, particularly finical exchanges and services, in the advanced world. The glue which holds these together is that the force behind these changes is irreversible and largely outside the control of human agency. They are in some way a logic of development that can at best be shaped but cannot be held back.'* (Brown, 1999, p. 5)

Education and new technologies play a privileged role in this discourse. The New Labour Government has embraced the rhetoric of globalisation to argue that Britain must position itself in the global market by creating a highly skill and flexible labour force capable of attracting global capital flows (e.g. Blunkett, 2000). Social and educational policies have been honed to suit the needs of this supply side economic thinking with a focus on the need for individuals to take responsibility for improving the stock of human capital (Coffield, 1999; Schuller & Burns 1999; Schuller, 1996).

These arguments have been subject to critique from educational researchers for narrowing the meaning of education (Avis 1993,

2000) in the post-compulsory sector. Coffield (1999b, 1997) traces the economic drivers for lifelong learning to Confederation of British Industry's 1989 paper Towards a Skills Revolution, and a Department for Education and Employment (DfEE) paper on Competitiveness in 1994 (cited Coffield, 1999b). The first education White Paper produced by the new Labour Government in 1997 embraced this shift to human capital theory and with it the creation of a new Minister for Lifelong Learning. Even when policy pronouncements mention broader aims, the recommendations are targeted at meeting the demands of supply side economics, 'life' in the framing of 'lifelong', has become a euphemism for 'work' (Tight, 1998, p. 481). Human capital theory presupposes causality in the correlation between education and employment, and between the creation of flexible knowledge workers and the ability of the British economy to attract inward investment. However, these types of linkages reflect assumptions that are often 'heroic to the point of stupidity' (Schuller, 1996). While these ideas turn the rhetorical wheels of the training industry, human capital theory does not provide a satisfactory explanation of how learning relates, if at all, to economic growth. Education, of itself, does not create jobs or smooth the vagaries of the business cycle (Louis, 1995).

Critics have equally vigorously attacked the underlying theoretical architecture of the flexible labour debate, namely its pivotal role in the transition from 'Fordism' to 'Post-Fordism'. Brown and Lauder (1997) challenge some of the key features of the 'Fordist' 'Post-Fordist' account by pointing out that many features of contemporary capitalist systems are Neo-Fordist rather than Post-Fordist. Low skilled, low waged production has replaced previously better paid well-organised mass production work. This suggests that, rather than some inevitable tendency given by the technology, outcomes are effected by struggles over the conditions of accumulation. Technological and organisational advances, underpinned by new communication technologies, have aided the mobility of capital (Brown & Lauder, 2001), and in particular the ability to transfer jobs to low cost Export Processing Zones (Marchand, 1996). It still remains the case, however, that many new jobs created in the advance industrial world are neither high paid nor knowledge based. This is particularly important when the skill content of 'flexible' new technology jobs are considered. Many new technology jobs, including for example Call Centres, are in fact low paid extensions of women's secretarial and administrative work (Bain & Taylor, 1999; Belt, Richardson & Webster, 1999). While the introduction of new technologies has not resulted in the predicted reduction overall in employment in offices, neither has it, except in rare cases, led to a redefinition of skill or remuneration of the women who operate the systems (Vehvilainen, 1994). Many new technology jobs cannot in any sense be understood as knowledge based; moreover these jobs are often very inflexible from the point of view of the pre-dominantly female workforce. If the simple Fordist to Post-Fordist narrative is suspect from the point of view of technology it is also as Brown and Lauder (1996) have noted, often based on Neo-Fordist low trust management styles. In higher education, for example, the demands for greater responsiveness and flexibility from staff have often been accompanied by more managerialist practices and higher degrees of surveillance and audit. The extent to which the New Labour modernising agenda can actually deliver the sorts of high quality, high trust, knowledge based jobs that are the promise of 'flexibility' is open to doubt (Brown & Lauder, 2001), since as we have already noted, the underlying supply side logic underpinning the strategy is faulty (Schuller, 1996).

Our argument is not that some elements of labour 'flexibility' have not been achieved. As workers in one of the most 'flexible', i.e. casualised areas of the economy, higher education, we are all too aware that flexibility for organisations can be achieved at the expense of employee security. What we are contesting is the coherence of the different accounts of flexibility, and how these underpin policies, particularly education policy. New technologies as we have seen are woven into the flexibility myth, as both cause (new technologies driving the changes) and effect (the need for new technologies to be adopted because of the changes). We now want to turn to the ways in which metaphors of flexibility have migrated into the discourse of higher education, and in particular to look at how these are shaped by, and in turn shape, policy imperatives driving the uptake of new technologies.

EDUCATION, FLEXIBILITY AND NETWORKED LEARNING

The notion of flexibility in education is of course not new, traditional distance learning programmes were historically framed upon offering flexibility for students wishing to take a range of courses. However, the distinction between distance learning and what might be called traditional on-campus learning is becoming less clear (Tait & Mills, 1999). One of the reasons posited for this apparent blurring of boundaries is the increased use of learning technologies within the context of non-distance education programmes. New learning technologies in particular are increasingly framed as being able to offer students learning opportunities that facilitate flexible teaching and learning which in turn are designed to 'fit-in' with the particular needs of students. Technologies are posited as functioning as part of the 'knowledge economy' within the context of and increasingly 'connected' world. The technologies themselves are symbolic of the world of work 'out there' and as such, a crucial component of university life for reasons we have already pointed to above.

However, the notion of flexibility, as facilitated by learning technologies is generally under-theorised. Collis and Moonen (2001) argue that the key point relating to flexible learning is about '*learner choice in different aspects of the learning experience*' (p. 9). Moreover, they note that flexibility has many dimensions: '*flexibility in the location of the learner'; 'flexibility in the programme of learning'; 'flexibility in the types of interactions within a course'; 'flexibility in forms of communication within a course'*, and finally, '*flexibility in study materials'*, with students having a '*wider choice of resources and modalities'*. (See Collis & Moonen, 2001, pp. 12-13). While these characteristics have an apparent obviousness, each is open to question. The core argument is framed in terms of 'choice' with its connotations of a market relationship. However, if we consider physical setting for example, off campus

locations may not involve choice and flexibility from the students' point of view. It may be that students have other, more compelling, constraints of work or family responsibilities that restrict other modes of access. Moreover, the continued inequalities in the availability of new technology to households, and between household members, limit the flexibility of location in practice. Kirkpatrick and Jakupec (1999) borrowing from Chubb (1993) and Shapiro (1993) note that '*the introduction of flexible learning reflects a more general transformation of higher education influenced by technological change, public accountability, increased competition, restricted funding, and catering for the needs of a semi-mass rather than semi-elite system.'* (Kirkpatrick & Jakupec, p. 51)

System constraints, however, mean that technology is being designed into learning under a restricted set of assumptions about what it means to be student. Widening participation does not necessarily entail a model of the individualised student consumer. Other models of the learning relationship involving adult and non-traditional learners are available (Zukas & Malcolm, 2002). The epistemological assumptions that are built into the design of networked learning are being narrowed by a set of economic assumptions about the nature of markets, rather than the nature of learning '*impetus for this change is in part the rapid advances in electronic communications technology, that introduce flexibility in production, distribution and interactivity in education and the consequent tendency towards globalisation of education.'* (Kirkpatrick & Jakupec, p. 51) Rather than flexibility as a metaphor (Edwards, et al, 1999) we increasingly find that 'flexibility' has attained an un-challangeable ontological status. This ontology is at once, contradictory and self-mystifying.

Universities are being positioned as having to respond to the needs of an increasingly flexible, global and technologically orientated market (Clegg, Hudson & Steel, 2002). The provision of education increasingly mimics the attributes of the 'flexible workers'. These re-engineered relations in education create conditions under which students become 'flexible learners'. However, the flexible student is not a spontaneous occurrence. Students (including full-time students) have been engineered to become more 'flexible' as a result of policies, which have put more financial pressures on them to work in particular ways. It has also the created conditions under which the only way for many adults to access higher education is via 'flexible' modes of delivery. In this sense, students are *forced* to become 'flexible' and the flexibility to which they are supposed to conform is a particular pre-determined set of learning practices or process. The response of higher education institutions to the Dearing report in 1997, and the Blunkett speech in 2000, has meant that universities are compelled to embrace the new 'information age' and re-think and restructure the ways in which they have traditionally operated. Moreover, within the climate of scarcity of resources and finances, notions of efficiency and cost effectiveness of technologies are increasingly becoming more significant within the education sector (Moonen, 1997). Scott (1999) argues that the university itself is becoming a post-modern entity, realigned towards the needs of the post-Fordist economy. In particular he notes that '*tomorrow's graduates will have to be socialised into new jobs culture, because their occupational destinations will be much more diverse and diffuse'* (p. 45). Thus, according to Scott, not only do universities have to respond to the demands of the market (as we have suggested above); students too must reposition themselves as learners, and become more flexible entities themselves. Even within the curriculum, teaching must recognise and accommodate the post-Fordist condition (Sharp, 1996; Lewin, 1995). Thus students are compelled to adopt 'flexibility' as part of their learning experience. There is a contradiction between the rhetoric of flexibility and its prescription in practice. The notion of the 'knowledge worker' pre-defined by industry, and meeting the needs of the so-called 'knowledge age' is fast gaining currency within educational discourse (see Privateer, 1997).

Many of the organisational changes in universities, including modularization and semesterisation, have been introduced under the rhetoric of choice and diversity, and as breaking the hold of the academic provider and empowering the student. The role that technology has within the context of this model is twofold. Firstly, technologies are posited as possessing characteristics that will transform the actual learning experiences of students, and secondly they are premised on improving or developing learning and teaching practices (Maier, *et al*, 1996). However, in order to really address these issues we would need to ask prior questions about the underlying assumptions about the nature of education and knowledge (Rowland, 2000). These questions cannot be answered within a research paradigm based on the discrete evaluation of experiences based on the introduction of particular 'packages' of networked learning. In much of this research the student experience has already been prescribed and is already presumed to be pre-shaped by the regimes of higher education that constitute them as flexible learners, ready for the demand of the flexible work place. Networked learning may indeed 'improve' this experience, but only if the wider context is presumed invariant and un-challangeable. What is lacking in this model of work and career development are concepts of the lifeworld of those who inhabit this flexible and limiting learning universe.

CONCLUSION: TOWARDS A PHENOMENOLOGY OF FLEXIBILITY

Many of the questions we are raising are not answerable by deconstructive logic alone. The questions we are posing involve the formulation of a different research agenda. Killen et al. (1999) have argued that we need a phenomenology of human capital investment if we are to look critically at the assumption '*higher education driven by (cost-bearing) students and employer demand will become better adapted to the needs of industry, and hence the labour market'*. This brings us back to arguments we made in the first section of this paper, that many of the claims about flexibility involve piling sets of arguments on top of one another, which involve essentially empirical claims about people and their relationship to work and education. A phenomenological approach by contrast brackets these assumptions and enquires into the lifeworld (Ashworth & Lucas, 2002). We want to bracket the assumptions

behind the notion of technology as facilitator and/or driver of flexibility. Changing practices and processes in universities will have effects, but rather than presuming we already know what these are, by virtue of the way they are framed in policy discourse, we need to enquire much more closely into the lifeworlds of both staff and students. We need a phenomenology of flexibility, in which the lifeworld of the staff and students is critically explored in order to unpack the contradictory and ideological potent discourse of flexibility.

While we are arguing for a new research agenda, fortunately we are not starting from a blank sheet. There are studies that have looked at the experiences of students, and those who are not participating do not engage in higher (or indeed any formal) education. There is, moreover, a growing literature about the experiences of staff at different levels within institutions (Steel & Hudson, 2001). However, this research is not usually part of the debate on networked learning, which to a large extent has been framed by policy initiatives (Gibbs, 2001), the nature of the technology (e.g. www.jisc.ac.uk), and the evaluation of particular learning experiences (Alt-J). The literature that might help us is not confined to higher education. One of the most curious aspects of higher education research is that it often framed outside the debates that have gone on in adult education (Usher, Bryant & Johnston, 1997), in lifelong education (Coffield, 1999), community education (e.g. Thompson, 2000), and the rich and varied organisational learning literature from within critical management. Yet these literatures all have much to say about the experiences of the 'non-traditional' students whose needs it is claimed we are meeting through networked learning. Of course this research is not framed explicitly as a phenomenology of flexibility, but it does give some insight into the complexities of the lifeworld, which cannot be reduced to rhetoric about choice and flexibility.

To take some examples which have explored the experiences of both staff, and potential and actual learners. There is now a large and growing literature loosely organised under the heading of managerialism (e.g. Deem, 1998; Trowler, 1998), which deals with the experiences of staff within higher education. Much of this literature is critical in tone and suggests that many of the practices associated with managerialism are held at bay by individual staff who do not account for their own practice in terms of its tenets. Staff who are actively engaged employed exploiting the advantages of networked learning may not think of their activities as part of the discourse of flexibility outlined above. Rather, the role of developments using new media in their own lives is much more complex. They work with understandings of their own and their students' learning based on explicit and tacit assumptions about the relationships between them, the learners, and type of learning in which they are engaged. The experiences of networked learning are therefore likely to be much less uni-dimensional than the discourse of flexibility assumes. There is considerable anecdotal evidence that this is the case.

At conferences such as these for example there are reports of an extraordinary range of developments which are not reducible to particular models of technology, the student, efficiency, or single disciplinary understandings. One way of re-reading the evaluation literature, is not as the objective assessment of what works, but as the attempts of staff to make sense of their practice. This is of course complicated by he justificatory language of many evaluations and by the subtle trade in symbolic capital which research represents (Lucas, 2000). Nonetheless the creativity and excitement of some academics and designers suggests that practice is not reducible to institutional policy. Other literature suggests that students do not come pre-packaged as flexible learners. Studies of those who are not engaged in education suggest that the lived experience of many people does not approximate the individualistic rational notions of personhood that underpin human capital theory, or the idea that education produces the subjectivities appropriate to the flexible market. Some students, in some discipline areas, may operate with a sense of self that does operate in this way, but that is a question that requires empirical investigation rather than assertion. A good example of taking shortcuts and assuming that definitions are obvious and uncontroversial relates, for example, to plagiarism. Designers of software which is intended to catch 'cheats', encapsulate models of the student that are not phenomenologically grounded. The work of Ashworth, Bannister & Thorne (1997) for example suggests that students' understandings of plagiarism are much more complex. Other studies of women students (Moss, 2001) have looked at how women re-organise their lives to take into account of the rhythms, times and places of the practices of education. These studies suggest that the sort of responsiveness they value and desire is not the flexibility of the market. Making sense of the cross cutting time zones of modules and semesters, terms and patterns of assessment is enmeshed within lifeworld that overlaps with paid and unpaid work and domestic responsibilities. The idea that modularization and semesterisation, offering students more flexibility, is an assertion based on the market logic of 'choice', rather than phenomenologically grounded enquiry.

Our argument has at its core a model of human beings as being incompletely produced by discourse. Of course the discourse of flexibility and its material practices have effects, but these are not totalising effects. The system analysis that Sayer (2000, 2001) for example defends has much to recommend it. We are not arguing for reducing system to the life world, or that questions of political economy should not be analysed at levels of abstraction, which dissociate system from the concrete practices and properties of individuals. However, knowledge of the lifeworld is important as a way of challenging inappropriate abstraction. This surely must be the case when we are dealing with policy assumptions which recast the lifeworld in terms of the logic of market rationality and flexibility, and offer mechanistic and reductionist understandings of the education process and the role of technology within it.

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Applying National Politics: Linking Strategy with Local Developments

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Abstract

This paper illustrates how networked-learning now impacts across all aspects of the teaching, learning and research provision within institutions. It argues that there is a need to integrate strategy and policy in this area and embed it firmly into relevant policy and practice, and ensure cohesion between constituent elements. The paper provides a context for this work by highlighting current drivers with respect to ICT in Higher Education and in particular the increasing importance which is being placed on the establishment of appropriate higher-level strategic thinking to support appropriate and timely use of networked-learning. It also relates this national thinking to developments at a local level with a case study of the development of networked-learning and its relationship to institutional strategies at the University of Bristol.

Introduction

National strategy and policy for the HE-sector and, in particular, the role of Information and Communication Technology (ICT) to support learning and research, sit within a context of rapid technological change. This provides immense opportunities, whilst at the same time making firm commitment to specific systems or developments very difficult. More recently, there is evidence that this area is maturing; it is becoming integrated into the core business of institutions, and in particular is being considered as part of a wider, more generic learning and teaching debate. The Higher Education Funding Council for England (HEFCE) now requires all HEIs to have in place a clear and demonstrable learning and teaching strategy as a condition of funding. In parallel the Joint Information Systems Committee (JISC) has developed a framework for institutional Information Strategies and most HEIs now have in place an Information Strategy (IS) to ensure that this is appropriately embedded into the institution. It is clear that the focus is on considering the wider implications of ICT within context as the following extract from the JISC's five year strategy for 1996-2001 illustrates:

The successful implementation of information systems into higher education is arguably more a matter of economics, sociology, psychology and even politics than of any technical rationality. Although technological developments are important, such progress needs to be tempered by a sensitivity for the human issues which are ultimately much more critical determinants of eventual success or failure. The JISC will also seek to identify and promulgate information on likely costs and benefits. The development of Information Strategies by the institutions is an important step in identifying and addressing, where appropriate, the necessary changes

The above indicates that ICT is moving from being associated with peripheral innovations and developments to underpinning and affecting all aspects of learning and teaching within institutions. However, it is also clear that the "ICT-debate" should not be addressed in isolation, but needs to be considered across all institutional strategy and policy and also within the wider context, including relevant national strategic thinking and developments. The latter has a profound effect and influence on funding mechanisms and national initiatives and to what extent ICT features within the various funding themes. Current national drivers in the UK for example, reflect some of the thinking above. There is evidence of an increased prominence of the importance of ICT. For example, the National Grid for Learning (NGfL) and the University for Industry (UfI) are major initiatives to increase the base-level ICT skills within the community and to provide a solid technological infrastructure for education from primary through to tertiary level. The shift towards embedding ICT is well illustrated by the Teaching and Learning Technology Programme (TLTP), where the last phase of funding for the programme clearly shifted from development of materials to integration . Recent UK calls for proposals from JISC confirm the above, with a great focus on developing 'joined-up' technologies and providing a solid technical infrastructure with a critical mass of materials through the development of a Distributed National Electronic Resource (DNER). There is also an increased emphasis on repurposing and re-use, as is evident in the lastest JISC calls (the X4L and FAIR calls). In addition the foundations have been laid for the development of a national network for learning and teaching through the setting up of the Institute for Learning and Teaching (ILT) and the 24 Learning and Teaching Support Centres (LTSNs). However, it is still unclear how all of these national initiatives inter-relate and perhaps more importantly, how they impact ot institutional, departmental and individual level.

Within institutions, these national initiatives and drivers impact through relevant strategic fora (such as the learning and teaching, information and human resource strategies), via institutional innovation funds and developments and through the institutions own quality and audit mechanism. Indeed the teaching quality assessment process has been a significant driver to improving teaching and learning and raising awareness of the role and importance of ICT innovation. In part support of this, the institutional strand of the Teaching Quality Enhancement Fund states that institutional learning and teaching strategy "will play a crucial role in improving learning and teaching in HE". In particular HEFCE states funding for this strand could be directed at:

Developing high-quality staff, including supporting membership of the ILT

Innovations in learning and teaching, especially in the use of information communication technologies (ICT)

Transferring and adopting good practices

Activities to increase the employability of graduates and diplomats, including work experience and developing key skills

The recent human resources strategies explicitly articulate the importance of identifying and addressing the ICT skill needs of staff and students . Many institutions are now beginning to 'join-up these institutional activities and externally funding initiatives to provide a more cohesive university-wide drive in this area. The fact that ICT is now recognised as impacting across all aspects of provision within institutions means that the importance of ICT (and its potential impact) cannot be marginalised, or its use considered in isolation. Rather there is a need to integrate ICT strategy and policy across all levels, and embed it firmly into relevant policy and practice, whilst ensuring co-ordination and cohesion between constituent elements. This suggests that there needs to be a long-term approach and in particular a need to develop meta-strategies and a means of inter-relating the different strategic developments.

Professional bodies, national networks and online resources

In parallel to the developments in national policy and initiatives, an extensive array of professional bodies and national networks has arisen which all have some connection or involvement with networked-learning. Figure 1 maps out the national landscape in this area according to three areas of activity: research, resources and practice.

This work builds on a career development scoping study (, which carried out an audit and analysis of learning technologists and their location across the sector. Part of the report mapped the role of these new professionals within organisational structures. Beetham's model consider mapping at a local level (ie the level of a learning situation in the context of the report) in terms of 'Pedagogy', 'tools' and 'resources' and at an institutional level in terms of 'culture', 'tools' and 'expertise'. In this context the areas used are 'research', 'resources' and 'practice'. Figure 1 attempts to classify some of the related initiatives that have arisen as a result of this according to whether they are primarily research, resource or practice focused. Overarching this are the bodies which help to define and drive forward national thinking, policy and strategy in these areas and although others (both national and international) could be included, we focus here on the three more relevant:

The research councils (ESRC and EPSRC) - which tend to take a lead on driving forward research, but also have a role in terms of community building through the development of specialist research centres, networks and seminars.

The JISC - in terms of providing the technical infrastructures and increasingly a body of resources, materials and services for use in learning and research.

The ILT and the LTSNs - in terms of supporting and informing practitioners and building communities of practice.

These link at the institutional level through the cognate subject disciplines in a variety of ways (via research grants, through use of resources at the local level and by involvement with relevant LTSNs). But also through local e-learning units, Beetham et al provide a much richer picture of the current landscape of institutional e-learning units and their locations within organisational structures . Finally, increasingly at the local the value of institutional strategies in terms of linking things together is being recognised, such as Information strategies, learning and teaching strategies and most recently the use of HR strategies.

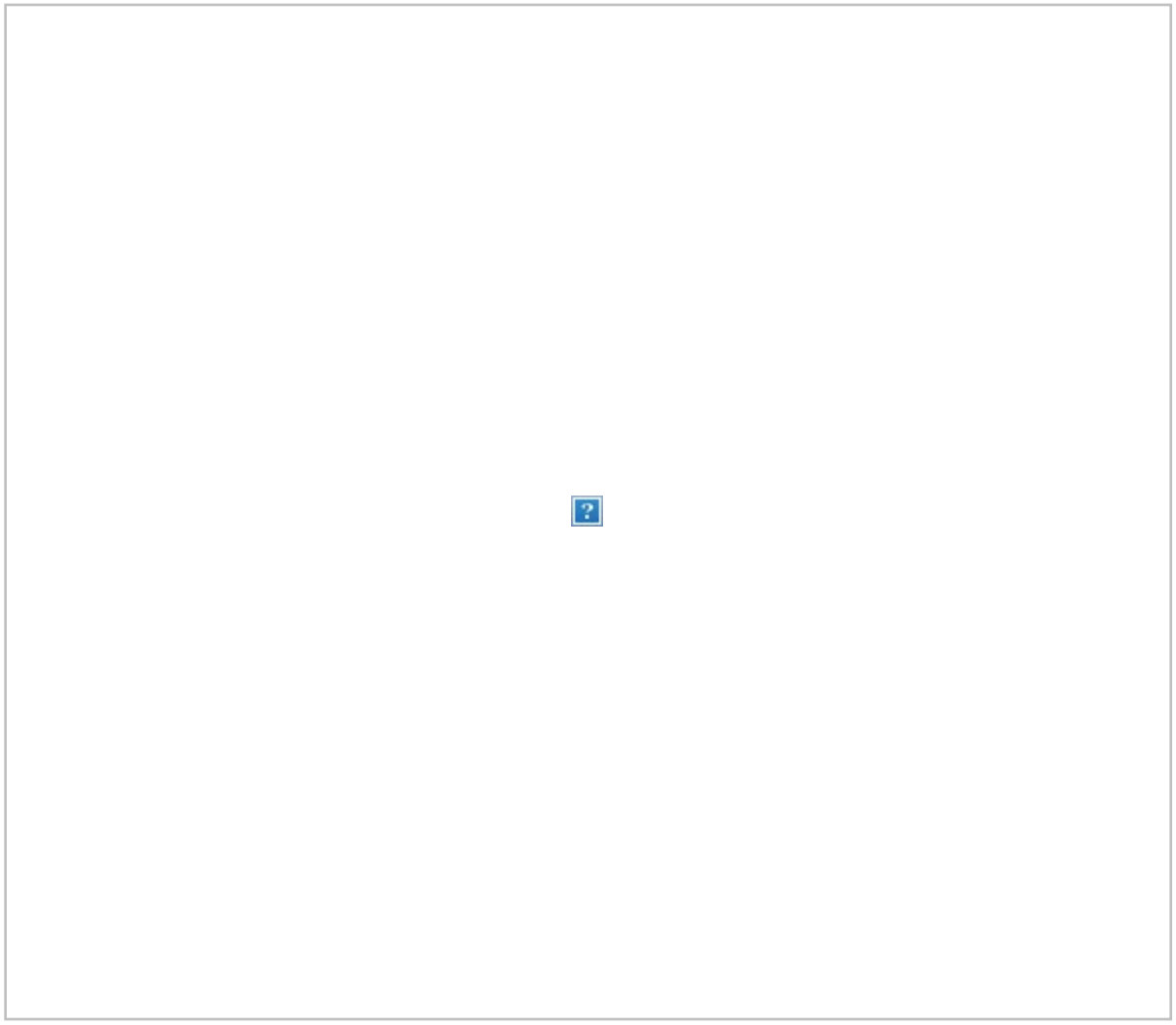

Figure 1: Mapping of e-learning initiatives and national organisations

Overlying the local activities and the national drivers is a continuous 'moving conveyor' belt of topical e-learning technologies. So whereas a few years ago there was considerable activity and debate on the use of 'Computer Assisted Assessment' and 'Networked Learning', recent emphasis has shifted to 'Virtual/Managed Learning Environments' and e-learning. Some of the pertinent projects, resources, and services that have arisen from this are listed on the diagram. Many of these have arisen as a result of funding opportunities and initiatives by the national bodies (JISC, the research councils and, more recently, ILT and the LTSNs) and expansion of the acronyms can be found from the relevant funding body sites. Equally important are the local institutional development, such as projects funded under innovation funds and cross-institutional initiatives (many HEIs for example have developed embedding learning technology programmes and supporting services), more recently many are now moving towards instigating large scale MLEs).

Current ICT developments

This section provides a brief overview of current ICT developments. It is divided into two main categories - Virtual and Management Learning Environments (associated learning technology tools), and digital gateways. A more recent report has been produced by the Association of Learning Technology , which provides a useful contextualisation of learning technologies and technologies, an overview of the main tools and the ways in which they can be used.

ICT can be classified in three main ways: as a tool, as a resource, or as medium for communication . These can range from simple office tools through specialised databases and applications, to subject specific tools (chemical molecule drawing packages or CAD software for engineers). Tools can be used to produce a range of digital resources, ranging from simple text documents, through diagrams and animated presentations, to complex modelling tools. These digital resources can be grouped in a variety of ways, such as by user or subject. Finally ICT can be used as a communication mechanism. There are two main types - asynchronous and synchronous. Examples of the former include email and discussion boards where the interaction does not occur in real time, users post information and others can reply in their own time. In contrast, synchronous communication, by definition occurs in real time.

Examples include live chat groups and video conferencing. Users must participate all at the same, although not necessarily in the same location. ICT tools can be combined in a variety of ways to meet specific purposes and functions, or for use within a specific context. Examples of this will be illustrated with two examples:

The development of an ICT framework of tools (V/MLEs) and in particular their development and increasing role/importance within HE.

Resource and information management via collections of resources, information sources and 'signposting' services (Digital libraries/gateways and portals) and in particular the increasing importance of tailored information to meet specific needs through sorting, collating, collecting and archiving information for specific audiences. A recent detailed JISC report on current practice and developments in digital libraries and VLEs has been carried out .

There are a host of activities that VLEs are purported to support (eg 'encouraging active learning', 'shifting the teacher from sage on the sage to guide on the side' or 'building virtual worlds and online communities'). The reality is more complex and although there is a grain of truth in much of the above the more important point is the context within which these systems are used and how well they are adapted/tailored to specific student needs. Making a discussion board available on a course will not magically create a motivated virtual community of collaborating students with a benevolent smiling ‘tutor on the side’. Therefore although VLEs can be used to significant effect for the delivery of materials, for supporting learning and as a management tool, this is more to do with the way in which the tools are used than the technologies themselves.

VLEs have three main applications; i) as an administrative tool for management, ii) providing a mechanism for storing information and knowledge, and iii) acting as a support or supplement to learning and teaching or delivery of materials. The administrative functionality can be divided into two categories: communication and management. Communication functions include the use of 'Virtual notice boards', Pre- and post meeting agendas, minutes and papers, setting up of tailored email groups and mailing lists, and the use of discussion boards for debates around meetings or issues. Management functionality include the setting up of staff and student details, collaborative document writing, monitoring or tracking of use of materials and resources, as a staff development tool or ‘nursery slope’ in terms of exploring the potential of the online environment and ways of sharing expertise. The second category can be divided into Information and Knowledge. Information management includes: the develop of shared virtual filing cabinets, mechanisms for storing of learning materials and resources, shared repositories of information on course documentation, curriculum, syllabus, timetables and diaries of activities and events. The knowledge management includes: setting up a staff expertise database, models and templates for courses and activities, shared resources, question banks and FAQs, shared bookmarks, and reference repositories. Finally, in addition to the above VLEs can also be used to support learning and teaching in the following ways: use of discussion boards to encourage debate, mechanisms for extending face-to-face contact, pre- and post- workshop topics, peer support groups, live chats around topical issues, and access to subject experts.

Recent interest has shifted to thinking about how these can be ‘joined-up’ with other university administrative and management systems, such as student records and personnel data. A Managed Learning Environment (MLE) might also include administrative information about courses, resources, support and guidance, collaborative information, assessment and feedback; essentially linking up to backend office systems and databases. JISC is currently undertaking a large programme of work on the development of Integrated Environments for Learners or Managed Learning Environments. The programme covers a range of projects and information services that seek to evaluate and pilot information & communication technologies for learning and teaching and promote the uptake of IT-based application to improve student support systems. There is an extensive website associated with this, which includes details and progress on the projects (http://www.jisc.ac.uk/mle/). In addition there are a series of MLE briefings and reports, as well as an MLE information pack .

Over the past five years, number of niche information gateways have developed. The term ‘gateway’ is used to describe a range of Internet sites that in some way provide access to other, predominantly Internet-accessible, resources. Gateways are intended to facilitate resource discovery by their target audience, to help their users find what they need via the Internet. ‘Information Gateway' is a generic term that refers to a whole range of Web-based resource guides pointing to Internet information resources, whereas ‘Subject Gateways’ are subject-based resource discovery guides that provide links to information resources (documents, collections, sites or services), predominantly accessible via the Internet . Resource description and subject classifications are the most important characteristics of such guides. In addition, it is becoming more common for publishers to make journals and books available online (often on some form of individual or institutional charge basis), as well as online data archives, collections, etc. Considerable thought is being given as to how end-users can access and use these resources in a coherent way; a good example of this is a recent definition of a portal architecture by .

There are a host of related issues associated with networked-learning, which can be divided into three main categories, technical, pedagogical and cultural. Technical issues include the current debates surrounding interoperability of technologies and the development of coherent and transparent standards. The JISC provide a number of key services in this area, including i) technology and standards watch, ii) accessibility and iii) legal information (via the JISC Legal Information Service,

http://www.jisc.ac.uk/legal/). In addition there are a host of cultural and organisational issues. The JISC Committee for Awareness, Liaison and Training (JCALT) is a good starting point for finding relevant literature on these kinds of issues (http://www.jisc.ac.uk/jcalt/). See for example .

Issues in choosing and implementing e-learning technologies

Appropriate integration of networked learning within a particular organisational context invokes a complicated set of inter-related issues. There are the technical issues, however how effective these systems are, depends fundamentally on how they are used. In terms of application to learning and teaching, the importance of having good solid pedagogical models is critical, as is the continued need to evaluate and research the use of these systems (research which is really still really only in its infancy). The analogy that a book or library is not a University is very true. Discussion boards *can* be excellent vehicles for supporting online collaboration and communication as both McConnell and Salmon's recent books testify, but they can also provide miserable environments if used incorrectly. The integration of these systems has huge structural implications. For example: Who should be responsible for what? Who should implement, maintain and support these types of systems? Who needs to be a look out for the future? Indeed much of the costs associated with implementation of these kinds of systems are soft hidden ones and in particular staff and user training is key. Staff who are going to be involved in using or developing these systems need time to play and explore them, to reflect on their use in the context of their own practice and over time work towards how to appropriately integrate. Time to do this and time over which to do this is important. Finally the strategic and organisational aspects need to be addressed - clear joined up strategies and leadership, but also buy in and ownership from others in the organisation is important.

So an organisation contemplating implementing networked-learning need to think carefully about its position with respect to the following:

Should the organisation consider buying commercial products or building in-house?

How much of the services and products should be online or face-to-face?

What kind of investment can be allocated to this and more importantly what does this realistically get the organisation?

How joined up or stand alone does the organisation want to be - in terms of the systems and strategic partnerships (particularly in terms of the potential to share resources or technologies)

ICT developments and strategy at the University of Bristol

Like many universities, historically the University of Bristol has relied on innovations developed by enthusiasts. These have been encouraged through internal initiatives or catalysed by timely external funding or major technological advances. Often associated strategy was not resonant (or even aware) of these developments and hence there was a tension and a lack of ability to scale up good practice. Bristol is unusual as it has a large department which focuses on capitalising on ICT-funding opportunities and harnessing it within the university. The department (the Institute for Learning and Research Technology, ILRT) is concerned with the use of ICT for learning and research.

Recent developments at Bristol have attempted to address the disparity between innovations in the use of ICT been primarily the provost of enthusiasts and peripheral departments like ILRT. The main focus has been on providing clearer lines of communication between the different committees concerned with ICT across the University and a more clearly articulated mapping of the benefits of the outputs of ILRT projects and activities to core business. This section will describe some of these different stakeholder groups, their interest and remit and will attempt to show how these groups are now working more closely together to better use and embed ICT.

Each faculty has established groups concerned with the use of ICT to support learning and teaching. In general this work is linked in with other more general learning and teaching issues and reports through the appropriate departmental and faculty working groups and committees. In addition, the University's Learning and Teaching Group develops learning/teaching strategy and advises on internal innovation funding. In addition it considers other policy and planning matters referred to it by the Education Committee. This group has recently been responsible for the University's new learning and teaching strategy, which is acting as a key driver to better integrating ICT across the curriculum.

At the ground level, the Learning and Teaching Group is supported by the Learning Technology Support Service (LTSS), which provides staff development and support for departmental projects, as well as assisting with University-wide projects such as implementation VLEs. LTSS focuses on the pedagogy and aims to share best practices/disseminate information on latest developments to the teaching community. The LTSS works closely with appropriate sections of computing services and teaching support unit (who are responsible for quality and learning and teaching overall), and through the faculties via appropriate

representatives. LTSS also contribute to the new lecturer's learning and teaching programme, run by the Graduate School of Education. In parallel the more innovative and outward focusing research and development work is carried out by ILRT. Co-location of the LTSS with ILRT ensures that the University gains maximum benefit from the findings and outputs of the Institute's research work.

To ensure maximum cohesion between the different type of stakeholder groups, such as those outlined above the university has put in place two fundamental higher level strategies; the information and learning and teaching strategies. The learning and teaching strategy (Clarke, 1999) takes account of all the factors which impinge on learning and teaching provision, and in particular provide an understanding of the wider context and current external developments. The strategy attempts to find a way of best utilising University services and working groups to enhance the learning and teaching provision and to achieve the aspirations set out in the learning and teaching strategy. The strategy aims to build on and go beyond initial innovations in order to ensure the use of technology becomes part of the mainstream activities across the Institution.

These strategies provide clear guiding principles to support the developments and work of the different ICT-stakeholders. In addition, there are now a number of practical manifestations of these strategies:

An audit of ICT provision and support, current provision of suitably equipped lecture theatres and associated computer support is variable across the University. Both strategies make it clear that an adequate supporting infrastructure is essential to support the rise in the number of ICT-related learning and teaching activities.

Each department has now a nominated Learning and Teaching Adviser, who are key to cascading down the strategies and helping to implement at departmental level.

Clearer linking of ICT-project work with institutional strategy has now been established. For example, more explicit mapping of the benefits of the ICT research work carried out by the ILRT. In particular, the strategies seek aims to better integrate these activities in the future and link project and research work more demonstrably to strategy.

Exemplar flagship projects, which attempt to address a range of the issues that networked-learning raise and which are designed to cut across existing institutional structures. A recent example of some of these activities is described more fully elsewhere . In addition the university has recently complete a feasibility study about the implementation of Virtual Learning Environments, which compared the integration of a commercial VLE, alongside bespoke developments . Experience and knowledge gained from this work are now feeding into a more comprehensive and visionary cross-institutional ICT development as part of the university strategic direction over the next five years.

Issues

The linking of strategy with networked-learning activities that this paper has discussed highlights some broader issues which institutions will need to address to achieve full implementation and embedding. In particular, a change in the emphasis of learning and teaching and a shift towards as increased use of ICT will have a number of consequences.

Firstly, this debate highlights that there are divergent opinions on how ICT should be used, ranging from ICT being primarily used to supplement to the more radical view that it should lead to a fundamentally different way of teaching. Whilst it will be important to accommodate where possible these different views, it is important that there is some form of 'institutional view' on where a university as a whole lies along this spectrum. By clarifying the University position in this way it will be easier to plan and phase in associated developments and change, and these can then be more transparently linked to resourcing, training and associated infrastructure change. Secondly, increasing the use of ICT has a significant impact on the IT infrastructure and a number of dilemmas emerge. On the one hand, whatever technology is implemented today (whether it is a new Virtual Learning Environment, an assessment system or a student record system) will be out of date tomorrow. In other words, there is no way of predicting what will be the key drivers for the future. On the other hand, if universities don't capitalise on current developments, there is a danger that the infrastructure will become outdated. Thirdly, universities need to adopt a more holistic approach to providing a truly integrated and joined-up IT infrastructure, but such a system will require significant investment. Fourthly, students are increasingly expecting high-quality delivery and access to resources. Therefore, ICT innovations and developments need to be transparently linked to resources and imaginative strategies used to supplement main provision. Fifthly, substantial staff development will be needed to ensure that all staff are adequately skilled to take advantage of the potential benefits of ICT. However, there is an associated issue of time for staff to attend and complete staff development, to reflect and then to experiment, innovate and evaluate. . One of the most important drivers for increased use of ICT amongst staff comes from the informal cascade process of transfer of knowledge between the enthusiasts and the wider teaching body. This is not currently recognised as an important process. Sixthly, adequate support and training is also needed for students. The increasing impact of ICT in all aspects of a university's work means that all students need to attain a threshold level of IT-competence. In general, it is already evident that it is important that all students receive adequate exposure to ICT. This means they need exposure to a wide range of ICT and implicitly suggests that ICT use

should be a common aspect of most courses in the future.

There are a host of associated issues that need to be taken into account. Firstly there are access issues - a move to increased use of ICT will lead to consequential increase in the demand placed on students to use ICT and hence an increased demand on IT equipment within universities. Increasingly students will opt to have home equipment, and it is likely that a PC (or equivalent) will become a standard application in the home within the next few years. However, in the interim, care must be taken to ensure that we do not violate our commitment to access and move too quickly to networked-learning at the expense of some students. Secondly, there are associated accessibility issues (particularly given the new governmental directives in this area). In terms of accessibility universities will need to ensure that any decisions do not have a significant, irreversible or catastrophic effect on students with disabilities. Thirdly, an increasing shift towards networked-learning consequentially means an increase in flexibility, which in turn means increased flexibility in timetabling and staff teaching hours. Universities need to consider how the whole process can be managed and how to develop a more adaptive form of accounting for staff time.

Conclusions

This paper has mapped current national thinking and initiatives in the use of ICT within HE to local strategy and developments. Form this a series of generic recommendations are listed below, which can be used to help institutions in working towards better integration and use of networked-learning.

Firstly it is important that higher-level strategy work is coherent and focussed and should be in line with national recommendations and developments. The overarching strategy needs to incorporate the vision for the use of networked-learning and a set of guidelines for good practice should be developed. The guidelines will give some grounding for current work, help fuel discussions and provide a mechanism for updating and developing developments in this area, whilst disseminating good practice across the institution. Secondly, universities will need to continue to audit the use of ICT and should develop mechanisms for monitoring innovations. Bristol's activities in this are described more fully elsewhere . Thirdly, institutions may need to increase staff development to support these initiatives, either through central support (in the form of educational developers and learning technologies) and/or through increased faculty representation of this kind. More thought is also likely to be needed in terms of student support, although there is an increase divide emerging in institutions ranging from highly technical ICT-literate students at one end through to complete novices at the other. The needs of both ends of the spectrum will have to be addressed. Fourthly, universities needs to be clear about position with respect to the balance between innovation in this area and the development of cutting-edge technology applications and the confines of the IT infrastructure and support. In general, there is a need for a clearer mechanism for communication and decisions about ICT-related matters across the institution and this should be addressed within the strategy and policy developments. There is also an urgent need to develop appropriate recognition and reward structures for innovation work in learning and teaching (including accreditation, promotion, incentives and remuneration). Finally, greater consideration needs to be given to the evaluation of the cost and educational effectiveness of learning and teaching innovations and developments, particularly with respect to the use and integration of ICT. This needs to become a standard aspect of innovation project work, but should also be evaluated at an institutional level to assess cross-faculty impact and factors.

This paper has described the issues associated with the increased use of networked-learning. It has mapped general issues to local developments and shown how this translates into a series of practical questions that need to be addressed. Finally, the paper concluded with some suggested recommendations for ensuring that the enormous potential offered by networked-learning is harnessed in an appropriate way to enhance and enrich the learning experience of students.

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Complexity, Uncertainty and Autonomy: the Politics of Networked Learning

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ABSTRACT

Much contemporary education and training policy and practice is built on representations of knowledge presented as certain. Ambitious programmes aim to stimulate the rapid spread of knowledge-based computing in order to create ambient intelligence. However, representations of knowledge (ontologies) are unreliable. They depend on identity conditions arising from social structures. Nevertheless knowledge *is* transmitted — that is, learning occurs — systematically and may have self-replicating characteristics. Learning is constituted in discourse, which is mediated, and all cultural goods and social practice are appropriated as mediational means. However, people also engage in discourse in order to produce identity. Thus, there is a recursive aspect to the propagation of knowledge. Certainty is either infinitely regressive or impossible. This leads to the premise that only by rejecting certainty can knowledge be progressive. Discursive practice built on representations of knowledge presented as certain serves to validate authority, limit autonomy and to preserve the unequal distribution of resources. Increasingly technologies deployed in networked learning embody representations of knowledge. Some of these technologies might soon become — or appear to become — social actors. Adaptive systems unite people with machines in learning. Learning to work with such systems will be an important educational theme for the immediate future. This paper sets out a cultural-theoretical orientation for a research agenda that might inform the development of networked learning.

Key words

learning technology, education policy, culture theory, uncertainty, complexity, adaptive intelligent systems, mediated discourse analysis

Introduction

Much contemporary education and training policy and practice is built on representations of knowledge presented as certain. Ambitious Information Society Technologies (IST) programmes aim to stimulate the rapid spread of knowledge-based computing in order to create ambient intelligence, "AmI" (ISTAG 2001). However, representations of knowledge (ontologies) are unreliable. Such policies and practice serve to validate authority, limit autonomy and to preserve the unequal distribution of resources. This paper sets out a cultural-theoretical orientation for a research agenda that might inform the development of IST in networked learning. It considers networked learning technologies from two broad perspectives: 1) the IEEE Learning Technology Support Architecture and 2) Ron Scollon's "Mediated Discourse Analysis".

representation of knowledge and the question of identity

Ontology

Before considering the propagation of knowledge in a system, I want to look first at ontologies. An ontology is an ordered classification of knowledge that assigns meaning (semantics) to instances and classes of items according to a structure or schema. For example, the domain knowledge of an expert system is an ontology. In current educational policy and practice NVQ competency frameworks are ontologies. Computer-aided assessment (CAA) question and answer banks are ontologies. Other examples of ontologies include metadata, library catalogues, grammars and lexicons, instruction manuals and faith creeds.

Identity and complexity

The question of identity is important in the representation of knowledge. As Guarino and Welty (2000) assert, "Identity is one of the most fundamental notions in ontology, yet the related issues are very subtle, and isolating the most relevant ones is not an easy task." Identity, and the related concept, unity, are the primary means by which ontologies are built. Identity is concerned with properties of things (abstract or concrete) such that it might be known that an instance (a single thing) is a member of a class by virtue of a certain property or properties (unity conditions) and yet is unambiguously itself by virtue of other properties (identity conditions). For example: I am a man by virtue, say, of a particular arrangement of chromosomes (unity condition), and I am me by virtue of having been born to a particular woman, my mother, at a particular place and time (identity conditions). However, identity is complex. What it means to be a man in society is more than an arrangement of chromosomes. That is, formally, identity may not be describable by a single rule, its structure may exist on many scales whose characteristics are not reducible to only one level of description and it may exhibit unexpected features not contained within a specification (see CALResCo Glossary). For Deutsch (1997), this epistemology is a fundamental component of the fabric of reality: "Knowledge," he says, "can be understood as complexity that extends across large numbers of universes." Even without Deutsch's many-worlds view, reduction of complexity will feature large in the development of any ontology.

Machine learning

In machine learning, complex identity questions have been ignored. For example, an automatic adaptive intelligent supervising process controller (Burnham et al., 2000) for a combined-cycle gas turbine (CCGT) power plant uses an expert system, comprising domain knowledge (an ontology) about the thermodynamic and electro-conductive (among other) properties of the materials in the system, with an operating model and a Bayesian inference engine. The controller does not worry about the identity of components in the system, or unity properties of steel in general. A self-adapting controller might modify the operating model without human interference, based on operating data. The process by which the controller learns about the operating conditions of the specific installation and modifies the operating regime can be modelled without modifying its ontology. Adaptation occurs down few pathways.

Social origin of identity

Identity problems becomes increasingly important — and more problematic — as the domain of application becomes wider, more abstract or computationally less tractable. As Guarino and Welty (2000) further observe, judgements about identity and unity are relative and based upon assumptions:

> The actual conditions we use to support our judgements concerning identity and unity for a certain class of things vary from case to case, depending on the properties holding for these things. If we find a condition that consistently supports identity or unity judgements for all instances of a certain property, then we say that property carries an identity or a unity condition. Of course, deciding this depends on the assumptions resulting from our conceptualisation of the world, i.e. on our ontology.

This regressive, relativist, assumptive basis of ontologies in a personal ontology gives rise to both formal and "common-sense" problems. The principal common-sense problem has to do with the identity of individual human beings. Agre (1999) places the problem of identity at the centre of social and institutional life, and observes that:

> ... the concept of identity is interpreted in quite different ways. A vast intellectual and popular discourse, for example, speaks of ethnic identities, of the role of identity in the construction of nation and community. ... Identity in this sense is a public, symbolic phenomenon that is located in history, culture, and social structure ...

Identity emerges from social systems, which, according to Forrester (1995) are themselves complex, "...multi-loop non-linear feedback systems." Given the problem of identity, the validation of systems based on representations of knowledge will remain problematic (Gonzales and Barr 2000).

Learning Technology support architecture (LTSA)

The IEEE Learning Technology Systems Architecture (LTSA) (figure one) provides a very useful cybernetic model at a high level of abstraction of the propagation of knowledge — learning — in a system. Pangaro observes that:

> Cybernetics ... has evolved from a "constructivist" view of the world where objectivity derives from shared agreement about meaning, and where information (or intelligence for that matter) is an attribute of an interaction rather than a commodity stored in a computer.

The architecture consists of four interacting "Processes": "Learner Entity", "Evaluation", "Coach" and "Delivery", two "Stores", "Learning Resources" and "Learner Records", and a number of "Information Flows" between the Processes and the Stores.

The generality of the LTSA model arises because it makes no specification about the phylogeny (biological or non-biological) of the processes or the stores. It describes a set of relationships and functions by which knowledge is propagated in a system. This propagation of knowledge can be called learning. The model is valid on the mechanical level (automata), the genetic level, and throughout the kingdoms and orders of life. Life is here considered a class of self-replicating automata.

Figure 1:IEEE Learning Technology Support Architecture System Components

Finite automata

For the purpose of the model it is sufficient only that each Process and Store have the characteristics of a finite automaton. The characteristics of a finite automaton (Gravell and Ultes-Nitsche, CM219) are that 1) it exists and 2) it can be replicated (although it need not necessarily be self-replicating); 3) it receives inputs and 4) produces outputs 5) using letters, events or other signals (S), which are 6) organised in a language (L of S *) according to validation rules (morphology, grammar, syntax, or indeed physical laws); 7) it has an internal state ($q_0 \hat{\imath} Q$) that 8) can change in accordance with 9) a transition function (d) such that, 10) as a result of a valid input in the language, the internal state becomes different (d : $q_0 \prime$ S ® q_x). Any process or any store might be a single individual (biological or non-biological) or any number of individuals (all biological, all non-biological, or mixed) organised in some way.

The LTSA models human, animal and machine learning but, although it may be hypothesised, it cannot be demonstrated that the LTSA might be implemented without human intervention. In education practice, the Process nodes are usually people or organisations of people, or are roles conventionally or necessarily done by and for people. Increasingly, people are assisted by computing in undertaking these roles.

evolutionary replication of knowledge

So far I have claimed that knowledge can be propagated within a system by both biological and non-biological automata, but that representations of knowledge are problematic, because identity 1) is based on assumptions and 2) emerges from social systems. I will now look briefly at the memetic quality of knowledge. According to Deutsch (1997, p. 170), "A replicator is any entity that causes certain environments to copy it." As life is based on molecular replicators, that is, genes, so too does the replication of knowledge appear to be based in part on similar principles. I do not wish to address memetics in detail here, nor do I wish to revive linguistic determinism (Pinker, 1994, pp. 52-53). I take knowledge to be an abstraction that might be mutually constituted with the knower, but cannot be shown to be constituted independently from the knower. Knowledge is to some extent emergent, self-ordering and evolving within a "niche" or "environment". In certain environments certain knowledge is replicated, and it appears that the instruction for replication itself is replicated and included in subsequent generations. Popper also draws evolutionary analogies for the propagation of knowledge:

> On all three levels that I am considering, the genetic, the behavioural and the scientific levels, we are operating with inherited structures which are passed on by instruction — whether through the genetic code or through tradition. On all the three levels, new structures and new instructions arise by trial changes from within the structure: by tentative trials, which are subject to natural selection or the elimination of error. (Popper 1994, p. 4-5)

Mediated Discourse

Learning — the propagation of knowledge — is social action. It engages social actors in social systems, which are formally complex. Laurillard (1994) says, "... remember how complex the learning context is, and how little control we have over any part of it". Social action — and therefore learning — is constituted in discourse and discourse is mediated. We cannot "purge our minds of all theories" (Popper , 1994, 86), indeed, "all observations are theory impregnated. There is no pure, disinterested, theory-free

observation" (Popper, 1994, 8). Scollon's Mediated Discourse Analysis provides a structure for considering the environments within which knowledge is propagated.

Scollon (2000, p. 13) shows that humans do not engage in practice or in practices (i.e. do things) simply for the sake of producing the practice over time. There is always a focus is on the production of identities: the self-construction of the social actor. Social action requires the deployment of practices and mediational means at a site of engagement. A practice is a historical accumulation of mediated actions which are recognisable to other social actors as 'the same' social action. That is, they share unity conditions.

Mediational means are:

> ... not just abstract or cognitive systems of representation such as languages or systems of visual representation, but also any and all material objects in the world which are appropriated for the purposes of taking a social action. This would include, for example, the layout and design of the room as well as the grammatical structure of any utterances made by the social actors. (MDA)

Similarly a site of engagement is a location in and among many discourses.

Social actors themselves and the objects — material and abstract — of their culture are all means by which discourse is both mediated and replicated. Mediation and replication occurs at a site of engagement, which is the coming together in discourse of social actors and mediational means. Sites of engagement constitute the "niche" or "environment" within which discourse evolves, and sites of engagement co-evolve with discourse. The evolution of discourse is evidence of learning.

Sites of networked learning engagements

The LTSA can be seen as such an environment: a general model for sites of engagement where the Processes and stores within the LTSA are the social actors.

Complexity and the LTSA

While the LTSA is a simple representation, the propagation of knowledge within a system is complex. An observable feature of this complexity is that at each Process node, the entire LTSA can be recapitulated. This complexity is present regardless of the origin of the agent of the process. For example, evaluation may be undertaken by a team of evaluators assisted by a decision support tool. That evaluation panel will have learned, through formal or informal processes, how to conduct the evaluation. The decision support software used by the panel will also have been "instructed", that is its state will have been changed by being set with particular variables. The evaluation panel has at one time had the characteristics of a Learner Entity, and those characteristics persist — are recapitulated — in the Evaluation process. The Evaluation node is learning as it goes along. Similarly a student may have access to considerable personal Learning Resources in the form of experience that can be drawn upon, and, through reflection, can be self-delivered. That student may also weigh options and advise (Coach) him/herself on programmes of study and may well also evaluate her/his own performance. That is, the LTSA is recapitulated within the Learner Entity.

The virtual problem

Deutsch suggests that virtual reality and reality share the same ontological status; that is: virtual reality is reality and vice versa (Deutsch 1997, p.121). While this may be extrapolated from Turing's and von Neumann's work current technology is incapable of rendering virtual reality such that it does not appear somehow different from reality. The term virtual, applied to any construct, carries with it a number of unity conditions that somehow sets "virtual" instances of a class apart from "real" instances of the class. I only need to introduce my "virtual girlfriend" to illustrate the point. Learning technology applications development in UK HE, until very recently has been dominated by the proliferation of Virtual Learning Environments (VLEs). Almost without exception these are accessed using Internet technology and some form of personal computer.

Politics, ideology and learning technology

Tony Bates (1995) recognises the difficulty in positing ideological neutrality for any educational use of technology: "... there is a direct link between the use of technology and different ideologies of teaching and learning." That is, regardless of the discourse, one of the mediational means appropriated to it is the computer. And, any discourse with a computer using the Internet, brings Microsoft to the site of engagement. And, it is more than Microsoft. As Naomi Klein (2000) might say, brand choice is no choice; whatever brand you choose, branding is strengthened.

At the level of the individual it can be seen that, "... the increasing sophistication of online resources and virtual environments ... can provide a biased view or filter out information that might be of relevance to the user." (Conole, 2001). At the level of the nation,

education policy has replaced industrial policy as the means by which the government competes in a global economy (Field 1995). This has encouraged the adoption of an instrumentalist curriculum intended to be closely aligned to the needs of industry. The principle of "chunking" learning (enshrined in policy DfEE, 1999, 66) lends itself to the support of an administered market in education (cf. Ranson 1994). In this education market, the authority of those who manage capital is substituted for the authority of those who manage the state (cf. Ball 1990). This authority prefers the employer over the employee, the centre over the periphery and is concerned with the validation of authority itself. The validation of authority is ideologically motivated: consistent with the increasing concentration of power and other resources, and the widening of differential access to social and material goods, including education. It aims to limit participation in the discourse of learning and hence is anti-memetic: limiting the advance of knowledge.

Information Society Technologies

Future developments will see the emergence of hybrid complex adaptable automata. With expert systems, machine learning and virtual reality, our concept of learning has moved beyond the person to embrace not only learning technology but the learning organisation and the learning society. As the LTSA may be recapitulated in any of its process nodes, so organisations and society can be assumed into the Learner Entity (or, indeed any Process).

Intelligence in learning technology applications

In learning technology applications, content and knowledge management systems facilitate the creation of Learning Resources and the building of the Learning Resources Store. Authoring systems also help design the Delivery, Evaluation and Coaching Processes and related Information Flows. Increasingly, intelligence is being built into these systems, which incorporate considerable knowledge of the course design process using wizards and extensive context-sensitive help to guide the course development team (Dean Interactive 2001). These systems and others like them facilitate the rapid production of courseware. They are based, implicitly or explicitly, on underlying representations/models and "facts" (ontologies) about learning itself. This is to say that they manifest an unreliable conceptualisation but present it as reliable.

Sentient computing

The AT&T Sentient Computing Project at the University of Cambridge asks, "What could we do if computer programs could see a model of the world?" (AT&T 2001), and posits that, "By acting within the world, we would be interacting with programs via the model. It would seem to us as if the whole world were a user interface." The concept of machine sentience finds expression in applications such as the "Future House" (Kidd et al 1999 and see also Georgia Tech, Future Computing Environments Smart House Web Survey). The EU Information Society Technologies (IST) programmes envisage "ambient intelligence" (AmI): persistent, ubiquitous, adaptive computing where the environment is the interface (ISTAG, 2001). **Person-based, mobile and location-aware applications are becoming increasingly able to adapt to environmental and knowledge inputs (see, e.g. Roussopoulos et al, 1999).**

As sentient, location-aware information agents emerge from the laboratories and begin to have identifiable persistent existence on the Internet (Coen et al 2000), some will be acting for commercial interests, some will be acting for personal interests and some will be acting for and against the interest of the state. The questions that arise are fundamental to society. Optimistic services for mobile people have counterparts in limiting mobility:

> Electronic monitors can be used on a number of offender and suspect groups and situations, including pre-trial defendants on conditional release and convicted offenders on probation or parole. It may also be used as part of intensive supervision or work release (day parole) programs. (John Howard Society 2000).

Location-based systems, whether for marketing, communication or monitoring are provided with or induce rules that cause messages to be sent either to the retailer, subscriber or to the security service operator when certain location events occur. Other location-based intelligent surveillance systems analyse the movements of people observed on CCTV, alerting operators if deviant patterns are detected (see Integrated Machine Vision Project). Similar induction engines also monitor credit-card transactions, learning rules for the behaviour of individual shoppers in different locations, for example purchasing behaviour at home and abroad. If behaviour contrary to rules derived by the system for the user of that card is detected alarms can be raised (Chan et al 1999, and Mende).

Evolutionary computing

McMullin (2001) has recently suggested that in the late 1940's John von Neumann, drawing on Turing, demonstrated that logically, a "general constructive automaton" might produce any machine at all. A "constructive automaton" is a specialised Turing machine whose function is to manufacture ("construct") another machine. As a universal Turing machine can carry out the function of any

specialised Turing machine, so a "general constructive automaton" can construct any machine that a specialised constructive automaton can construct. One form of constructive automaton is a self-replicating machine. Therefore a general constructive automaton is also self replicating. In the case of phylogenetic evolution it is taken as self-evident that complexity has increased over time. It is therefore assumed that simple automata must be able to give rise to more complex automata. von Neumann first demonstrated that any machine of arbitrary complexity might be self-replicating. Then by allowing for "perturbations" (i.e. mutations) in the description, additional constructional pathways are opened up. Some of these will be degenerating, but others will be pathways of increasing complexity. von Neumann's work forms the basis of next-generation of adaptive systems.

Personal information agents

Personal Information Agents are beginning to emerge that may have interesting educational application (see MIT Software Agents Group, UMBC Agent Web and Agent Link). Personal Information Agents act as mediators between individuals and the world. Applications are envisaged that may help preserve the personal anonymity of the human component of the human-agent pair: the agent acting as a filter, screening information and only allowing the person to see what the agent's induction engine has determined to be useful from long hours observing the person's preferences and behaviour. Such agents will be socially intelligent (Dautenhahn 1998). Dautenhahn supposes that relationships that develop between people and their personal information agents will be co-adaptive. Not only will the agent learn the human's preferences, "... agent tools that are behaving socially can influence human conceptions of sociality".

conclusion

This paper has set out a cultural-theoretical orientation for a research agenda that might inform the development of networked learning. Stephen Hepple (2000) asks, "Do the new technologies herald the beginning of an era of a new broader literacy?" Learning is social action, constituted in discourse, which is mediated. Any and all cultural goods and social practice are appropriated as mediational means. However, people engage in practice and discourse for the purpose of producing identity. That is, there is a recursive aspect to the propagation of knowledge. Certainty is likely either to be infinitely regressive or impossible. This leads to the premise that only by rejecting certainty can knowledge be progressive. Much contemporary education and training policy and practice, however, is built on representations of knowledge presented as certain. Such policies and practice serve to validate authority, limit autonomy and preserve the unequal distribution of resources. Increasingly the technologies deployed in networked learning embody representations of knowledge. It is expected that some of these technologies might soon become — or appear to become — social actors. If these social actors are to engage in the progress of knowledge rather than the validation of authority, they will have to be inherently uncertain. Learning to work with such systems will be an important educational theme for the immediate future.

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