

NIACE Lifelong, life-wide learning Inquiry Technology¹ and Learning - some observations

"If you asked that child making the picture, "What are you doing?" she would have said, "Making a picture, making a bird." It's very interesting to compare this - imagine going to a poet and saying, "What are you doing?" You'd be very surprised if the poet said, "I'm using a pencil". The poet would have said, "I'm writing a poem," or, "Leave me alone, I'm busy." Of course the poet was using a pencil, but that's not worth saying, and the same should be true of computers."

"Nobody knows how computers will be used in 10 or 20 or 30 year's time. What we do know is that they'll be everywhere, as much as pencils. Everybody will have them all the time."

(Seymour Papert; Conference, Japan 1983).

"I bought a paper last week. And as I stood fumbling around for the 70p, it suddenly struck me: this is a very strange way to go about things. I give the guy some coins, he gives me a whole sheaf of stuff, only bits of which I actually want, and then the next day I chuck it all away. How weird is that?"

(Martin Wright; Green Futures November/December 2006)

¹ In using 'technology' throughout the Paper, I am referring to information and communications technology but in particular, the Internet.

1.0 Introduction.

The purpose of this Paper is to provide some observations regarding the role and influence of information and communications technology, but in particular the Internet, on the ways in which adults will access and manage learning in the future. By the future, the view I am taking is based on the idea of 'a school generation' - so, twelve to fourteen years: the time it will take those just starting school to reach adulthood. It doesn't really feel a very long time. But of course in terms of digital technology it *is* a long time, if we recall that it was 1993 when the Mosaic web browser was introduced, generally considered to the turning point for the start of the world wide web - all of fourteen years ago.

I am also making these observations through a lens that does not see 'learners' and 'non-learners'. Apart from those terms being discriminatory, their use prejudices the wider view of those information and knowledge transactions that happen throughout life, in circumstances quite outside formal education. To exclude this would be to obscure a view of where many, if not most, of the technical and behavioural shifts are taking place.

The content of this Paper owes a great deal to a range of references, formal and informal, derived from publications but also interviews² and discussions. I have attempted referencing of these as appropriate, but it is not as comprehensive as it should be.

We witness endless debate and political hand-wringing regarding what education is for and how learning processes function. But less central to this is how technology questions how people can *learn differently* - not so much how we can *teach differently*, that is an important distinction.

But it is often technology that prompts questions about control and role, formal and informal. Technology itself is providing the growing emphasis on the importance of not only acquiring knowledge and information, but on developing the resources and skills necessary to engage with social and technical change, and on continuing this throughout life.

We are witnessing the rapid proliferation of technologies which are less about 'narrowcasting' to individuals and more about the creation of communities and resources in which individuals come together to learn, collaborate and build knowledge (social software). The 'upside' view of the intersection of these two trends offers

² I am particularly grateful for the interviews I have had with staff with Morgan Stanley, the Judge Institute University of Cambridge, Arc Limited, and Futurelab.

significant potential for the development of new approaches to education. The 'downside' view offers an illusion of the personalisation of learning, with the reality being the personalisation being actually dictated by mass movements and self-interest at industrial level. Either way, there are certainly opportunities being presented by technology that are unparalleled in our history, relating to how knowledge, creativity and innovation can be generated in the practices of the 'information/knowledge society'.

Undoubtedly we are seeing fundamental change in the way in which information and knowledge is organised, moving away from strictly classified 'disciplines' and 'subjects', to more fluid and responsive practice which allows information and knowledge to be organised and accessed in ways that can have different significance at different times and in different places. At the same time, we see massive change in the 'spaces' for information and knowledge, from its emergence within discrete institutional boundaries, to its generation in virtual and cross-institutional settings. Moreover, the ways in which we engage with information and knowledge are increasingly characterised by 'multi-tasking', engaging with multiple and overlapping information and knowledge streams. There are also changes in our understanding of practices of creativity and innovation – from the idea of the isolated development to the concept of 'communities of practice', where reflection and feedback are important collaborative processes and the process is on-going rather than finite.

Inevitably these changes are creating confusion and anxiety. No more so, of course, than with those governments, organisations and individuals who have a perceived interest in the ownership and control of information and knowledge systems.

At best, the changes are making governments, organisations and individuals think less about prescribing the content of what should be learned and more about how best to enable learning.

There is a key issue in terms of looking at the historical perspective of how education has become engaged with technology. For the digital technologies used in education have largely been, particularly in the case of hardware, 'hand-me-downs' from the leisure, defence or business worlds. The desktop and laptop computer, the PDA, the whiteboard were all first designed for business, not education. Similarly, if we look at the history of the development of 'ICT skills' in education, these have been introduced primarily in the service of an economic agenda. Educational institutions have been equipped with hardware and software and ICT has been introduced to ensure

that learners compete in the workforce. ***One result of this has been the retention of the idea that the role of digital technologies in education is simply a question of 'modernising it' and a corollary of that is the tacit view that really the fundamentals of teaching and learning, curriculum and institutions do not need to be changed. This is a deeply mistaken position.***

But how can we re-position? Will the 'world of work', the employer 'demand side', be the agents of change? The prospect looks doubtful, certainly if one looks at more conventional business practice and its views of human resources development. Perhaps the drivers are coming from other directions. We are witnessing social practice skills, increasingly being mediated through technological developments, being defined and developed primarily through informal, 'domestic' and personal contexts. It is here that much of the experimentation is being driven. For example, ownership of mobile phones has grown exponentially over the past four years and while this is particularly marked in the context of younger people³, the increase is spread across the adult age bandwidth and across socio-economic groups. As these phones become ever more sophisticated with multiple functions and a convergence of media internet access and MP3, video games, camera capabilities etc., people also see and engage with the convergence of Internet-enabled media products within the context of the home. As the technical developments continue, we see a proliferation of technologically mediated behaviour and interaction that becomes more unpredictable. We have reached the position where people, of whatever age, cannot be expected to abandon these experiences and behaviours when they 'enter the gates' of formal education. In some cases the educational and social establishment have erected rules to shore up their defences against what they judge to be unmanageable, but in other cases those in formal education are examining the ways in which these behavioural realities can be used to support learning within more formal contexts. But there is a profound difference between grudging acceptance and willing recognition of the opportunities.

The question of 'what and who is leading whom?' is not of course confined to education. A similar question hangs over the areas of government and citizen engagement more generally. Technology may be contributing to peoples' disenchantment with politics and centralist versions of democratic processes, but it may also pose a solution. Politicians have suggested⁴ that "digital technology has important implications for the relationship between citizen and

³ 95% of 16-25 year olds own a mobile phone: OfCom (2006); Consumer Panel Report.

⁴ The former Home Secretary, David Blunkett: IPPR (2004); Manifesto for a Digital Britain.

state" and that "the new technologies define(s) society so completely that they should be at the core of the content for citizenship education". *It may be that this response is particularly telling, as it suggests that the way forward is to study the new phenomenon by the old methods, as opposed to engaging with the phenomenon itself.*

This observation really returns us to education and learning, to see whether we will be able to remain 'once removed' or whether we will really engage. Of course, the situation is that the idea of any choice is actually illusory - non-engagement is in fact not a menu option.

In considering and the position of education and technology, we need to acknowledge that adult learning and education is contextually far more complex on almost all counts than school-based learning and education and in many ways the volatility being introduced by technology and technologically-practised adult learners is more difficult to respond to. But really the point is that it is only a matter of time until there is a considerable blurring of the distinctions between school and adult learning and when those now at school become adults in due course, bringing with them a level of expectation and experience in relation to the use of technology, it will require adult education to be very well prepared in terms of understanding the issues.

It will simply not be sufficient for that state of preparation to be managed in terms of knowledge and acceptance of whatever may be Government policy on technology and education. The real drivers of change will be coming from many other sources.

2.0 The influence and impact of technology.

2.1 'Hard' or 'Soft' views of the influence of technology.

So, what is it that is so 'new' about current and prospective technology and what is and may be the nature of its influence? Basically, there are two views:

- a) The role of technology as amplifying existing behaviour and practice.
- b) The role of technology as changing existing behaviour and practice.

We can give a) and b) a name each:

a) can be termed '*status quo+ technology*';

and,

b) can be termed '*disruptive technology*'.

Both views are correct. Sometimes the changes we see have one characteristic, sometimes the other. Sometimes the influence of technology operates on one level but then dramatically changes due to particular factors of timing, congruence with other technologies and social or political shifts. Where we often are mistaken is in assuming that we will spot disruptive technology by looking at the technology itself as opposed to peoples' behaviour with it. Nowhere is this truer than with the Internet and the world wide web.

We forget perhaps that Web technology's first use was essentially a form of social software: it was a tool for physicists to share and discuss their experimental findings. But the subsequent 'development' into what we now term 'Web 1.0' was actually quite retrograde, working primarily as a massive if flexible repository of information that was accessible but that limited contribution and dialogue. However, in the past three years or so, with a series of developments that have become known as 'Web 2.0', we have witnessed a renaissance of the idea of 'social software' in the emergence of tools, resources and practices that can be seen as returning the web to its early potential to facilitate collaboration and social interaction.

So, the early days of the Internet can be seen as 'status quo+', in that the technology was simply assisting and so amplifying existing behaviour. Where Web 2.0 moves to becoming 'disruptive

technology' is through a combination of factors: technical, commercial and social that has revolutionised the scale of access and is opening up the idea and reality of interconnection to people who had not previously practised or considered it before. It is therefore scale and ubiquity that trigger the disruption, rather than the technology itself. This is a fundamental observation for formal education, because it needs to observe and understand the 'tipping points' in technological pervasiveness. It may be that the tipping points are occurring primarily in contexts outside education itself, in broader society, and then back up into formal education. This entirely changes ideas about ownership and control and its relationship with policy. Howard Rheingold, in 'Smart Mobs' (a pun on the ideas of mobility and a mass of people intelligently acting together), argues that:

"Smart mobs emerge when communication and computing technologies amplify human talents for cooperation. The impacts of smart mob technology already appear to be both beneficial and destructive, used by some of its earliest adopters to support democracy and by others to coordinate terrorist attacks."

We are really still awaiting real 'smart mob' behaviour within formal education, but all the signs of it happening are assembling.

2.2 The Technological Revolution - industrial scale or wider?

The development of computing and the digital technologies can be termed an 'industrial revolution'. Industrial revolutions cause profound and paradigmatic social change. The scale of technological change in the last twenty five years is characterised not only by its speed but increasingly by its pervasiveness across all sections of society, eliciting highly unpredictable degrees of passive or active response. So, the term 'industrial' does not seem in itself wholly adequate as a descriptor. A good example of this is the way in which Short Message Service technology developed and the uses that have been developed for it.

Within the technological revolution, in both industrial and social terms, there are many versions of 'have's' and 'have not's', adopters and non-adopters, and varieties of exclusion - socio-economic and attitudinal. These issues are not limited to the fiscal. We will need to redefine the nature of 'exclusion' in relation to technology.

The technological revolution has meant that the role of education systems and institutions in meeting the needs of society in the

context of economic and social development has been rendered much more complex. But this complexity may not be the most problematic aspect for formal education. For if we recognise that the present 'industrial' model of schooling evolved to meet the needs and form of a particular phase of capitalist industrial development, and that pre-1840 this was not the predominant context for learning, then not only is education's capacity to respond to technology in terms of 'teaching about it' being questioned, it questions its whole role and position. This is particularly the case when the knowledge and communications management systems being developed by digital technology seem more closely related to the pre-1840 context, where learning was more informal, through social networks (albeit highly contained) and by what we would now call work-based or practice-based activities. But there are also some interesting parallels between responses to the 1893 Elementary Education (School Attendance) Act and responses to technology-enabled social networking and learning - concern that such developments might mean encouraging 'free-thinking' and potential revolt against centralist authority⁵; also, there was the fear of 'indoctrination' - as there is today with the concern that the commercial interest behind much of the Internet's development and 'product' indoctrinates the user.

The 18th and 19th century Industrial Revolutions imposed new requirements in terms of skills and knowledge that were justified in that sense. We can analyse that much remains in our current approach to the curriculum and to pedagogy that is based on the Taylorist organisation of production. It is this very position that is being challenged by the technology revolution, whether one takes the 'hard' or the 'soft' view of the influence and impact of technology. It may be helpful to look at some aspects of the challenge in more detail and perhaps consider whether they constitute a fully disruptive scale of likely change.

2.2.1 The re-introduction of lifelong learning

Lifelong learning can be viewed as simply giving a formal term to what we do anyway in order to negotiate and survive life, some being more adept than others. As stated above, circa 1840 in England, we can see the start of a process when the State started to organise learning. We can see points at which other organisations and movements provided different versions of such organisation, for example those rooted in the workers movement, focussing on improving their own as opposed to 'state/industrially-required' education, providing access to broader learning resources and linking this with social activity. There were points at which the

⁵ I am obviously referring to the sort of argument currently propounded against the development of Wikis and knowledge sources developing and operating outside hierarchies of academic authority.

various views and practice interconnected and were also guided by a belief in the power of education for emancipation. So we see over the years there has been a changing picture on the degree to which the State supported the wider belief and where it was mistrustful or dismissive of it.

More recently, the picture seems to have narrowed in terms of the rationale for lifelong learning and this has been attributed still to industrial and business competitiveness contexts, but where now a shorter product life cycle, an increasing speed of adoption and an increasing instability of employment, is 'reasoning' that employees need continuous learning throughout their work-life to update their occupational skills and knowledge or to learn new occupational competences. What seems to have taken much of the energy of discourse is who would be responsible for this and this is still playing out. While it does so, the realities of business competition, the influence of digital technologies and the needs of individuals in their social contexts have been developing their own profile defining lifelong learning. This is emerging as much closer to an idea of learning as multi episodic, with individuals spending occasional periods of formal education and training throughout their working life, but the role of informal learning and peer and social networking growing both in importance and in technology increasingly supporting them to do so.

Meanwhile, despite the rhetoric in most countries, there is little evidence of really coherent moves to support lifelong learning at formal, political level or to understand the informal versions of it that are developing. In its insistence on education being defined by the idea of employability, the skills strategies place considerable emphasis on continuing learning and the updating of skills and competences for the individual on the learner themselves. What constitutes support within the increasingly technology dominated contexts of information and knowledge is not always understood and so the individuals get reintegrated within the outdated, inflexible systems which have failed them in the first place⁶. *While it is often learning providers that have been held to account for not delivering fit for purpose, flexible provision for adult learners, it is increasingly exposed that it is in fact the administrative and funding methodologies that are at fault.* Unfortunately, it has been the case until comparatively recently that computing technology has been deployed primarily for managing the administrative and financial systems rather than for supporting learners and learner infrastructures. It may be the case now that we are beginning to see the balance tip in favour of technology serving the learners and this, together with the weight of the learners' own increasing

⁶ Graham Attwell, Director, Pontydysgu.

expertise and technological access, will see a scale of disruption that centralised administrative and financial systems in their current form will not survive.

2.2.2 Disruption of established learning environments

Perhaps the most compelling challenge to our present systems of formal education and training and the major disruption to its ethos will be caused by the ways in which people are using digital technology to access and manage information, knowledge and construct their own environments, inclusive of links to other people, groups and organisations.

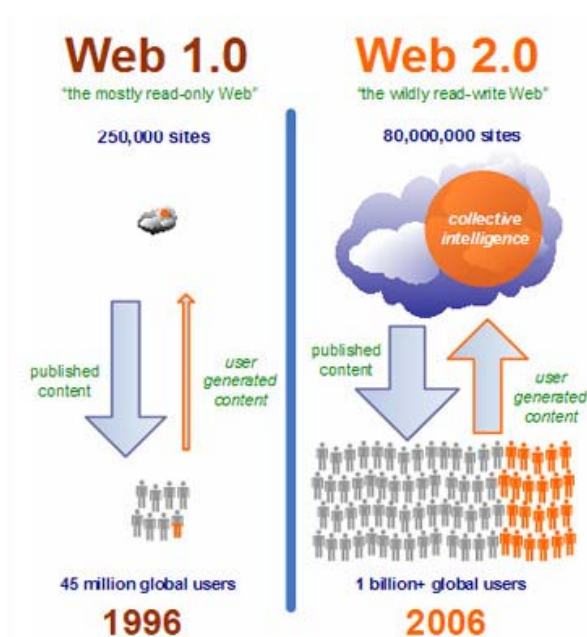
Over the past decade, we could describe learning environments, including Web 1.0 derived, as having these characteristics:

- centralist; prescribed learning; admin teams;
- collaborative tools about what has been delivered: forums, chat rooms, white boards - 'pass the content parcel'.
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But Web 2.0 and beyond are moving us towards different characteristics:

- user generated content systems;
- collective intelligence and knowledge;
- collaborative tools with dynamic delivery enabling continual further input and adjustment.

This is of course a simplification and there are many aspects of overlap - but the direction of travel does seem clear:



If this is the case, then as well as having to respond to the multitude of imperatives around flexibility, design of spaces, management of place, ownership and copyright⁷, formal education will have to understand a new, or newly defined, role in supporting the learners' navigation of information. This is primarily because the technology-supported shift from centralist control to user focus is only of value if it underpins the growth of discovery or experiential learning. As people work in the new digital media, at whatever level, they deploy what John Seeley Brown has termed 'Bricolage'. Bricolage relates to the concrete and has to do with the ability to find something – a learning object - and to use it in a new way and in a new context. But to be a successful 'bricoleur' of the virtual rather than the physical you have to be able to decide whether or not to trust or believe these things. Therefore the need for making judgements is greater than ever before⁸. This implies a huge shift in the role of the teacher/tutor - not in the sense that supporting and advising on navigation of information and knowledge is new in itself, but it has not been at the centre of the role and it has not had to operate in an information universe that is expanding exponentially. In Seeley Brown's phrase, it will be supporting learners to "(operate) learning as much social as cognitive, as much concrete as abstract, and becomes intertwined with judgement and exploration". These observations are supported by research showing how younger learners in particular are using computers for 'creative activities, writing and posting of the internet, mixing and constructing multimedia and developing their own content, looking to web tools to share what they think and do online:

"These (people are) born into a digital world where they expect to be able to create, consume, remix, and share material with each other and lots of strangers⁹."

2.2.3 The implications of technology-enabled social networking

MySpace has more than 50 million members, with 160,000 new ones joining every day. YouTube is visited more than 100 million times a day and sends data equivalent to 75 billion e-mails. More than half the world's bloggers are in their teens still. Skype puts on more than 150,000 new user a day.

⁷ These are addressed in 3.0 below.

⁸ Seely Brown J. Learning, Working and Playing in the Digital Age: Creating Learning Ecologies.

⁹ Lenhart and Madden, (2005).

And so the statistics of scale keep rolling in - and are entirely meaningless to us, unless we start to better understand what they mean in terms of behavioural change at all levels.

It is estimated that by 2010 more than 70% of digital information will have been generated, not by commercial producers, but by Joe Public. In early 2007 the Pew Research¹⁰ centre in the USA found that:

- 55% of online teenagers had created a personal profile online and had used social networking sites.
- 48% of teenagers were visiting social networking sites daily of more often.

Particularly interesting are studies of the access behaviour involved here:

"MySpace is kept opened while they are doing homework or talking on instant messenger. In schools where it is not banned or blocked, MySpace is checked during passing period, lunch, study hall and immediately before and after school - this is particularly important for those who don't have computer access at home."¹¹

The emerging issues here that concern identity formation, impression management and the creation of frameworks for building versions of cultural knowledge, are highly relevant when we consider the more formal management of learning environments, virtual and otherwise. For while we may question how much learning actually takes place within this sort of social networking, nevertheless the failure of formal education to engage with and understand the nature of the activity will risk educational institutions being positioned as irrelevant if they cannot utilise the methodologies for interaction and exchange of information, ideas and knowledge being used 'elsewhere'. It is very concerning that students emerging from their teacher training:

" ... have MySpace and Facebook accounts ... and are familiar with social media/social networking technologies, yet often keep these technologies separate from their professional practice ... and see no connection between their personal use of the Read/Write Web and their professional use."

The lack of examination, development and adoption of social networking technology is also evident within adult education. The

¹⁰ Pew Research is a non-partisan USA-based 'fact tank' that provides information on the issues, attitudes and trends shaping America and the world through public opinion polling

¹¹ Danah Boyd; speech to the American Association for the Advancement of Science, (2006).

excuse cannot be used that social networking is considered the province of the young - a temporarily sustainable position anyway, as we have stated. For in studies of the use of digital technologies in Small and Medium Enterprises¹² it was found that there was very little use of formal e-learning but that computer technology was being widely used for informal learning, with the use of networking and distributed communities rapidly growing. It is also worth noting that this methodology for informal learning was particularly prevalent amongst older workers at middle and senior level, as they has more work autonomy.

2.3 Formal education systems and their 'disposition' regarding technology.

To some degree primary education, through its inherent 'learner management environment', supports children to interact in a way that joins social interaction with learning. The pedagogic approaches that include story telling, group work, play and project based learning all seem to support this 'bricolage' approach. At university level there seems a disposition that links learning with the principals of social and knowledge networks. The role of technology within this is acknowledged. We observe this in HE's 'market positioning' and how they sell their disposition on communications technology to prospective students. But within non-HE adult learning the position seems far more variable and it seems as if discourse regarding the role of technology, the effect of informal social networking, information access and social networking, has been far more limited. While debate and practice are not absent, it seems less consistent and developmental and much more limited. We have seen FE market their disposition regarding technology as being matter of 'equipment and facilities ownership' as opposed to communicating their views and understanding of its benefits to learners. Perhaps this reflects the synchronisation of the growth of pervading technology with the endless political tinkering with the FE and adult education systems. Secondary education too seems to be particularly challenged regarding the ways in which young people are using technology and have not developed¹³ the curriculum in such a way that younger peoples' growing use and familiarity with technology informs their behaviour.

Whatever the educational sector however, and of course there are exceptions, it has been the case that:

¹² Attwell, 2007.

¹³ Not for want of trying, it has to be said, in the case of some individual institutions.

- The major implementations of educational technology have been not to encourage networking and creativity but to control learning and to isolate networks.
- Systems have been developed as a 'walled garden', to perpetuate the isolation of the educational institution from the wider outside community.
- The new technologies have been used to duplicate 'more effective' older social forms of organisation.

So, we still see virtual classrooms recreating and preserving the old paradigm of education with new technical forms. It is notable that even in SecondLife¹⁴ universities have been investing heavily in buying islands to recreate in 3D form their building and classrooms.

Even where organisations have recognised the value of informal learning and have set up technical platforms to facilitate forums, these have then been over-mediated by teachers and trainers and have remained barely used. This is not limited to the education sector: a salutary tale is of one company spending a six-figure sum setting up mediated forums only to abandon them for lack of use; the same company then saw eight of its graduate intake set up their own forum, using open source freeware, which grew to 8,000 plus users in a matter of months¹⁵.

The position remains that most education systems are behaving as if social networking systems and technologies are a problem (which can be, of course) rather than an opportunity.

There is something of an irony here, for as formal education continues to either question or to panic regarding the influence of technology, so in business and informal contexts Web 2.0 applications and social software are increasingly being used for knowledge development and sharing, for cultural interchange and networking. Research in economic development continually advances the idea of the need for developing learning regions that are based on collaboration between enterprises and between enterprises and other social institutions. The theory of connectivism¹⁶ states that successful learning actively attempts to create meaning through engagement in networks, yet much of the formal skills and learning model remains rigidly tied to the idea of developing and assessing individual attainment.

¹⁴ **Second Life** is a 3D digital world imagined, created, and owned by its residents: www.secondlife.com.

¹⁵ Trainingzone debate topic (2007).

¹⁶ Siemens, (2005).

To summarise, the research tells us that most learning does not take place in formal educational programmes¹⁷. Increasingly technology is being used for learning, both by young people of school age and older people in work, through social networks and is greatly increasing in its power to do so. Learning can increasingly be facilitated through technology to take place in multiple contexts, in work, in the community and in the home as well as in educational institutions, and yet we remain inept at responding to this at curriculum, pedagogical, administrative or financial levels. If this situation remains, and we can publish a (or 'the') major report on skills and competitiveness that scarcely mentions the role and influence of technology in skills and learning, then we face a very real danger that, just as with democracy, formal education will increasingly seem irrelevant for the very day lives and learning of many people.

3. Individual, organisational, and 'network' behaviour.

As terms, descriptors, the 'information society' and 'the knowledge economy' are unhelpful in understanding the effects of technology on the individual or the organisation. They are indicative of the outdated approach of wishing to provide collective terms to sets of behaviour that are actually highly unpredictable.

We can examine some of the characteristics associated with the 'information society' and 'the knowledge economy' and then see whether those appear to be making any sense in terms of the ways in which individuals and organisations appear to be behaving.

We can see that technology now enables, if that is actually the appropriate term, the individual and/or organisation to receive multiple and often contesting perspectives on any single issue from a variety of sources, including those authored by other members of the public or by organisations not necessarily considered authoritative in the traditional sense. This factor alone increasingly requires a far more active role on the part of the enquirer to assess what might be relevant and *genuinely* authoritative, a situation that may then require some form of information mediation. This poses many problems, as access to boundless data may simply elicit behaviour that insists on collecting more of the same, viewing the opportunity as reinforcement of already formed views. On the other

¹⁷ Jay Cross (2006) argues that only 10 -15 per cent of learning is formal, that 85 per cent of our learning takes place outside of formal settings.

hand, access to boundless information may present itself as 'choice', but in fact result in confusion or straightforward retreat into the existing mindset. The notion of 'choice' is a much vaunted feature of Western democracy and education is not apart from this. But 'choice' in itself, reinforced by increasingly powerful data technologies, is illusory if it is not supported by the ability to focus, refine and discriminate in the context of some form of value system.

Formal education has everything to offer the learner in negotiating technologically-mediated data, providing it develops the methodologies and the disposition to develop the role. This is particularly evident in the debates around the role of citizenship education and its role in preparing people for life in an 'online society'. Simply viewing citizenship education as a lens to view and inform about technical development is not going to be helpful in promoting an understanding how the citizen can actually configure technology in the service of citizenship.

One feature of individual and organisational behaviour is that it is often developed, either psychologically or administratively, to resist change. It is worthwhile to contrast this with network and 'swarm' behaviour, where the role of the individual behaviour is to contribute to configuring perpetual change in the face of circumstances. One factor about current technological development, with Web 2.0 or open source for example, is that the software systems are increasingly dynamic - that is, they are launched in imperfect states but committed and set up to continually rethink and develop further. Moreover, that dynamic process is not regarded as the owned province of the original developers but depends on the contribution of users. There is much about this that is deeply at variance to more traditional and formal views of education, where the whole system, from the curriculum to the ways in which the 'learning environment' is organised, is established on the basis that there is no change and the learner is assessed on the basis of their grasp and representation of this. Therefore, the emerging 'perpetual change' and protean dynamics required and supported by technology is highly disruptive of conventional educational and learning practice.

It is increasingly concerning that current skills and learning policy, despite its supposed focus on the 'demand side', demonstrates little understanding of merging business practice and enterprise thinking. Also, for example in the Leitch Report, there is virtually no indication that any real thought has been devoted to the ways in which technology will engage, support and steer learning practice. But if we actually look at what those who are at the leading edge of exploring the creative processes required by industry and business

then we can see how technology is embedded not simply in the sense of enabling the processes but in the actual processes themselves. In looking at the innovative processes being considered and developed in Japanese industry, Hirotaka Takeuchi¹⁸ comments that:

"making personal knowledge available to others is the central activity of the knowledge-creating company"

He makes the point that the recognition that creating new knowledge does not simply mean processing information, but:

"...tapping the tacit and often highly subjective insights, intuitions, and hunches of individual employees and making those insights available for testing and use by the company as whole."

The knowledge-creating process of converting tacit knowledge into explicit knowledge operates:

"First, by linking contradictory things and ideas through metaphor; then, by resolving these contradictions through analogy; and, finally, by crystallizing the created concepts and embodying them in a model, which makes the knowledge available to the rest of the company."

Tacit knowledge is personal, difficult to formalise, subjective, intuitive, and rooted in one's actions and experiences, ideals, values and emotions. Processes of learning and creation take place by:

- sharing ideas with colleagues in half formed and loose ways (sharing current tacit knowledge);
- using others to help you clarify and explain your ideas (moving from tacit to explicit);
- seeing and fitting your ideas into the pattern of ideas generated in the framework around you.

The relationship of these processes to the ways in which technology can support the communications environment required is very clear. There is much to advise the role of formal educational in assisting, through an understanding of technology and social networking, an interaction between learners and sources of information and knowledge that changes the learner and leads to a better developed outcome.

Perhaps all this is best summed up by a rather over-simple play of changing the term 'e-learning' to 'c-learning': communicative and

¹⁸ Nonaka, L & Takeuchi, H (1995); the Knowledge Creating Company. Oxford University Press.

collaborative learning. This addresses all the dynamics we associate with more informal learning practice and moves it into an area of acknowledgement on the part of more formal learning that increasingly the 'walls are down' as we issue in communicative and collaborative learning and recognize how we learn in the contemporary environment. There are two questions here:

1. If it 'takes a village to educate a child', is technology's role in expanding and re-building the village fundamentally changing the nature of social and cultural exchange because of its sheer capacity on all fronts?
2. How does education, for both adults and children, re-organise itself to manage the interface between its own identity and learner experience outside its gates?

4. Learning and place - concepts of 'where you do things'.

We are already seeing conference centres, university and corporate campuses and even entire cities being turned into Wi-Fi hotspots. Trains, planes, airports and libraries are installing wireless networks to serve customers carrying wireless gadgets. As a result, many business people, students and other citizens are beginning to expect cheap, easy access to the internet as a matter of course. We are seeing some interesting research that demonstrates the degree to which people can feel stranded and lost without mobile connectivity.

This constant connectivity has changed what it means to participate in life. It also involves a change in social behaviour. For example, it is becoming acceptable, for some, to be in several information streams rather than focusing wholly on the people you are with. We are currently very mixed in our views of the benefits and demerits of all this. We are far from sure whether the social aspects of this behaviour can be appropriate or of value if transferred to learning practice, even if it appears possibly to align with informal learning and episodic and 'just in time' learning requirements. But where it is particularly fascinating is in its relationship with ideas regarding 'where people are' and 'where are they communicating with'.

Since its inception there has always been a notion of being online as being *in a space*. Web documents are called sites and collections of them are locations and portals. The notion of virtual meeting places is easy to accept in the web culture. We are also moving to a stage

were pervasive technologies actually overlay real space with an augmented reality. Furthermore, the virtual spaces also enable different types of social interaction and social relations. As this develops, there is a blurring between what is global and what is local. Who you are friends with, who you work with and learn from are not necessarily people from the same physical space, but they may be from the same online community. In terms of education and learning it raises all sorts of questions about the relationship between learning and geographical identity and established physical resources' relationship with information and knowledge.

At its simplest level it requires us to rethink the way in which we may design our built environments for formal education and learning. But there is a more complex dimension, for as individuals increasingly transport and 'wear' their means of communications and information access, the more learning becomes disassociated from any set place at all. This in turn adds complexity to notions of identity and the way in which this may increasingly be constructed by what we own and use as we move from place to place. We are already seeing the way in which young peoples' consumption of media is one way of constructing an identity and there is a definite parallel emerging in the ways in which peoples' information and knowledge identity is defined by the technical devices that they carry and have access to. This does play around with all sorts of notions of identity - where someone is from, where they be going to and to what degree might they arrive in a formal learning context already 'wired in' to a range of information and knowledge locations quite apart from the educational institution they are approaching. This begins to construct the idea of the 'informed client' or the 'informed learner', which presents a very different proposition for the formal institution or system having to receive and respond to them. It also completely throws open ideas regarding assessment - are you running assessment procedures that examine the individual or the technological devices that they directly access. If you disassociate them from this access temporarily, for the purpose of assessment, are you fundamentally questioning their learning functionality?

Technology is affecting conventional ideas of space and place and their relationship to information and learning in other ways. We are witnessing ways in which spatial and geographic data is emerging as a significant feature in the social software itself. For example, 'geo-tagging' means the Internet is slowly being wedded with real space, enhancing physical places with information that can deepen our

experiences of them and “making computing into a more continuous part of our real lives.”¹⁹ The availability of web-enabled tools like Google Earth and MSN Virtual Earth which combine satellite imagery, maps and search facilities that allow us to access a wide range of geographical information that is then aligned with all sorts of other resources developed by third parties around it are developing very rapidly. Photographs can be tagged with geographic and locative information and metadata by the user which automates access to layers of information that otherwise would require entirely independent search and find work. Physical locations and objects within them can now contain digital devices that display and link any amount of data relating to them. Thus the notion of ‘a place’ is becoming hugely enriched with ‘customised’ data according to individual requirements. The effect of this can be transformational for the learner, as it combines being in touch with a set place while then visiting any number of other ‘information and knowledge’ locations, synchronously mixing objective and subjective data in a way that may make concepts of ‘authority’ very opaque.

5.0 Barriers to the ‘transformational’ technology.

A key ‘rule of thumb’ of whether a technology is transformational is whether it gives the individual a worthwhile return for their endeavour in engaging with it. It may be that the pivotal factor in providing a worthwhile return is the mediation between the individual and the technology. Adult education needs to look closely at models of technical mediation, what adds value and what does not. For example, an interesting research finding demonstrates how in in-house business training operations more formal e-learning support appears to be able to offer very little value to the prevalent informal learning practice, except in the area of performance support. So, it may be that learning providers may underestimate the learning abilities of their learners when it come to using technology, but over-estimate the ability of the institution’s formalised intranet/VLE systems. Increasingly learners will be coming into education institutions from a world where content management systems are very ‘joined up’ and highly navigable, whereas institutionalised intranets/VLEs have often been developed as ‘information/knowledge islands’, which then undermine the learner’s capacity to run more widely connected searches.

Open Educational Resources (OER) is a development already underway in a number of countries - with the Open University’s ‘OpenLearn’ initiative being a very interesting example - which

¹⁹ Toyoma - Microsoft Research

represents a response to the influence and impact of technology on learning practice. It rightly blurs the borders between formal and informal learning and OER research demonstrates how many OER learners are 'self-learners'. Providing fiscal models can be developed that support OER development, there is a dramatic opportunity here to promote and support lifelong learning, to widen participation, and to bridge unnecessary gaps between non-formal, informal and formal learning. The development of OER rides in tandem with open source development within the technology itself.

The OER and open source movements have wider implications - for example, the 'open access movement' is claiming that all publicly funded research should be made publicly accessible shortly after publication and we are seeing the development of fiscal models that can underpin this, such as the Wellcome Trust's policy of providing grant holders with additional funding to cover the costs of open publishing. We have seen various fiascos in some of the educational sectors which simply have not been thought through effectively and have been subject to political rather than effective business and social enterprise pressure and influence. But the 'Wellcome model' could be applied to funds for educational purposes much more widely. In the UK we have not had a *coherent approach* to this by Government²⁰.

At institutional level there will be a variety of growing pressure to develop strategy and practice regarding OER, for a variety of reasons: because the competition is doing it and new business and cost recovery models are being developed; because the opportunities for collaboration in the production and use of OER are growing, the pressure of the increase in digital resources free for educational use is growing; and because and the technological developments and increasing push from individuals who are experienced in the enlarging use of the Internet and social and collaborative software will prove irresistible. But it will mean that institutions are going to have to develop very well-reasoned and businesslike information technology strategies and e-learning issues will have to be entirely integrated with those, rather than being seen as something separate. This will have considerable implications for access to people who have these development skills, either inside or external to the institution. It will also has considerable implications for the politicians and civil servants involved in the publicly funded elements and their capacity to understand the ways in which funds are offered and managed.

²⁰ Unlike Norway, where all public web portals are expected to adhere to Web Access Initiative principles and academic and educational resources that are fully or largely publicly funded have to be freely available under an appropriate open content licence.

Developments like OER, social networking, and collaborative technologies generally will mean that the learner will be far more able to *compare* curriculum offers. We have already seen this happening in HE and to a lesser extent with FE. It has also meant that not only is the curriculum up for comparison and consideration, but so are the wider aspects of the 'learning experience and environment' offered by the institution. A visit to many education provider websites now demonstrates an increasing awareness of this.

The change required is not limited to tutors and teaching staff. The cliché of the 'sage on the stage' becoming 'the guide by the side' also has truth for those involved in all aspects of information, advice and guidance. It does not stop there, for it may not that long before even the 'guide by the side' role is further influenced by technology. Not in the sense that 'the guide' will have to support access to ever increasing amounts and complexities of data, which of course they will, but they will increasingly see the technology itself managing some of the advisory and support behaviour rather than just the data itself. Development work on computer management of collective intelligence of independent agents will, just as in the customer recognition systems of Google²¹ or Amazon demonstrate, eventually establish technically-managed systems that will act as on-going support agents for learners and this will either assist the teacher or the IAG worker or threaten them, probably depending on their disposition as opposed to what might actually be the case.

6.0 Embedded technology: who is the expert and who gets to learn?

These are some long-look observations on technological trends, which raise a range of potential questions for education and learning. They are derived from a variety of sources, but in particular from Futurelab's work on '2020 and beyond - future scenarios for education in the age of new technologies'.

The next decade of digital technology development will see rapid increase in the ways in which the technology is embedded and distributed in the objects and artefacts that we use day to day. We are already seeing this in the more obvious personal objects, such

²¹ Just an observation: currently Google, its search engine now integrated into many internet browsers, is reaching out to integrate its services into university life with its 'Google Apps for Education'. Arizona State University, with 65,000 students, has moved to Google Apps, as has Linköpings University in Sweden, with 26,000 students, and Trinity College, Dublin. This will provide students with many advantages, including any terminal access, a range of on-line tools, real-time collaboration systems etc. It will also provide Google with valuable transaction data deriving from all the HE students and which will be carried through on the portable Google account post-university.

as notebooks and keys, but we will see this being extended to clothes, newspapers and household goods. At the risk of sounding close to the Woody Allen routine about his white goods plotting against him, the other feature regarding this 'technological embedding' will be that the devices will communicate with each other and, as a result, we will interact with these technologies in ways which are more seamlessly and invisibly integrated into normal activities. If you think this sounds too far into science fiction, then think back five years, just prior to Bluetooth technology - we have already come a long way since then, if we play out in our mind what is currently possible with a Bluetooth enabled PDA/'phone and the ways in which that can interact with our desktop PC, our internet links and through into climbing into our vehicle and journeying to a meeting where there is then technological interaction as well as human interaction with those that we meet, when we exchange data and update diaries and action planners.

What sort of questions are raised for adult learning by the development of these embedded and ubiquitous devices? They are surprisingly profound. For example, who or what should be tested in exams - the person, the person plus tools or the person's use of tools? What skills should education develop - should the focus be on skills of interpretation of complex and ongoing data flows, or skills of finding silence and reflection in the midst of constant information? Who is the subject of education - the learner or the tools which need to learn to support that learner? What are educational basics when interaction with information and knowledge is as likely to come through auditory and image-based media as through written text? What does a 'fair' education system look like, if intelligence is enhanced and developed through tools that can be purchased? To what extent will education have to work with employers to design their provision in terms of the technical environment of the business?

As digital technology is developed to be 'everywhere', will in fact the 'everywhere' have an increasing tendency to mean 'urban' and will this amplify issues of digital exclusion on the basis of geography as well as socio-economics? To what extent will the built environment housing adult learning provision be able to replicate and even customize the levels of technology increasingly embedded in everything around us in the 'outside' world - from city streets, shops, banks, railways stations and bus stops? Will there be a new phase of this when these embedded technologies start having really organized ability to communicate with the technologies that you carry about with you?

Educational institutions have embedded within them what has been called a 'built pedagogy'. We know that this can both work for and against adult learners, their access and their navigation of learning. The idea of educational institutions having the potential to design built infrastructures that have a level of 'intelligent environment' proposes all sorts of opportunities to examine the relationship between 'learning spaces' and adult learning behaviour, rendering it potentially infinitely more complex. It raises so many questions: if environments are intelligent, will they offer the opportunity of responding to the specific needs, preferences and difficulties of individuals. At the same time, as they potentially offer increased flexibility, is there the capacity to reshape educational environments in multiple ways at different times to meet the needs of different occupants of the space. For example, different information can be displayed on walls; different levels of stimulus can be made visible; temperature, air pressure and light levels can be transformed to serve different purposes. The institution could be seen as a constantly changing and evolving environment, rather than a fixed resource with only limited properties and adaptability. The proposition enables one to look at current problems in a new light: for example, the policy of 'extending schools', countering the ethos of schools as places defined by exclusion, nevertheless have problems with access for and to non-teaching adults because of security concerns. But if institutions knew who and who isn't allowed access then the intelligent environment could operate appropriate 'open (or closed) door policies'.

We are currently seeing technology increasingly being networked together and the concept of interoperability and convergence gradually being applied through the development of international standards. The most obvious example is the blanket connectivity to the wireless network which allows (in rich countries) access to all communications channels, sometimes even in more remote areas. The development of integrated networks combined with intelligent environments raises a number of questions for formal education and for adult education in particular, not tasked with 'child security' in the same way as schools, although schools will be drawn into these questions anyway. The foremost question is 'where do providers of education' need to be?' Whereas in the past schools, universities and other institutions grew around the fixed resources of libraries and laboratories. But if information can be accessed anywhere, if simulations and experiments can be run anywhere, if 'human' interaction can be achieved virtually in any location, where does learning *need* to take place? What sorts of new practices, institutional arrangements and human interaction can be developed to best support learning when we are not reliant upon a centrally organised location for people and material resources, but instead

can enable 'near presence' interactions between learners, experts, advisors and mentors wherever they might be? Many of the barriers to this happening are artificial in the sense that they are erected by administrative and financial requirements that are institutionally managed. With the concept of a unique learner number for every citizen undertaking formal education or training through the MIAP scheme, there is a development of a system that does propose a level of data convergence and interoperability in the support of fluency throughout lifetime learning. But this is still focusing on the educational process as linear, across successive institutions, rather than data management for the individual as a 'personal hub', accessing learning where and when they require.

If the reality of network integration is developing, at least for some, then it brings with it a shift in the idea of where data processing takes place. We have been accustomed to understanding this on the basis of each individual technical resource providing its own, or its own close/closed network, processing power - so, we have had processing power firmly acquainted with the individual and a consequent obsession with the individual processing power and the speeds of individual pieces of technology. What is now occurring, and has in fact been the case for a lengthy period but not so much in the 'public domain, is that processing will not be located at the level of the individual device but centralised, with consequent massive increases in available processing power. So, the learner will be able to do much more complicated and resource intensive things on any of their personal devices than at present. This increase in processing power may enable relationships to develop between users and software which offer new approaches to teaching and learning. Where complex simulations and experiments were once the property only of those with significant training and access to expensive machinery, now it is possible for anyone to input ideas, sketches, draft notes and, working with the computer, explore the implications of these ideas as simulations. Trial and error, rapid experimentation and evolution of ideas becomes possible. The challenge for education is to understand how best to harness this increased capacity, how to share ideas and information generated, how to engage with people's capacity potentially to act as experimenters, designers and creators. It is not that we are not already seeing this - we observe it in all sorts of contexts, from people using computers to design garden layouts with linked data on soil types, growing conditions and planting suggestions, through to programs that manage genealogical analysis at levels of complexity that five years ago would not have been accessed outside a research laboratory. But there will be further development, for the increased processing power will enable digital technologies to become 'more intelligent' and to offer bespoke and

specific information and recommendations in the development of ideas and actions. So, technology will have the ability to act more as collaborator than 'tool' and so new concepts of creativity and originality will be required and new approaches to the assessment of learning with these tools will become necessary. Again, we are already seeing the early days response to this in our concern that learners may be 'cheating' using internet-enabled resources .

As data storage becomes cheaper, available on 'the network' rather than on personal devices, so worries about backups and disk crashes recede. But the concept of limitless storage of data raises key questions about the competencies and skills we will need to learn in future. Will recall of facts and events become obsolete as a socially valued skill? Will the ability to synthesis information become the primary goal of education? Will the development of complex searching and archiving techniques become a 'new basic' in education? What is its goal when all information – from facts, to skills advice – is constantly accessible? At more profound level, will there be increasing disquiet that we are being 'robbed' of our own memories and their placement within us and will we grow increasingly perturbed by the notion that we have no ownership or control of what should be our internal world?

7. 10 strands to watch.

Technology becomes truly disruptive when it alters the status quo. We hope that the alteration can be for the better, but that may depend on your perspective. For some, disruptive technology must mean that it gives people something that they didn't have or couldn't do before. Of course, it is true that the 'didn't have' or 'couldn't do' has to be analysed in terms of the 'so what?' principle before any judgement on real 'disruption' can be made. But too often in education we have been subject to two sets of pressures: from those who have told us that every technological development was a breakthrough and going to change everything, or from those whose immediate response was always 'so what?'. What this usually reveals is the psychological disposition of those concerned and, of course, our own in believing one or the other. But our culture and economy is marked at intervals by those who seem able to really understand the potential influence of a technological development and provide analysis of what it might give an individual or organisation in return for their investment, whatever that investment might be. In education we have been largely lacking these people and we seem to have many problems in creating the discourse that may support and reveal where they may be. Too often we assume, usually incorrectly, they will be technologists and then that exposes much of our cultural attitude towards science and technology.

It may be that instead of watching out for any single piece or area of technology, it would be better to look out for signs of behavioural change and then track it back and 'discover' what is actually causing it. In this spirit I have listed seven 'behaviours' that I believe, if 'tracked back', reveal an area of technology. One can then analyse whether it is likely that the technology in question is likely to become more powerful and more influential and therefore force that behavioural change even further. You can then consider whether the behaviour is potentially positive and what scale of action is required to work with it, counter or mollify it, or whether it is in fact irresistible.

Seven 'Behaviours' associated with the influence of technology.

The list is a selection at random and is in no order of priority or reference.

A. Role change: for example,

- Consumers of learning also become producers of learning content, initiating an un-owned and un-tethered 'curriculum cloud'.
- Learners define user environments as opposed to environments defining users.
- Inanimate objects become actively informational.

B. Communities of practice – learning through communities of interest is re-defined, becoming highly dynamic, un-located, forming, dissembling and reforming according to a focus of interest that is self-defined and evolutionary as opposed to pre-defined and rigid.

C. Continuous partial attention: learning is re-positioned through technologies that invite us to perpetually scan for un-defined opportunity in any given moment, paying continuous partial attention in an effort not to miss anything, involving an artificial sense of constant crisis as we are always in high alert.

D. Uncoupling cost from learning content: the provision of information is not regarded as a service, becoming effectively cost-free and costs become defined on the basis of the value added to information provision.

E. Portability: learning will be increasingly unconstrained by having to make choices about where to go, what to take, or what to bring at any given time.

F. The informed learner: learners join formal learning contexts carrying with them substantial, undisclosed information resources.

G. Learning becomes less about whom you know and more about what you know with.

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