IFLL
Inquiry into the Future for Lifelong Learning

Technological Change

IFLL Thematic Paper 2

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Charity registration no. 1002775

NIACE has a broad remit to promote lifelong learning opportunities for adults. NIACE works to develop increased participation in education and training, particularly for those who do not have easy access because of class, gender, age, race, language and culture, learning difficulties or disabilities, or insufficient financial resources.

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Cataloguing in Publication Data
A CIP record of this title is available from the British Library
Designed and typeset by Creative by Design, Paisley, Scotland
Printed and bound in the UK

ISBN: 978 1 86201 407 7

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Acknowledgements

My particular thanks to the reviewers of the drafts of this paper for their very detailed and helpful comments:

Jo Pye, Senior Researcher, Marchmont Observatory, SLIM, University of Exeter

Seb Schmoller, Chief Executive, Association for Learning Technology

Alan Clarke, Associate Director for ICT and Learning, NIACE

Professor Phil Candy, Director of Education, Training and Development for NHS Connecting for Health

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Foreword

This is the second Thematic Paper to be published from the Inquiry into the Future for Lifelong Learning (IFLL). The Inquiry was established in September 2007 and will produce its main report in mid-2009. It is sponsored by the National Institute of Adult and Continuing Education (NIACE), with an independent Board of Commissioners under the chairmanship of Sir David Watson. Full details of the IFLL can be found at www.niace.org.uk/lifelonglearninginquiry. The overall goal of the Inquiry is to offer **an authoritative and coherent strategic framework for lifelong learning in the UK**. This will involve:

- articulating a broad rationale for public and private investment in lifelong learning;
- a re-appraisal of the social and cultural value attached to it by policy-makers and the public;
- developing new perspectives on policy and practice.

IFLL: principal strands

The Thematic Papers are complemented by several other strands of IFLL work:

– *Expenditure Papers.* These will provide a broad overall picture of expenditure on all forms of lifelong learning: by government, across all departments; by employers, public and private; by the third sector; and by individuals and households. We shall provide, as a complement, a summary of overall participation. The two in combination should provide a benchmark for mapping future trends.

– *Sector Papers*. These will discuss the implications of lifelong learning for each of the sectors involved in providing learning opportunities: pre-school, school, FE, HE, adult education centres, private trainers, third sector organisations and local authorities. The goal here is to encourage innovative thinking on how these parts do or do not fit together, as part of a systemic approach to lifelong learning.

– *Public Value Papers*. These will look, from different angles and using a variety of techniques, at the 'social productivity' of lifelong learning; i.e. what effects it has on areas such as health, civic activity or crime. The goal is both to provide evidence on these effects and to stimulate a broader debate on how such effects can be measured and analysed.

– *Learning Infrastructures*. Unlike the others, this strand consists not of a series of papers but of a set of scenarios, designed to promote debate and imagination on what the infrastructure for learning might look like in the future. This challenges us to integrate the physical environments of learning, the virtual environments of learning technologies, and people's competences and behaviour.

We have also been consulting in the four UK nations, and amongst learner groups and other stakeholders. Periodic updates on IFLL progress are to be found in our Bulletin (you can register for Inquiry Bulletins at: www.niace.org.uk/lifelonglearninginquiry).

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Thematic Papers

The Thematic Papers form the core initial substance of the Inquiry's work. They cover the following:

Prosperity, Employment and Work
Demography and Social Structure
Well-being and Happiness
Migration and Communities
Technological Change
Poverty and Social Exclusion
Citizenship and Belonging
Crime and Social Exclusion
Sustainable Development

Each of these themes has been tackled in the same way: a call for evidence was issued; a day-long seminar was organised, with inputs from practitioners, policy-makers and researchers; and the results of these two stages, and subsequent discussions and contributions, are distilled into a Thematic Paper, written either by an Inquiry Commissioner or a member of the Inquiry Secretariat.

We have posted on the Inquiry website the evidence submitted specifically to the Inquiry, along with the papers and presentations contributed to the thematic seminar. A list of those who submitted evidence on Technological Change is at the end of this paper.

Next steps

This Thematic Paper represents the culmination of one stage in the Inquiry's work on this strand. We are very grateful to all those who responded to the call for evidence, and who contributed subsequently to the seminar. However, we are very well aware that the process of debate and consultation has been limited. Some people will not have been aware of the call for evidence, or not had time to make a submission. Others will have waited until there were some conclusions to respond to. Therefore, the publication of this Thematic Paper is also an invitation for a second round of comment, submission and debate. Are there important issues which are not covered here? What further evidence should be included? And, most importantly, what further conclusions should be drawn, to feed into the Inquiry's final recommendations? Please send your comments to lifelonglearninginquiry@niace.org.uk

Responses to these questions will be taken into account as we move towards preparing the Inquiry's main report. This is due to be published in September 2009. It will be followed by a further period of discussion – and revision.

Tom Schuller
Director, IFLL

Sir David Watson
Chair, IFLL Commissioners

Executive summary

Digital technologies have become central to our lives in the 21st century. Whether or not we consider that we directly engage with them, they profoundly affect how we now live and how our society functions.

Computers are now so ubiquitous that our relationship with technology is changing. The human-computer-interface (HCI) is transforming how we communicate with individuals, organisations and communities, but the nature of these 'behaviours' is less clear.

We cannot approach the theme of Lifelong Learning and Technology on the basis of involvement being a matter of choice, as if technology was something 'out there' and optional. Technology is disruptive. It questions accepted positions, not only within formal education practice, but by testing the values and nature of community and connection. The first priority is to better understand the scale of disruption and its intrinsic opportunities and difficulties.

The rapid proliferation of technologies are less about 'narrow-casting' to individuals and more about the creation of communities in which individuals come together to learn, collaborate and build knowledge. Such social construction is not a new phenomenon. However, the scale, complexity and pace transform human behaviour and challenge many of the assumptions that underpin our society, particularly formal education. The optimistic view is that technology offers significant potential for the development of new approaches to education and for a new relationship between formal and informal learning. The pessimistic view is that perceived benefits of the personalisation of learning – and individual control – are illusory, such that 'personalisation' will increasingly be dictated by a toxic combination of mass movements and concerned with self-interest at an industrial level. Those examining the future of lifelong learning must better understand how such developments relate to the integration of knowledge, creativity and innovation into lifelong learning practice at all levels.

We see formal adult education largely as managing technology by accommodating it in the traditional classroom, through established pedagogical practice. Where the responsibility lies for taking this forward is not clear. We urgently need to understand who the agents of change are, as currently technological developments are profiled primarily through informal, business, domestic and personal contexts rather than within Government or public sector education. We need to understand the 'tipping points' in technological pervasiveness, especially where they are occurring outside education itself. We then need to see how these align with formal education. We look to developments in Open Education Resources (OER) as a key example of how this might be done, as they transform key assumptions about ownership and control.

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Most learning does not take place in formal educational programmes[1]. Increasingly, technology is being used for learning – both by young people of school age and older people inside and outside work, interacting with social networks – and is greatly increasing in its power to do so. Yet we remain largely inept at responding to this at curriculum, pedagogical, administrative or financial levels. If this situation remains, then formal education is likely to become less relevant for the everyday lives and learning of many people. Of course, lifelong learning will not cease to be, but may be increasingly disconnected from the formal provision of education. However unpredictable the long-term nature of technological change, lifelong learning will be shaped by the increasing power and adaptability of the Web and the applications that it supports.

The paper highlights the requirement for a rethinking on what constitutes computer and information literacy, and questions the appropriateness of the term 'literacy'. This in turn relates to reconceptualising 'digital exclusion'. This requires more sophisticated modelling, beyond simple correlation with socio-economic, generational and geographical determinates.

The redesign of environments where 'learning takes place' is made more complex because contact with people, information and knowledge is no longer dictated by constraints of geographical place or time. The term 'architecture' takes on a whole new meaning when applied to the virtual objects that themselves connect to, and present, information and knowledge. Enabling people to access knowledge beyond the immediate place will require radical rethinking of the role of institutional space.

If intelligence is effectively distributed but subject to the communications devices embedded with the individual this raises fundamental questions for assessment and accreditation. We cannot approach students as 'blank slates', but instead need to recognise them as evolving, networked individuals.

Finally, the paper argues that it is wrong to treat technology as either a panacea or a perpetual threat. As technology continues to spread into the home, the community and the workplace, we need to understand how to use technology to support people throughout their lives so that involvement is about creation and action as opposed to passivity.

Headline messages

Digital technologies profoundly affect how we live and how our society functions. The increasing ubiquity of computers gives us little choice regarding whether or not we are affected by their presence and functionality. Those engaged with lifelong learning in any capacity need to better understand the implications of this, so that future societies are the ones we seek rather than the ones we end up with.

[1] Jay Cross argues that only 10–15 per cent of learning is formal, that 85 per cent of our learning takes place outside of formal settings. See Cross (2006).

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The nature of change

Digital technologies are fundamentally changing the behaviours that we associate with teaching and learning, systemically affecting the infrastructures that support both formal and informal lifelong learning.

Four major areas of change are particularly evident:

- digital technology no longer inhabits peripheral contexts, characterised only by devices that we choose to use or not. Increasingly, it sits at the centre, defining the ways in which we receive and transmit information and knowledge;
- the pace and scale of technological development is exponential, but the deployment, adoption and adaptation of technology evolves on many different timelines;
- increasingly, access to information and knowledge is defined by available technological connectivity, dislocating traditional concepts of place and time;
- who is involved with the development and ownership of information and knowledge and what constitutes expertise is increasingly volatile, complex and subject to questions regarding quality and validity.

The challenges of change

These changes raise questions fundamental to accepted norms associated with education, including:

- what defines capability to utilise information and knowledge is growing more complex. These factors cannot be easily correlated with conventional socio-economic, occupational or demographic models;
- the divisions between informal and formal learning are breaking down;
- the legitimacy of assessing individual aptitude is challenged where information and knowledge is collectively developed and managed;
- the identities of learning organisations are no longer so clear when technology enables boundless information sources and collaboration beyond physical locations.

Dimensions of uncertainty

How these changes will play out will depend on a variety of factors. Particularly important will be:

- how Government regards the role of policy in contexts where it does not control the main levers for change and development;
- the degree to which those directly involved with technological development are supported to fully engage with the social and ethical implications of their work;

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- the extent to which educational providers place the requirement to understand the implications of technological development at the heart of lifelong learning;
- whether or not more research will be focused on the behavioural changes brought about by an increasingly techno-centric world.

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1. Introduction

This paper rejects absolute distinctions between 'learners' and 'non-learners'. Their use prejudices the wider perspective of those information and knowledge transactions that happen throughout life, in circumstances quite outside formal education. Not acknowledging these obscures where many of the technical and behavioural shifts are taking place.

For the future of lifelong learning, simply acknowledging the importance of technology is not an option. We are no longer able to treat technology as something 'separate', as if our engagement were a matter of personal choice. Computer technology presents the prospect of a future world where the technologies increasingly work together in intended or unintended ways, often independent of human involvement. Lifelong learning must be intimately involved with this in two ways: firstly, in developing understanding of the cultural implications of technology beyond its technical capabilities; secondly, in researching and utilising computing technology to inform and develop the ways in which we can best advance lifelong learning.

Computer technologies are not neutral – they are laden with human, cultural and social values. For example, the development of neural networks, recognition algorithms and data-mining present contexts for human behaviour that will be central to how we live our lives. In our increasingly connected world our notions of what it means to live on one's own, to be part of a family, to be at work, to gain information and develop knowledge, to be a teenager, to grow old, are all changing as a result of how we use social networking tools, home entertainment systems, health monitoring systems, mobile communications technology and so on[2]. These changes raise fundamental questions about what we anticipate of the computer systems of the future.

Lifelong learning and education for adults is contextually more complex on almost all counts than school-based education. In many ways the unpredictability introduced by technology and technologically practised adult learners is more difficult for educators to respond to. But a considerable blurring of the distinctions between school and adult learning is inevitable. When those now at school become adults, they will bring with them entirely different expectations and experience in use of technology. It will not be sufficient to rely on government policies on technology and education, however positive and helpful these may be. The real drivers of change will be coming from many other sources.

[2] Harper, Rodden, Rogers and Sellen (Ed.) (2008).

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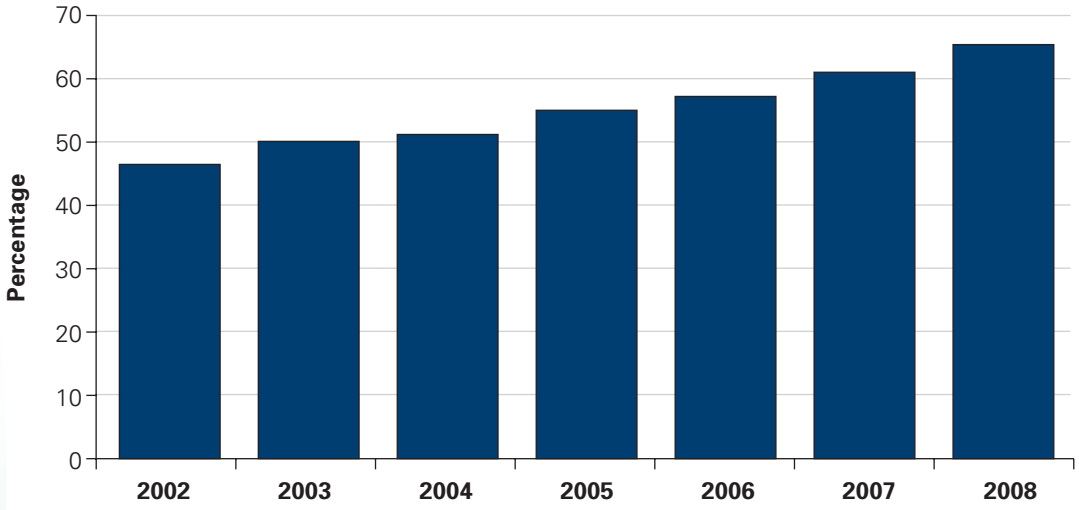
2 Overview of the current context

2.1 The nature of change

Portrayals of the current context are often led by statistics. Certainly, we need high-quality, current data based on real-world ownership and acquisition of technology. We are regularly reminded of the extent to which technology is becoming cheaper and more powerful.

Figure 1: Households with access to the Internet, GB



Source: National Statistics Omnibus Survey; Northern Ireland Omnibus Survey, August 2008

But the qualitative and behavioural interpretation of these data is more difficult – not simply because of the speed of change, but because of the *complexity* of the signals involved. Simply being told that technology is 'transforming every aspect of our lives', and that it is easier to use, does not actually help us very much. The British Educational Communications and Technology Agency (Becta)[3] has pointed out the limitations of analysing the benefits and the challenges of technology in terms of non-access or 'inefficient access', rather than as a behavioural shift.

It is no longer sufficient to track quantitative aspects of change. There is little point in examining future horizons, without a definitive idea about the current position. So, what is it that is 'new' about current technology and its influence? Either:

a) technology is amplifying existing behaviour and practice: '*status quo + technology*'; or

b) technology is changing existing behaviour and practice: '*disruptive technology*'.

[3] Becta (2008).

It is a mistake to assume that we will recognise and understand either 'status quo +' or 'disruptive technology' by looking at the technology itself rather than people's behaviour with it. Nowhere is this proving truer than with the Internet and the World Wide Web.

The same is true of the changes in learning being brought about by technology. It is helpful to pinpoint those aspects of technological influence that are particularly resonant for lifelong learning.

- *Technology, collaboration and collective intelligence*: if the curriculum is defined as referring to both the content (the material to be learned) and the process of learning (the actions involved in teaching and learning), then technology privileges process rather than content. Increasingly, technology supports the social constructivism model that has always emphasised collaborative and active learning, rather than passive reception and absorption. Technology offers modes of communication and 'hyperlink behaviour' that allow both students and teachers to make their own choices in order to collect information and construct knowledge, rather than passively receiving the pre-filtered content of 'the curriculum'. There is a very close relationship between these developments, the social purpose and liberal traditions of adult education, and the tacit knowledge and informal learning methods of workplace learning. But the pace of development is such that the established dynamics of 'knowledge ownership' and its associated roles are subject to intense disruption[4,5]. For some, it is the scale rather than the principle of these developments that is unnerving. Recently, there have been indications that we are turning to the technology itself to develop systems, such as the semantic web, that could assist in 'understanding' and 're-scaling' the sheer volume of data.
- *Technology and purpose*: we can discern two 'models' of development that appear contradictory, but are in fact facets of the same phenomenon. On the one hand, there is an exploding universe of distributed information and knowledge, supported by a communication architecture that engenders behaviours that are 'counter to focus' – perpetual change, continuous partial attention, inefficient multi-tasking and professional amateurism. They disrupt any structure or framework for lifelong learning. On the other hand, there are levels of convergence and a speed of collaboration, rehearsal, feedback and negotiation that can result in products and services that support very precise objectives[6]. This form of disruption has positive

[4] There are positive examples of collaboration across distributed systems whose scale is unprecedented: in February 2008, the Encyclopaedia of Life covering 1.8 million species, put 30,000 pages as a first stage up online (MacArthur Foundation) – one of a worldwide movement towards open-access science; the US National Institutes of Health's $28 billion annually will require its 10,000 researchers to make results available online and Harvard is to do likewise.

[5] According to Charles Leadbetter, We Think 2008: as an example of the technology's collaborative power, if 1 per cent of school children in the UK were contributing learning developers, then we would have 70,000 new sources of that material that could be open source.

[6] A striking current example is the way new technology has changed the ways in which the election process can be managed. The US is witnessing political campaigns that use the Internet to allow citizens to log in, receive briefings and scripts and then make telephone calls to voters in other states around the country; party volunteers going into unfamiliar neighbourhoods are given very precise mapping of every potential voter's residence, plotted on a Google Map and referenced with previous history as an active voter; and the use of text messaging and social networking is having a huge impact on voter turnout at caucuses and polling places, organising behaviour without the trappings of formal organisations.

messages for how lifelong learning could be organised and rendered meaningful for learners and flexible for teachers.

- *Technology and human behaviour*: we are told that communications technologies will change what it means to be human and that the non-biological portion of our intelligence will be many times more capable than the biological portion[7]. Human transaction is fundamental to lifelong learning and so, as the scale of impact of technology is more clearly acknowledged, those in education will have to redefine human contact in order to work with that impact. This will not be through retaining transactional models characterised by ownership of information and by limitations of time, place and space. It will mean continual attention to the evolution of increasingly multiple – and intermingled – roles for students and teachers. For them, how expertise is validated and by whom becomes far more sensitive.

This requires change in our ideas regarding status, authority and value. Technology now supports delivery of multiple and often conflicting perspectives on any single issue from a variety of sources, including those authored by the general public or by less 'authoritative' organisations. Some form of information mediation is required to help the enquirer to assess what might be relevant and genuinely authoritative. Access to boundless data may simply mean collecting more of the same to reinforce already formed views. In these contexts, formal education has everything to offer the learner in negotiating technologically managed data. But educational institutions and their staff will have to examine their real disposition towards technology in doing this. Is it an opportunity or a threat?

2.2 Mapping the territory

> "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."
>
> (Seymour Papert; Conference, Japan, 1983)

The diversity of response to the Inquiry's Call for Evidence has been particularly helpful in providing a range of perspectives. Whilst there is not necessarily agreement regarding the importance across these areas, there is some sense of the overall 'territory' in a way that was not evident, even two to three years ago. This section scans that territory, summarising the current key trends and then developing the themes we believe significant for the future. These themes may be seen as 'strong signals', which few would dispute in terms of their importance and high profile; there

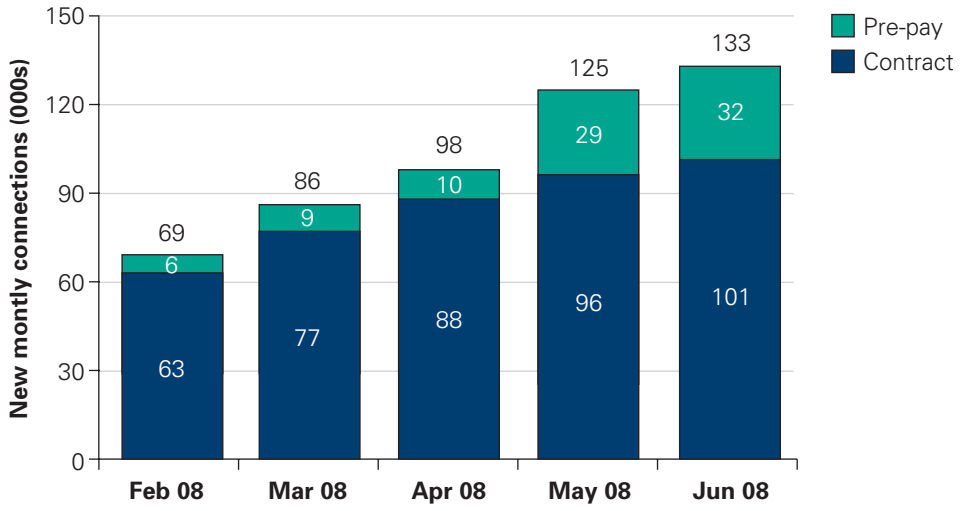
[7] Kurzwell (2005).

may also be 'weak signals' which are less obvious and more subject to dispute as regards their longer-term importance and impact.

Access and ownership

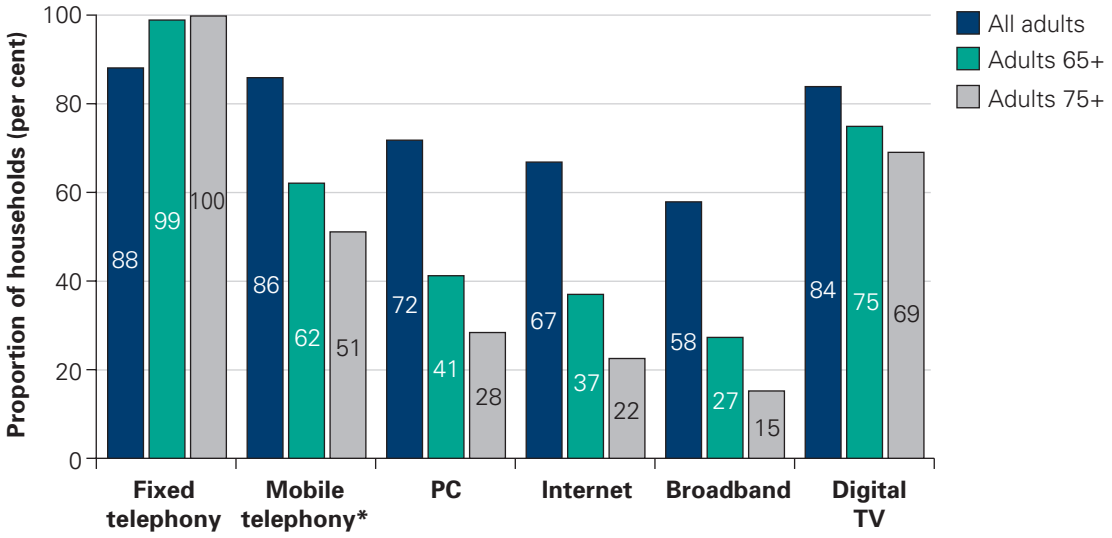
We are witnessing rapid uptake of technology, as can be seen in Figures 2 and 3.

Figure 2: New mobile broadband connections



Source: GfK retail data (includes only consumer channels)

Figure 3: Take-up of communications services, by age



Source: Ofcom research, Q1 2008

*Note: *Data for mobile penetration refer to the proportion of people who personally use a mobile phone*

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We can 'cut' the statistics in a variety of ways. There are trends that are clearly discernible, such as the level of direct access to broadband connectivity by younger people (94 per cent for 15–19 year olds) compared to older people (27 per cent for adults 65+ and 15 per cent for adults 75+).

Often, the emphasis concerning lifelong learning is focused on those who do not own or access technology. The digital divide – by generation, class or other variable – is highly salient. However, ownership of computing technology does not directly correlate to wealth, or to actual engagement with ownership. A limited focus on particular technologies, like PC and laptop ownership/access, ignores the implications of changes in mobile technology ownership and their own capabilities to transform usage. Access to technology and skills does not ensure digital take-up, and factors such as motivation, gender and age are equally likely to affect an individual's relationship with technology. This has broadened the potential profile of a digitally excluded individual to include characteristics well beyond socio-economic factors – and also opened up a debate as to the role of personal choice in that digital exclusion.

'Access and ownership' research tends to use our own geographically limited perspectives. We remain focused on the UK position as benchmarked with other countries and ignore geographical boundaries, although fundamental changes in access[8] may have far more profound effects on the global society than comparatively minor shifts in access and ownership in our own country.

Aspiration and control

Just as technology raises questions of choice and adaptability, it raises concerns of control. The position here is highly ambivalent. On the one hand individuals manage their technological environment in highly personalised ways, using a vast range of commercial and open source resources that they can directly configure. On the other hand companies such as Google are increasingly hosting applications and data online in ways that remove it from the individual's personal computer hardware so that what constitutes 'a centre' becomes impossible to pin down. Education itself has to make institutional choices regarding the control it exercises over students' use of technology and access to communications. A further underlying assumption is that technological development and its effects somehow proceed in a linear way or, if they do not, then linearity can be imposed. Policy is set out in terms of development phases, which proceed step by step – otherwise how can you attribute funding and measure achievement? But aspirations based on perceptions of control may not be realistic. Lifelong learning's engagement with technology needs to be particularly clear-headed over scale and pace. Paul Strassman's observation remains salutary:

> "The history of IT can be characterised as the overestimation of what can be achieved immediately and the underestimation of the long term consequences."

8 By mid-2009 the East Africa Submarine Cable System will connect 21 countries on the eastern half of Africa and provide affordable links to the global internet highway.

Autonomy and personalisation

There is some degree of confusion regarding 'autonomy' and 'personalisation'. Current policy stresses the value and indeed necessity of personalising learning as part of a wider political agenda seeking to enhance the 'demand-side'. One of technology's perceived strengths is in enabling personalisation. Personalisation creates the opportunity for choice and choice sits at the heart of autonomy. But then tensions arise when personalisation is attached to political agendas that have pre-determined targets:

> "In an educational setting, personalisation means working in partnership with the learner and employer – to tailor their learning experience and pathways, according to their needs and personal objectives – in a way which delivers success."[9]

Technology may be seen as being central to '*delivering personalisation*'[10], but equally "*there is a decline in pupils' perceptions of personalisation of learning at both primary and secondary level as the pupils move through their schools*"[11] towards qualifications targets. Whether or not such 'decline' continues to be experienced in post-compulsory education and lifelong learning is not well researched. An overemphasis on formal learning towards achievement of qualifications and employment creates tensions between a 'personalisation' agenda and actual demands for skills by individuals or employers. It is hardly a surprise that there are differences between individuals and institutions regarding what constitutes 'personalisation'.[12]

We need to remember that learning:

> "…. has and always will be a personal experience. But the organisation of mass education has inevitably been impersonal and it has been the role of the skilled teacher to put the personal back into systems that are largely impersonal."[13]

Informal learning, including 'learning on the job', also delivers personal aspects. But has technology supported the personal or the uniform? Technology to date has been largely amplifying existing educational practice. Therefore, Web 1.0 simply provides a massively expanded repository of content, for example, often accessed through 'managed learning systems' that are 'institutional gate-keepers'. However, we are now beginning to see a fundamental change in the relationship between technology, personalisation and autonomy. This results from a triangulation of factors:

- the increasing ubiquity of computing devices, where convergent functionality brings together access to information and various forms of communication;
- personal ownership of computing devices and infrastructure that is often as, if not more, substantial as that of the formal education institutions;
- the changing nature of the Internet, with Web 2.0 developments.

[9] DfES (2006).
[10] As often promoted, particularly in the Care Sector.
[11] *Impact 2007: Personalising learning with technology*; Becta, July 2007.
[12] Ibid.
[13] Yapp (2008).

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We are witnessing what John Seely Brown sees resulting from access to information, knowledge and communication no longer dictated by location:

- multiple intelligences – abstract, textual, visual, musical, social and kinaesthetic – being catered for;
- highly sophisticated systems supporting learning as a social as well as cognitive construct;
- a weaving together of 'knowing what' with 'knowing how', constituting a 'fabric of learning' through communities of practice that support understanding of how knowledge is distributed and learning to learn[14].

How the individual 'learns to learn' is largely beyond the direct control of Government or educational institutions. The Government has to date allowed these developments to proceed from the sidelines: what is at stake is their distinctive role in supporting an individual to exercise personal choice to progress within this emergent technological context.

One example of the use of technology to facilitate personalisation and autonomy is in information, advice and guidance (IAG), where the traditional, formal careers advice 'offer' is increasingly unfit for purpose. Web-enabled contexts for employer and job information fuse employer and job information with access to live accounts of job experience[15]. This is much closer to how people actually gather advice from peers and a whole range of informal resources. The individual is able to take control of navigating the search and enquiry process. Single-point, set-time careers services are redundant. A further example concerns how the access of people with disabilities to assistive technologies can be limited by 'traditional' views of how support is provided. A 'fusion of informality' rather than formal instruction supports carers as well as the individual and is a more effective way of engaging technology to good effect[16].

Capability

'Capability' sits alongside 'personalisation' and 'autonomy'. "*The dynamic nature of technology is such that we need more than initial training*"[17], and whatever the process is, it will be as ongoing as lifelong learning itself:

> "It is clear that a lack of ICT skills, including not having the skills to learn through ICT, is potentially as great a barrier to employability and social exclusion as a lack of achievement in literacy and numeracy."[18]

But the issue of capability is far more complex and unpredictable than ICT skills. The broader observations that: '…. *one common problem is too much emphasis on basic*

[14] Seely Brown (2002).
[15] Examples of this can be seen at www.growingambitions.org; www.canucutit.co.uk
[16] Skills (2008).
[17] *E-Business and ICT Skills in Europe*: Synthesis Report. ICT Skills Monitoring Group, Europe Go Digital, June 2002.
[18] DfES (2002).

computer literacy in isolation from broader skills,'[19] and that: '*the term e-skills is used here to mean the ability to find and use digital knowledge resources, and includes those e-learning skills that will be increasingly essential for lifelong learning*'[20] are more accurate, yet still seem to imply that the skills involved are somehow separately discernible. The following quotation from the core principles of One Laptop Per Child (OLPC)[21] is revealing:

> "I wear my XO[22] like my pair of shoes. I have good XO shoes for a long walk. A healthy education is like a vaccination. When we talk together we stay together. Give me a free and open environment and I will learn and teach with joy."[23]

Here, the use of technology in lifelong learning is conceptualised as more of an extension of the individual rather than something that is just 'used'. Speaking, listening, reading and writing are undergoing significant change as technology develops, so that there are more forms of language and new tones of voice. The following observation comes from someone concerned with literacy teaching:

> "Reading and writing online is a more social and potentially exposed activity requiring new skills."[24]

Technology is not simply changing the teaching of literacy its definition and experience. This will become more acute as the human-computer interface (HCI) becomes far more sophisticated. Capability will not be defined in terms of the familiar notions of 'entry-point', socio-economic deprivation, exclusion, or generation. Current labels of 'digital immigrants' and 'digital natives' offer no additional insights as, according to one commentator:

> "Even amongst groups that have relatively low expectations of being able to 'do things online', the absolute proportion with this expectation is already substantial"[25].

Content to communication

'*Need for shared intelligence to understand the market*'[26] is well established. Similarly, the value of accessing knowledge from sources outside those immediately available has always been understood, even in the most formal of educational systems. The 1990s and early 2000s saw technology as largely expanding what might be termed

[19] Warschauer (2003).
[20] Learning and Skills Council of England (2002).
[21] One Laptop per Child (OLPC) is a new, non-profit association dedicated to research to develop a low-cost, connected laptop. The laptop is designed specifically for use in education by children and to be produced in mass quantities supplied to less developed countries' governments.
[22] The 'XO' is the '$100' laptop developed by OLPC.
[23] See OLPC Wiki at http://laptop.org/vision/index.shtml .
[24] National Literacy Trust (2008).
[25] Contribution to the IFLL Expert Seminar on Technology and Lifelong Learning by Seb Schmoller, Chief Executive, Association for Learning Technology.
[26] Construction Skills (2008).

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'on-site' access to knowledge, primarily through larger collections of content, stored and accessed through new technologies. It was a centralist offer, linked to prescribed learning, requiring a repertoire of administrative and technical support, and often at the cost of support to learning and learners. Collaborative tools were focused on what was 'delivered', so that shared applications such as forums, chat rooms and whiteboards actually 'passed the content parcel around'. We're now seeing something very different and entirely less predictable:

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

The direction of travel seems clear: the traditional tenets and behaviours associated with information and knowledge management are being replaced by a model of behavioural evolution that is increasingly difficult to capture.

Figure 4: The themes of Web 2.0[27]

The lifelong learner can now be virtually off-site without being physically off-site, either through the auspices of the formal education institution or otherwise.

Of course, connectivity may develop to a point that challenges our capacity to maintain any sense of understanding. The move to 'open source' does far more than offer enhanced links to residual information and knowledge by removing many of the barriers that we associate with commercial protectionism. Knowledge is not just being transferred, but constructed and created in different ways that counter set ideas of

[27] Tag cloud constructed by Markus Angermeier to sum up some of the themes of Web 2.0: http://en.wikipedia.org/wiki/Image:Web_2.0_Map.svg

ownership. Evolution is 'perpetual beta', offering what John Seely Brown has called a '*learning ecology: open, complex, adaptive, dynamic and interdependent*'.[28] Web 2.0 developments and beyond promise to fundamentally change the dynamics and territory of knowledge creation. They also question established concepts of control regarding who operates within, and owns elements of, that territory. This does seem supremely aligned with a certain view for lifelong learning:

> "Nobody owns anything, but everyone is rich."[29]

However, faced with this prospect, educational institutions and Government are faced with having to consider fundamental changes in the design of spaces, management of place, ownership and copyright. Formal education will have to:

> "[operate] learning as much social as cognitive, as much concrete as abstract, and become intertwined with judgement and exploration"[30].

People are managing informal learning 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 strangers."[31]

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 emails. More than half the world's bloggers are in their teens still. Skype puts on more than 150,000 new users a day. It is estimated that by 2010 more than 70 per cent of digital information will have been generated, not by commercial producers, but by 'Joe Public'.

- In early 2007 the Pew Research[32] Centre in the USA found that 55 per cent of online teenagers had created a personal profile online and had used social networking sites.
- 48 per cent of teenagers were visiting social networking sites daily or more often.

Particularly interesting are studies of the access behaviour involved here:

> "MySpace is kept open 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

[28] Seely Brown (1999).
[29] More (1516).
[30] Seely Brown (1999).
[31] Lenhart and Madden (2005).
[32] Pew Internet and American Life Project. 'Teens and Social Media'; 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.

– this is particularly important for those who don't have computer access at home." [33,34]

The ways in which technology is enabling communication amongst students and between students and teachers is increasingly fluid and multi-layered:

> "An important aspect of this multi-layered communication between student peers is computer-mediated (CMC), which is observed to saturate students' lives. In the context of formal instruction, it has become increasingly common for teaching staff to provide online learning materials to students on personal or departmental web pages... students use computers to access these materials and to engage in a wide variety of technology-enhanced learning activities... However, students also commonly use computer-mediated communication to relax, and regularly incorporate it as part of breaks in their study routine. Periods of concentrated work are interpolated by web surfing, checking phone messages, checking email and social networking sites such as Facebook, and – for some students – instant messaging."[35]

Identity formation, impression management and the creation of frameworks for cultural knowledge construction are highly relevant when considering the more formal management of lifelong learning environments, virtual and otherwise. While we may question how much learning actually takes place within social networking contexts, a failure of educational institutions to come to grips with methodologies for interaction and exchange of information, ideas and knowledge will risk their being sidelined as 'purveyors' of formal learning.

The way in which some educational institutions are responding to the move from proprietary to open source is an indication of direction for lifelong learning management more widely. The Open University's OpenLearn developments are initiating software applications that will:

> "…allow OpenLearn clients to move past the passive absorption of the OpenLearn content and become more active learners. Current activity is focused around the creation of applications to build communities of learning around particular sections of content, to analyse content using tools to display graphically the structure of argument and tools to allow clients to evaluate their progress in learning."[36]

[33] Boyd (2006).
[34] The Statistical Cybernetics Research Group at the University of Wolverhampton is currently conducting a range of research on social networking user behaviour: http://www.wlv.ac.uk/Default.aspx?page=8902.
[35] Howell (2008).
[36] Clark (2008).

The following are fruitful pointers:

- sharing and valuing individual production, social networking and user-generated content; (blogs, wikis, MySpace, Facebook, YouTube, Podcasting, Flickr);
- harnessing collective intelligence ('Wisdom of Crowds', Yahoo! Answers, 'Crowdsourcing');
- co-operative, voluntary online activity to generate unique products (Wikipedia);
- forming communities of interest online (Del.icio.us);
- reusing and/or remixing of publicly available content;
- exploiting 'network effects' (in which a site or application works better the more people use it);
- users adding value, being seen as co-developers (application building on Facebook);
- personalised reception of audio and audiovisual content, where you want, when you want (portals, Podcast downloads, RSS, internet video);
- Open Standards and Open Systems (Open Source; Open Content, Open APIs)."[37]

However, this sort of analysis currently remains exceptional. There is little pedagogic research on the application of Web 2.0 principles in university teaching and learning, with only five universities in the UK establishing an institutional strategy for the use of Web 2.0:

> "... our consultative work revealed strong feeling that educationalists do not as yet know how the increased use of Web 2.0 technology will interrelate with learning and teaching, and in turn demand new pedagogies and new assessment methods."[38].

The pace at which the technology is developing raises the question of whether it is possible to have an institutional strategy on Web 2.0. In adult and community learning, technical limitations remain in the classroom, but are less evident at individual student personal level.[39]. The study of how people learn – the cognitive science of learning – remains a minority pursuit, despite the strength of the argument that 'good teaching' is in fact learning design[40]. Some learning providers[41] feel that Web 2.0 is essentially peripheral and experimental, when in fact the evidence shows that:

> " … social software is being used for learning, and is quickly moving past the stage of experimentation by innovators and early adopters into large scale implementations."[42]

[37] Clark (2008).
[38] Franklin and van Harmelen (2007).
[39] Becta (2008).
[40] Contribution to the IFLL Expert Seminar on Technology and Lifelong Learning by Seb Schmoller, Chief Executive, Association for Learning Technology.
[41] Views were expressed to this effect by some of those responding to the IFLL Call for Evidence on the Technology and Lifelong Learning Theme.
[42] Swansea University (2008).

and:

> " … the multi-roles for staff within education in engaging with learners, managing resources and designing a curriculum in a world where today's geographic, physical, temporal and cultural boundaries are no more."[43]

As Web 2.0, its interconnectedness and open source territory continue to develop, there is a greater need for lifelong learning to understand the interplay between teaching, learning and technology, and directions for its evolution. If this seems too radical a view, a more conservative consensus is evident regarding the role of staff as e-learning evolves:

> " ... learners should be suitably supported (by peers or with tutor support)... implementers should make informed decisions about 'blend'; that is to say the mix of technology and non-technology approaches to take in a particular learning intervention, rather than assume, say, that only one e-learning approach is appropriate."[44]

Investment

The idea of 'investment' for technology in lifelong learning may not be entirely what it seems. The obvious interpretation covers what funds are invested in technology infrastructure and equipment. The current UK Government has provided considerable investment into Further Education (FE), but acknowledges that education organisations' own investment is at least quadruple that. There has been further investment in informal learning through the broader infrastructure of libraries, museums, the voluntary sector etc. The media, particularly the BBC, has invested very substantially:

> "The contemporaneous growth of Web 2.0 co-occurs with increased media convergence, particularly in respect of broadband communications, telephony and the broadcast media. While professionally produced and edited media are likely to persist, we will see the broadcast media increasingly adopting Web 2.0 technologies, with greater audience participation and audience created content. In parallel, we will also see an increasing number of channels funded in very diverse ways."[45]

Other forms of investment include people and time. Government has understood that they can reduce their capital contributions while supporting staff expertise development such as e-Guides[46]. As individuals' own use of technology becomes more expert, this also constitutes 'investment' in technology and counters the need for formal education to 'train' students in the use of ICT. More broadly still, commercial

[43] Op cit.
[44] David Jennings, David Kay, and Seb Schmoller, with Camilla Umar and Liz Wallis. *Generating Demand for E-learning: The 21st Century Citizen: A research report prepared for Learning Light.* October, 2005.
[45] Op cit.
[46] http://teachingandlearning.qia.org.uk/tlp/eguides/

investment in communications infrastructure and computing devices makes it clear there is no neat dividing line between education and learning and other aspects of life. Investment is increasing, not because of Government funding, but due to the ever-widening investment base.

Despite these investments, some people remain unable or unwilling to connect. We may be close to the time when without connectivity and Internet access a citizen will not be able to be a 'lifelong learner'. Government and educational institutions need to radically reconsider the direction of investment in technology and learning.

Lifelong learning

It may seem curious to have a sub-heading for 'lifelong learning'. However, technology may be redefining what we mean by lifelong learning. It reinforces how increasingly irrelevant the divisions have become between formal and informal learning, workplace, institution and home-based learning. These very divisions, convenient though they are for the administration and funding of educational provision, will become dysfunctional and increasingly confusing for individuals. If Web engagement becomes central to the ways in which people communicate, obtain information and build knowledge, then how can we distinguish between what constitutes formal and what constitutes informal, in work or outside work, targeted or random?

But is this actually problematic? The majority of learning at work takes place informally anyway and knowledge is collective rather than individualised. Economic development requires learning environments based on collaboration between enterprises themselves and other social institutions. The theory of connectivism[47] states that successful learning actively creates meaning through engagement in networks. Yet much formal learning couples lifelong learning with assessing individual attainment. The whole idea of assessment practice within formal learning structures needs to be radically reconsidered if it is to make sense to the learner operating in a connected environment. So, there is a problem here, symptomatic of the wider threats to formal education. If learning can increasingly be facilitated through technology to take place in multiple contexts – in work, in the community and in the home – and individual assessment practice feels increasingly 'out of place', then formal education more generally may increasingly seem irrelevant for the everyday lives and learning of many people if:

> "... learners' worlds inside and outside education become too disparate... new learners increasingly familiar with learning through the Internet, will be able to find experts elsewhere and the critical voice of the local tutor will be lost"[48];

[47] Siemens (2005).
[48] Swansea University (2008).

and:

> "Why put up with poor quality physics teaching if I can watch MIT's Walter Lewin?"[49]

Developments that deny the value of the tutor are problematic. They assume high levels of learner motivation, independence and knowledge of what may be 'out there'. As already pointed out, the capabilities governing effective use of learning technology will concern a good deal more than the ability to use just the technology itself. The role of the tutor, while it necessarily evolves and takes many and various forms, will be crucial.

Those in employment will require regular opportunities to revitalise their vocational and professional skills. But this correlates very closely with the 'bricolage' idea of learning as a continual process of assembling and re-assembling knowledge in ways that require openness of communication and access. As Microsoft's David Burrows puts it:

> "It is now commonplace to talk in policy terms about the school/home continuum and about the role of ICT needs to play in facilitating this. Should we not now also be talking about the work/home learning continuum, since in many contexts, the home will be a suitable place to do work-related e-learning?"[50]

Yet again this raises the issue of 'learning design' and adult education organisations making a distinct and valuable contribution to, not control of, learning design, negotiated and shared with the individual. A good example of this thinking is set out by John Stone[51]:

> "The design of learning spaces will also evolve. As learners spend more time learning online, at home or in the office, there will be more emphasis on the social role of the campus. It will become a more important part of the 'college experience', and increasingly exploited for the development of 'soft' social, networking and team-building skills – skills critical for employability. It is already common for businesses reliant on extensive home working and hot-desking to set up social facilities. In this way canteens and leisure facilities may be drawn into the education process. Libraries and IT centres may be increasingly difficult to justify as personal mobile computers become the norm with information available any time, any place, anywhere. This will itself drive curriculum change as the acquisition of information decreases in relevance and the analysis, application and creation of knowledge take its place."

What constitutes *appropriate* change, how it is derived and managed and at what pace that proceeds, is key. Rather than how fast technology develops, we need to better understand how *change is now an intrinsic part of technology's behaviour itself* and not just a 'result'.

[49] Swansea University (2008).
[50] Jennings, Kay and Schmoller, with Umar and Wallis (2005).
[51] Stone (2008).

Much of this challenges perceived notions of 'quality', the abiding focus for educational provision over the past decade. For example, the Web 2.0 dynamic process is not regarded as the owned province of the original developers but depends on the contribution of users. This is deeply at variance with more traditional views of education. But although 'perpetual change' is highly disruptive of conventional formal education, it is a good deal closer to our experience of learning throughout our lives. To what degree would these comments of Hirotaka Takeuchi[52], when writing about learning development in companies, be understood in considering lifelong learning policy?

> "[Creating knowledge requires] 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. 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 (knowledge utilisation)."

Ubiquity

> "Nobody knows how computers will be used in 10 or 20 or 30 years' time. What we do know is that they'll be everywhere, as much as pencils. Everybody will have them all the time."[53]

While we may not yet be where Seymour Papert predicted, we are heading in that direction. But when using the term 'ubiquity', commentators often seem to mean it is just a case of there being 'a lot of it (technology) and it's increasing'. With this view, lifelong learning should focus on ensuring everyone has more access, more choice, and more capability, and that 'computing' is about PCs or standalone 'devices'. However, the concept of ubiquity goes beyond the number of devices to encompass their interconnectedness, 'always on' and constantly developing further services. Impact does not reside in devices but in the services delivered and in the convergence involved.

The longer-term structural impact of ubiquity has become apparent only recently as wireless technology enables users to access services managed outside the personal computing device, through the Internet and with permanent connectivity. The information and knowledge environment is increasingly 'out there' and not resident

[52] Nonaka and Takeuchi (1995).
[53] Seymour Papert, Conference, Japan, 1983.

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'in here'. The challenge is to communicate effectively with this 'external cloud' of data and services. Increasingly, this redefines the idea of 'making journeys' for physical interaction, as access is not necessarily dependent on movement and the individual potentially has a 'different relationship to time, to place and to other people'[54].

As sociologists examine how technological mediated communications will change interaction between people, anthropologists and psychologists examine states of dependency and autonomy, and architects and planners consider how use of buildings and travel will be altered, educators will have to work out what the ubiquity of technology will mean for learning. Of all the technological devices developed, the mobile phone is now touching more people across the world[55] than any other. Merging mobile technology with Internet access will vastly expand the potential and dynamics for an almost unimaginable interconnectivity. The fact that those transacting will be without knowledge of, or control over, the technology infrastructure that supports them may become the single most important issue f or lifelong learning to address.

Ambiguities and warnings

Views of technology and lifelong learning tend to polarise opinion, but the polarisation may be exaggerated. Historically, technology's role in teaching and learning has been an area for confrontation. You are either a 'technophile' or 'technophobe'; either claiming unsubstantiated benefits or indicting unreasonable levels of expenditure with little return and alienation of core principles of human communication.

This history of 'over-claiming'/'over-trashing' technology has not been helped by the fact that the introduction of technology to education was for some time the province of enthusiasts who were drawn into both over-stating and defending their case. Moreover, Government's own use and deployment of computing technology has not always had good results. Arguably, progress has occurred more through personal and business technological developments and practice than from within the public sector. There are fears within the education system that computing technology is being driven by commercial rather than civic values, and this has been extrapolated into concerns for equality of access. There are claims and counter-claims on whether technology supports or undermines literacy. There are concerns over reduced sociability and communication from over-involvement with technologically supported communication:

> "I know more about many of my fellow bloggers' research than I do about a colleague whose office is down the corridor."[56]

[54] Kluth (2008).
[55] 3.3 billion, more than half the world's population, now subscribe to a mobile phone service. Source: International Telecommunication Union at www.itu.int/net/home/index.aspx
[56] Swansea University (2008).

Children express more confidence in their reading abilities in private than when reading in public[57]. Technology provides space for private reading, and the social interaction that takes place through technology can be highly appropriate for some learners of all ages. Computers can often support the more visual or verbal student, being adapted to learning styles crucial for those with a range of different impairments[58]. The ability of computer software expert systems to sift through and interpret data can be seen as a threat rather than an opportunity. We have a polarity of views about technology both helping teachers' workloads and adding to it. Access to information and knowledge is seen as a huge benefit, but also as a danger in becoming unmanageable. The paradoxes are well expressed by the recent Inquiry into the Future of Civil Society in the UK and Ireland:

> "The application of technology has many great strengths and has energised many parts of civil society, increasing the ability of associations to broaden their scope and richness of connections. It was also seen as a good organising tool for collective action. However, technology was also seen by participants in the Inquiry workshops as a source of fragmentation and atomisation. Civil society associations will inevitably review the way in which they apply technology".[59]

The recent European Commission Safer Internet Forum also portrays the ambivalence very clearly:

> "Social networking sites present us with two sides of the same coin: on the one hand, they have changed our use and understanding of new technologies. They have turned us into active users of the Internet and have shown us that we do not need special skills in order to create new forms of art online. They have changed our social relations, how we get a job, how we do business, how we look for information. In doing so they influence, more than anything, the everyday lives of children and young people who were born in the digital era and are citizens of the online world, just as much as they are citizens of the real, offline world... on the other hand, we have to make sure that the digital world is as safe as possible for children and youngsters, while respecting their right to privacy. Let us not forget how important it is to allow them to express themselves and to take advantage of the many opportunities offered by social networking sites."[60]

So the warnings and panaceas roll out and on. The overall picture of technology, its drivers, values and examples and nature of good practice is a complex one containing much ambiguity. Education practice and design needs to accept such ambiguity and strive to understand how lifelong learning can align with the systemic manner in which

[57] Joseph Rowntree Foundation (2007) *Children researching links between poverty and literacy.*
[58] Skill (2008).
[59] Carnegie UK. Inquiry into the Future of Civil Society in the UK and Ireland. 2008.
[60] Viviane Reding speech to EU Safer Internet Forum: 'Social Networking in Europe – success and challenges'. Luxembourg, 26 September 2008.

people are adopting and adapting technology throughout their lives, so that they do not see learning as somehow 'outside that experience', difficult and problematic as that may be.

Looking backwards to the future

We have discussed those major trends identified by contributors to the Inquiry's Call for Evidence and by some who commentate on technology and learning more generally. Before translating those trends into issues for policy, practice and research, it is helpful to examine how we got to this current position. This is not 'driving with our rear-view mirror', but ensuring that we understand what sort of perspectives have been adopted in the past so that we can better understand the level of change we need to make when then looking forward.

Formal education has little history of developing computer technologies for its own purposes. The technologies used in education have largely been 'hand-me-downs' from the leisure, defence or business worlds. With some very notable exceptions[61], the desktop and laptop computer, the PDA and the whiteboard were all first designed for business, not education. Similarly, 'ICT skills' in education have been introduced primarily in the service of an economic agenda, geared to training students to compete in the workforce. One result has been the idea that the role of digital technologies in education is simply a question of 'modernising it' to keep up with the workplace. A corollary is the tacit view that really the *fundamentals* of teaching and learning, curriculum and institutions do not need to be changed at a deep level.

It is also useful to look further back to observe how the more formal organisation of education has worked alongside other, more informal systems. The present 'industrial model of schooling' has evolved to meet the needs and form of a particular phase of capitalist industrial development, but pre-1840 this was not the predominant context for learning. The knowledge and communications systems being developed by Internet technology seem particularly closely related to the pre-1840 context, where learning was more informal, evolved through social networks (albeit highly contained), and by what we would now call work-based or practice-based activities. Nowadays, a knowledge worker's value in the labour market often derives in part from the network that they are connected to, a re-versioning of the pre-industrial context. There are 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 encourage 'free thinking' and potential revolt against centralist authority[62]. Also, there was the fear of 'indoctrination' – as

[61] The BBC B and Archimedes developments undoubtedly played a significant role in pioneering education's involvement with computer technology and its applications, but the continuity of Government support and publicly-funded direction was not well managed and lost its way in the face of commercial pressures.
[62] The sort of concerns regarding the development of wikis and knowledge sources developing and operating outside hierarchies of academic authority.

there is today with the concern about the commercial interests behind the Internet's development.

The 18th and 19th century Industrial Revolutions imposed new requirements on skills and knowledge. Much remains of this in our current approach to the curriculum and to pedagogy based on the Taylorist organisation of production. This position is challenged by Web 2.0 technologies. We can view 'lifelong learning' as a comparatively recent and convenient formal term for what we do anyway in order to negotiate and survive life. This would have been well understood pre-1840 and did not disappear in the mid-19th century at the start of the State's organisation of learning, since there were points at which the diverse views and practice interconnected, for example, through belief in the power of education for social change through emancipation.

More recently, public and private education systems intermingle in the provision of lifelong learning. Changes have been justified in terms of industrial competitiveness with shorter product lifecycles, increasing speeds of adoption and instability of employment, so that employees need continuous learning throughout their work life to update their occupational knowledge or to learn new competences. However, the speed and flexibility of formal learning and skills provision can be slowed by debates on the respective responsibilities of the 'demand' and 'supply' sides. In the meantime, the realities of business competition, the influence of digital technologies and the needs of individuals in their social contexts develop alternative landscapes for lifelong learning, both inside and outside the world of work. Emergent ideas are of learning as multi-episodic, with individuals spending occasional periods of formal education and training throughout their working life, alongside a growing role for informal learning and peer and social networking, facilitated through technology. How far matters have really changed is unclear, as many individuals still get reintegrated within the outdated, inflexible systems in the name of adult skills similar to those that failed them at the outset of their formal education[63]. Often, educational providers are held to account for not delivering fit-for-purpose, flexible provision for adult students, when it is the administrative and funding methodologies that are at fault. If the role of technology in learning really does tip towards wholly serving the individual, then existing centralised administrative and financial systems will require a radical overhaul.

We see broadly where the formal educational system has been in alignment with lifelong learning and correlate that with behaviours emerging from new communications technologies. Certainly, primary education often seeks to support children to interact in a way that joins social interaction with learning. The pedagogic approaches that include storytelling, group work, play and project-based learning all seem close to the 'bricolage' approach. In higher and further education the principle of social and knowledge networks have been acknowledged despite that fact that only a minority of universities and colleges are strategically exploring the pedagogical

[63] Attwell (2007).

implication of Web 2.0 and beyond. Where this occurs, the results and implications of exploration are important across a range of learning infrastructure issues:

> "ICTs have had a significant impact on students' experience and use of space. In general, the effects of ICT are experienced by students as highly positive. The reported benefits of ICTs include:
>
> - helping students to co-ordinate 'on the fly' and to manage workload and 'just-in- time' study practices;
> - allowing students to communicate with peers, combat isolation and enhance their social environment;
> - mediating peer discussion about study, and the exchange of informal 'how-to' knowledge between students.
>
> ICT use is thoroughly integrated into students' lives, to the point where its absence is felt by students to be a barrier to study …"[64]

But there is little research in the UK into the information skills and practice of people in and entering post-school education[65]. Within non-HE adult learning the discourse regarding the role of technology has been confined more to strategies relating to 'equipment and facilities ownership' rather than understanding of its benefits to learners. Perhaps this reflects the synchronisation of the growth of pervading technology with the endless political tinkering with the adult education systems.

Even where organisations recognise the value of informal learning and have set up technical platforms to facilitate forums, these have tended to be over-mediated by teachers and trainers and have remained little used. This phenomenon is not limited to the education sector: there are examples of companies setting up mediated forums only to abandon them for lack of use, while in the same company employees set up their own forums, using open source freeware, which gain heavy usage and involvement[66]. The distinctions between top-down imposition and bottom-up ownership are clear.

Most education systems behave as if social networking systems and technological infrastructures are a problem rather than a solution. This is perhaps most concerning when in a world emphasising and facilitating collaboration and collective intelligence, much of the formal skills and learning model remains rigidly tied to assessing individual attainment.

Formal education needs to consider the degree to which it remains the case that:

- the major implementations of educational technology have been not to encourage networking and creativity but have been concerned to control learning and to isolate networks;

[64] Howell (2008).

[65] *The information behaviour of the researcher of the future: a CIBER briefing paper*. UCL, 2008. See also work within the ESRC Teaching and Learning Research Programme (TLRP), notably by Julian Williams, John Brennan and colleagues – www.tlrp.org/dspace/handle/123456789/1158

[66] Trainingzone debate topic. www.trainingzone.co.uk/index.html, 2007.

- systems have been developed as a 'walled garden' to perpetuate the isolation of the educational institution from the wider outside community;
- the new technologies are used to duplicate 'more effective' older social forms of organisation[67].

Finally, perhaps the closest alignment is not with formal education practice at all, but with the media. This alignment is not a particularly recent one. In 1928, the British Broadcasting Corporation (BBC) identified the '*desirability of group listening and dangers of one-way communication*' and promoted a new venture to support listeners' discussion groups. By 1930 there were 664 listening groups and by 1936 10,000 schools had been registered as 'listening groups'. The stated aim was to '*stimulate – engage – guide – enable communication, and encourage to create, author or do*'[68]. This sounds very close to the claims being made for people's involvement with Web 2.0. More recently, the BBC has acknowledged the challenge for 'Media Literacy' to engage fruitfully with education and learning delivered by the new technologies:

> *The BBC's design points for 21st century lifelong learning, accommodating:*
>
> - *A variety of learning styles*
> - *Existence of prior knowledge*
> - *Likelihood of frequent interruption*
> - *Sporadic access*
> - *Delivery anywhere, anytime and anyhow.* [69]

With the Internet's increasing integration with the media, the BBC has developed services that engage the realities of the sporadic, anywhere, anytime and multi-platform delivery. It folds together attributes of formal and informal learning into something like a prospect for lifelong learning and technology.

[67] We still see virtual classrooms recreating and preserving the old paradigm of education with new technical forms. It is notable that even in SecondLife universities have been investing heavily in buying islands to recreate their building and classrooms in 3D form. SecondLife is a 3D digital world imagined, created, and owned by its residents: www.secondlife.com .
[68] Auckland (2008).
[69] Ibid.

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3. Issues and concerns

The idea of spelling out 'conclusions' seems to run counter to the nature of the process we've described as constantly evolving, so we will instead identify signals of changing behaviour. Understanding these signals is particularly important if lifelong learning is to be effectively supported by those working within education and beyond.

3.1 Issues for us all

Organisation of information and knowledge

We are seeing fundamental change in the way in which information and knowledge are 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 depending on time and place. At the same time, we see massive change in the 'spaces' for information and knowledge, from their emergence within discrete institutional boundaries, to their generation in virtual and cross-institutional settings. As data storage becomes cheaper, available on 'the network' rather than on personal devices, so concerns about individual care of it may 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 personal recall of facts and events become obsolete as a socially valued skill? Will the ability to synthesise information become the primary goal of education? Will the development of complex searching and archiving techniques become a 'new basic' in education? What is the goal of education and learning when all information – from facts, to skills advice – is constantly accessible? At a 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 our internal world when so much is 'outsourced'?

Control of information and knowledge

At one level, communications technology is supporting distribution rather than centralisation of control. This can be highly disruptive, notably for those governments, organisations and individuals who have a material interest in the ownership and control of information and knowledge systems. But, at best, these developments are enabling us to think less about prescribing the content of what should be learned, and instead emphasise how best to enable learning. Thus, technology is raising the issue of how people can learn differently and less about how we can teach differently.

Individual and organisational behaviour often develops, either psychologically or administratively, to resist change. This contrasts with network and 'swarm'

behaviour[70], where individual behaviour contributes to configuring perpetual change. Software systems are increasingly dynamic and are characterised by 'swarm' behaviour. They are launched in imperfect states, set up to continually rethink, reform and reconstitute. Increasingly, this dynamic process not only questions notions of control but also of ownership. Knowledge is not regarded as the owned province of the original developers but as the contribution of users. There are huge tensions in this. Much about it is deeply at variance with more traditional views of education, and highly disruptive of formalised practice.

The nature of expertise

Technology undermines accepted notions of individually based knowledge and expertise. It can inspire emphasis on acquiring knowledge through social collaboration, a process that necessarily continues throughout life. It brings with it a shift in the idea of where 'data processing' and learning might be taking place. We are accustomed to the idea that each individual has their own processing power, rather as we used to focus on the processing speeds of computing devices. Now, with the individual's use of technology, processing is both distributed and hidden, and its capacity massively increased. Therefore, individuals are able to do much more complicated and resource-intensive things by working collaboratively.

This increase in processing power enables relationships to develop between users and software services which offer new opportunities for learning. Where complex simulations and experiments were once the property only of those with significant training and access to expensive machinery, now anyone can 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 are possible.

The challenge for education is to understand how best to harness this increased capacity, how to share ideas and information generated, and how to engage with people's potential to act as experimenters, designers and creators. This is already visible in 'informal contexts', with people using computers to design garden layouts with linked data on soil types, growing conditions and planting suggestions, through to use of programs that manage genealogical analysis at levels of complexity that five years ago would not have been available outside a research laboratory. Increased processing power will enable digital technologies to offer bespoke and specific

[70] The swarming behaviour of ants, bees, termites and other social insects has implications far beyond the hive. Swarm intelligence – the collective behaviour of independent agents, each responding to local stimuli without supervision – can be used to understand and model phenomena as diverse as blood clotting, highway traffic patterns, gene expression and immune responses, to name just a few. Swarm technology is proving useful in a wide range of applications, including robotics and nanotechnology, molecular biology and medicine, traffic and crowd control, military tactics, and even interactive art: www.physorg.com. The biggest changes may be on the Internet. Consider the way Google uses group smarts to find what you're looking for. When you type in a search query, Google surveys billions of web pages on its index servers to identify the most relevant ones. It then ranks them by the number of pages that link to them, counting links as votes (the most popular sites get weighted votes, since they're more likely to be reliable). The pages that receive the most votes are listed first in the search results. In this way, Google says, it 'uses the collective intelligence of the Web to determine a page's importance'; *National Geographic*, Peter Miller, July 2007.

information and recommendations in the development of an individual's ideas and actions. This idea of technology itself having the ability to act as collaborator rather than being simply a tool will require new concepts of creativity and originality, with novel approaches to the assessment of individual expertise.

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, hotels and libraries are installing wireless networks to serve customers carrying wireless gadgets. Many business people, students and other citizens expect cheap, easy access to the Internet as a matter of course. People can feel stranded without mobile connectivity. For some[71], this constant connectivity is changing social behaviour. It is becoming acceptable, for some, to occupy several information streams simultaneously rather than focusing wholly on the people you are with. We are far from sure whether the social aspects of 'continual partial attention behaviour'[72] can be appropriate if transferred to learning practice, even if it aligns with informal and episodic learning. But it is particularly fascinating in its relationship with ideas regarding 'where people are' and 'where they are communicating to'.

The Internet has tended to use a language of identified 'place', with a notion of 'online' and being *in a space*. Web documents are called sites and collections of them are locations and portals. Gradually, the notion of virtual meeting places has become easier to accept in the web culture. Virtual spaces enable different types of social interaction. Who you are friends with, and 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. It raises all sorts of questions about the relationship between learning and geographical identity and the established relationship between physical resources, information and knowledge.

This requires us to rethink the way in which we may design our built environments for formal education and learning. A more complex dimension, as individuals increasingly transport and 'wear' their means of communications and information access, is that learning actually becomes disassociated from any set place *at all*. This in turn adds complexity to notions of identity and how this may increasingly be constructed by what we own and use as we move from place to place.

But technology is affecting conventional ideas of space and place and their relationship to information and learning in other ways. Spatial and geographic data are a significant

[71] It may be many more than we think. For those resistant to the idea, it is worth 'rewinding' how our working lives have been affected by email over the past decade. Its effects have been far more systemic than people imagine, until they start really surveying their behaviour both inside and beyond the workplace.
[72] Continuous partial attention describes how many of us use our attention today. It is different from multi-tasking. To pay continuous partial attention is to pay partial attention – *continuously* – motivated by a desire to be a *live* node on the network. Linda Stone, The Huffington Post, 2008.

feature in the social software itself. 'Geo-tagging' means the Internet is slowly being wedded with real space, enhancing physical places with information that can deepen our experience of them "*making computing into a more continuous part of our real lives.*"[73] Consider work behaviour and how we are interacting with these technologies in ways which are more seamlessly and invisibly integrated than perhaps we realise. So, armed with a Bluetooth-enabled PDA/'phone/satellite-navigation device, we climb into our vehicle and journey to a meeting where there continues to be technological and human interaction as we exchange data and update diaries and action planners. This has moved from 'unreality' to reality well within five years.

As the notion of 'a place' becomes hugely enriched with customised data according to individual requirements, will this counter an increasing urbanism? Will this amplify issues of digital exclusion on the basis of geography as well as the other factors discussed[74]? To what extent will built environments housing adult learning provision be able to replicate and even customise the levels of technology increasingly embedded in everything around us in the 'outside' world – from streets, shops, banks, museums, galleries, offices, railways stations and bus stops? Does the idea of being in a set place while then visiting any number of other 'information and knowledge' locations, synchronously mixing objective and subjective information and knowledge, further disrupt ideas of stability, authority and control?

3.2 Issues for education

> "I personally believe that the future changes to further education will be more than just changes to structures, responsibilities, funding and organisational arrangements."[75]

During 2006, the then DTI supported a visit to the USA to consider learning technology. This[76] identified significant trends in five areas: participatory learning; creative learning; on-demand learning; games and simulation-based learning; and mobile learning. The visiting group then identified a range of problems they saw arising from these areas and heading this list was:

> "The ability of formal educational institutions to cope with these developments."[77]

In lifelong learning the range of educational organisations involved is considerable and various across a spectrum of formality and informality. Our summary of issues here is therefore confined to those we see as generic and widely relevant, rather than particular and 'sectoral'.

[73] Toyoma, Microsoft Research at http://research.microsoft.com/~toyama/
[74] It is estimated that the next-generation broadband over fibre-optics will cost the UK in excess of £28 billion, and while this cost could be reduced substantially by re-using the existing civil infrastructure, the economics of rolling it out to more rural areas has no immediate commercial solution (Broadband Stakeholder Group, September 2008).
[75] Stone (2008).
[76] Global Watch Service (2006).
[77] Ibid.

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Formal and informal learning and the nature of relevance

As technology blurs the boundaries between informal and formal processes of gathering information and developing knowledge, it will be more difficult to identify which forms of access have relevance to learning goals. Studies of digital technologies in small and medium enterprises (SMEs)[78] show very little use of formal e-learning but that computer technology was being widely used for informal learning, with networking and distributed communities rapidly growing. This methodology for informal learning was particularly prevalent amongst older workers at middle and senior level, as they have more work autonomy. Combining the formal and informal has become very much the ethos of some companies.

In what ways have educational institutions understood the increasingly necessary interface between formal and informal learning? Is it symptomatic that students emerging from their teacher training are fully familiar with technology-enabled social networking at a personal level but 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...'[79]? How does such an observation reflect the ways in which use of technology is becoming embedded in people's lives but not necessarily understood and engaged with institutionally?[80]

Learning environments and institutional identity

Educational institutions have embedded within them what has been called a 'built pedagogy'. This can both work for and against adult learners, their access and their navigation of learning. If educational institutions can design technology infrastructures as 'intelligent environments', the relationship between 'learning spaces' and adult learning behaviour will become much more complex. Will such intelligent environments offer the opportunity of responding to the specific needs of individuals? To what extent will there be the capacity to reshape educational environments to meet the needs of diverse occupants of the space? The institution could be seen as a constantly changing and evolving environment, rather than a fixed resource with only limited properties and adaptability. Community-based institutions could evolve specifically to support learning, rather than just be 'a place' to go where some educational delivery had been arranged.

We are used to schools, FE colleges and universities growing around the fixed resources of libraries and laboratories, but now we are developing a situation

[78] Attwell (presented 2005). This Leonardo da Vinci ICT and SME project included a survey of more than 350 SMEs, focus group meetings and 90 case studies in seven different countries.
[79] Swansea University (2008).
[80] DIUS Consultation into Informal Learning was launched in January 2008. This received responses from some 5,500 individuals and organisations, a massive reaction compared with the responses such government consultations usually attract. The Consultation has opened up considerable debate regarding the nature and value of informal learning against more formal, qualification-targeted learning and growing recognition of the ways in which technology is blurring boundaries and facilitating different learning behaviour.

where information can be accessible almost anywhere[81]. Further, if simulations and experiments can be run anywhere, and if 'human interaction' can be achieved in virtually 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. Such issues, actively considered in the design of schools and of universities, are equally pressing on FE colleges and adult education organisations given their diverse and continually changing clientele.

There is an increasing divergence between what is occurring in the commercial world and what appears to be possible in the education sector. For example, the concept of a unique learner number for every citizen[82] proposes a level of data convergence and interoperability throughout lifetime learning. But progress has hardly been rapid, whilst commercial-level loyalty cards are well established and have a whole range of knowledge management systems behind them. So, while educational institutions increasingly have to consider how to develop learning management for the individual as a highly connected 'personal hub', they nevertheless have to follow progression routes that are strictly linear, set across a landscape of largely discrete other institutions. Educational practice remains rooted in the idea that an institution has to offer the student effective management of 'a place'. In fact, technology looks to institutional identity as part of a larger canvas that mixes present and remote aspects of the built environment, technical capacity, information and knowledge resources, networking links, staffing resources, and assessment systems.

Technology and the educational workforce

There is still a belief that technology adds to the workload of the teacher rather than transforms it. But in the long term the real issue will be how technology and human-computer-interface developments require the teaching role to change. This does not mean abandoning those factors we have traditionally associated with good teaching, and for that reason the change will be particularly demanding:

> "All forms of education, irrespective of context, presuppose a world of accelerating change – a central task of educators must therefore be to equip those whose development they are concerned to nurture with the knowledge, skills and dispositions and values that will enable learners to flourish in that

[81] Of course there are exceptions, between urban and rural contexts for example, and between people and groups across society. One suspects that this will remain the case and will require close attention at both Government and community level, particularly because the reasons for it and its location are not as predictable as we are often led to believe. However, looking at the last decade, the overwhelming direction regarding technology-mediated information access is that it has become more systemic, more flexible and less costly.

[82] The Managing Information Across Partners (MIAP) development, intended to streamline the collection, handling and sharing of information on learning and achievement for education, is still effectively only at pilot stage in England.

changing world – such an education would itself make a significant contribution to the capacity of learners to meet the demands imposed by technological change."[83]

The scale of change in pedagogic style and practice will have to fully engage that technological change itself, so:

"The teacher must morph into a multimedia designer and a learning facilitator, while remaining a scholar and an academic: a very demanding task."[84]

Moreover, such transformation of the teaching role will not be 'single point', but will call for continual evolution with radically different approaches to continuous professional development, bringing it far closer to commercial informal and tacit learning models. Perhaps the most salutary aspect of this is the level of flexibility required and the pace of change behind it:

"What the next five years will bring is anybody's guess, but it will require flexibility of response, both to make the most of the pedagogic possibilities inherent in the technology and to respond effectively to how the next generation[85] of learners has been exploited and been shaped by it."[86]

The changes required will not be 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 (IAG). Not only will the guide have to support data access of increasing volume and complexity, the technology itself will also manage some of the support. Development of computer-based collective intelligence will, just as in the customer recognition systems of Google[87] or Amazon, eventually establish technically managed systems that will act as ongoing support agents for learners.

Individual identity and assessment

We are already seeing people's consumption of media as one way of constructing an identity, and individuals' identities are defined by the technical devices that they have access to. This does play around with all sorts of notions of identity for those entering formal learning contexts; where someone is from, where they are going and to what degree they might already be 'wired in' to a range of knowledge as well as the educational institution they are approaching. It begins to construct the idea of the

[83] UCET (2008).
[84] Ibid.
[85] It will also be the case that in lifelong learning the idea of 'next generation' in linear age terms will be made more complex, as the use, knowledge and expectation of technology for learning increases with existing generations also.
[86] Op cit.
[87] Google 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 Linkopings 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 online tools and 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.

'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:

> "On a ten-year timeframe it is being predicted that each person will be embedded in a personal 'cloud' of miniature computing devices that are attuned to the individual's mental and physical activities, predilections and attributes and are connected to multiple networks, to the extent that it will be a moot point whether it is sensible to assess the abilities of an individual minus the cloud, given that the cloud is a permanent part of the individual's thinking, reasoning and affective processes."[88]

This 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? But what does a 'fair' education system look like, if intelligence is enhanced and developed through tools that can be purchased? It reiterates the central question that has arisen throughout: *to what further extent will education have to design provision in terms of the technical environment as much as human resources environment* as the two become inextricably linked?

Transformational technology for whom?

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/virtual learning environments (VLEs) have often been developed as 'information/knowledge islands', which then undermine the learner's capacity to run more widely connected searches. Perhaps the most explicit current example of a positive educational response to the behaviour we have identified with technology is the development of Open Educational Resources (OER)[89]. It is a development already underway in a number of countries, with The Open University's 'OpenLearn' initiative being an interesting example, representing a very powerful and purposeful 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

[88] Clark (2008).
[89] Centre for Education Research and Innovation (CERI), (2007). The report offers a comprehensive overview of the rapidly changing phenomenon of Open Educational Resources and the challenges it poses for higher education. It examines reasons for individuals and institutions to share resources for free, and looks at copyright issues, sustainability and business models, as well as policy implications. It will be of particular interest to those involved in e-learning or strategic decision making within higher education, to researchers and to students of new technologies.

here to promote and support lifelong learning, to widen participation, and to bridge unnecessary gaps between non-formal, informal and formal learning[90].

The OER and open source movements have wider transformation implications, challenging accepted practice. 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[91]. Could the EC Petition for guaranteed public access to publicly funded research results[92] and the 'Wellcome model' be applied to funds for educational purposes much more widely? In the UK, we have not had a coherent approach to this by Government[93].

Strategic pressure

If developments like OER are the way forward, then at institutional level there will be a variety of growing pressures to develop new strategy and practice regarding OER for a variety of reasons. This might be because:

- the competition is doing it and new business and cost recovery models are being developed;
- the opportunities for collaboration in the production and use of OER are growing, as with pressures for free digital resources for educational use;
- technological developments and the increasing push from experienced individuals will prove irresistible.

But institutions will have to develop very well-reasoned and business-like information technology strategies, including full integration with e-learning. In the main, with Higher Education (HE) being the possible exception, we have not seen this level of strategic freedom really devolved to institutional level by Government. Institutional freedom, with strategic development less tied by required targets, would have

[90] OER has been given a boost by the recent US court decision, which gives added legal protection to works created using open source. Another interesting aspect to OER, pointed out by a *Guardian* newspaper editorial, is that the collaborative movement is probably 'recession proof', as it does not involve standard cash transactions, yet it adds to our wealth.

[91] Such as the Wellcome Trust's policy of providing grant holders with additional funding to cover the costs of open publishing.

[92] The EC Petition urges the EC to endorse the recommendations of the EC's January 2006 published Study on the Economic and Technical Evolution of the Scientific Publication Markets of Europe in full, but in particular to adopt the first recommendation as a matter of urgency: to guarantee public access to publicly funded research results shortly after publication. Research funding agencies have a central role in determining researchers' publishing practices. Following the lead of the National Institutes of Health and other institutions, they should promote and support the archiving of publications in open repositories, after a (possibly domain-specific) time period to be discussed with publishers. This archiving could become a condition for funding. The EC Petition suggests that the following actions could be taken at the European level: (i) establish a European policy mandating published articles arising from EC-funded research to be available after a given time period in open access archives, and (ii) explore with Member States and with European research and academic associations whether and how such policies and open repositories could be implemented.

[93] 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.

considerable implications for institutions to recruit people who have these development skills.

Developments such as OER, social networking, and collaborative technologies generally will mean that the learner will be more able to *compare* curriculum offers. We have already seen this happening in HE, and to a lesser extent in FE. 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 some education provider websites now demonstrates an increasing awareness of this.

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4. Conclusions

These conclusions are not a summary of the issues dealt with in the paper, but 'face forward' in proposing what we should be looking out for and where we might direct further research.

4.1 Behavioural change and types of learning

> "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?"[94]

We have emphasised throughout that understanding the scale and nature of technology's 'proposition' for lifelong learning is informed primarily by observing and judging the levels of the behavioural change it induces. Also, we need to judge what might be the 'scale of disruption' involved. For some, disruptive technology means 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 the real value of disruption can be made. But to reiterate: too often in education we have been subject either to those who have told us that every technological development was a breakthrough and going to change everything, or to those whose immediate response was always 'so what?'. But our culture and economy are 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 offer and how we might respond.

In education, HE has had the longest history of technology-based applications made accessible to staff and students by substantial and largely continuous funding. In contrast, FE and adult education have largely lacked the opportunities to create *sustained and developmental* discourse, and have too often assumed that you cannot have it without technologists anyway. We now have the opportunity to open up analysis and widen the discourse. It is highly appropriate for lifelong learning to conduct this, as the examples to support our understanding of technological development can increasingly be drawn from everyday life, outside formal contexts. Interestingly, it has been the music industry that has led the way for many people in proposing how technology and open source communications can turn what was primarily a one-way, expensive, largely non-interactive process into something far more dynamic and democratic.[95]

[94] Wright (2006).

[95] We see this process being applied, for example, by Rice University's Connexions Project developing open source tools and content that range from the production of the Engineering 'Super Textbook' to Kitty Schmidt-Jones's Introduction to Music, which now attracts 600,000 users per month from K-12 teachers and students: http://cnx.org/

An emergent framework for lifelong learning might do well to see how examples of 'valuable disruption' actually function and what the key constituents are when technology and learning work together so that the qualities listed by Richard Baraniuk are realised:

> "Vibrant, interactive, community, connected, innovative and up to date."[96]

As the implications of technology are increasingly being drawn from life outside formal education, it is essential that lifelong learning sees what has been happening more generally in human-computer-interface (HCI) development and understands the scale of change:

> "At the start of the 21st century, HCI is an interdisciplinary… [having] undergone enormous change. In terms of a science or discipline, these changes have occurred over a very short time.
>
> HCI now encompasses many philosophies, perspectives and types of expertise. There are multiple and overlapping groups of researchers, some emphasising design, others evaluation, and yet others using modelling. These experts work in a complex space, each examining different aspects …"[97]

It is for this reason that it would be better to observe the scope of the signals of behavioural change in order to collaborate on a future for lifelong learning.

Throughout this paper we have assembled a profile of signals particularly relevant for the future of lifelong learning deriving from HCI that we would draw attention to.

A. *Role change* – in particular:

- individuals becoming producers of learning content, initiating an un-owned and un-tethered 'curriculum cloud';
- individuals and user groups defining user environments as opposed to environments defining users;
- inanimate objects becoming actively informational, both for the user but also across themselves.

B. *Communities of practice*: learning through communities of interest being self-defined rather than institutionally defined, becoming highly dynamic, un-located, forming, dissembling and reforming according to a focus of interest.

C. *Continuous partial attention*: learning being repositioned as a perpetual scan for undefined opportunity in any given moment, paying continuous partial attention in an effort not to miss anything, involving an artificial sense of constant crisis as the individual is 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 appropriate information provision.

[96] Richard Baraniuk, TED Talk 2006: www.ted.com/index.php/talks/richard_baraniuk_on_open_source_learning.html .
[97] Harper, Rodden, Rogers and Sellen (Ed.) (2008).

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E. *Portability*: information and knowledge access become 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*: individuals or groups joining formal learning contexts, carrying with them substantial, undisclosed information resources.

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

4.2 Areas for research

This is a summary of those areas that would seem particularly to inform understanding of how technology and lifelong learning could be advanced within a national framework. It is only possible in this paper to summarily outline those areas indicated by contributors to the Inquiry that seem well attuned to the signals arriving from other sources concerned with technology and learning. The areas are placed under headings that suggest a model for work in the shorter to longer term – but these timelines are not indicators regarding any prioritisation, simply a recognition that they should be dealt with sooner rather than later. However, it should also be emphasised that none of these are 'one-off' concerns, and the last thing we should be recommending is a 'task and finish' approach to them, when the technology itself is developing at such a rate.

In the shorter term (1–3 years):

- How to move education across all its sectors closer to the work being carried out in human-computer-interface research, to develop a curriculum designed to better understand the changing landscape of society being brought about by computers.
- Assisting effective information consumption to develop a perspective on which aspects of information literacy could be addressed to assist all those engaged in lifelong learning:
  - the development of mental maps of how the Internet works;
  - how information is accessed in the context of publishing on demand;
  - the evaluation of resources derived from electronic sources;
  - methods for transferring information literacy.
- Understanding exclusion from technology in terms of access, capacity and the opportunities that people are excluded from.
- 'Listening to students' to better understand how they conceptualise and use technology within both their informal and formal learning activity in order to develop contextual models to enhance learning, improve and, where necessary, redefine institutional services.
- Developing funding models for the individual that are removed from explicit educational provision but address access to and capability for engagement with communications infrastructures that support lifelong learning.

- The role of public broadcasting in the support of formal and informal lifelong learning.
- The role of libraries, museums and archives in the context of open access publishing and institutional archiving and of user-generated content.
- Incentives for FE educational institutions and adult education staff to work with OER development, including exploration of innovative co-operative ventures with the businesses for which they provide work-based and workplace training.

In the longer term (3–10 years):

- Community development to enable access to next-generation broadband.
- The collaborative role of providers of education and local authorities in developing virtual public spaces for connecting different voices in different communities.
- How educational institutions can respond to the changes brought through technology in terms of appropriate assessment and accreditation systems.
- The role of simulations within virtual worlds to test potential models of engagement between lifelong learning institutions, producers and consumers.
- The implications of the semantic web's development of intelligent web-based analysis systems for the management of lifelong learning.

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References

Attwell, G. in Beer, D et al. (presented 2005) *E-learning in small and medium-sized enterprises.* Waxmann, Munster

Attwell, G. (2007) *Personal Learning Environments – the future of eLearning?* eLearning Papers, vol.2 no.1. ISSN 1887-1542

Boyd, D. (2006) Identity Production in a Networked Culture: Why Youth Heart MySpace; speech to the American Association for the Advancement of Science

Carnegie Institute (2008) *The shape of civil society to come*. Inquiry into the Future of Civil Society in the UK and Ireland

Centre for Education Research and Innovation (CERI) (2007) *Giving Knowledge for Free: The Emergence of Open Educational Resources*. OECD

Cross, J. (2006) *Informal Learning: Rediscovering the Natural Pathways That Inspire Innovation and Performance.* John Wiley and Sons Ltd

DfES (2002) *Get On with IT – The Post 16 E-Learning Strategy Task Force Report*

DfES (2006) *Personalising Further Education: Developing a Vision.* DfES Publications

Franklin, T. and van Harmelen, M. (2007) *Web 2.0 for Content for Learning and Teaching in Higher Education*. JISC

Global Watch Service (2006) *Global Watch Report.* DTI

Harper, R., Rodden, T., Rogers, Y. and Sellen, A. (Ed.) (2008) *Being Human: Human-Computer Interaction in the year 2020.* Microsoft Research Ltd

Howell, C. (2008) *Thematic Analysis: Space. Learning Landscape Project.* University of Cambridge

ICT Skills Monitoring Group (2002) *E-Business and ICT Skills in Europe*: *Synthesis Report*. Europe Go Digital

Jennings, D., Kay, D. and Schmoller, S. with Umar, C. and Wallis, L.(2005) *Generating Demand for E-learning: The 21st Century Citizen.* Learning Light

Kellett, M. and Dar. A. (2007) *Children researching links between poverty and literacy.* Joseph Rowntree Foundation

Kluth, A. (2008) *Nomads at last.* Special Report, The Economist

Kurzwell, R. (2005) *The Singularity is Near: When Humans Transcend Biology*. Viking Penguin

Lenhart and Madden (2005) *Teens and Technology*. Pew Interne

Lenhart, A., Madden, M., Rankin Macgill, A. and Smith, A. (2007) *Teens and Social media.* Pew Internet and American Life Project

More, Sir Thomas (1516) *Utopia*

Nonaka, L. and Takeuchi, H. (1995) *The Knowledge Creating Company.* Oxford University Press

Seely Brown, J. (1999) *Learning, Working and Playing in the Digital Age: Creating Learning Ecologies.* AAHE Conference on Higher Education

Seely Brown, J. (2002) *Growing Up Digital – How the Web Changes Work, Education, and the Ways People Learn*. USDLA Journal, Volume 16; No. 2

Siemens, G. (2005) *Connectivism: a Learning Theory for the Digital Age*. Article on elearnspace: www.elearnspace.org/Articles/connectivism.htm

Stone, J. (2008) Foreword to *The Future of Further education*. Learning and Skills Network

Learning and Skills Council of England (2002) *The Distributed and Electronic Learning Group (DELG*). Report

Underwood, J., Baguley, T., Banyard, P., Coyne, E., Farrington Flint, L. and Selwood, I. (2007) *Impact 2007: Personalising learning with technology*. Becta

Warschauer, M. (2003) *Technology and social inclusion: Rethinking the digital divide.* Cambridge, MA: MIT Press

Wright, M. (2006) *And Another Thing*. Article, Green Futures Magazine

Evidence

Papers presented to the Inquiry Expert Seminar

Auckland, G. (2008) *Technological Change and Adult Learning,* paper prepared for the Expert Seminar on Lifelong Learning and Technological Change, BBC

Clark, P. (2008) *Technological Change and Life-long Learning: Perfect Storm or Tornado?* Paper prepared for the Expert Seminar on Lifelong Learning and Technological Change, Institute of Educational Technology, The Open University

Mauger, M (2008) *Technology and Learning – some observations,* paper prepared for the Expert Seminar on Lifelong Learning and Technological Change, NIACE

Overton, L. (2008*) Improving the impact of learning technologies at work – lessons from businesses and their employees,* paper prepared for the Expert Seminar on Lifelong Learning and Technological Change, Towards Maturity Project, e-skills UK

Yapp, C. (2008) *Taming technological change to the learning agenda,* presentation prepared for the Expert Seminar on Lifelong Learning and Technological Change, Capgemini UK

Evidence submitted

Becta (2008) *Harnessing Technology for Further Education, Skills and Regeneration,* Becta

Cook. D. (2008) *Letter in response to the Independent Commission of Inquiry into the Future of Lifelong Learning: call for evidence on Lifelong learning and Technological Change*

Graney, A. (2008) *Response to the Independent Commission of Inquiry into the Future of Lifelong Learning call for evidence: Lifelong Learning and Technological Change,* Open College Network, North West Region

Enoch, G. (2008) *Adults with learning difficulties:* Personal & observational evidence

UCET (2008) *The Future for Lifelong Learning: Call for Evidence on Lifelong Learning and Technological Change*

Skillfast-UK (2008) *Response to the Independent Commission of Inquiry into the Future of Lifelong Learning call for evidence: Lifelong Learning and Technological Change*

Skill (2008) *Evidence for Independent Commission of Inquiry into the Future of Lifelong Learning; Lifelong Learning and Technological Change*

Becta (2008) *A paper for the Expert Seminar on Lifelong Learning and Technological Change*

Yapp, C. (2008) *It takes a Global Village to educate a child,* a paper for the Independent Commission of Inquiry into the Future for Lifelong Learning and Technological Change

Adshead, J. (2008) *Evidence for the Independent Commission of Inquiry into the Future of Lifelong Learning and Technological Change*, The National Federation of Women's Institutes (NFWI)

National Literacy Trust (2008) *Links on technology and literacy*, response to the Independent Commission of Inquiry into the Future of Lifelong Learning and Technological Change

South West Opportunities for Older People (2008) *ePortfolio Evaluation: Final Report*, South West Opportunities for Older People (SWOOP), University of Exeter

Pye, J. (2007) *ePortfolio Technical Review*, Marchmont Observatory/SLIM, University of Exeter

Stevens, H. (2008) *Letter in response to the Independent Commission of Inquiry into the Future of Lifelong Learning call for evidence on Lifelong learning and Technological Change*, SWOOP, Marchmont Observatory, University of Exeter

National Foundation for Educational Research (2008) *Evidence for the Independent Commission of Inquiry into the Future of Lifelong Learning and Technological Change*

Nairn, K. (2008) *Evidence for the Independent Commission of Inquiry into the Future of Lifelong Learning and Technological Change*

Merseytravel (2008**)** *Evidence to the Independent Commission of Inquiry into the Future of Lifelong Learning and Technological Change*

Skills Commission (2008) *Submission for the Independent Commission of Inquiry into the Future of Lifelong Learning and Technological Change*

Ufi (2008) *Response to the Commission of Inquiry into the Future of Lifelong Learning and Technological Change*

Construction Skills (2008) *Response to the Commission of Inquiry into the Future of Lifelong Learning and Technological Change*

The Pentalk Network (2008) *Response to the Commission of Inquiry into the Future of Lifelong Learning and Technological Change*

Pachkowski, L. (2008) *Response to the Commission of Inquiry into the Future of Lifelong Learning and Technological Change,* Joint Information Systems Committee (JISC), University of Bristol

Lindsay, S., Smith, S. and Bellaby, P. (2008) *Can Informal e-learning and Peer Support Help Bridge the Digital Divide?* Institute for Social, Culture and Policy Research at the University of Salford, Cambridge University Press

Swansea University (2008) *Response to the Commission of Inquiry into the Future of Lifelong Learning and Technological Change*

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Skillfast

Skills Commission

Swansea University

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UCET

Ufi

Annex: Links to other Inquiry themes

As we have remarked, at the heart of the matter of looking at technology lies the question of what it means to be human[98]. So there is no theme in this Inquiry that technology does not touch and where it does not pose both opportunities and dangers:

> "The broadening and diversification of the digital in our everyday lives requires an increasingly broad set of disciplines with an interest in human values."[99]

These disciplines can be found across the range of the Inquiry's themes. At a time when Government is both leading and reflecting cross-policy approaches, we see technology rendering previously stable and fixed divisions more permeable anyway. This has the effect of testing the human values of community and connection by both supporting and undermining them. There are reasons for optimism and for concern across the themes when connecting the effects of technology.

In the thematically shared assertion of the value of local democracy, technology can be seen as supporting this, enabling people to express themselves in increasingly direct ways. Equally, technology can violate human values such as trust, privacy and a sense of fairness. In our personal lives and in lifelong learning we could see as beneficial the means and capacity to store our data cheaply and efficiently, but we are far more concerned about the application of this in other thematic areas, like Crime and Social Exclusion. We may only just be realising the implications of the persistence of our personal data in domains when we consider Employment and Work or Citizenship and Belonging, and the levels of threat posed by new methods and scales of centralised data storage, individual tracking and the potential for civil liberties infringements on the basis, not only of the effectiveness and efficiency of such systems, but also more worryingly perhaps on the basis of the potential effects of inefficient management of the systems.

On the other hand, we can see how web-enabled social networking facilitates the development and support of new communities such as migrant worker groups, leading to new energies and what has been termed 'new types of associational life'[100], which is:

> "far more richly connected to other parts of their diasporas than was the case in the past, providing a global connection which can support the culture of the migrant community, and also provide a channel by which it diffuses into the cultures and traditions of the locality of which it has become a part."[101]

But the Carnegie Institute's work has also signalled the negative implications for associational life that affect many aspects of the Inquiry's themes:

[98] Harper, Rodden, Rogers and Sellen (Ed.) (2008).
[99] Ibid.
[100] The shape of civil society to come. Carnegie Institute, 2008.
[101] Ibid.

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> "Technology can also be divisive in terms of use and access – certain groups in society become excluded, exacerbating the issues… proliferation of virtual worlds can also lead to fragmentation, as particular interests are channelled into particular virtual groups and remain disconnected from each other."[102]

Thus, across all the Themes, technology presents a challenge regarding how it can be understood and deployed to reflect ethical values and enable actions that support that. It is a very significant aspiration, not only for those involved with developing technology and human-computer-interfaces, but also lifelong learning, to engage development that can design for and support differences in human value, irrespective of the economic means of those seeking those values. In this way, the future can be different and diverse because people want it to be. This is a potent vision for all the Inquiry's Themes and at one with the central tenet of lifelong learning, and we ignore the central role of technology in this at our peril.

[102] Ibid.