

Technological Change and Life-long Learning: Perfect Storm or Tornado?

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Abstract

This paper is a contribution to a NIACE-sponsored committee of inquiry into the future of life-long learning. Six questions were set to frame the discussion, centred on the topics of the impact of new technology, required changes in pedagogy and curriculum, the guarantee of quality, the digital divide, infrastructure requirements, and cost allocation. This paper concentrates on the first four topics, in the order quality, digital divide, pedagogy and new technology. Examination of these topics has focused on the following points.

Quality assurance of public domain content has been enhanced through the work of large numbers of public commentators using Web 2.0 applications (blogs, wikis) and the operation of publicly visible forums for debate during the process of concept definition (Wikipedia).

Discussion of digital divides moves past socio-economic concerns to examine generational divides-the net generation versus teachers and parents-focusing on their impact on learning styles and consequently required pedagogical change. Pedagogy is seen to be challenged by the arrival of multi-media virtual learning environments for institutional learning, by the capabilities of the net generation to create and live in media-rich environments and by the transformation of learning styles induced by the immersion of the net generation in "new technology" applications. The possible impact on both pedagogy and the relation of teaching to research dissemination is explored.

The arrival of Web 2.0 applications, and their massive uptake by the net generation, is expanding the range of opportunity for life-long learning for adults as well as young people (children and teenagers). New sources of learning materials and services are being made freely available through the Open Content Initiatives, delivered over the Web. Creation of online communities of interest spanning a wide range of interests is now a reality. The rate of change of technological innovation is unpredictable on a five to ten year timescale but it is clear that life-long learning, formal or informal, independently or in collaboration with others, in the workplace or outwith it, will be mediated and enhanced by the increasing power and adaptability of the Web and the applications that it supports.

Introduction

The last 15 years has seen an enormous investment in the technology to support learning at all levels of the education system, from primary school to post-graduate learning and doctoral study. However, the relationship of technology and pedagogy, both expected and actual, is still a matter of study and debate. For example, the question of whether progress is best made by adapting learning and teaching processes to the capabilities of new technologies as they come along, or whether a clear pedagogic rationale should be formulated in advance of the use of any particular application to try to deliver it, has exercised members of the academic community for years. As well, the whole issue is very much a moving target, owing to the rate of change of the technology available and the resulting changes in the entire conception of learning (content and process) embodied in these new technologies. In this paper I shall look across the last 10-15 years of activity in the use of ICT in higher education and informal learning (drawing particularly on my experience at various levels of the Open University, in which the technology-pedagogy relationship has been a 40 year debate) and then engage with the set questions that form the framework of this inquiry.

Definitions

There are a few terms whose meanings need to be specified for the purposes of what follows in this paper. The first of the six questions asks about the possible improvements in “prospects and opportunities”. Prospects for what and opportunities in aid of what prospects? Let us define “prospect” to be the probability of achieving a specified future state. The word “opportunities” can be taken to refer to the activities required to achieve the (desired) future state. The term prospects is easier to envisage in relation to the workplace than to the rest of life. However, being better informed or more greatly empowered by being better informed through the use of new technology is a positive prospect. For example, a desired future state could involve being able to speak with more conviction and understanding to members of the medical profession as a result of consulting NHS Direct and other websites that inform the public about matters of health and disease. (For further reference, this activity of informing oneself, particularly through the use of websites, is an example of “informal learning” that is to be examined in more detail below.)

The other term to be defined for the purposes of this paper is “new technology”. Since the span of this paper covers the period 1993-2008, the term “new technology is also taken in an inclusive sense to mean Information and Communications Technologies (ICTs) as conceived over the past 15 years

Given that the analysis is to be centred around the learner in and out of the workplace and that the learner can engage with both formal and informal learning (as the NHS Direct example above suggests), the situation of the learner can be mapped as set out below. The vertical axis specifies the relation to work and the horizontal axis maps formal and informal learning.

Typical examples of learning activity can be associated with each of the four quadrants so created.

<p>Secondment to F/HE;</p> <p>Distance Learning in F/HE</p>	<p>Outside Workplace</p> <p><i>Browsing the Web</i></p> <p><i>Web 2.0</i></p> <p>Open Educational Resources (OpenLearn)</p>
<p>Formal Learning</p> <p>CPD delivered by ICT</p>	<p>Informal Learning</p> <p>Web browsing (including search)</p> <p>Use of Blogs and Wikis</p> <p>Learning on the job</p> <p>In workplace</p>

Table 1: eLearning activity plotted against context of learning (formal/informal) and place of learning with respect to employment.

The next section will focus on the impact of the evolution of new technologies on formal learning inside and outside the workplace (the two left-hand quadrants). The section following will then look at the processes of informal learning, where the most radical thinking in relation to the technology-pedagogy tension has emerged over the past few years.

New technologies and Formal Learning.

For the majority of further or higher education institutions, engagement with the use of ICT for pedagogic purposes began in the mid to late 1990s, with the introduction of commercial systems such as WebCT, Blackboard, Learnwise or eCollege. These systems were conceived as Learning Management Systems (LMSs) to support the work of face-to-face teaching by academic staff in conventional institutions of further and higher education (F/HEIs). They therefore typically provided applications such as a website for each course where lecture notes and other documents could be posted, an application to allow the lecturer to create quizzes of multiple choice questions the student answers to which are automatically graded and placed in a “gradebook” and a discussion forum for all the students in a given course. The pedagogy supported by these LMSs was decidedly “teacher-centred” and in many cases the use of them came down to delivering texts (lecture notes

and other documents) to the website (to be printed off by the students rather than the teacher). The form of pedagogy most naturally supported by these LMSs was decidedly “content transmission” and little provision was made for student-centred activity to be facilitated by this technology. Moderated discussions using a discussion forum was probably the most student-centred feature of these systems.

More recently, there have been two areas of change in the relationship between technology and pedagogy, one on each side of the divide. Firstly, there has been an increasing acceptance of social constructivism as a valid theory of learning with its emphasis on collaborative learning and, more fundamentally, meaning-making as a product of collective activity. This point of view puts a premium on active learning, as opposed to passive reception and absorption of content, although this bifurcation can be somewhat crude, depending on the discipline being studied. (The parallel recognition that work in the Knowledge Economy is increasingly carried out in teams using ICTs as a medium of discussion and collaborative production, raising the value of effective collaborative activity, may, or may not, be co-incidental.)

On the technical side, there has been a conscious effort to produce Virtual Learning Environments (VLEs) that provide applications that facilitate collaborative activity, such as discussion forums, instant messaging, synchronous audio conferencing, collaborative document production using a Wiki, blogging software, podcasting or videocasting by students or teachers, and an online portfolio to allow students to build up a collection of electronic resources for private use or career development purposes. The plethora of media of communication, and therefore types of creative production by teachers and students (for example, the student presentation of an “essay” that includes sections of audio recording, still images and recorded audio-visual material, as well as text) opens up a wide range of potential learning activities for students but, consequentially, makes greater demand on the teacher’s abilities both to formulate stimulating learning activities using any combination of these media AND being able to evaluate a multi-media presentation, respecting the contributions of each medium to the final product. For most academics this is a new aspect of their professional competence for which they have had no training.

In the educational world, these collaborative VLEs have predominantly been developed by individuals and groups committed to the Open Source method of production and maintenance, in which the primary products (software) are freely released to any individual or organisation that wishes to use them, thus creating a community of producers and users. The quid pro quo is that any improvements or modifications subsequently created by the recipients are to be freely given back to the community of users/producers. One of the most successful Open Source VLEs is called “Moodle”, which now has 34,000 registered sites, 14,000,000 users and products in 75 languages. The fact of Moodle (and similar open source products) being free to the user and sustained by the community of users as a whole enhances the possibility of take-up, allows smaller institutions to benefit from the work of larger institutions in improving the product and this ethos accords with a long-

standing commitment by Web evangelists that the Web should be a medium driven by the desire to share freely its remarkable properties ^[1].

The development of products such as Moodle, along with the unimaginable wealth of digital resources held on the web, support and enable two dimensions of learning; collaborative learning, as described above and independent learning. In the latter mode the student can work with a variety of learning materials: text (in all its forms) digital resources in textual, still image, audio or audio-visual varieties and, where available, simulations or educational games. Table 2 below maps a sample of the uses of ICT in relation to these two variables; the vertical axis maps the context of learning (independent or collaborative learning) while the horizontal axis maps the type of learning (formal or informal learning). (A small glossary of terms from this Table appears as Annex 1.)

<p>Standard HE Digital Essay production Educational Games and Simulations Recorded lectures eAssessment Digital information search in libraries or on the Web</p>	<p>Independent</p> <p>Web Browsing Self-publishing Educational Games and Simulations Open Educational Resources Blogging</p>
<p>Formal</p> <p>Wikis for Group Project work Tools for Group assessment</p> <p>Search tools for Resource-based Learning and Problem-based Learning</p> <p>Discussion forums, IM, Blogs, for Collaborative Study,</p>	<p>Informal</p> <p><i>Web 2.0</i> Tagging Facebook Del.icio.us YouTube MySpace SecondLife Flickr</p> <p>Collaborative</p>

Table 2: eLearning activity plotted against context of Learning (Formal/informal) and mode of learning (independent/collaborative)

It is clear that elements of “new technology”, broadly conceived, can support and enable all four of these types of learning, within an institutional or informal context. The above analysis has, however, focused on the *educational processes* that new technology can facilitate. A significant avenue of expansion, that of *educational content* being made available to the informal learner through the use of new technology, is being provided by the movement labelled as Open Educational Resources in the top right-hand quadrant above. The Open Educational Resources movement, also called the Open Courseware Initiative or Open Content, was thrust into prominence

by MIT's decision, ten years ago, to make freely available all its teaching materials on the Web. The hope at that time was that Open Courseware would follow the lead of Open Source in that institutions or individuals who took up the MIT materials would, in the course of using them, modify and enhance them and then return them to the MIT site for others to use. This evolutionary development process did not materialise. In 2006, the OU, with the financial support of the Hewlett Foundation, launched its Open Courseware Initiative, called OpenLearn. Selected sections of OU teaching materials across a wide range of academic and professional disciplines have been placed in the public domain on the OU website. As of April 30th, 2008, 5000 hours of such study materials, originally created by the OU for its own courses, will have been made freely available on the <http://openlearn.open.ac.uk> site, in a section called the Learning Space. Provision has also been made, in a companion section called the Lab Space, for users to download these materials, modify them to suit their needs and then return the modified material to the Lab Space for others to use. Also in the Lab Space, provision is being made to develop software applications to 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. It is particularly hoped that individuals and institutions in the developing world will find these freely available materials and learning tools useful for incorporation into their teaching and learning activities. The response to the OpenLearn initiative since its launch has been very gratifying. To date there have been over 1.526 million unique visitors to the site who have undertaken 2.159 million visits. As should be obvious, these developments in aid of expanding the availability and effectiveness of learning in a structured but open environment depend crucially on the availability of new technology to deliver them.

The Web 2.0 Phenomenon

In looking at current developments in the impact of ICT on learning, broadly conceived, the most obvious and radical phenomenon to come to grips with is Web 2.0 and the ways in which people are using online interaction. The websites that host the activities that exemplify 2.0 behaviour (e.g., MySpace, YouTube, Flickr, Facebook, De.licio.us) have truly massive levels of participation and inspire awesome degrees of consumer loyalty. Such applications, along with (hundreds of) millions of websites, wikis and blogs produce an environment of information, expertise and opinion that is almost beyond comprehension.

The phenomenon of "Web 2.0" is discussed and pursued in the online and business communities from a variety of perspectives; technological, commercial and social/educational^[2]. It is the third of these perspectives that is of concern here: Web-user motivation and social activity online, and their

educational possibilities. Typical forms of Web 2.0 social activity are listed below, along with the websites that most commonly support them:

- 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);
- People-power (individuals successfully competing for an audience with institutions, such as newspapers, corporations, or universities) ;
- 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).

In general the shift from Web 1.0 to Web 2.0 can be characterised by:

- the user becoming an active participant in Web-based creative, online, social or learning activity, rather than being a passive recipient of the information riches of vast databases;
- the user exploiting the capacity to join communities of interest online though the use of applications that facilitate the making of interest-based connections

Web 2.0 applications greatly enhance and extend the opportunities for independent or collaborative learning. At present these opportunities are largely focused on informal learning, both within the workplace and outwith it.

The Example of Diebold

In the situation in which the inherent possibilities of the technology and the informal uses to which it is presently being put suggest what its pedagogic potential might be, it is worth the effort to examine particular cases of use

outside formal education that demonstrate aspects of Web 2.0 in use, with great informal learning outcomes.

Such a case is described by Professor Yoquai Benkler in his book “The Wealth of Networks” [3]. The case involved the manufacturer of electronic voting machines, named “Diebold”, and a particular activist, named Ms Beverley Harris, whose area of interest included the authenticity of voting results produced by these machines,. (Remember that this case took place in 2003, three years after the voting machine scandal in the 2000 American presidential election.) Ms Harris was doing some research on Diebold and set up a whistleblower’s website in relation to the operation of voting machines. Acting on a tip, she found an open website containing 40,000 Diebold files containing material on how the voting machines, and the vote tallying procedures, work. Ms Harris published her findings on a particular website, Scoop.com, where other people, including technical experts, could examine the files and the code that they contained. Based on the discussion on the Scoop site, Ms Harris published an analysis that pointed out that access to the Diebold files could have been used to affect the outcome of a close Senatorial electoral race in the state of Georgia. The editors of Scoop published the location of the original data set. Recognising that Diebold could try to suppress this information, Scoop editors recommended that users of the site copy the files to other sites including file-sharing sites. They also gave information on sites that contained applications that could open Zip protected files and repair damaged files, thus making the original data available to a much wider audience. A team of heavyweight computer scientists from Johns Hopkins University took up the work of analysis and published a report that presented deep criticism of the Diebold system and its vulnerability in many dimensions. A lively online discussion ensued, with points being scored on either side. In all, three major reports were published demonstrating a wide range of flaws in the systems they examined which required modification.

There is more to this story, including the publication of more damaging material by whistleblowers and the maintenance of the availability of that information, against Diebold’s wishes, by wide-spread copying by university students to other sites. Students also successfully took Diebold to court over the company’s claim that the material was privileged.

This example has been described in some detail because it demonstrates the weaving together of the aspects of Web 2.0 activity to produce an enormous amount of informal community learning and an impressive example of civic responsibility. Specifically, it illustrates the application of the following Web 2.0 concepts

People Power – the whole story began with the actions of a single activist and a whistleblower.

Harnessing collective intelligence (activists, data repair specialists, students, whistleblowers, professional computer scientists, online publishers)

Users add value and Network effects: the activity worked better the more people got involved, particularly in defending access to data from Diebold's attempts to suppress it.

No one person or organisation could have carried out the exploration and publication of this issue. Nor was the plan of action pre-prepared; it evolved as the situation developed. In the process, an enormous amount was learned in a variety of subjects. The informal and social Web 2.0 learning model illustrated in the Diebold example challenges the more structured and hierarchical learning models of teacher-student relationships in school and university teaching.

With so many people producing digital content and making continuous use of many social networking websites, natural questions to explore for those involved in formal education include the following:

- 1) to what degree is the Web 2.0 phenomenon is being taken up by institutions of further or higher education?;
- 2) how is this take-up impacting on present-day relationships between teachers and students?;
- 3) how can educational uses of Web 2.0 processes engender anything like the degrees of motivation and passion that are exemplified by the informal uses of these sites, which presently have truly gigantic client bases?

The current answer to question 1 from the UK perspective, can be found in two major studies commissioned, in the last year, by the Joint Information Systems Committee (Anderson) ^[4] and the Observatory on Borderless Higher Education (Franklin et al). ^[5] They both have found very little systematic experimentation in the literature to report. Anderson (2007) reports that there is very little pedagogic research on the application of Web 2.0 principles in university teaching and Franklin et al (2007) indicates that in the UK there are only 5 universities that have established an institutional strategy for the use of Web 2.0 applications and a substantial proportion of this activity is concerned with institutional information availability rather than learning and teaching activity. Institutional take up of Web 2.0 applications for learning and teaching purposes is decidedly slow in the UK, according to these reviews.

As Franklin et al summarise from their consultations across the UK higher education sector, "we are at an early stage of development in our use of Web 2.0 technologies in learning and teaching" and 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, how it will demand new pedagogies and new assessment methods". This situation could evolve quite rapidly and it is therefore difficult to have one's finger on the pulse of development, either technological (a new killer app) or pedagogic (a brilliantly successful application of present technology in an educational setting).

One way to obtain some indication of the shape of things to come is given by the results of studies done the USA and Canada. Two very recent studies are reported here. The first gives a picture of enormous take-up of the use of social media by American teenagers.

Findings from the Pew Internet and American Life Project “Teens and Social Media” [6]

- Some 93% of teens use the internet, and more of them than ever are treating it as a venue for social interaction – a place where they can share creations, tell stories, and interact with others.
- The Pew Internet & American Life Project has found that 64% of online teens ages 12-17 have participated in one or more among a wide range of content-creating activities on the internet, up from 57% of online teens in a similar survey at the end of 2004.
- 39% of online teens share their own artistic creations online, such as artwork, photos, stories, or videos, up from 33% in 2004.
- 33% create or work on webpages or blogs for others, including those for groups they belong to, friends, or school assignments, basically unchanged from 2004 (32%).
- 28% have created their own online journal or blog, up from 19% in 2004.
- 27% maintain their own personal webpage, up from 22% in 2004.
- 26% remix content they find online into their own creations, up from 19% in 2004.
- The percentage of those ages 12-17 who said “yes” to at least one of those five content-creation activities is 64% of online teens, or 59% of all teens.

In addition to those core elements of content creation, 55% of online teens ages 12-17 have created a profile on a social networking site such as Facebook or MySpace; 47% of online teens have uploaded photos where others can see them, though many restrict access to the photos in some way; and 14% of online teens have posted videos online. The current survey marks the first time questions about video-sharing and posting were asked.

The figures speak for themselves as to the degree of penetration of social networking activity in American teenage life and the level of sophistication of in matters of Web use displayed by substantial percentages of them.

To probe questions 2 and 3 above as they relate to the teacher-student relationship in the North American context (and presumably in the UK before too long) a recent publication by Scott Leslie and Bruce Landon [7] describes and documents a large range of experiments and implementation of social software for learning. They conclude their study as follows:

“Is social software [i.e., blogs, social networking, wikis, social media, concept maps] useful for learning? Increasingly, this is not the correct question to be asking. At least five years beyond the latest round of innovation, 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. There are now huge numbers of other examples to point to beyond those discussed in this paper, and whilst additional study into the factors that contribute to its pedagogical effectiveness and its sustainability is both welcome and needed, there can be little doubt of the impact these various technologies and new approaches are already having inside, outside and across organisations....”

“At the end of the day, as much as we have tried to argue that there are good reasons from a software perspective for organisations to consider using social software in more ‘open’ ways, it is ultimately less about the software and what it necessitates, and more about creating authentic learning opportunities that do not approach the learner as a blank slate but as an ongoing, evolving and networked

individual, and making choices organisationally in our educational ICT that enable instead of require.

If students are to cope with the increasingly complex problems they face, they will need to graduate not simply knowing 'what and how,' but also with the ability to tap into networks in which they've become situated not because of their credentials but because of their contributions, conversant with collaborative, distributed and rapid forms of co-production, co-operation and organisation. Social software, along with its sister phenomena of peer production, crowd sourcing, open content and the "mass amateurisation of everything," offers an opportunity for both pedagogical and organisational transformation that can result in lifelong learners and permeable organisations which are an integral part of, instead of apart from, true borderless higher education."

The Questions of the Enquiry

I now wish to focus on the questions set for discussion at this meeting. To be able to pursue the thread of my argument I need to change the order in which I address the questions. I shall not address the question on infrastructures, for which I have no expertise to contribute.

How to secure and guarantee standards of service to learners?

There is a need at the outset to clarify the use of the terms "standard" and "quality". In this paper, "standard" is meant to refer to a level of achievement as an outcome of study. For example, the Subject Benchmark Statements set out for each subject by the Quality Assurance Agency attempt to set standards of learning outcome for undergraduate degrees. The word "quality" will refer to the process of learner activity by means of which the student is meant to achieve the appropriate standard of outcome. In this respect quality will be defined as "fitness for purpose" where the purpose is to achieve a particular standard of learning outcome. I shall also rephrase the question at the head of this section to read:

"How can the *quality* of service be secured and guaranteed to learners where the provision is delivered wholly or largely through new technology?"

At the outset one must distinguish between the quality of service for formal learners who receive instruction from a specific institution that is responsible for the quality of provision of learning materials and services, whether delivered face-to-face or online, from the quality of the services that informal learners avail themselves of, that come from sites on the Web available to anyone. For formal learners the QAA evaluates the quality of provision of online learning in the same manner as for face-to-face provision using an audit method. But online learning materials and services are more easily evaluated in that they are all available for inspection by learners, teaching colleagues and institutional management alike, in a manner not possible for the lecture, seminar or tutorial (but see below).

The situation is quite different for informal learners who use the publicly available Web 2.0 websites and the applications they support. In the older, Web 1. perspective of the use of the Web for learning, emphasis was put on the enormous range of materials on the Web and much concern was voiced over the fact that there was very little ability to assess the validity of any of it. Web 2.0 has brought a range of activities that have the capacity to evaluate and verify the quality and correctness of Web-based information. With an enormous number of bloggers on the Web with a wide variety of interests and levels of expertise, erroneous or ill-informed statements are often very quickly challenged in a very public way. In a more organised manner, the online encyclopedia, Wikipedia, has systematic and public processes for the evaluation of the quality and correctness of any of its entries. The public is able to observe the page on which the contenders carry on their dispute and, on the top page, readers can see one of a roster of warnings outlining the current concern with the entry in question (e.g., “the neutrality of this article is disputed; please see the discussion on the talk page” or “the current version of this article reads like an advertisement”). In general, Web 2.0 applications give substantial opportunities for public discussion and debate that would be much more difficult to implement without their online presence; this debate often raises the quality and veracity of the information under discussion.

A particular form of evaluation that is principally used by American undergraduates (or prospective undergraduates) is represented by a plethora of websites called “RatemyProfessor” in which students can post their opinions about the quality of education provided by their professors. While largely a North American phenomenon, the Times Higher Education Supplement last year posted a report of a British student who took a video clip of his/her lecturer in class and posted it on YouTube. While one can have mixed feeling about such behaviour, it indicates both the technological possibilities available today and a complete lack of deference in (some fraction of) today’s students. It is possibly today’s instance of a phenomenon that has been observed since the introduction of student fees, that if the student is paying, s/he will behave more like a customer than a student in relation to the quality of service s/he is receiving.

Impact of the Digital Divide and the strategies needed to reduce it.

It is reasonable to suggest that there have been, and still are, at least two different versions of the digital divide, so that the strategies for reducing their impact have to be differentiated. They are listed below:

1. the socio-economic divide;
2. the “net generation” in relation to older users of ICT

The socio-economic divide separates those who live in deprived circumstances and cannot undertake online study for financial or social reasons (or both). The solution here is in part at least one of political policy to

make the resources available to those who cannot afford them. The Open University has been given hypothecated resources to assure that those students who meet the government criteria of socio-economic deprivation can be given a computer and be provided with funding to maintain an internet connection. (The OU also expends considerable funding and expertise to develop learning materials and services that are accessible to students with a wide variety of disabilities.)

The “net generation” is a term that singles out that fraction of the population who are too young to remember life before the personal computer (born after 1983). Computers and online connection, mobile phones, SMS, mp3s, computer and video games and other pieces of electronic kit, have been part of their world along with the massive use of social software indicated in the Pew Internet study above. They are highly digitally literate. They have seized the potential of networked media. They are used to learning by doing, not by reading (“Gimme a manual?; gimme a break!”). They gravitate towards activities that promote social interaction and prefer to work in teams. Finally, the net generation is attracted to media-rich environments. (An abbreviated enumeration of characteristics of the Net Generation appears at Annex 2)

For the net generation it is argued that successful learning and teaching will need to embody the shift in the teacher-student relationship described in the section on changes in pedagogy below. What is particular here is the need to adapt the style of communication to the form that connects with the style that the net generation have absorbed by the intense interaction they have had with the world of ICT in the most formative stage of their lives. The adaptation that the teacher/facilitator will have to make in their professional activity with students, and their image of themselves, will be very demanding. Many will remain uncomprehendingly styles of learning and teaching into which they were socialised many years ago.

Changes in pedagogy and curriculum to secure maximum benefits from new technology for learning by adults

There are three areas of discussion that are relevant to the topic of changes in pedagogy, one associated with the development of multi-media VLEs and the others both consequences of the advent of Web 2.0 applications.

It is reasonable to expect that adult learners are more than likely to be in work (75% of OU students are in employment) and therefore formal adult learners will here be assumed to be predominantly distance learners. The requirements for good distance learning provision therefore can be applied to this question. Notwithstanding the expectation that distance learners will search in the digital library or on the Web for resources relevant to their study, they require materials and services from the education provider that are clear, comprehensive, well-integrated and that exploit the qualities (technically called “affordances”) of the media through which they are delivered. The

rapid expansion of the range of media and applications (described above) that can be brought into play (for e.g., a mixture of text, audio and/or video, eAssessment, simulation, peer-to-peer discussion, support or activity, tutor-mediated discussion or activity) requires a whole new realm of pedagogic understanding and learning-design capabilities from the teacher/facilitator. For most teaching staff in further and higher education (with whom adults would predominantly be studying) these are new and challenging aspects of pedagogic provision for distance learning. To meet the challenges, and to deliver the advantages, of the multi-media world of contemporary VLEs requires that teaching and support staff become adept at the design of effective multi-media learning activities as opposed to pumping textual content to static websites.

The second type of change in pedagogy is much more fundamental a challenge to the teacher-student relationship and is especially relevant to the realm of adult learners. One of the most striking changes in moving from Web 1 to Web 2.0 is the prominence of user-generated material, in blogs, wikis, or repositories such as Flickr, or in “crowd-sourcing” questions to find the expert who can provide the answer easily. In particular, there is a reasonable possibility that an adult student, through work activity or online community interaction, could be better informed than the teacher in a given topic within a course and can publicly debate the teacher’s position through writing a personal blog that anyone can read on the Web. To gain the benefit of the collective knowledge of the students on a course requires a shift in the pedagogic perspective of the teacher from the position of sensing the knowledge/understanding of a “student-expert” as a threat to authority in such a situation to a position of welcoming an extra resource. While the existence of student-experts has always been a phenomenon in adult education, the ease of publication and the breadth of expertise that exists on the Web suggest that, when appropriate, the teacher’s views should be less “ex cathedra” and more facilitative.

The third area of required change in pedagogic practice relates to those students who have the properties of the net generation, regardless of present age. As the next decade passes they will become an increasing fraction of the student population. To meet the needs and abilities of the Net Generation learners, teaching staff will have to change many aspects of their pedagogic style and practice. According to current thinking, information will have to be imparted in smaller amounts (the current jargon phrase is “micro-learning”). Particular forms of active learning (games-based learning, problem-based learning, collaborative learning) will have to become a standard part of teachers’ practice in learning design. The full range of forms of media (text, audio, still image, moving image, audio/visual) will need to be utilised in student learning activity and also in student assignment submission, to be graded by the teacher/instructor. Some forms of social software may take over from more formal activities as legitimate parts of university education (e.g., blogging replacing some essay writing requirements). The teacher must morph into a multi-media designer and a learning facilitator, while remaining a scholar and an academic: a very demanding task. This transformation of the teaching role will not be a once-off effort. As technology changes and moves

into new areas of social and individual activity, and as the younger generation follows the technology, the impact on pedagogy will continue and possibly accelerate.

Who should pay for what?

“Who should pay for what?” in adult learning is a complex issue to which I do not feel that I have a clear answer to offer. But since adult learning is very much in the centre of this inquiry and is strongly focused on job-related personal improvement (75% of OU students are studying, at least in part, to improve their career chances), the policy of the present government in relation to non-payment for study at a level at which the student already holds a qualification (the Equivalent or Lower Qualifications policy, or ELQ) can neither be in the interest of the individual or of the knowledge economy of the UK. Refusing to support an individual who wishes to gain qualifications to change career by taking a second MSc 15 years after the first one is to implement a policy that is, in the timeworn phrase, “fatally flawed”.

Ways in which new technologies can improve the prospects and opportunities for learners both in and outside the workplace

I now wish to come back to the first of the questions set by this enquiry, keeping in mind the analysis of the related pedagogic changes outlined above, since technology and pedagogy must evolve in lock-step if the promise of greater educational opportunity is to be realised.

It is clear that the development of ICT outlined in this paper has expanded the range of educational opportunity enormously over the past ten years, for formal or informal learning, for independent or collaborative study, in the workplace and outwith it. In the realm of formal learning, open source learning environments provide integrated, secure and relatively affordable VLEs that blend Web 1 independent learning applications with Web 2.0 collaborative facilities. As well, collaborative learning activities delivered with relatively simple software have made possible the expansion of distance learning provision in conventional universities (predominantly at the MSc level). In the area of informal learning, the Open Content movement is putting increasingly large amounts of structured learning materials into the public domain. Alongside this initiative, the unimaginable volumes of information on the Web, together with enhanced search facilities and Web 2.0 applications “expand the volume of the individual voice” and provide facilities to form communities for both social and educational purposes. These are enormous steps forward that show no sign of letting up.

The longer-term prospects of Web-based learning are hard to predict, given the number of variables involved and the speed and extent of possible change/evolution of any one of them. Of these variables I shall pick four for comment, either because they have obvious impact or because of the challenge to present thinking that they entail. The four variables are:

- evolution of the adult student body
- changing teaching role of academic staff
- evolution of technology
- expansion of available learning resources

1) Evolution of the Adult Student Body: the age profile

A good deal of the discussion around the most appropriate use of ICT in (higher) education focuses on the properties of the Net Generation and the manner in which technology is integrated into all aspects of their lives, learning included. At the OU the student population age profile is running just ahead of the Net Generation wave, as shown below in the age distribution in 2007:

	Undergraduate	Postgraduate
Male: female ratio	40:60	53:47
Age profile		
Under 25	13%	3%
25-34	30%	33%
35-44	31%	38%
45-54	16%	20%
55-64	7%	5%
65 and over	3%	1%
Median age of new undergraduate level students 32		

Table 3: Age distribution of OU student population in 2007.

Only 13% of undergraduates could be young enough to have acquired the characteristics of the Net Generation. However, given the fact that the 18-24 year old cohort is the fastest growing proportion of the student body, the next decade should see the proportion of students young enough to qualify (>33%) make a significant impact on the style of learning that they require and can benefit from. The impact of the ELQ policy could skew the profile even further towards the young end of the spectrum, as they are most likely to have no prior qualifications to impede them. The OU, with its Moodle VLE coming on-stream, the OpenLearn project moving ahead and other experiments being pursued in the Web 2.0 pedagogy-technology relationship, would be in an ideal position to study the net generational properties, preferences and reactions of its student body as they move through the next decade.

2 Changing teaching role of academic staff

There are two aspects of the changing role of the academic teacher that stand out in this discussion. Firstly, considering the comprehensiveness of the change in teaching process described above and the continuing nature of that process of change, the question poses itself as to whether we now need to form a partnership of academic and learning designer to meet both the academic and the pedagogic demands of higher education teaching in the future? The second question concerns the relationship of the academic's teaching activity (in the net generation form) and her or his research activity. Bringing the process and results of research activity to enhance and enrich student learning has traditionally been one of the reasons for associating the two activities in university life (either in the face-to-face or distance-learning modes). Research narratives are commonly quite long and complex, with a logical structure that needs to be grasped to see the import of the activity. However, long and structured narratives are exactly the type of expression that the net generation has difficulty absorbing or being interested in. It is one thing to structure a problem-based learning activity as a computer game; structuring a substantial research narrative into the same form would be time-

consuming and may not do justice to the nature of the inquiry or the stage of understanding achieved.

3 Evolution of technology

The manner in which “new technology” has evolved over the past five years and the impact that this evolution has had on educational thinking has shaped many of the considerations articulated in this paper. From one year to the next the new activity of choice has moved from podcasting to social networking to virtual worlds (Second Life in particular). The whole suite of applications loosely grouped under the banner of Web 2.0 has provided many possibilities for informal collaborative learning and self expression not envisaged five years ago. 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 of learners has exploited it and been shaped by it. On a ten-year timeframe it is being predicted that each person will be embedded in a personal “cloud” of miniature computing devices ^[8] 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. At that point, “thinking becomes a distributed activity”.

4 Evolution of Learning Resources

One of the most important ways in which more learning resources have been made available for both formal and informal learning alike is the development of the Open Content initiative, as has been described above. It is clear that only through Web-based delivery is it possible to meet the objectives of being free to the user and available world-wide. While much of the material available presently is text-based content, the first ambition for future development is to provide learning tools that move the student beyond passive reading to an interactive experience (e.g., group discussion with other students interested in the same textual materials). Secondly, the stimulation of reversioning and reuse of the initial set of materials will produce a multiplier effect on the range and applicability of materials available; this still remains a challenge. Finally the search is still on for a viable business model to defer the substantial cost of transforming materials into a suitable format and mounting them on the Web.

Conclusion: Perfect Storm or Tornado

The past 10 – 15 years has seen an enormous growth in the capacity of adults to enhance their knowledge and understanding across a wide range of subjects or interests. The arrival of the Web and the continuous enhancement of the performance of search engines has put an unfathomable wealth of information into the hands of almost the whole UK adult population,

if points of access in libraries and other public buildings are added to the large majority who have personal ICT access. The providers of formal study have also used ICT to expand the quality and range of their offerings, both directly to individuals and through course offered online directly into the workplace. The initial worry about the quality and veracity of much of what was held on the Web has lessened with the arrival of self-correcting mechanisms such as the vigilant blogger or the discussion space and health warnings given with contested entries on Wikipedia.

At the same time the availability of a large range of media and software applications is (or should be) placing a greater demand on the talents of teaching staff to produce media-rich learning materials, while the exposure since childhood to a wide range of media, social software and computer or video games has (purportedly) shaped the intellectual responses of the next generation in the image of the quick action, immediate gratification, multi-tasking, problem-solving aspects of the media that they engage with. While all this is going on, the relentless advance of technology makes prediction of possibilities even 2 or 3 years hence a very inexact science. (Who would have predicted, three years ago, the present-day intensity of interest in Second Life as an educational medium?).

The question implicit in the title of this paper is whether the large range of relevant factors can add up in a constructive manner to create an educational and social environment that achieves as much as possible (a perfect storm) or whether some of the less constructive aspects of internet culture are damaging to the present-day net generation students in ways that will be hard to remedy and will impoverish the intellectual environment. (If it is really true that early, intense exposure to computer and video games renders a student incapable of, and/or disinterested in, following a logical argument of any depth, then there is genuine cause for concern. But it is incumbent on us to bring into the balance the skills s/he has in abundance; multi-tasking, intuitive problem-solving, etc.)

The next decade in learning in general, and in adult learning in particular, will be both a challenge and a great adventure as we try to bring the remarkable tools that the Web has brought us to maximise the benefit to the individual and the society that it more and more underpins.

Annex 1: Glossary of Selected Terms, adapted from Wikipedia

A blog (a portmanteau of web log) is a website where entries are commonly displayed in reverse chronological order. "Blog" can also be used as a verb, meaning *to maintain or add content to a blog*.

Many blogs provide commentary or news on a particular subject; others function as more personal online diaries. A typical blog combines text, images, and links to other blogs, web pages, and other media related to its topic. The ability for readers to leave comments in an interactive format is an important part of many blogs. Most blogs are primarily textual, although some focus on art (artlog), photographs (photoblog), sketchblog, videos (vlog), music (MP3 blog), audio (podcasting) are part of a wider network of social media. Micro-blogging is another type of blogging which consists of blogs with very short posts. As of December 2007, blog search engine Technorati was tracking more than 112 million blogs

A wiki is software that allows users to easily create, edit, and link pages together. Wikis are often used to create collaborative websites and to power community websites. These wiki websites are often also referred to as *wikis*; for example, Wikipedia is one of the best known wikis. Wikis are used in many businesses to provide affordable and effective Intranets and for Knowledge Management. Wikis are generally designed with the philosophy of making it easy to correct mistakes, rather than making it difficult to make them. Thus, while wikis are very open, they provide a means to verify the validity of recent additions to the body of pages. The most prominent, on almost every wiki, is the "Recent Changes" page—a specific list numbering recent edits, or a list of all the edits made within a given time frame

Del.icio.us (pronounced "delicious") is a social bookmarking web service for storing, sharing, and discovering web bookmarks Del.icio.us uses a non-hierarchical keyword categorization system in which users can tag each of their bookmarks with a number of freely chosen keywords (cf. folksonomy). A

combined view of everyone's bookmarks with a given tag is available; for instance, the URL "<http://del.icio.us/tag/wiki>" displays all of the most recent links tagged "wiki". Its collective nature makes it possible to view bookmarks added by similar-minded users

MySpace is a social networking website offering an interactive, user-submitted network of friends, personal profiles, blogs, groups, photos, music and videos for teenagers and adults internationally. Profiles contain two standard "blurbs:" "About Me" and "Who I'd Like to Meet" sections. Profiles also contain an "Interests" section and a "Details" section. MySpace allows users to customize their user profile pages by entering HTML into such areas as "About Me," "I'd Like to Meet," and "Interests." Videos and flash-based content can be included this way. Users also have the option to add music to their profile pages via MySpace Music, a service that allows bands to post songs for use on MySpace.

Facebook is a social networking website that was launched on February 4, 2004 and open to anyone over the age of 13. When Facebook launched, it included several features that still exist today on the website. They include the Wall, which is a space on each user's profile page that allows friends to post messages for the user to see, Pokes, which allows users to send a virtual "poke" to each other, Photos, where users can upload albums and photos, and status, which allows users to inform their friends of their current whereabouts and actions. The Facebook Wall allows users to post messages on the profile of their friends. A user's wall, dependent on privacy settings, is visible to anyone who is able to see that user's profile. In July 2007, Facebook began allowing users to post attachments to the wall, whereas the wall was previously limited to textual content only.

YouTube is a video sharing website where users can upload, view and share video clips. YouTube was created in mid-February 2005 and uses Adobe Flash technology to display a wide variety of video content, including movie clips, TV clips and music videos, as well as amateur content such as videoblogging and short original videos. Unregistered users can watch most

videos on the site, while registered users are permitted to upload an unlimited number of videos. Some videos are available only to users of age 18 or older (e.g. videos containing potentially offensive content).. Related videos, determined by title and tags, appear onscreen to the right of a given video. In YouTube's second year, functions were added to enhance user ability to post video 'responses' and subscribe to content feeds.

RSS (Really Simple Syndication) is a family of Web feed formats used to publish frequently updated content including, but not limited to, blog entries, news headlines, and podcasts. An RSS document (which is called a "feed" or "web feed" or "channel") contains either a summary of content from an associated web site or the full text. RSS makes it possible for people to keep up with their favorite web sites in an automated manner that can be piped into special programs or filtered displays. RSS content can be read using software called an "RSS reader", "feed reader" or an "aggregator". The user subscribes to a feed by entering the feed's link into the reader or by clicking an RSS icon in a browser that initiates the subscription process. The reader checks the user's subscribed feeds regularly for new content, downloading any updates that it finds.

Web 2.0 is a trend in World Wide Web technology, and web design, a second generation of web-based communities and hosted services such as social-networking sites, wikis, blogs, and folksonomies, which aim to facilitate creativity, information sharing, collaboration, and sharing among users. It is almost defined as the new era of the World Wide Web. Although the term suggests a new version of the World Wide Web, it does not refer to an update to any technical specification, but to changes in the ways software developers and end-users use webs.

Flickr is a photo sharing website and web services suite, and an online community platform. It was one of the earliest Web 2.0 applications. In addition to being a popular Web site for users to share personal photographs,

the service is widely used by bloggers as a photo repository. Its popularity has been fueled by its innovative online community tools that allow photos to be tagged and browsed by folksonomic means. It hosts more than two billion images

Second Life (abbreviated as *SL*) is an Internet-based virtual world launched in 2003, developed by Linden Research, Inc (commonly referred to as Linden Lab), which came to international attention via mainstream news media in late 2006 and early 2007. A downloadable client program called the Second Life Viewer enables its users, called "Residents", to interact with each other through motional avatars, providing an advanced level of a social network service combined with general aspects of a metaverse. Residents can explore, meet other Residents, socialize, participate in individual and group activities, create and trade items (virtual property) and services from one another.

Annex 2: Characteristics of the Net Generation –

(adapted from Oblinger and Oblinger ^[9]“Educating the Net Generation”)

Digitally Literate

Having grown up with widespread access to technology, the Net Generation is able to intuitively use a variety of IT devices and navigate the Internet

Connected

“As long as they’ve been alive, the world has been a connected place, and more than any preceding generation they have seized on the potential of networked media

Immediate

Whether it is the immediacy with which a response is expected or the speed at which they are used to receiving information, the Net Generation is fast

Experiential

Most Net Generation learners prefer to learn by doing rather by being told what to do.

Social

“Prolific communicators, they gravitate toward activities that promote and reinforce social interaction

Teams

The Net Generation often prefers to learn and work in teams

Structure

The Net Generation is very achievement oriented. They want parameters, rules, priorities, and procedures

Visual and Kinesthetic

The Net Generation is more comfortable in image-rich environments than with text.

Things that Matter

The Net Generation readily takes part in community activities. Given a choice, they seem to prefer working on things that matter, such as addressing an environmental concern or a community problem.

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