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## Learning Systems in Post-statutory Education

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**ABSTRACT** This article examines the broad scope of systemised learning (e-learning) in post-statutory education. Issues for discussion include the origins and forms of learning systems, including technical and educational concepts and approaches, such as distributed and collaborative learning. The VLE (Virtual Learning Environment) is defined as the prevalent form of e-learning, including the use of related systems within the MLE (Managed Learning Environment) such as CMS (Content Management Systems) and learning repositories. Challenges in the delivery of systems and software to facilitate learning in a digital context are described, including system selection issues, system configuration, project deployment, system management and integration with other library systems; consideration is also given to user support and training. Accessibility requirements within VLEs are briefly described, including a definition of web standards required for accessibility compliance. Trends in e-learning are also explored, including future technologies such as m-learning (mobile learning). The article concludes with a discussion on the emergence of the global market in education and critical perspectives on learning systems.

### Introduction

According to the latest sector-wide research, some 95% of higher education institutions in the United Kingdom have some form of learning system, actively supporting and delivering educational programmes for tens of thousands of students (Universities and Colleges Information Systems Association [UCISA], 2005). These systems are typically delivered via the medium of the World Wide Web, a socially interactive communications channel which has become ubiquitous in areas as diverse as commerce, entertainment and education, exacerbated by growing computer literacy, improved Internet connectivity and ownership of computer devices:

The widespread availability and popularity of the Internet has made it possible for people to communicate unlike any other time in history. Applications for instantaneous communication are as diverse as the global cultures utilizing the Internet. As more people join and participate in this global communication medium, these users are expecting more from their online experience. Consumers are increasingly asking questions such as, 'why can't the Internet do', or 'when will I be able to online?' (Chan & Welebir, 2003, p. 196)

Web-based learning systems provide a range of interactive functions, including communication channels, content-publishing and assessment tools. It can be seen that these systems have begun to permeate and impact on many aspects of post-statutory education, with recent web technologies allowing for closer systems integration across institutional systems, including library catalogue, student records and finance systems. In the United Kingdom, this institute-wide computing infrastructure is often considered a holistic learning environment:

'Managed Learning Environment' (MLE) refers to the whole range of information systems and processes of a college or university ... that contribute directly, or indirectly, to learning and the management of that learning. (Erskine 2003)

Whilst terms such as the 'digital library' and 'e-university' have been used to describe the transformation of traditional library and information facilities toward increasing digitisation and database-driven systems, it can be seen that the web-enabled MLE represents a shift from campus-based systems to personalised and ubiquitous access for end-users.

The MLE typically includes a range of systems, such as library catalogues, learning systems, personalised student records, online journals, web-based portals, directories, content repositories (e.g. containing self-directed learning resources) and 'social networking' facilities. It is perhaps important to consider the disparity between these systems before the emergence of the Web (e.g. relying on various computer applications or terminal systems) – resulting in the need for user training across several individual systems. In this sense, the term Managed Learning Environment describes a consistent or standardised interface to diverse systems (i.e. via the web browser application); conversely, the MLE should not be considered as a single homogeneous system – with educational organisations purchasing (or developing) a variety of web systems; however, some homogeneity is usually possible, e.g. customisation of web content to reflect an institutional design or integration of user login credentials (i.e. using a directory system such as *Microsoft Active Directory*).

Inevitably, the web-based MLE relies fundamentally on information and communications technology (ICT) literacy and student-led approaches for information handling. In this context, we can consider the role of staff facilitating the educational experience themselves subject to change from facilitators of education and related support services to facilitators (or intermediaries) of systems which themselves facilitate the educational experience.

Whilst in recent years, end-users could have been considered as members of the 'digital library', it may now be more pertinent to consider the educational experience in context to the 'digital native', i.e. an individual who moves seamlessly between web-based resources for educational, vocational and leisure purposes, applying web-browsing skills to interrogate information and discover resources within and beyond the institutional MLE.

To understand systemised approaches to learning it is perhaps necessary to identify some fundamental issues and perspectives in this field. Issues for discussion in the article will include:

- the technical background to learning systems;
- defining systemised learning and its relationship with learning technology;
- strengths, challenges and questions raised by systemised learning;
- the contemporary context for learning systems;
- trends and likely future developments for learning systems; and
- critical, social and polemic perspectives on learning technology.

One of the key difficulties associated with contemporary learning systems is the disparity of terminology used to conceptually define learning systems. The following definitions may be helpful:

- *Online Learning*. Often used to refer to computer-assisted learning in an online, i.e. Internet-based context where the student is able to access remote learning materials or communication tools via Internet software. Contemporary learning systems are almost entirely provided via a 'web browser' client, such as *Internet Explorer* or *Netscape*, hence the association of 'online learning' with web-based learning systems (ostensibly delivered via 'web pages'). Other terms synonymous with 'online learning' include 'computer-mediated communication' (CMC) and 'online education'.
- *E-learning*: The prefix 'E' for 'electronic' has been applied to a variety of traditional labels, such as *E-marketing* and *E-library*. In this sense, e-learning could be considered a label for any educational process involving an electronic device; however, this term has more recently come to represent a web-based learning experience.
- *VLE: Virtual Learning Environment*. This is the predominant form of learning system since the late 1990s, involving a web-based portal to a variety of communication, content publishing,

assessment and related tools. The terms 'VLE' and 'e-learning' are now virtually synonymous in the United Kingdom. Other terms synonymous with VLE include:

- LSS (Learning Support System);
  - CMS (Course Management System);
  - LP (Learning Platform);
  - LCMS (Learning Content Management System);
  - LMS (Learning Management System).
- *MLE: Managed Learning Environment.* This term is often used to define the wider composition of web-based systems within an educational institution, including – but not limited to – the Library Management System (LMS), Student Records System (SRS), VLE, Finance system, etc. Integration is perhaps a key aspect of the MLE concept, often involving 'single-sign-on' to access a diverse range of services and systems using uniform login credentials.
  - *CMS: Content Management System.* This acronym describes a typically web-based system for institutional documentation or information. VLE and CMS typically share the objective of providing an accessible interface for staff to upload or manage system features without considerable technical knowledge (e.g. to upload digital documents in a CMS or create an online assessment in a VLE); however, the CMS does not have an educational focus, but describes a system used to develop an organisational website or document repository system (e.g. for restricted access as a staff intranet).
  - *Portal.* A term increasingly used to define a more fully integrated web-based system, perhaps drawing together disparate systems but presenting them in a unified manner (i.e. using a standard layout and navigation structure to convey a sense of institutional identity). The Portal is sometimes a purely cosmetic concept but is increasingly used to describe a unified and integrated interface to systems.

This article will provide a broad overview of the present context for learning systems.

### The Origins of Learning Systems

At the time of writing, the VLE is the present model for computer-assisted learning, based on high-end server computers, with capabilities for integration with institutional authentication systems (i.e. user directory system for systems access) and delivered to any Internet-connected computer via the web client (such as *Internet Explorer*, *Mozilla* or *Opera*).

The web-based VLE has evolved around several key principles; these include usability (i.e. of the system interface) for staff to manage and upload resources and for end-users to view and interact with resources, and the capability to deliver communication and collaboration facilities in a remote context, e.g. to the student's home or work computer.

We would be forgiven for thinking the rapid ubiquity of web-based learning represents a fundamental shift in practice for post-statutory education, yet it can be seen that these systems represent only the most recent stage in the evolution of learning technologies, with origins as far back as the 1950s. In 1956 the educationalist and computer technologist Gordon Pask developed his 'Self-Adaptive-Key-board-Instructor' (SAKI) and in 1960, the University of Illinois developed the 'Programmed Logic for Automated Teaching Operations' system (PLATO), which was run on one of the first computers (ILLIAC I), using a television screen to display navigation menus. The PLATO system displayed several seminal concepts in systemised learning, including distinct 'system roles' such as 'instructors' and 'students', the use of programmable 'lessons' and a memo-based communication tool for student-tutor interaction. The PLATO system evolved throughout the 1970s and was 'ported' to a number of later computer operating systems, including the IBM personal computer (Woolley, 1993)

Later developments in learning systems can be seen in the emergence of the Internet during the 1960s as a military communication and defence system (the Advanced Research Projects Agency Network or ARPANET), which introduced basic Internet technology such as email (1971) and File Transfer Protocol or FTP (1973). Later developments saw the emergence of SERCNET (now the JANET network for UK academic and research organisations) in 1974 and CSNET (Computer Science Network) operating a similar academic network in the USA.

The emergence of a networked university and scholarly community was initially dependent on early UNIX-like, mainframe-based computers, often requiring knowledge of command-line syntax (e.g. using a terminal client machine); however, the emergence of graphical operating systems in the early 1980s (such as Microsoft Windows) featuring *Windows, Icons, Menus and Pointers* (WIMP) quickly opened computing to a general user base and to more usable (graphical) Internet software, such as email, FTP (for file transfer), BBS (bulletin boards), USENET (newsgroups) and early information networks, such as *Gopher* (providing access to text-based resources located on Gopher servers around the world).

### **Web 1.0**

By the mid 1990s, the World Wide Web had emerged as an attractive and usable alternative to earlier text-based Internet systems. Invented by Tim Berners-Lee in 1989 as a document retrieval system at CERN (European Organisation for Nuclear Research), Berners-Lee's *Web Browser* and *Hypertext* encoding system would become the basis of World Wide Web, eventually providing a graphical medium for the delivery of information across the existing Internet. This period was marked by increasingly usable interfaces to computing (mainly due to the arrival of IBM computers and early Windows operating systems) and the success of basic communication tools such as email.

The mid 1990s also saw an explosion in the use of web editing software such as *Netscape Composer* to develop web pages in HTML (Hyper-Text Markup Language) – developed by Tim Berners-Lee as a means of encoding text (and eventually multimedia). The educational application of the Web became increasingly prolific, with 'static' HTML pages available for general viewing by any individual with access to a web browser and Internet connection.

The early Web, with its plethora of web-based pages, still lacking interactive features for the better part, provided the foundation for the next stage of educational systems, establishing the viability and success of mass communication via the Internet. The development of more sophisticated approaches to web design such as CGI (Common Gateway Interface), ASP (Active Server Pages), *Java* and *JavaScript* (to name a few) soon provided the basis for the development of interactive web systems, including web-based bulletin and discussion boards, web-based email, simultaneous chat and other interactive features delivered directly via the web browser.

### **The Emergence of Training and Learning Systems**

The role of corporate and non-educational sectors in the development of early learning systems can be seen in the US military funding of ARPANET, the first Wide Area Network (ostensibly as a military communication system capable of withstanding nuclear attack, but facilitated by academic and research institutions), in the development of in-house corporate training systems by companies such as IBM and in the early implementation of electronic learning systems by the US military, for mass training purposes.

Early examples of learning systems developed or sponsored by non-educational interests also included the invention of the first mouse pointing device by Douglas Engelbart in 1963 and IBM's 'Coursewriter' system in 1966 – a system which included networked access for student access within campus.

The 1970s and early 1980s saw a wide range of corporate experimentation in the development of learning systems, including the development by the PARC company (Palo Alto Research Center, Inc.) of the first graphical computer interface for teaching purposes (*KiddiKomputer*), whilst the CBT company (Computer Based Training) pioneered the use of CD-ROMs to provide training solutions for computer technology products (later becoming 'SmartForce The eLearning company').

In *An Informal History of eLearning*, a former CBT member, Jay Cross, describes the focus of early learning systems in the corporate sector, emphasising the origins of e-learning as a form of systemised training, rather than an educational process in the traditional academic context. Cross's reference to 'eLearning' is perhaps the first use of this term in computing literature:

In 1998, I wrote, 'eLearning is learning on Internet Time, the convergence of learning and networks. eLearning is a vision of what corporate training can become.' (Cross, 2004)

By the mid 1990s, corporate providers had begun to use hypertext-based systems and the web browser as the prevalent medium for delivering learning systems. Some of the earliest web-based learning systems included *Lotus Notes* (combining an in-built communication and email system with content publishing and coursework submission tools) and *Firstclass* (becoming a messaging and collaboration-focused system).

The corporate sector was never unchallenged, however, with increasing interest in learning systems amongst the emerging Open Source community. Early not-for-profit and home-grown systems included the *Boddingtons* system developed by the University of Leeds in the late 1990s and the *COSE* system (Creation of Online Study Environments) developed by Staffordshire University.

It can therefore be seen that a range of perspectives has shaped the ongoing development of systemised learning, with perhaps two distinct influences with differing aims and philosophies: firstly, educational approaches, reflecting the traditional structures and terminology of teaching, including a focus on longitudinal and social interaction (e.g. communication and assessment aspects), and, secondly, instructional approaches to e-learning, characterised by early corporate and military systems, with emphasis on instructional design and sequential learning (i.e. breaking a defined objective into multiple smaller segments with the desired aim of imparting a routine-based task on the learner) rather than the development of subject expertise, critical analysis or learner insights.

Learning objects and e-learning standardization bear the imprint of the ideology and culture of the American military-industrial complex – of ways of thinking that are related either marginally or antithetically to the interests and values of education generally and public education in particular. (Friesen 2004)

## VLEs

The growth of teaching and learning systems delivered via the Internet has accelerated in recent years with the emergence of the Virtual Learning Environment (VLE) as the general model for web-based learning. These systems combine earlier developments in dynamic web technologies such as *Java*, ASP, PHP, etc. and recent developments in *modular systems architecture* – incorporating a range of network systems such as relational databases, directory systems, authentication systems and web hosting services.

The VLE is typically web-based, often running on a traditional web server such as *Apache* or *Internet Information Server*; however, there are considerable differences between the VLE and traditional static web pages (often termed Web 1.0). Key characteristics of the VLE include individualised user access, often allowing for user profiles and portfolios within the system (e.g. within Moodle VLE). The VLE often relies on integrated systems, allowing for common login credentials (i.e. user-name and password) across a range of systems – avoiding the need for different credentials for email, VLE, library and other systems. *Single-Sign-on* is also a possibility, allowing a user to log into an institutional computer, and then seamlessly access other systems without any further login challenge.

As a networked application, the VLE is typically optimised for a variety of user connection speeds, e.g. from a high speed broadband connection to an older and slower 56 kbps modem. The interface itself typically offers a layout and behaviour familiar to existing web users, including hyperlinks, navigation menus, frames (containing sub-pages), etc.

Whilst the VLE market has been dominated by commercial systems such as *Blackboard*, *WebCT* and *Learnwise*, there has been a growing interest across the post-statutory education sector in not-for-profit and open source solutions such as Moodle.

The most typical features of the VLE include the following:

- Content publishing and dissemination tools – to allow academic and other staff to upload document resources (such as Microsoft *Office* files) for access by students. Additionally, there are often features to organise or structure resources by category or using named folders.
- Assessment and ‘quiz’ tools – these often provide a means to create automated multiple-choice or similar style assessments (using tick boxes, text boxes and similar web features). Online assessment tools such as *Questionmark* provide an automated approach for grading user responses. Other features include score weighting (for setting the value of particular questions or

assessments within a wider assessment framework) and the use of question repositories to allow for the quick construction of assessments from an existing question archive.

- Collaboration and communication features – these include *asynchronous* tools such as online discussion boards (resembling earlier Bulletin Board Systems for posting and replying to short topical messages), file exchange (e.g. for displaying group coursework and allowing other group members to develop and re-upload the file), versioning (to track changes to developed content), messaging (to provide a simple message system within the system for staff and users), and email (integrating the ability to send email to defined users who may then receive email via the VLE or their own email software). *Synchronous* tools include chat style features to allow rapid/real-time discussions and tutor-led debates, often including *whiteboard* tools for displaying images, websites, uploaded documents, etc. in context to the discussion.
- Reusable Learning Objects and Learning Repositories – with origins in instructional design and military training research, *Reusable Learning Objects* have become a feature of VLEs and related web-based software. The key aims of Learning Objects include portability (i.e. for the resource to function in any compatible learning system) and re-usability (i.e. to allow for easy retrieval from within a Learning Object Repository for sharing and re-use in another system). Learning Objects are typically considered self-contained learning units or resources, providing some level of user interaction (which could be provided in a wide range of digital formats, such as images, *Flash* movies or interactive applications such as *Java*, etc.). Applications of Learning Objects can include any of the following:
  - an interactive quiz or assessment providing user feedback;
  - a sequential presentation, seminar or lecture;
  - a sequential task-based demonstration, split into slides or scenes;
  - movie or audio experience, with additional interactive features, such as a notes tool.

Another key aspect of Learning Objects is the formal specifications which determine how they are created (often using software or VLE-type systems) and uploaded into compatible systems; there are two principal Learning Object standards: *SCORM* (Sharable Content Object Reference Model) and *IMS* (company). Both these standards share similar aims and approaches for 'wrapping' content using *metadata* (descriptive scripts) to define issues such as the resource title, description, subject matter and educational level. More complex metadata may also allow for integration between the learning object and a host learning system (e.g. to store score values or user details). Whilst a key aim of Learning Objects has been to provide compatibility and ease of integration with VLEs, this has been hampered by lack of standardisation, resulting in a myriad of Learning Object specifications and differing levels of support for particular VLE systems.

### Challenges and Concerns in VLEs

The deployment and delivery of the VLE is complicated by the vast range of commercial and open source systems available, by often prohibitive licensing models for commercial systems and by complex systems and integration requirements for software installation. Whilst it may be tempting to consider an open source or not-for-profit alternative VLE, it should be remembered that not-for-profit systems often lack a formal or accountable support service; however, open source systems often have a large network of voluntary developers and community enthusiasts able to offer help of some form to resolve system problems.

Other issues in choosing a VLE system include content portability – i.e. can courseware or published resources be easily extracted from a particular system and used within another system?

The issue of 'locked' content also has financial implications, i.e. it is possible the institution will become dependent on a particular system, preferring an ongoing licence to maintain the historical system rather than risk the loss of content by migrating to another system (often involving a complex process of content conversion).

From an operational perspective, there are several key tasks to be faced for the deployment of learning systems. These include:

- analysis of system requirements and the learning context, e.g. will the system simply support conventional teaching or distance learning; can the system deal with institutional capacity/user load;

- assessment and selection of a system suitable for the institutional context (with several thousand systems on the market, this is no small endeavour);
- liaison with (and potential recruitment of) institutional stakeholders in VLE procurement and eventual use, including managers, support staff, academic users, etc.;
- deciding use of a commercial or non-commercial system and associated considerations, e.g. system support provision, licensing fee model and budget;
- procurement of computer systems/servers to run the e-learning system according to VLE specifications;
- installation and configuration of the VLE (often the initial configuration will be crucial in determining how the system will function);
- integrating the VLE within the institutional infrastructure, from a technical perspective (e.g. to enable access to the VLE via an existing user login);
- initial testing, training for high-level system administrators, etc.;
- the initial pilot to test the VLE, obtaining feedback for user satisfaction;
- gradual roll-out, possibly to selected academic schools/faculties, providing suitable staff and student training and support materials, obtaining feedback and user satisfaction responses;
- full roll-out of the system, with continued liaison with institutional stakeholders to report progress, obtain satisfaction feedback, etc.;
- ongoing support provision, possibly including retraining of existing staff or procurement of new VLE-specific support staff.

There will be considerable social, political and educational issues for any staff engaged in the deployment of a new VLE or learning system. Workload and administrative support may be a factor (e.g. in managing online enrolments and supporting students in an online context via email); other concerns can include fears of automation to replace teaching staff or skills challenges by staff expected to use the new system.

The resolution of challenges to deployment of learning systems is perhaps best considered as a process of consultation, negotiation and promotion of shared ownership for the system, achieved through dialogue with all 'stakeholders' from the earliest stages of system selection through to negotiation of student support mechanisms, balance of IT and academic support, etc.

### **Accessibility and Web Standards**

The early World Wide Web was characterised by considerable disparity across web browsers (*Internet Explorer*, *Netscape*, etc.) Each browser implemented standard forms of HTML but added additional proprietary functionality, special features and effects not found in other browsers. The development of proprietary HTML rules for individual web browsers became less problematic with an improved awareness of HTML standards amongst both web software developers and HTML coders; however, the problems of proprietary HTML remain due partly to the myriad range of web browsers available and a continuing disparity in the way web pages are produced (i.e. using various web editing applications and manually coded HTML).

The open-ended nature of HTML and related standards (including CSS – Cascading Style Sheets) and HTML variants (such as XHTML) has resulted in considerable challenges for the provision of web resources which are accessible and usable for the widest possible audience.

A variety of issues can impair the use of web resources, particularly for individuals who rely on standards-based applications to enhance their web browsing experience; web accessibility issues include:

- poorly generated or 'coded' HTML, which subsequently fails to display correctly in a standards-compliant web browser;
- difficulties enlarging fonts for visually impaired users;
- difficulties 'reading' web pages using a screen reader application;
- issues converting a colour-based site to a high-contrast or other alternative style to suite a particular visual preference.

The main standards body for the Web is called the *World Wide Web Consortium* (or W3C). This body was founded by the originator of the World Wide Web, Tim Berners-Lee and has responsibility for the technical specifications of the Web and related guidelines for production of

web content. Several core standards are published to ensure content developers and web editing system developers are able to work within common rules and guidelines. These include:

- web mark-up standards (such as HTML – Hypertext Markup Language) and its variants, such as XHTML – Extensible Hypertext Markup Language (various versions);
- XML and derivatives (Extensible Mark-Up Language). XML is a basis for the encoding and exchange of data in a web context;
- the Web Content Accessibility Guidelines (WCAG) – a set of 14 guidelines for the production of accessible web content. The WCAG are partly technical and partly stylistic, recommending developers consider a range of usability and accessibility issues from a unified perspective, i.e. developing material in a manner which is usable for all web users.

The specifications mentioned above are available at the W3C website (<http://www.w3c.org>). In practice, the W3C guidelines and specifications endeavour to ensure all web pages are built using the same technical rules, allowing web browsers to display web material in a consistent and compatible manner. Accessibility-focused specifications ensure a range of usability considerations such as:

- use of standard headings to designate page titles (e.g. Heading 1, Heading 2, etc.);
- use of titles, descriptions, etc. for images, tables and other graphical features (to ensure alternative textual content is available for users with visual impairment);
- use of key-based shortcuts to enable users with motor difficulties to access and navigate the web page, including complex forms and menus.

These considerations are particularly important for the VLE, due to its increasing ubiquity in post-statutory educational life. Additionally, given the growth in student profile diversity (including diversity of age and disability), it is important to provide e-learning systems which offer considerable web accessibility, e.g. for users with visual, motor or cognitive disabilities.

### **Blended and Distance E-learning**

Recent years have seen some agreement on terminology used to describe the use of learning systems in particular contexts. The use of the VLE alongside conventional teaching has been termed ‘distributed’ or ‘blended’ learning, often supporting class-based teaching through emphasis on resource publication rather than communication or collaboration.

The VLE system may also be used as an exclusive platform to deliver a course of education, i.e. to support remote learners with minimal or no tutor contact. Issues which may arise from study delivered entirely remotely via the VLE can include student dissociation from the course or institution, isolation from peers and staff, poor coursework feedback or pastoral relationship with tutors and difficulties with the technology, including network connectivity, IT support, etc.

### **Web 2.0 and E-learning 2.0**

More recently, we have also seen considerable growth in experimentation with models of e-learning, e.g. using a range of VLE systems within the same organisation to provide specific tools seen as strengths of particular systems, or basic integration (often provided via hyperlinks) between the VLE and third party systems such as Microsoft Live (chat, email and discussion tools) and other ‘social networking’ services on the World Wide Web, such as *MySpace*. Additionally, the emergence of *Web 2.0* applications, such as social networking websites, *wikis* (collaborative document systems), *blogs* (collaborative web logs) and other innovations have been seized upon by some educational institutions with the intention of promoting learning and teaching via technology and encouraging participation with peers and tutors.

The growth in mobile devices has similarly promoted adoption of mobile phones as a means for disseminating of information via SMS (Short Message Service) messages, e.g. in order to notify students of a timetable change or other notable news.

The emergence of Web 2.0 has seen the incorporation of these tools within VLE systems, purporting to improve interaction and collaborative aspects of web content. However, negative

issues arising from university-sanctioned use of social networking tools can involve uncensored and non-moderated comments amongst students and comments directed against the host institution.

### **M-Learning**

With increasing dependence on e-learning systems and growing availability of mobile networked computing, students will increasingly access online study in a diverse range of contexts. Until recently, the majority of e-learning activities within educational institutions were restricted to use of static networked terminals (i.e. connected via cabling to a network socket). The advent of WiLANs (Wireless Local Area Networks) is allowing the use of portable computer devices such as laptops or PDAs (Personal Digital Assistants) at any location within the higher education institution, e.g. allowing students to access institutional systems in the lecture theatre, refectory or any other location within the wireless transmission range. The rise of portable and handheld networked devices may also widen access to institutional systems outside the academic institution; for example, a 'smart phone' could access institutional email, calendaring systems or even a WAP (wireless application protocol)-enabled VLE.

Whilst current laptop computers are widely used for limited portable computing, the handheld device has the advantage of easy portability, with latest models combining phone and SMS functionality with PDA-style Internet access and personal computing functionality.

### **Learner Trends and the Role of Learning Systems**

Recent years have seen an emphasis by the UK Labour Government on widening access to post-statutory education and training and use of emerging technologies to achieve these aims. Reports such as the *Dearing Report* (1997), *The Learning Age* (Department for Education and Employment [DfEE], 1998) and *21st Century Skills: realising our potential* (Home Office, 2003) presented both industry and the education sectors with a number of goals focused on improving educational standards as a vehicle to strengthen the UK economy. The aims of this legislation can be summarised in the following extract from *21st Century Skills*:

There are four principles underlying our approach to improved publicly-funded training provision for adults. It should:

- Be led by the needs of employers and learners.
- Be shaped by the skill needs prioritised in each sector, region and locality.
- Make the best use of Information and Communications Technology (ICT) to deliver and assess learning.
- Give colleges and training providers maximum discretion to decide how best to respond to needs. (p. 87)

More recently, the government paper *Harnessing Technology: transforming learning and children's services* (DfEE, 2005) describes the Government's vision to develop the use of ICTs within all educational sectors.

These reports emphasise the importance of a demand-led approach within the education sectors and the development of links between education providers and industry – prompting a debate on the role of colleges and universities in the wider economy and implications for subject areas within a market-led approach to educational funding. Gibson et al (1999) comment on this emerging agenda:

sub-degree level courses and flexible structures of certification have become more common. Access to lifelong learning has increasingly been seen by policymakers at all levels as a social and economic priority. (p. 219)

Universities have been encouraged to adopt an inclusive approach to recruitment, i.e. for mature, disabled and ethnic minority entrants; recent statistics suggest an increase in the number of entrants matching these criteria, suggesting a growing trend in mature, part-time study:

1,236,300 (66%) of all enrolments are full-time, an increase in numbers of 3% since 2000/01. The number of part-time enrolments also grew by 3% over the same period. (Office of National Statistics, 2003)

Learning systems are often cited as a solution for the emerging trends of part-time study in educational provision; however, we should consider the ICT literacy of this wider student context, many of whom may not have a prior knowledge of IT or the World Wide Web in their private or vocational lives.

Additionally, the VLE does rely on Internet availability; many individuals such as the disabled or elderly may be unable to use web-based resources for accessibility reasons. Further, it should also not be assumed that all school-leavers may be satisfied studying via the Web, with class-based tuition remaining the prevalent medium of education. Cullen (2001) reflects this:

A number of research and policy papers addressing the issue of the digital divide identify specific groups of people as being especially disadvantaged in their uptake of ICTs. These include: people on low incomes, people with few educational qualifications or with low literacy levels, the unemployed, elderly people, people in isolated or rural areas, people with disabilities, sole parents, women and girls. Because they are often already disadvantaged in terms of education, income and health statu s... (p. 312)

It can therefore be seen that reliance on ICT skills in an increasingly diverse student population raises a number of usability and accessibility concerns for the adoption of learning systems.

### **Corporate (and Global) Developments**

We have already discussed the commercial background to the e-learning industry and its relationship with academic providers. There is arguably a new educational industry developing around the e-learning product which ostensibly facilitates education, solving many of the problems associated with low-contact study; however, it can be seen that in many ways, this emerging industry is facilitating a fundamental shift towards an entirely new medium of instructional design, based on the VLE model. Pailing (2002) comments:

the industry has suffered from a lot of hype and suppliers and customers need to look at e-learning in perspective. It is hardly surprising that most of the predictions about the e-learning market come out of the USA. (p. 151)

In 'Digital Diploma Mills: the automation of higher education' (1998), David Noble presents a theory of the 'commoditization' of learning, describing the emerging relationship between the education sectors, government and technology industries in the USA, reflecting similar developments in the United Kingdom and Europe:

For the universities are not simply undergoing a technological transformation. Beneath that change, and camouflaged by it, lies another: the commercialization of higher education. For here as elsewhere technology is but a vehicle and a disarming disguise.

Noble links the growth of the e-learning industry with increasing commercialisation (commoditization) of post-statutory education, citing the growth of digital industries as a direct result of the collapse of older heavy industries in the 1980s:

The foremost promoters of this transformation are rather the vendors of the network hardware, software, and 'content' – Apple, IBM, Bell, the cable companies, Microsoft, and the edutainment and publishing companies Disney, Simon and Schuster, Prentice-Hall, et al – who view education as a market for their wares, a market estimated by the Lehman Brothers investment firm potentially to be worth several hundred billion dollars. (Noble, 1998)

In this sense, we may be witnessing a transformation of education from the traditional taught approach to a commodity-based instructional model, where courses can be run through via systems without the imposition of experienced academic staff.

The widespread adoption of learning systems can therefore be seen to facilitate a new commercial market – part of the growing *information industry*. These developments reflect the

concern of academic staff about the threat of automated systems. This systemification of learning is suggested as an inevitable outcome for education by Halkett (2002):

There is no need for the creation of courses by those who did not create them before. There is no need for any new institutions. There is every need for existing institutions and existing educators to rise to the new challenge and have the best possible tools put at their disposal. (p. 82)

The provision of training in an e-learning context, with minimal instructor input, is already being deployed by some training companies such as Thompson NETg, with contracts for training in the business and public sectors in the USA and United Kingdom. Nixon & Helms (2002) have indicated the spread of e-learning in some government and public bodies:

Corporate universities are not new, but have experienced tremendous growth during the last ten years. Predictions are that corporate universities will outnumber traditional colleges and universities within the next ten years ... Corporate universities exist in government settings and include the Internal Revenue Service, the City of Tempe's Learning Center and NASA's Marshall Space Flight Center. (pp. 144-145)

Jay Cross describes the ethos of e-learning in its original corporate context, considering the imperative of systemised learning as a sequential training device, rather than encouraging the kind of developmental activity found in traditional models of education:

Executives don't care about learning; they care about execution. I may talk about 'learning' with you, but when I'm in the boardroom, I'll substitute 'improving performance.' (Cross 2004)

The role of learning systems, cited as a progressive solution to distance learning, have therefore prompted concerns for the commoditisation of post-statutory education; it remains to be seen if learning systems will diminish the role of academic practitioners, with the expansion of e-training in competition with traditional post-statutory education.

## **Conclusions**

It can be seen that learning systems present both challenges and opportunities for academic staff and end-users. However, the prevalence and increasing reliance on these systems in post-statutory education should be approached with caution, especially with respect to motivational factors and support issues.

The emerging model of further and higher education as a part-time occupation, undertaken by working students, with increasing numbers of mature and non-traditional entrants, presents a challenging context for staff with responsibility for teaching and supporting students via the medium of learning systems.

The barriers and operational questions for systemised learning are becoming more apparent as educational institutions become more dependent on systems for course delivery, blended learning and distance-learning models of study. What, perhaps, is less clear are the wider motives of educational providers and governments in encouraging the use of ICTs within the wider lifelong learning agenda, where systemised learning can clearly be seen as a facilitator in driving lifelong learning and the new 'knowledge economy'.

Furthermore, the increasing systemisation of learning and trend toward a market-led model of education represents both a digression from traditional focus on academic achievement and a serious challenge to underpinning values of critical and reflective educational practice. Certainly, the diversity seen across VLE systems, with differing interfaces and emphasis on synchronous, asynchronous, collaborative, communication and content features makes any study or assessment of systemised learning all the more difficult. Perhaps a concluding remark can be offered by Tim Berners-Lee, the developer of the first web systems:

As the Web passes through its first decade of widespread use, we still know surprisingly little about these complex technical and social mechanisms. We have only scratched the surface of what could be realized with deeper scientific investigation into its design, operation and impact on society. (Berners-Lee, 2007)

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