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## STRATEGIES FOR E-LEARNING IN UNIVERSITIES

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### ABSTRACT

This paper examines the e-learning strategies adopted by universities, from the perspective of three common objectives: widening access to educational opportunity; enhancing the quality of learning; and reducing the cost of higher education. The discussion is illustrated by drawing on case studies of universities in Europe and the United States. It is concluded that the most striking characteristic of the e-learning strategies adopted by universities is their diversity, and inherent characteristic of adaptability in use and flexibility in application. The implicit compatibility with institutional aims suggests that the e-learning strategies universities adopt reflect, rather than influence, institutional ethos and that by virtue of the capacity to adapt to different contexts, e-learning may be more adaptable – and ultimately less threatening – to academic mores than some observers fear.

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### 1. Introduction

E-learning (or online education as it is still commonly termed) has been variously defined, but can be simply described as a learning process in which learners can communicate with their instructors and their peers, and access learning materials, over the Internet or other computer networks.<sup>1</sup> It therefore provides a means through which the powerful and pervasive computing and communications technologies can be applied to tertiary education – and to some of the key challenges now facing universities.

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<sup>1</sup> See definition of asynchronous learning networks by Mayadas (1994), cited in: Oakley, B. (2000). "Learning Effectiveness: An Introduction". In J. Bourne, (ed.), *On-line Education: Learning Effectiveness and Faculty Satisfaction*. Proceedings of the 1999 Sloan Summer Workshop. Nashville: ALN Center, Vanderbilt University.

## 1.1 E-learning and universities

Why do universities engage in e-learning? Academics were prominent among the early users of email and the World Wide Web, initially to support their research, access information, or communicate with colleagues, and later to supplement their teaching. As a consequence, many of the diverse strategies now in place in traditional universities can be traced to early, often modest, pilot projects and initiatives by individual teachers. While many of these early applications involved little more than making lecture notes, or other instructional materials, available online, some teachers went further, using online technology to communicate with their students, provide access to external resources and – where interest and opportunity coalesced – to develop and teach Web-based courses.

Many of these early programmes were developed by staff in departments of Computer Science or Informatics, where the synergy between research and teaching was strongest, and the essential infrastructure for course development and delivery most accessible; similar synergistic opportunities (in research, marketing, or programme development) stimulated involvement by schools of education, and by departments of continuing education and extension studies.<sup>2</sup> As access to the required facilities became increasingly ubiquitous, and experience of using the technologies grew, online-learning inevitably expanded to embrace a wider range of programmes and institutional staff.

## 1.2 Institutional e-learning strategies

With expansion came awareness; as universities became increasingly conscious of the potential of online technologies – and of related demands on staff time and central resources – more and more universities moved to develop *institutional* strategies for the deployment of e-learning. Initially this process might entail little more than providing the necessary staff and infrastructure to allow application of these technologies to routine tasks (e.g. facilitating student access to syllabi, course readings, and bibliographic services; providing the essential infrastructure for teacher-student communication) – but on a more systematic and centralised basis. As the process of assimilation continued, many universities adopted additional measures to promote the use of online learning (e.g., by providing funding to encourage teaching staff to use online resources in their regular teaching practice; assigning to a dedicated unit responsibility for promoting the use of technology-based teaching; or providing the necessary infrastructural and training support to staff engaged in e-learning initiatives).

The effectiveness of these measures inevitably varied somewhat at an institutional level, but overall the speed and pervasiveness of the subsequent spread of online learning among tertiary institutions is impressive. A survey of about one hundred U.S. tertiary institutions (in 1998) showed that two-thirds were already participating in a 'virtual university', or were a partner in an IT-supported distance-education

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<sup>2</sup> Early examples include: The 'Virtual Lecture' programme in the School of Computer Applications at Dublin City University; the 'Virtual College' initiated in the School of Continuing Education at New York University in the Spring of 1992; and the 'Virtual Course in Educational Technology' at the University of Oulu in Finland. See: Curran, C., and S. Fox. (1999). *Telematics in Open and Distance-learning*. Weinheim: Deutscher Studied Verlag,. Pp. 7-13. (A study funded by the Commission of the European Communities. DG XXII Education, Training and Youth. Socrates Programme).

project that benefited non-traditional students.<sup>3</sup> A later, more extensive, survey showed that 55% of responding institutions offered college-level, credit-granting, distance education courses; more impressive still, 30% of institutions presented degree programmes to be completed totally through distance education.<sup>4</sup> True, this data relates to distance education (rather than e-learning *per se*) and no doubt reflects the increasing involvement by universities in distance education (an experience common to most OECD countries<sup>5</sup>); but the (acknowledged) synergistic link, between distance teaching and online learning, (discussed below) reaffirms the perception of pervasive growth.

### 1.3 Institutional objectives

The impressive growth of e-learning was, no doubt, stimulated by the then omnipresent awareness of online technology (and related speculative boom) of the late 1990s<sup>6</sup>; the 'perceived' potential to reach an extensive, even global, student body (coupled with a fear of 'missing the boat') may well have been an additional incentive to invest. But however influential considerations of this kind may have been, there were reasons – more proximate and reflective of perennial institutional interests – for universities' commitment to e-learning. While objectives vary from one case to another (and institutional aims are rarely uni-faceted), the diversity of interests can be subsumed in three generic objectives: widening access to educational opportunity; enhancing the quality of teaching and learning; and containing (if not reducing) the cost of higher education.

Notwithstanding the commonality of purpose represented by these objectives, the e-learning strategies universities adopt in pursuit of these objectives are highly disparate. This disparity in approach is illustrated (in the text that follows) by a number of case studies (each presented in brief outline) – with the aim of illustrating, in each case, a particular approach to a common objective. These case studies (numbered *a* to *k* in the text that follows) are drawn from an on-going study of e-learning strategies in universities in Europe and the United States (on which the author is currently engaged). The diverse strategies adopted by these (sample) institutions, and concomitant adaptability and flexibility in the application of online technology, help to account for the speed and pervasiveness of the spread of e-learning among tertiary institutions.

## 2. Widening access to educational opportunity

A commitment to widening access to education, especially for non-traditional or external students, is a common goal of many university e-learning strategies. In a recent survey on the importance of various goals to institutions' distance education programmes (a high proportion of which use online technology as a primary or

<sup>3</sup> NASULGC. (1999). *Connecting with the Future*. National Association of State Universities and Land-Grant Colleges.

<sup>4</sup> Waits, T., L. Lewis, and B. Greene. (2003). *Distance Education at Degree-Granting Postsecondary Institutions: 2000-2001*. NCES 2003-017. Washington DC: National Center for Education Statistics. While the data relates specifically to distance education, almost 90% of public and private four-year institutions used asynchronous Internet courses for instructional delivery.

<sup>5</sup> Jenkins, J. (1995). "Past distance." In D. Sewart (ed.), *One World, Many Voices: Quality in Open and Distance-learning*. Vol 1. Milton Keynes: ICDE and The Open University. Pp. 427-430.

<sup>6</sup> [a] Cassidy, J. (2002). *dot.con*. London: Allen Lane, The Penguin Press. [b] Shiller, R. (2000). *Irrational Exuberance*. Princeton University Press.

supporting medium of instruction<sup>7</sup>), two out of three U.S. four-year public institutions indicated that increasing student access was a very important goal; either by "making courses available at convenient locations" (72%), or by "reducing time constraints for course taking" (66%). The corresponding figures for four-year private institutions were also high (65% and 61% respectively). In Europe, as well, there is abundant evidence to show that widening access to their programmes – and to their related academic resources – is an important objective of many university e-learning strategies; reaching new groups of students is an additional and closely related goal. Similarly in the United States, 69% of four-year public institutions indicated that "increasing the institution's access to new student audiences" was an important goal of their distance education courses; the corresponding figure for four-year private institutions was 64%. Similarly, "increasing institution enrollments" was ranked quite high: 58% in the case of four-year public institutions, and 57% in the case of four-year private institutions.<sup>8</sup>

## 2.1 Access to university degrees

Widening access to education is still commonly associated with providing a 'second-chance' opportunity for mature students to 'earn a baccalaureate degree', especially for individuals who did not have an opportunity to attend university during late adolescence or early adulthood – as exemplified, for example, by the early programmes of the European Open Universities. However, from the outset e-learning provision has tended to be more diversified in aim, embracing a wider range of programmes, and, within the important category of 'degree-level, for-credit' programmes, including substantive provision leading to post-graduate awards. While operational strategies for widening access to university degrees vary from one university to another, case *a* (below) illustrates an *institution-wide* strategy in a U.K. university that incorporates some typical features of more structured e-learning strategies.

### [ a ] Widening access to post-graduate degrees (U.K.)

This U.K. University, with more than 20,000 students, is sited in a large provincial city and provides a broad range of courses for on-campus students (ranging from part-time certificate to doctoral studies). The Institution has a well-established reputation for innovative course offerings and long experience in working closely with local business and the professions. The University is committed to e-learning as a regular, alternative mode of instruction, and has invested heavily in developing the required infrastructure (e.g. hardware, software, administrative systems and staff support). The e-learning programme offers a range of distance education programmes – with a strong focus on provision of postgraduate degrees.

The initiation, development and teaching of e-learning programmes, in this institution, are an integrated part of regular university procedures. Academic departments are encouraged to make proposals for the initiation of e-learning programmes, in accordance with procedures agreed on by the central decision-making committees of the University. Proposals, together with related budgetary estimates, are submitted to a central committee for approval. Those Heads of Departments who submit successful bids are advanced the funds required to develop the programme, in the form of a loan against anticipated income. Part of

<sup>7</sup> op. cit. NCES 2003-017. Table 17, page 54.

<sup>8</sup> *ibid.*

the additional income, accruing to the online version, is retained by the department responsible for developing and teaching the programme.

Courses are developed by tenured faculty, and are usually based on existing courses taught on campus (so no additional accreditation is required). Programmes, once developed, become a standard part of the university curriculum, available to both on-campus and off-campus students. Courses, for the most part, are also taught by tenured staff (a small number of adjunct faculty are employed, mainly to teach external students). A dedicated unit, reporting to the Vice-Chancellor's Office, is responsible for facilitating the process (e.g. providing essential training and support to faculty in the development and delivery of programmes).

This case provides an interesting illustration of a well-structured, academically-integrated, university-wide approach to e-learning. The strategy, which has been in operation for some years, has enabled the University to offer an extensive range of degree programmes to prospective students. Most of the programmes on offer are at post-graduate level, in subjects as diverse as Bio-Medical Science and Cultural Heritage; and many of the students enrolled in these programmes are resident in other European countries, in various parts of Asia, and in other areas of the World.

## 2.2 Scale of programme provision

But how significant is e-learning in widening access to university education and degree awards in the context of the tertiary sector as a whole? It seems clear from the speed and pervasiveness of its spread among tertiary institutions that they – and more important still, their potential students – see e-learning as an appropriate and convenient means of engaging in tertiary studies. Early evidence of this process can be seen in an initiative (by the Alfred P. Sloan Foundation) that started in 1993 with the development of ALN versions of a few courses. By 2001/02, the one hundred or so institutions (by then involved in the programme) "offered over 300 full degree and certification programmes to the 400,000 who enrolled . . . approximately 20% of all enrollments in online 'for-credit' courses" – an impressive pace of growth over less than a decade. A contemporaneous, nationally representative survey of distance education, degree-granting, post-secondary institutions in the United States, covering the period 2000-2001, showed that more than two thousand (2,250) college-level degree programmes (designed to be completed totally through distance education) were offered by four-year public and private institutions. While again the focus is on distance education (and not e-learning per se), 90% of all degree-granting institutions offering any distance education courses reported using asynchronous Internet courses as a primary mode of instructional delivery. Clearly this is a very high percentage (and a substantial increase on reported use just a few years earlier). The conclusions of a still more recent survey – focused directly on the quality and extent of online education – indicates that 81% of all U.S. institutions of higher education "...offer at least one fully online or blended course," and that complete online degree programmes "...are offered by 34 percent of the

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<sup>9</sup> op. cit. NCES 2003-017. (An additional 520 undergraduate degree programmes were presented by 2-year institutions, and 1,330 certificate programmes by all institutions.)

<sup>10</sup> Greene, B. (1998). *Distance Education in Higher Education Institutions: Incidence, Audiences, and Plans to Expand*. NCES 98-132. Washington DC: National Center for Education Statistics.

institutions.”<sup>11</sup> Indeed, however inconstant the absolute estimate, the evidence of significant growth in programme provision in the United States over the last decade is incontrovertible.

While similar data on e-learning in Europe is sparse, a few points are clear. Firstly, many universities (and other tertiary institutions) are providing programmes wholly or partly online; some for students on-campus, and many for external (distance-education) students. While the aggregate scale of university involvement in e-learning is uncertain, observation suggests that virtually all universities in EU countries have well developed IT infrastructures (with facilities for Internet access, email, file transfer, and the like), and many (e.g., virtually all those visited by the author) routinely use these facilities in teaching students. Just what proportion of European universities offer *discrete* e-learning programmes, however, or have formal strategies for the deployment of online technologies in teaching, is unclear at this time. A recent strategic study, carried out on behalf of the EU Commission, showed that while the level of integration of ICT in teaching has increased greatly over the last two years, considerable variation still exists between institutions in this regard.<sup>12</sup> Secondly, while strategies vary between institutions, and scale of provision between countries,<sup>13</sup> e-learning activity in Europe continues to grow. A survey of the use of e-learning (in training and professional development) showed that some 14% of total spending by users of training went to e-learning-related content in 2001 – “appreciably more than two years earlier when the figure was under 10%”.<sup>14</sup> Similarly, e-learning was estimated to be responsible for about a third of the total income of training suppliers (from the supply of training content and material) in 2001 – markedly higher than just under 18% two years earlier.<sup>15</sup>

### 2.3 Enrolment growth

Broadly similar trends are evident in enrolment growth. Enrolment in ‘for-credit’ distance-education courses in the United States (a high proportion of which use online technology as a primary or supporting medium of instruction) more than doubled over a three-year period, from 1.3 million in 1997/98 to 2.9 million in 2000/01 (with some 2.4 million enrolments in undergraduate distance education courses).<sup>16</sup> How significant is this enrolment relative to the tertiary sector as a whole? Placing the 2.9 million enrolments (in ‘for-credit’ distance education courses) in the context of the more than 15 million students enrolled in (relevant) U.S. institutions would be highly informative as an indicator of relative scale.

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<sup>11</sup> Allen, I. E., and Seaman, J. (2003). *Sizing the Opportunity: The Quality and Extent of Online Education in the United States, 2002 and 2003*. Sloan-C.

<sup>12</sup> PLS RAMBOLL. (2004). *Studies in the Context of the E-learning Initiative: Virtual Models of European Universities*. (Lot 1). Draft Final Report to the EU Commission. Copenhagen: DG Education and Culture. February.

<sup>13</sup> Martin, M. and A. Jennings. (2002). *The adoption, diffusion and exploitation of e-learning in Europe: An overview and analysis of the UK, Germany and France*. Dundee: University of Abertay, Dundee Business School.

<sup>14</sup> CEDEFOP. (2001). *e-Learning and training in Europe*. CEDEFOP Ref series 26. Luxembourg: Office for Official Publications of the European Communities. P. 48.

<sup>15</sup> *ibid*, p. 47.

<sup>16</sup> There were an estimated 2.35m undergraduate enrolments, and 0.51m graduate/first professional enrolments in college-level, credit-granting, distance education courses (in 2-year and 4-year Title IV degree-granting institutions) in 2000-2001. *op. cit.* NCES (2003-117).

Unfortunately, it is not possible to compare the two sets of data; and while some 8% of undergraduates, and 10% of graduate and first-professional students, reported taking distance education courses in 1999-2000 (with considerably more than half the students studying through e-learning), the proportion of their total studies completed online is uncertain. Fortunately the more recent survey of online education (noted above) is additionally informative in this regard and indicates that some 11% of U.S. higher education students "...took at least one online course" in Fall 2002, and over one-third of these students "...took all their courses online."<sup>19</sup> Data on enrolment at an institutional level is even more impressive; at least three U.S. universities are currently reporting *annual* rates of enrolment-growth of 50-100% in their online programmes – an exceptional phenomenon, even allowing for the small number of institutions to which the data relates.<sup>20</sup>

True, the substantive significance of online education in *university 'for-credit', degree level* teaching and learning as a whole is more difficult to assess, given the scarcity of data, a still early and labile phase of development, and significant sectoral variation in activity. Still, some estimate, even if imperfect, is better than none; and appraisal of the available data suggests that e-learning, taken as a percentage of core teaching activity (in 'for-credit, degree-level' programmes) in universities, may still be counted in single figures (even in the United States) – probably somewhat more than a few percentage points. This scale of provision, while significant, is not overly substantial relative to the university sector as a whole – what is impressive is the *pace of growth* and the *pervasive spread* of e-learning among traditional universities.

## 2.4 Widening access to continuing education

The diversity in aim that has characterised online learning since its inception extends beyond degree studies to embrace substantive provision of non-credit courses and extension studies – not least continuing education and the provision of programmes to develop the professional and occupational expertise of participants. Continuing education programmes of this kind are often provided by internal departments or units specially created, or specially designated, to undertake this role; less commonly, a university may establish a subsidiary organisation, partly or wholly outside the parent institution, for that purpose (as illustrated in case *b* below).

### [*b*] *University subsidiary (United States)*

A leading research university (in the United States) recently established a subsidiary organisation that works closely with experts at the University in developing e-learning programmes to provide on-line education for executives and professionals (a role consistent with the out-reach traditions of the parent university). Although a separate entity, the subsidiary-organisation is wholly owned by the parent University; the Executive Head reports to a Board, the majority of which are members of the University's Board of Trustees. Courses

<sup>17</sup> Mainly because the data on distance education relates to course enrolments, while that for the sector as a whole relates to students.

<sup>18</sup> Sikora, A. C., and C. D. Carroll. (2002). *A Profile of Participation in Distance Education: 1999-2000*. NCES 2003-154. Washington DC: National Center for Education Statistics. Among those who participated in distance education, 60% of undergraduates and 67% of graduate/first professional students said they did so through the Internet.

<sup>19</sup> Allen and Seaman, op. cit., p. 1.

<sup>20</sup> [a] [www.apollogrp.com](http://www.apollogrp.com) [b] [www.umuc.edu](http://www.umuc.edu) [c] *Chronicle of Higher Education*. (2003). Letter to the Editor. (From Dr Jack Wilson, CEO UmassOnline). February 21.



are developed by faculty in the University's schools, and are usually based on those taught on-campus. Faculty work with web-designers (employed directly by the subsidiary-organisation) in adapting courses for provision over the Internet. The pedagogic strategy is essentially based on online interaction and collaboration, with asynchronous discussion and synchronous conferences. Course content, including case studies and simulations, are delivered online; communication is by email, message boards and live forums allow students to view peer contributions, see instructors' comments, and share observations (there are no contiguous sessions). Tutorial support is available for some courses, but in general there is no direct monitoring of students, nor are there examinations.

The subsidiary-organisation pays a royalty, part of which goes to the University, and part to the relevant school and faculty member. Programmes do not lead to the normal credit awards of the university (however, students who complete the required courses may receive a certificate from the appropriate school). In addition, courses on selected topics (sometimes based on conferences, seminars, or symposia, presented by leading specialists) are provided through self-paced lecture-series, using streaming video and audio.

Indirect strategies of this kind have been adopted by a number of universities and, where appropriately designed, have distinct institutional advantages – not least the potential to widen access to the academic resources of the university, facilitate participation in a potentially fruitful innovation in higher education, and afford staff an opportunity to work with the new technologies (and so ultimately to enrich teaching and learning on-campus). Where an appropriately constituted separate or 'spin-off' entity is established, it is possible to draw on the expertise (and reputation) of the parent university in developing, marketing, and teaching programmes; and to facilitate speedy response to emergent (commercial) opportunities, without putting undue pressure on established internal procedures of consensual, deliberative decision-making (that obtain in many research universities). It can additionally provide a means of engaging in online learning at lower risk (to institutional reputation and internal harmony), and may additionally provide a source of extra resources (although the demise of some early, well-resourced, spin-off ventures, might counsel a degree of caution in this last regard).

## 2.5 Widening access to university resources

Other research-intensive universities, similarly motivated by a desire to use the power of new technology to widen access to their academic resources, adopt variations on an indirect approach. Strategies again vary from one institution to another. Case *c* (below) illustrates a co-operative approach that allows the participating universities to widen access to their academic resources – and to university-level, lifelong education – without the participating universities having to engage directly in provision of e-learning programmes, or provide concomitant access to their degrees and other awards.

### [ *c* ] *Widening access to university education (United States)*

Life-long learning is the objective of a not-for profit, distance learning venture established recently in the United States, based on an alliance of elite universities. A primary aim of the strategy is to widen access to their academic resources by offering non-credit, college-level, on-line programmes to alumni of the participating universities, and to other adult learners. The body established by

the universities has a separate legal status, with a Board comprised mainly of senior officers from each member university. An academic standards committee, comprising faculty members from the participating universities, is responsible for the overall academic aspects of the programme.

The courses offered are primarily for personal enrichment and directed towards individuals interested in continuing their education; they provide students with the opportunity to engage in discussion with faculty, and with other students with similar interests. Courses are written by faculty in the participating universities; faculty tutor the courses they develop, or, where this is not the case, generally select or approve the required tutors. An academic advisor on the campus of each university assists in identifying faculty interested in writing or tutoring courses (and works with faculty in developing course outlines and related matters).

The three case studies (outlined above) illustrate just a few of the strategies universities adopt to widen access to their academic resources and (in some cases) to their 'for-credit' courses and degree awards. The most striking characteristic of these strategies is their diversity – in programme aims, in the extent to which the activities form an integrated part of established academic structures, in the arrangements for management and governance of e-learning activities, and in the pedagogic approach adopted. Taken as a whole, they show significant diversity in the e-learning strategies universities adopt in providing e-learning programmes and a concomitant facility for adaptability in use, and flexibility in the application, of e-learning.

Indeed the adaptability of online technology extends still further, by allowing universities to provide access to academic resources without ever having to enrol students or teach courses (directly or indirectly); the MIT OpenCourseWare Project is perhaps the best known case. A faculty committee of MIT – when asked for strategic guidance on how the institute should position itself in the distance, or e-learning, environment – opted for an original concept: using the Internet to give away teaching materials.<sup>21</sup> Funding of some \$11 million was provided by the William and Flora Hewlett and Andrew W. Mellon foundations for the first two years of the project. By the Fall of 2003, some 500 courses from about a third of MIT faculty were available on-line and it is expected that a further 1,500 courses will be added over the next few years. It is reported that the pilot run of the programme drew responses from more than 200 countries and territories.<sup>22</sup> True, many in the developing world, most in need of the content made available through the OCW project, currently lack the infrastructure required for access, or the education to make effective use of the content in the form provided<sup>23</sup> (the current 'OCW visitor base' is well educated, most (87%) have some level of post-secondary education, and "...85% of all self-learners have attained a bachelor's degree or beyond<sup>24</sup>). Nonetheless, this innovation seems set to widen access to educational opportunity, both directly and indirectly (through its influence on enabling strategies adopted by other institutions). Innovative strategies of this kind reach beyond the practice of

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<sup>21</sup> Vest, C. M. (2004). "Why MIT Decided to Give Away All Its Course Materials via the Internet." *Chronicle of Higher Education*. January 30.

<sup>22</sup> Diamond, D. (2003). "MIT Everywhere" *Wired* (11.09) September.

<sup>23</sup> MIT OpenCourseWare Program Evaluation Findings Report. (March 2004) p 24.

<sup>24</sup> *Ibid*, p. 10.

earlier modes of technology-based teaching, their ultimate impact on widening access, and otherwise influencing tertiary education – as yet unclear – may prove highly significant.

## 2.6 Widening access: conclusions

E-learning – the latest innovation in technology-based teaching – is more pervasive in use than its predecessors, due in large part to the ubiquity of the enabling technologies; and more diverse in application, due in large part to the changing environment in which universities now discharge their traditional roles. From the outset of their involvement in e-learning, universities have offered programmes in response to varied demands: for career-related qualifications, for professional development, for 'top-up' programmes that allow students to complete degree studies commenced years earlier, or more generally to provide opportunities for lifelong learning.

But how effective is e-learning in widening access to degree qualifications? The doubling of enrolment in 'for-credit' distance-education courses over a three-year period in the United States suggests that e-learning is indeed widening access to higher education. The impressive data on enrolment growth in online programmes at an institutional level, with current *annual* growth rates of 50-100% reported by at least three institutions, reaffirms that view. Moreover, further growth seems inevitable with the increasing demand for lifelong education and for access qualifications. True, the scale of activity *relative to the sector as a whole* is more difficult to assess; and such data as is available suggests that e-learning, taken as a percentage of 'core' teaching activity in universities, may still be counted in single figures (even in the United States). This scale of provision, while significant, is not *prima facie* particularly impressive; what is so is the pace of growth and the pervasive spread of e-learning among traditional universities.

The impact of e-learning on widening access is positive; however, the effect on *equity of access* is more problematic, and dispersion of the enabling technologies is such that universal access through e-learning remains elusive. In spite of the potential of e-learning for widening access to university education, and the substantive progress to date, it is not yet clear that this positive effect will extend to equity of access; indeed the prospects in this connection seem, at best, problematic. Access to the enabling technologies – while becoming ever more ubiquitous – is still unevenly distributed, even in the United States.<sup>25</sup> Moreover, appraisal of current development shows that growth in provision (even in Europe) is fastest in programmes for the corporate sector, where the opportunity cost of participant-time is high, and substantial fees can be transferred more easily to employers for payment. (On-line training programmes for the corporate sector are reported to be growing at a particularly fast rate in Europe, and future forecasts are highly positive: one source estimates that e-learning will account for a quarter of the European IT training market by 2005 and will be worth nearly six billion U.S. dollars.)<sup>26</sup> This focus is in marked contrast to the early experience of the European Open Universities which, by virtue of the socio-economic mission, highly-scaleable

<sup>25</sup> [a] U.S. Department of Commerce. (2000). *Falling Through the Net: Toward Digital Inclusion*. Washington: U.S. Department of Commerce. [b] Gladieux, L. E., et al. (2000). *The Virtual University and Educational Opportunity: Issues of Equity and Access of the Next Generation*. Washington: The College Board. [c] Gladieux, L. E. (2000). "Global On-line-learning: Hope or Hype." In *International Higher Education* 18. The Boston College Centre for International Higher Education. 18 (Winter).

<sup>26</sup> International Data Corporation. (2001). Source: <http://www.nua.ie/surveys/>

technology, and substantive state funding, opened access to many thousands of second-chance students. The UKOU alone has "served more than two million students since 1971",<sup>27</sup> and credit enrolments in the European Open Universities, as a percentage of enrolment in higher education in their respective countries, ranged from some 2.2% to 10%.<sup>28</sup>

### 3. Enhancing the quality of teaching

A commitment to enhancing the quality of teaching and learning, especially for students on-campus, is a recurrent aim of university e-learning strategies – especially in traditional, research-intensive universities. Earlier modes of technology-based teaching were primarily used in distance teaching (most notably perhaps in open universities) and, as a consequence, virtually all related research was predicated on a sharp dichotomy between contiguous teaching on-campus, on the one hand, and a distinctly different 'industrialised' mode of teaching, on the other. A dichotomy reinforced by self-evident differences in institutional mission, in the student populations served, and in their respective scale of enrolment, but less relevant now as former sharp distinctions (e.g., in mission and student characteristics) become increasingly blurred; and interest (in traditional universities) in the instructional potential of the new technology continues to grow. A recent survey of U.S. colleges and universities showed that about a third of respondents perceived instructional integration as a key IT issue for their institutions.<sup>29</sup>

#### 3.1 Supplementing teaching on-campus

In some universities, enhancing the quality of teaching and learning in on-campus programmes, through the use of new technology, is a primary goal; a common approach is to use e-learning to supplement traditional teaching by providing an additional (sometimes optional) component in the teaching-learning process. In programmes of this kind, the primary focus is on the teaching of regular courses to conventional, on-campus students, enrolled in courses developed and taught by whole-time faculty, that lead to the normal degrees and awards of the university. Programmes of this kind are typically an *integrated* part of the standard university curriculum, with e-learning employed essentially as a *supplementary* pedagogy for on-campus students. One of the older universities in Western Europe provides an interesting illustration of the development and integration of e-learning in on-campus teaching. The University, no stranger to change, has survived many vicissitudes over the five centuries or so since its foundation, and today it is a leading European University – with more than 25,000 students and an international reputation for research in Science and the Humanities.

[d] *E-learning on-campus (Europe)*

The commitment to technology-based teaching at the University initially began (in the 1980s) with the establishment of a task force to explore new ways of teaching – with particular reference to the potential of new technology, and an emphasis on deep-level learning. A programme to support research and innovation in

<sup>27</sup> Daniel, J. (2001). "Lessons from the Open University: Low-Tech Learning Often Works Best." *Chronicle of Higher Education*. September 7.

<sup>28</sup> Curran, C. (1999). "Social Costs and Benefits of University Distance Education". In G. E. Ortner and F. Nickolmann (eds.), *Socio-Economics of Virtual Universities*. Weinheim: Deutscher Studien Verlag, pp. 53-76.

<sup>29</sup> Green, K. (2001). The 2001 National Survey of Information Technology in US Higher Education. Source: [www.campuscomputing.net](http://www.campuscomputing.net)

computer-based teaching followed, based on a 'call for tenders' procedure, open to all professors at the University. Much was learned from a consequent series of design and development projects on computer use, not least the need to record the process of innovative teaching, and to disseminate the experiential information (emerging from pilot projects and early applications) to peers throughout the University.

A single unified platform was accordingly initiated to support innovative teaching, and to provide staff with information on courseware and other pertinent matters. It was seen as important also to adopt a richer pedagogy, firmly grounded in the principles of effective instructional design, developed around the concept that "students learn best when they act as independent critical researchers within their discipline".<sup>30</sup> A university-wide strategy was developed around a traditional, campus-based perspective, with a primary focus on pedagogical outcomes. In keeping with a university-wide strategic approach, subsequent developments focussed on programmes, rather than courses, with systematic procedures for evaluation; central co-ordination by a university council; and the integration of educational, organisational, and technological support.

The experience of this university illustrates how research on learning methods and instructional design, initiated in the 1980s, ultimately led to the adoption of a university-wide strategy for the pedagogic enhancement of campus-based teaching.<sup>31</sup> The initial commitment, with subsequent involvement in a wide and continuing range of technology-based teaching initiatives, has culminated in the extensive use of technology in teaching across the institution. The experimental use of technology, with a focus on pedagogical outcomes (grounded in the principles of instructional design), and university-wide strategy; has had a highly positive outcome. The University now orients its curriculum according to the concept of 'guided self study' through which the student progressively learns to acquire knowledge independently, and to develop and apply it.<sup>32</sup> A broadly similar strategy, developed around a special centre for learning technology, has been adopted by another of the older universities in Europe (established in the late 16<sup>th</sup> Century) with a current enrolment of some 12,000 students.

[e] *E-learning support centres*

This University initiated a strategic review in 1998/99 on the use of ICT (information and communication technology) to enhance student learning on-campus. The review led to the establishment of a 'Centre for Learning Technology' to support academic staff in research and innovative development, with respect to teaching and learning with new technology. The Centre effectively acts as a single-source of support for faculty planning and developing e-learning

<sup>30</sup> [a] Beulens, H., W. Roosels, A. Wils, and L. Van Rentergem. (2002). "One year e-learning at the K.U.Leuven: an examination of log-files." [b] Naga, E., M. Clement, and H. Buelens. (2002). "Developing faculty to teach with an e-learning platform: some design principles." Papers presented at the European Conference on *The new educational benefits of ICT in higher education*, September. Rotterdam. [c] Buelens, H., and L. Van Rentergem. (2002). "Toledo, a university wide implementation a VLE: impact beyond education." Paper presented at *EUNIS 2003: Beyond the Network*, 9<sup>th</sup> International Conference of European Information Systems, 2-4 July. Amsterdam, The Netherlands.

<sup>31</sup> For a more extensive discussion see: Lowyck, J. The incentive policy of the K.U.Leuven with regard to ICT applications in education in the past five years: evolution, evaluation and perspective. (Mono) Centre for Instructional Psychology and Technology, K.U.Leuven

<sup>32</sup> Elen, J. (2002). "The reality of excellence in higher education: The case of guided independent learning at K.U.Leuven." In E. De Corte (ed.), *Excellence in higher education: the case of guided independent learning*. London: Portland Press.

activities to enhance students' learning. To-date, programmes have been developed in a wide range of disciplines including: Architecture, Development Economics, Geography, Mechanical Engineering, Nursing and Midwifery, Political Science, Psychiatry, and Zoology.<sup>33</sup>

While on-campus e-learning strategies can vary in scope and focus, the creation of specialist centres (to assist in the development of programmes for the enhancement of teaching and learning on-campus) is a common, practical option. Other research universities reported to have established special centres of this kind include Columbia University in New York, Princeton University,<sup>34</sup> Oxford University,<sup>35</sup> and the University of Bristol in the U.K.

### 3.2 Hybrid and blended strategies on-campus

While often employed as a *supplement* to traditional on-campus teaching, in some universities e-learning is adopted as a *primary* pedagogy – usually in tandem with traditional, contiguous teaching. Hybrid strategies of this kind are becoming more common; it is reported that more than 1,500 students at Virginia Tech took both online and on-campus courses (at the same time) in the fall of 2002;<sup>36</sup> and that Fairleigh Dickinson University requires all students to take at least one course online each year (so most students at the University "will take about 10 percent of their courses online").<sup>37</sup> In addition, many universities are adopting a blended strategy, replacing some part of their contiguous teaching with online sessions. It is reported that the University of Central Florida now offers about 100 courses "that meet half the time in classrooms and half online."<sup>38</sup> A recent survey of online education in the United States indicates that more than half (55.6%) of the institutions offered 'online' and 'blended' courses and a further ten percent (9.6%) offered 'blended only' courses.<sup>39</sup> The reasons why universities provide some courses online can vary widely, from a desire to provide students with a wider choice of learning strategies, to the need to alleviate pressure on teaching space.<sup>40</sup>

### 3.3 Accessing external resources

In many universities, students and staff routinely use the Internet to access external resources to enhance the quality of teaching and learning on-campus. Much of this usage is eclectic, and some focussed. A survey of random visitors to the MIT Open CourseWare website (in November 2003) showed that 35% of those respondents – identified as faculty members in other institutions – said they would use OCW for planning, developing or teaching a course, or to enhance their understanding of

<sup>33</sup> Centre for Learning Technology, TCD. (2003). *E-learning in a research university: the Trinity experience*. 3<sup>rd</sup> Annual Conference, 13 May.

<sup>34</sup> Foster, A. L. (2001). "How a Princeton Classicist Leads in Instructional Technology." *Chronicle of Higher Education*. June 29.

<sup>35</sup> <http://www.tall>

<sup>36</sup> Carnevale, D., and F. Olsen. (2003). "How to succeed in Distance Education." *Chronicle of Higher Education*. June 13.

<sup>37</sup> Young J. R. (200?). "'Hybrid' Teaching Seeks to End the Divide Between Traditional and Online Instruction." *Chronicle of Higher Education*. March 22.

<sup>38</sup> Ibid.

<sup>39</sup> Op. cit., Allen and Seaman, p 8.

<sup>40</sup> Ibid.

specific subject matters.<sup>41</sup> Some universities adopt more structured strategies to access external resources, or to widen the range of options available to students. Co-operating with other institutions is one strategy – in particular in developing or sharing academic resources, enabling infrastructures, or other resources. Case *f* (below) illustrates an approach to developing and sharing online courses, adopted by a collaborative network of some twenty U.S. colleges and universities sharing a common tradition and educational philosophy.

[*f*] *Collaborative network (United States)*

The essential aim of the network is to develop and share online degree and certificate programmes to complement classroom learning on the campuses of participating universities, and to meet the needs of learners (including both on-campus and distance learners). More than 200 courses are currently provided for some 6,000 students. In this network of autonomous institutions, courses are provided under the authority of the university or college that offers the programme. Each member institution is responsible for – and retains ownership of – its own courses; has full control over the courses it offers online, through the network; decides what fees to charge students; and is responsible for supporting students in their learning.

The precise form of on-line pedagogy varies from one case to another, but is generally consistent with an educational philosophy of personal instruction and strong faculty support for students. Some courses can be taken entirely online, but most require some attendance on-campus. Almost all courses are written by full-time faculty (selected on the basis of internal competition); the teaching of a course generally becomes part of normal faculty workload. Most participating institutions use proprietary platforms to deliver courses to students on-campus, and the Internet for external students. Library and bibliographic services are generally made available through the institution providing the programme.

A central unit provides support for a Web-based catalogue of online programmes in member institutions, and additionally facilitates the training of faculty and the collaborative development of online courses. The central infrastructure to support the network (the search engine for an online catalogue, for example, and the user-interface) was developed with the support of specialists in member institutions. Similarly, media-production units in participating institutions are commissioned to produce the required course materials (to be made available through the network). Routine services (e.g., 24/7 technical support and server-hosts) are out-sourced to external providers.

Participation in consortia is a common strategy for co-operation between universities in e-learning. A recent survey, in the United States, showed that some 68% of public four-year institutions participated in a distance education consortia in 2000-2001.<sup>42</sup> (Here again, commonality of mission may be a contributing factor; the corresponding figure for private four-year institutions was markedly lower at 25%). A consortium strategy offers advantages to universities that engage in e-learning: it allows them to pool resources, share costs, to realise potential economies of scale in course development and delivery, and it facilitates specialisation of function between institutions (e.g., in staff training or the provision of technical support). It additionally minimises the investment risk for each institution, admits of considerable

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<sup>41</sup> op. cit. Vest, C. M. (2004).

<sup>42</sup> op. cit. NCES (2003-017).

diversity in application, and provides a mechanism through which universities can make better use of resources while retaining direct control of the academic aspects of their programmes.<sup>43</sup>

### 3.4 Introducing innovative pedagogy

Interest in the quality of teaching, and the adoption of innovative pedagogy, is not confined to teaching on-campus. Case g (below) relates to a pedagogically innovative, post-graduate programme in business economics, developed for external students in a Scandinavian university. The programme was based on, and is presented in unison with, a longer established course concurrently taught to some two hundred students on-campus.

[g] *Innovative pedagogy (Scandinavia)*

A key objective in developing the online programme was to facilitate the adoption of an innovative pedagogy, attuned to the pedagogical and curricular challenge of the particular subject matter and student group. Part of the cost of developing the programme was met through support from external companies that required their mid-career managers, located in some twenty countries around the world, to have access to post-graduate education in business economics. Faculty worked with industry representatives in developing a programme that was academically demanding, and responsive to the challenges confronting managers in those companies competing in a global market.

The pedagogical approach is based on a marked (even radical) departure from traditional practice, requiring considerable and ongoing participation and peer-collaboration by students. Part of this activity requires students to address a continuing series of problem-focussed tasks related to emerging 'real-life' corporate challenges. Students are required to identify the parameters of the challenge; and to apply statistical and other analytical techniques, and to source appropriate data sets, to support their analysis and response. To facilitate this activity, students have continuing access to central servers furnished with extensive 'real' data sets and an archive of related literature (compiled by faculty). Teaching on the programme is a core-activity for this group of academics.

This faculty-led initiative involved substantive commitment by staff in initiating and developing the programme and in teaching students. It was reported that most staff typically logged on twice each day, including weekends, and that one senior staff member spent an average of four hours each day online.<sup>44</sup> The difficulty of sustaining high input by research-active faculty in the longer-term is a potential weakness of such faculty-led initiatives. Not surprisingly, universities with longer-established faculty-led programmes tend to develop strategies to minimise the demands on faculty time, often by automating or delegating routine or repetitive tasks, or less commonly by adopting pedagogic and technical strategies to minimise the input required of academic staff.

[h] *Integrated pedagogy (United States)*

One research-intensive U.S. University, for example, has developed an integrated pedagogy using on-site video, in combination with software and IT-based facilities, to record and digitise in-class lectures/seminars for adaptation

<sup>43</sup> There are (inevitably) some potential disadvantages that need to be appropriately managed, not least potentially higher transaction costs and the difficulty of sustaining partnership.

<sup>44</sup> However, this level of engagement is expected to decline as the programme matures.



and dissemination on-line, coupled with the delegation of routine and repetitive tasks to support personnel. A strategy that *prima facie* seems close to an optimal deployment of a scarce faculty resource in a research-intensive university.

Faculty-led initiatives are more common at the post-graduate level and in subjects with a strong disciplinary or sectoral orientation (e.g., engineering, law, medicine, specific areas of business or economics). They are often provided by universities with a strong research orientation, through departments of high standing among peers in the relevant discipline or profession. Courses may be developed around the expertise and reputation of particular faculty members, in effect building on (and potentially contributing to) the peer-status of individual faculty, and of the department as a whole. The proximate reasons for advancing a proposal differ from one case to another, but are usually closely tied to the interests of the relevant department or school. A desire to secure additional funding for research or additional teaching posts, or to reach a wider and more diverse student population, perhaps embracing high-calibre post-graduate research students, may also be important. Other reasons may include the links to industry the initiative can provide, and the concomitant opportunity to secure external funding for related research (including sponsorship of doctoral-research students).

These case-studies again illustrate just a few of the strategies universities adopt in using e-learning to enhance the quality of teaching (e.g., the development of university-wide strategies embracing research, instructional-design, and programme development; the adoption of systematic procedures for the initiation, co-ordination, and evaluation of programmes; the use of 'hybrid' or 'blended' pedagogic strategies; inter-institutional co-operation in the development and sharing of programmes; and the use of external resources for curricular and pedagogic enrichment). Once again, diversity in approach and adaptability in use are the most striking characteristics of these strategies.

### 3.5 Enhancing the quality of teaching: conclusions

How effective is e-learning in enhancing the quality of teaching? The case studies discussed above illustrate just a few of the strategies universities now adopt in using e-learning to enhance the quality of teaching and learning for both on-campus and external students. Nonetheless, some concern has been expressed with respect to the possible long-term effect of e-learning on traditional teaching practice in universities.

A particular and recurrent concern, with respect to the quality of teaching, relates to the 'unbundling' of the teaching process – especially by potentially allowing a content expert to prepare materials to be subsequently delivered by a facilitator, effectively precluding (it is argued) critical ongoing interaction between students and teachers.<sup>45</sup> An unbundling of the teaching process is not new and has, for many decades, been an established part of distance education strategies, especially in large-scale systems. Peters view that the “structure of distance teaching is determined to a considerable degree by the principles of industrialization”,<sup>46</sup> although often challenged, reflects a dichotomy between traditional teaching, on the

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<sup>45</sup> Perley, J., and D. M. Tanguay. (1999). "Accrediting On-Line Institutions Diminishes Higher Education." *Chronicle of Higher Education*. October 29.

<sup>46</sup> Peters, O. (1984). "Distance teaching and industrial production: A comparative interpretation in outline." In D. Sewart, D. Keegan, and B. Holmberg (eds.), *Distance Education: International Perspectives*. (1988). London: Routledge. Pp. 95-113.

one hand, and a distinctly different, 'industrialised' mode of distance education, on the other – now widely acknowledged by distance educators. Interestingly, this dichotomy has not, of itself, impaired the quality of instruction in distance teaching. The European Open Universities, for example, have an excellent reputation for the quality of their teaching – the UKOU is consistently placed in the top 20% of national quality rankings, acclaimed for the excellence of its teaching in subjects like Music, Earth Sciences, and Chemistry.<sup>47</sup>

True, the open universities (and most other distance education systems) effectively operate in parallel with traditional education, providing for the needs of predominantly mature students who (other things being equal) are more likely to possess the characteristics of maturity and motivation required for success in this alternative mode of instruction. And there is now a good deal of experience to show that well designed and adequately resourced distance teaching is highly effective, and need not be a lesser form of instruction (in part, perhaps, because most effective systems *do provide* for ongoing critical interaction between students and teachers, where such is required).

Moreover, online learning – in principle, at least – holds out the prospect of overcoming an inherent limitation of some earlier forms of distance teaching (involving a need to provide substitutes for interpersonal communication, with consequent change in students' learning behavior and a propensity to alienation – as Peters noted).<sup>48</sup> In short, it is not evident that any negative impact on the quality of teaching is an inherent consequence of adopting technology – but rather of the particular operational and pedagogic strategies universities adopt for its deployment. Striking an appropriate balance between pedagogic strategies, scale of provision, and resource expenditures remains an inherent challenge for the future development of e-learning. The diversity of strategies adopted by universities for their deployment of e-learning is a testament to the currency of that challenge.

What impact, if any, is e-learning having on *traditional* teaching in universities? Even a cursory appraisal of the cases discussed above will show that e-learning is being incorporated in traditional, on-campus pedagogy in tertiary institutions – among them the oldest and most venerable universities. True, much of this activity is still small in scale, experimental, or essentially supplementary to traditional teaching (at the minimum providing a parallel, sometimes optional, addition to traditional teaching practice); nonetheless, the role of e-learning as an integral part of on-campus instructional programmes is growing. It is clear also that in some universities e-learning is being deployed – sometimes on the initiative of faculty – to introduce innovative pedagogical approaches more closely attuned to the particular curriculum and student population.

To what extent is e-learning inducing radical and pervasive change in the modalities of tertiary teaching? Already in some universities, e-learning provides not just a *supplement* to traditional teaching, but an *alternative* or *parallel* pedagogy. Reliable data on the aggregate scale of e-learning – provided *in direct substitution* for traditional, on-campus, teaching – is too sparse to support a definitive appraisal of its scale or significance. Nonetheless, such information as is available (as well as

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<sup>47</sup> Daniel, J. (1998). "Can you get my hard nose in focus? Universities, mass education and appropriate technology." In M. Eisenstadt and T. Vincent. *The Knowledge Web: Learning and Collaborating on the Net*. London: Kogan Page. Pp. 21-30.

<sup>48</sup> Keegan, D. (1986). *The Foundations of Distance Education*. London: Croom Helm. P. 87.

the evident interest of many more universities in integrating technology and instruction) indicates a potential to influence on-campus teaching in the longer-term; but the ultimate scope and impact of that influence, and in particular the extent to which e-learning may displace traditional modes of instruction, is still unclear. Overall, experience to date suggests that change in core teaching practice, if it occurs on a substantive scale, is likely to involve an evolutionary process of assimilation, rather than the sharp revolutionary change anticipated by some early observers. Change of this latter kind, if it occurs, seems likely to be confined to particular and somewhat special sectors of tertiary teaching.

#### 4. Reducing the cost of higher education

While reducing the cost of higher education is sometimes advanced as an objective of university e-learning strategies, much of the initial investment by universities in e-learning seems to have had scant regard to considerations of cost, perhaps because of the innovative character of the development and the proximate factors promoting investment. Moreover as most early programmes were experimental or pilot studies – often supported by external funding – considerations of cost effectiveness were often secondary to the challenge of developing and delivering innovative programmes – and where the issue of profit or loss was raised at all, expectations tended towards the sanguine. In a recent U.S. survey, respondents ranked the goal of "reducing institution's per-student costs" rather low: only 18% of public four-year institutions indicated it was an important goal of their distance education programmes (and only 11% of four-year private institutions).<sup>49</sup>

Still, with increasing experience of actual outcomes, expectations of generic profitability have moderated somewhat. The extent of this change in perception is difficult to assess, but it is clear at least that interest in measuring the cost, and assessing the cost-effectiveness, of e-learning is growing (an interest greatly assisted by the availability of research funding from sources such as the EU Commission and U.S. foundations).<sup>50</sup>

##### 4.1 Cost-effectiveness of e-learning

An expectation that technology-based teaching would reduce the cost of education is not new. Many of the earlier modes of technology-based teaching were the subject of substantive empirical research; early studies of broadcast media, in particular, contributed greatly to the development of an effective methodology for their cost analysis.<sup>51</sup> Most of the Open Universities established over the following decades (initially in Europe and later in some twenty other countries) were the

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<sup>49</sup> op. cit. NCES (2003-017).

<sup>50</sup> The Andrew Mellon Foundation recently funded 22 experiments on the cost and pedagogic effectiveness of instructional technology in higher education at US universities, with a view to assessing under what conditions the technology might be employed to reduce institutional costs and promote pedagogic gains. The Alfred P. Sloan Foundation recently commissioned studies on the cost and potential profitability of on-line education at each of six U.S. universities (all of which had received grants from the Foundation to develop on-line courses).

<sup>51</sup> [a] Jamison, D. T., S. J. Klees, and S. J. Wells. (1976). *Cost Analysis for Education Planning and Evaluation: Methodology and Application to Instructional Technology*. Princeton: Educational Testing Service, Economics and Educational Planning Group. [b] UNESCO. (1977). *The Economics of New Educational Media: Present Status of Research and Trends*, vols 1,2,3. Paris: UNESCO Press. [c] Orivel, F. (1987). *Analysing Costs in Distance Education Systems: A Methodological Approach*. Dijon: IREDU, Université de Bourgogne.

subject of empirical study – most of which took the form of an assessment of their unit-costs, relative to conventional universities in their respective countries.<sup>52</sup>

In keeping with this earlier experience, initial studies on the costs of telematic-networks, online education and e-learning learning networks tended also to focus on a comparison of costs (with more traditional modalities of instruction); with some early studies (in the absence of experiential data) based on hypothetical, but realistic, comparative scenarios.<sup>53</sup> Later, attention focussed on methodological issues, on the institutional return on investment, and on the development of related guides and handbooks to assist universities in analysing costs.<sup>54</sup> Overall, the results of this initial – and still rather sparse – empirical research might best be described as mixed, with some positive, if still tentative, indications of cost-effectiveness. There is good reason to expect potential savings on physical infrastructure, relative to traditional, contiguous teaching; but comparison of recurrent costs, relative to more traditional modes of distance education, have produced rather mixed results.<sup>55</sup>

As in earlier studies, much depends on perspective; where account is taken of the cost of students' time, online learning is more likely to provide a cost-effective alternative to more traditional learning modalities. (It is hardly surprising, then, that so many e-learning programmes are aimed at the professional and business sectors and at students for whom time has a high opportunity cost, in occupations where employers are more likely to meet the cost of tuition.) Overall, observation of early programmes suggests that those that respond to the ascertained needs of potential students, that have due regard to students' preferences with respect to timing and mode of access, and that use technology in an appropriate (often low-tech) way, are more likely to prove cost-effective – *and to survive*; and that programmes that ignore considerations of this kind, are less likely to do survive, even if exceptionally well-endowed.

## 4.2 Academic productivity

A closely related objective – increasing academic productivity through the use of the new technologies – has been a focus of interest for some years<sup>56</sup> (notwithstanding

<sup>52</sup> For a brief summary see: [a] Curran, C. (1990). "Resource Factors." In *Developments in Distance Education in Asia: an analysis of five case studies*. Paris: UNESCO/ICDE. Pp. 22-40. [b] –. (1996). "Distance Teaching at University Level: Historical Perspective and Potential." In G. Fandel, R. Bartz, and F. Nicholmann (eds.), *University Level Distance Education in Europe: Assessment and Perspectives..* Weinheim: Deutscher Studien Verlag Pp. 19-31. [c] – (1996). "Telematic and Open and Distance Learning." Brussels: Commission of the European Communities; Socrates Programme (Commissioned study).

<sup>53</sup> Bacsich, P., C. Curran, S. Fox, V. Hogg, R. Mason, and A. Rawlings. (1993). *Telematic Networks for Open and Distance Learning in the Tertiary Sector* (Final Report:1 -mimeo). Heerlen: European Association of Distance Teaching Universities.

<sup>54</sup> [a] Ash, C., S. Heginbotham, and P. Bacsich. (2001). *CNL Handbook: Guidelines and resources for costing courses using activity based costing*. Sheffield: Telematics in Education Research Group, Sheffield Hallam University. [b] Bacsich, P., C. Ash, S. Heginbotham, and P. Kandare. (2001). *The Costs of networked learning: Phase two*. Sheffield: Telematics in Education Research Group, Sheffield Hallam University. [c] Ehrmann, S. C., and J. H. Milam. (1999). *Modeling resource use in teaching and learning with technology*. Washington: TLT (Teaching, Learning and Technology) Group, AAHE (American Association of Higher Education). [d] Milam, J. (2000). *Cost Analysis of Online Courses*. (2000 AIR Forum Paper). Curry School of Education, University of Virginia.

<sup>55</sup> Curran, C. (2003). "Where are we now in the economics of e-learning?" In *Ontwikkeling en overhead. (Development and public finance: essays in honour of Prof. Dr. P. A. Cornelisse)* Den Haag: Sdu Uitgevers bv.

<sup>56</sup> Massy, W. F. and R. Zemsky. (1995). *Using Information Technology to Enhance Academic Productivity*. National Learning Infrastructure Initiative (NLII) and Educom. Source: <http://www.educause.edu/nlII/keydocs/massy.html>

the sparsity of evidence on earlier cost-effective use of computer-based instruction).<sup>57</sup> A number of studies have addressed the challenge of using e-learning to facilitate a higher student/faculty ratio without impairing the quality of instruction or students' learning experience, with some (tentative) indications of success. One study of nine projects in a U.S. university, while "not providing absolute confirmation", concluded with the view that "ALN can produce real efficiency gains in courses without sacrificing the quality of instruction" – provided a sensible pedagogic approach is embraced that afford students avenues to communicate about their learning.<sup>58</sup>

The use of e-technologies in teaching large classes, especially freshman classes in Science and Mathematics, has been of particular interest. A few universities have radically changed their traditional teaching practice (by replacing lectures to large classes with web-based resources, for example), with the aim of improving learning outcomes, raising learning-success rates, or increasing student-retention of material for later use – again with some early indications of success. One U.S. university, having restructured a large-introductory course, reported that scores in Mathematics in general had risen by 17.4%, with a drop in failure rates of 39%.<sup>59</sup> It was additionally noted that "the shift from a traditional course environment to a technology-based, student-centred learning environment" showed also "a measurable decrease in the cost of delivering the course".<sup>60</sup> A more recent (economic and pedagogical) analysis of an introductory, large-enrolment science class in a leading U.S. university concluded that there was increased student use of curricular resources, increased convenience, and a potential for cost savings.<sup>61</sup>

Discussion of productivity in higher education seems inevitably to raise questions about standards; as Mark Blaug noted some three decades ago, "The measurement of educational quality is ... at the bottom of all controversies over university productivity."<sup>62</sup> A specific focus of concern (in the case of e-learning) are the (feared) implications for the professional autonomy of faculty, a critically important issue given the intimate relationship of faculty autonomy to academic freedom – "the key legitimating concept of the university".<sup>63</sup> Initial concern focussed on the ownership of copyright to course materials developed by faculty, and the related potential negative consequences for faculty (to the extent even of their being "reconceptualised, without their consent, as workers for hire").<sup>64</sup> More generally, concern relates to a perceived change in the methods of instruction, with teaching

<sup>57</sup> McClure, P. A. (1993). "Growing our Academic Productivity." In R. C. Heterick. *Re-engineering Teaching and Learning in Higher Education: Sheltered Groves, Camelot, Windmills and Malls*.

<sup>58</sup> Arvan, L., J. C. Ory, C. D. Bullock, K. K. Burnaska, and Hanson. (1998). "The scale efficiency projects." *JALN* 2(2).

<sup>59</sup> Twigg, C. A. (1999). *Improving Learning & Reducing Costs: Redesigning Large-Enrollment Courses*. Pew Learning and Technology Program. NY Center for Academic Transformation. Rensselaer Polytechnic Institute. (Case study: Virginia Tech. p. 10).

<sup>60</sup> *ibid.*

<sup>61</sup> Harley, D., M. Maher, J. Henke and S. Lawrence. (2003). "An Analysis of Technology Enhancements in a Large Lecture Course" *Educause Quarterly* 26(3), 26-33.

<sup>62</sup> Blaug, M. (1968). "The Productivity of Universities." In M. Blaug (ed.), *Economics of Education* (2) Harmondsworth: Penguin. P. 317.

<sup>63</sup> Menand, L. (1996). *The Future of Academic Freedom*. Chicago: University Press. P. 4.

<sup>64</sup> Katz, S. N. (2001). "In Information Technology, Don't Mistake a Tool for a Goal." *Chronicle for Higher Education*. June 15.

activities being restructured through technology in a way that reduces the autonomy and independence of faculty and their control over their work.<sup>65</sup> Concerns are compounded by a more general unease, implicit in faculty fears of loss of tenure, replacement, or simply that the use of technology will mean more work for faculty members, or more time on teaching and less on research.<sup>66</sup>

In practice, as illustrated in a number of the case studies, many e-learning programmes are initiated by faculty; and, from an institutional perspective, the practical advantages of faculty involvement in course development and teaching are too obvious to need stating. Such involvement accords well with institutional mores, especially in research universities, giving due recognition to the role of the department as the basic organisational unit. In practice, the extent of faculty strategic control of e-learning can vary greatly between institutions, sometimes in subtle, but significant, ways; other things being equal, faculty-led (and faculty-influenced) initiatives seem more likely to prevail in research-intensive universities.

#### 4.3 Institutional strategies for cost containment

As investment has grown and the deployment of e-learning become more routine, more institutions are addressing the question of cost. Many now have established procedures for assessing the financial viability of proposals to initiate e-learning programmes, prior to their development and delivery; often this takes the form of a schedule of estimated costs and revenues over a specified period of years, or for a typical student cohort.<sup>67</sup> Dual-mode teaching – the oldest and (arguably) most ubiquitous form of technology-based instruction – raises particular difficulties in this connection because of the difficulty of allocating costs between on-campus and external students.<sup>68</sup> The difficulties of cost analysis, however, need not preclude dual-mode universities from adopting strategies that contain costs, minimize risk, and reduce uncertainty. The approach outlined in case *j* relates to one university, but a number of the key features are replicated in the strategies adopted by other universities in Europe and the United States.

##### [ *i* ] *Dual-mode e-learning (United States)*

One U.S. university (with long experience of preparing students for professional careers) uses e-learning to teach several thousand mature students in a range of undergraduate and Master's degree programmes. The University provides resources to support the development of e-learning programmes (in response to a request from the relevant Dean). Programmes generally respond to identified educational needs, and are often career-related and targeted at familiar market sectors. Courses are generally based on those taught on-campus (so issues of curriculum-design, academic content, and accreditation are easily resolved). Course-entry requirements, academic content, and assessment procedures are

<sup>65</sup> op. cit. Noble, D. F. (2001). P. 32.

<sup>66</sup> Bates, A. W. (2000). *Managing Technological Change*. San Francisco: Jossey Bass. P.104-105.

<sup>67</sup> Bishop, T., and C. Schweber. (2000). "UMUC's Online MBA Program: A Case Study of Cost-Effectiveness and the Implications for Large-Scale Programs." In Bourne and J. C. Moore (eds.), *Online Education (2) Learning Effectiveness, Faculty Satisfaction, and Cost Effectiveness*. Proceedings of the 2000 summer Workshop on Asynchronous Learning Networks. Needham: Sloan Center for Online Education. Pp. 173-182.

<sup>68</sup> Dual-mode teaching has been variously described but, in the interest of clarity, is here defined as e-learning programmes for external students that (in large measure) replicate programmes taught to students on-campus.

essentially the same for both teaching modes, as are the status of the credits and awards conferred on successful students.

In the main, adjunct faculty are contracted to develop courses (under the general supervision of a department chair – usually a fulltime faculty member, responsible for the programme), or fulltime faculty teaching the course on-campus are paid a stipend to develop the course. In addition, adjunct staff who develop courses are usually contracted to teach the programme. Courses generally follow a strict syllabus, with weekly lecture modules and regular assignments. Teaching strategies vary somewhat from one tutor to another, but the approach to teaching generally includes designated texts, provision of additional course materials online, the completion of personal assignments (often related to the student's work experience), and on-line peer discussion. Instruction tends to be predominantly text-based, with communication by email, and an instructional focus on group and individual project-work. A final proctored examination is an additional part of the assessment for most courses.

Courses generally are developed using a (proprietary) on-line platform, with assistance, as required, from a special support unit, incorporating instructional designers and web developers. Students additionally have online access to library services and bibliographic databases. An administrative unit is responsible for the operational management of the e-learning programme as a whole, with technical support services out-sourced to external providers. Online technologies tend to be used in a relatively simple mode, with the primary emphasis on easy access for students.

Dual-mode strategies of this kind have a potential for cost containment. Replicating (in large measure) courses taught to students on-campus should, other things being equal, reduce the cost of course development and administration. Targeting courses at known (often niche) occupational sectors should reduce uncertainty with respect to enrolment and income; similarly, contracting out the development (and sometimes teaching) of courses should aid predictability of future costs. Additionally, the employment of adjunct staff (as an alternative to allocating full-time faculty to course development and teaching) can be less costly; experience elsewhere has shown that direct and overhead unit costs of adjunct, or part-time staff, are generally lower than for wholetime faculty – often significantly so.

While the extensive employment of adjunct staff has been a focus of critical comment, many of the programmes concerned are directed towards the education of mature students, whose educational needs (and objectives) may be quite different from those of traditional, younger, university student populations. Often, the universities providing such programmes have considerable experience in teaching mature, part-time students, and in working with part-time staff. Many are situated in large urban centers where, by virtue of location and experience, they can call on a reservoir of qualified professionals to develop and teach their e-learning programmes. In addition, it is claimed that where the curriculum is focussed on career-related studies, student interaction with adjunct faculty working in related disciplinary fields can be a positive advantage.

#### 4.4 Replicating scale economies

While cost-containment is a viable strategy for at least some dual-mode e-learning strategies, replicating the scale economies – and related potential for extensive provision – of more traditional modes of distance teaching is a significant challenge.

The experience of the European Open Universities is of interest in this connection. These autonomous institutions, established and funded by their respective governments, predominantly teach mature, part-time, distance-education students, in response to an essentially egalitarian mission – to provide a 'second-chance' opportunity for access to higher education. Most distance educators attribute the (undoubted) success of these institutions, and their ready acceptance by peer universities, to a combination of factors: high quality course materials, effective tutorial support, efficient administration systems, and a related research base.

The European Open Universities seem uniquely well-placed to respond to the challenge of e-learning; each has excellent experience and reputation in developing, delivering, and administering distance teaching programmes; and well established study-centre networks and student support services. Most have dedicated centres active in research on instructional and e-technologies, and well-developed ICT infrastructures (by the mid-nineties, the UKOU was spending £10m every year on information technology alone, in addition to investment specifically dedicated to the adoption of new technology).<sup>69</sup> All have extensive archives of high quality course materials, and a potential for scale-economies in marketing (within their own and other countries). How then are these universities responding to the opportunity e-learning presents?

[ j ] *Open Universities online*

As might be expected, most were among the pioneers in research on the use of online technologies in distance teaching. Each continues to exploit these technologies in the administration of programmes and management of courses (e.g., providing information, registering students, facilitating communication). By the end of the 1990s, all were routinely using online technology, in one way or another, in teaching students. And yet, while their use of these technologies is impressive in scale and substance, as a group their response to e-learning might be best described as pragmatic, rather than radical. Many online activities are ancillary to longer-established instructional programmes, essentially constituting an add-on component; or an option in a dual system – in which e-learning components run in parallel with traditional distance teaching. Where e-learning is an *essential* element in teaching, it is often restricted to selected courses (in marked contrast, for example, to the University of Catalonia, established in the mid-nineties, that operates almost exclusively in virtual mode).

Overall, there are good reasons for pragmatism; for much distance teaching at university level, the strategies developed and tested over three decades (augmented appropriately by the newer technologies) still work well; and the cost of converting existing course materials (rich, varied and tightly-integrated) can be high. In addition, the original brief of these universities – to redress disadvantage by providing an opportunity for adults to obtain a university qualification – while no longer exclusive, continues to be central to their core mission.

More pertinent still, replicating the economies of scale inherent in the open university model is a significant challenge for most universities engaged in e-learning. These scale economies can be substantial: an early study of the UKOU showed that the ratio of fixed/variable cost for the equivalent of a first year course in Arts at the UKOU was almost 3000:1, compared to about 4:1 for a similar course at

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<sup>69</sup> Daniel, J. (1996). *Mega Universities and Knowledge Media: Technology Strategies for Higher Education*. London: Kogan Page. Pp. 150-151.



conventional campus universities in the UK.<sup>70</sup> By contrast, observation of e-learning strategies in traditional universities suggest that the fixed/variable cost ratio is closer to contiguous teaching. In particular, the cost of technology platforms, round-the-clock student support, and, in many cases, smaller class size in online programmes, can result in higher unit costs (even relative to comparable classroom teaching).<sup>71</sup> Part of the difficulty may lie in the way technology is being used – with faculty-centred teaching and the dissemination of (more or less) traditional learning content via the Web. Some observers argue that a new paradigm is needed, and that a sustainable model has yet to emerge;<sup>72</sup> others argue for more efficient application of existing modalities, through measures such as the re-use and interoperability of instructional components, and the development of sharable pools of independent learning objects.<sup>73</sup>

#### 4.5 Facilitating change in higher education

In some cases, e-learning strategies have a less direct, but no less important, influence on the cost of higher education – in facilitating change and the adoption of new technology, for example. Case *k* (below) provides an interesting example of a national co-operative network that facilitates change and the adoption of new technology, and additionally enables virtual student-mobility and a widening of the range of course options available to students – at a lesser cost than would be possible through more conventional modes of instruction.

[*k*] *National co-operative network (Europe)*

The Finnish Virtual University (FVU) is a national, co-operative system embracing all twenty-one universities in Finland. The essential aim of the FVU is to promote networking between Finnish universities, in particular with respect to the use of NITs (new information and communication technologies) – including provision of online teaching. The 170,000 students in Finnish universities are the primary target-population for FVU services, especially those who want to study – and earn credit for – courses *unavailable* in their own universities. Facilitating virtual student mobility between universities is an important strategic objective (hardly surprising in a country with 21 universities and a population density of some 15 inhabitants per km<sup>2</sup>). An inter-university agreement on student-mobility (facilitated through the FVU) allows students to study, and earn credit for, courses taken at other Finnish universities.

A key part of the national strategy is to provide a national portal to link the virtual activities of the participating universities – providing, in effect, a virtual campus for students and teachers. When fully operational, the FVU-portal will provide information about on-line courses and facilities for tutoring students. It will additionally provide access to online library and bibliographic services; advice to course developers and providers (e.g., on appropriate platforms to support e-learning); and access to a range of subject-specific, cross-disciplinary teaching and research networks.

<sup>70</sup> Laidlaw, B., and P. R. G. Layard. (1974). "Traditional Versus Open University Teaching Methods: A Cost Comparison." *Higher Education* 3, pp. 439-468.

<sup>71</sup> See Schelin, E., and G. Smarte. (2002). "A conversation with Tony Digiovanni of the University of Phoenix." *e-learning*. March, pp. 42-44.

<sup>72</sup> Levy, J. (2003). "The Next China Revolution" *TD*. May, pp. 58-63.

<sup>73</sup> Kramer, B J., and H. W. Schmidt. (2001). "Components and tools for on-line education." *European Journal of Education*. 36(2), June, pp. 195-222.

The FVU is not a university and cannot confer awards on students. Most of the activities it promotes are carried out directly by – or through collaborative projects between – the participating universities. The University providing a course is responsible for the production of the required course materials and for tutorial support to students, and academic responsibility for the programmes resides with that university. Courses are developed by faculty in the participating universities; pedagogic strategies range from fully online programmes, to traditional classroom teaching supported by e-learning.

Once again, these case studies illustrate the diverse e-learning strategies universities adopt, on an individual or collective basis, and serve to point up some of the ways in which these strategies can impact on costs and cost-effectiveness.

#### 4.6 Reducing the cost of higher education: conclusions

How effective is e-learning in reducing the cost of higher education? While much initial investment in e-learning seems to have had scant regard to considerations of cost, interest in the cost – and cost-effectiveness – of e-learning is growing. However, initial results of empirical research on the cost-effectiveness of e-learning (relative to some alternative modality of instruction) are somewhat mixed, with some positive, if still tentative, indications; as in earlier studies of technology-based teaching, much depends on perspective. Overall, observation of early programmes suggests that those that respond to the ascertained needs, that have due regard to students' preferences, and that use technology in an appropriate (often low-tech) way, are more likely to prove self-sustaining.

While a strategy of cost-containment has proved viable for at least some dual-mode institutions, replicating the scale economies (and related potential for extensive provision) of more traditional modes of distance teaching remains a significant challenge. (The experience of the European Open Universities is of particular interest in this connection.) Empirical research on the use of the new technologies to increase academic productivity has shown some (tentative) indications of success, in particular with respect to the use of e-technologies in teaching large classes, especially freshman classes in Science and Mathematics. The application of e-learning to wider economic objectives – such as inducing technical change, or facilitating virtual-mobility of students – and the innovative use of online technology in new and sometimes pedagogically indirect ways, are interesting developments that may ultimately prove highly productive and cost-efficient.

### 5. Conclusions

E-learning has grown significantly over the last decade to become a significant mode of instruction in higher education. If as yet neither as ubiquitous or influential as some early proponents predicted, few doubt that it has the potential to become a substantive pedagogy – and one, perhaps, with a pervasive influence on tertiary teaching. Just how substantial that pedagogy proves to be, and the extent of its longer-term influence, are still unclear – an uncertainty due in part to the scarcity of reliable data on a still nascent innovation, but still more to the difficulty of assessing its future impact on an institution as ancient, diverse, phylogenetically complex and socially relevant as the modern university. Hardly surprising then that the potential influence of e-learning on universities is the focus of much current interest and widely divergent views. Much of the discussion has focussed on its possible impact on university teaching, but increasingly the debate has widened to discussion of its

potential influence on some fundamental, if contentious, issues, among them access, equity, the quality of university education, and even the preservation of academic freedom.

Enthusiasts generally take a sanguine view of that potential, perceiving in e-learning a means of widening access to educational opportunity,<sup>74</sup> of enhancing the quality of teaching, or of reducing the cost of higher education;<sup>75</sup> even, perhaps, of achieving all three goals simultaneously. For others, less convinced, or more committed to established modes of teaching and learning, the future seems more problematic – perhaps involving radical and pervasive change in the modalities of tertiary teaching, with as yet unknown effects, extending even to the demise of the residential university.<sup>76</sup> Still others see the influence of e-learning on tertiary education as essentially baleful, fearing it will ultimately lead to the commodification of university teaching and learning,<sup>77</sup> and the irreparable loss of treasured academic freedoms.

Which of these conflicting views will prove most prescient remains to be seen; we are still at an early and developmental stage in the application of e-learning, and it may be some time yet before the longer-term consequences for universities become clear. Experience to date suggests that the characteristics of adaptability, flexibility in application, and strategic diversity should (other things being equal) tend to reinforce the potential of e-learning to induce change in tertiary teaching. The inherent institutional constraints – of context, cost, and culture – should have a contrary effect. How these conflicting trends are ultimately resolved is an empirical question of continuing interest – and an appropriate focus for longitudinal study.

As can be seen from the sample case-studies discussed above, the most striking feature of the e-learning strategies universities adopt is their diversity. These differences in strategic approach, some easily seen, others less obvious, are influenced in part by institutional goals (e.g., widening access, reaching new students, enhancing the quality of teaching, reducing costs, and increasing academic productivity); and in part by institutional constraints (e.g., the need to reconcile divergent goals and interests; to involve faculty in e-learning initiatives; and to have due regard to ethos, mission, and the economy of established methodologies). Moreover, institutional goals are rarely simple or one-dimensional; and universities being the kind of institutions they are, their strategies have to work in a complex environment and be capable of accommodating potentially divergent, even conflicting, interests.

Divergence can take many forms: the need to respond quickly to emergent commercial opportunity, without distorting an established process of consensual, deliberative decision-making; the desire to widen access to scarce academic

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<sup>74</sup> Ravitch, D. (1993). "When Schooling Comes to You." *Economist* 328(7828). November 9.

<sup>75</sup> Redding, G. A., and J. D. Fletcher. (1996). "US Sub-Committee on Research and Development for Education and Training – Plan of Action. In A. Dumort and W. Paprotte (eds.), *The Road to the Information Society*. Brussels: European Commission. DGXII. Pp.52-66.

<sup>76</sup> [a] Hutchison, C. (1996). "New Access to a University Education: the Global University." In A. Dumort and W. Paprotte (eds.), *The Road to the Information Society*. Brussels: European Commission. DGXII. 127-139. [b] Lenzer, R., and S. Johnson. (1997). "Seeing things as they really are." *Forbes*. Vol 159 (5). March 10. P. 122. (Conversation with Peter Drucker about the future of the American Economy in the business world.)

<sup>77</sup> [a] Noble, D. E. (2001). *Digital Diploma Mills: The Automation of Higher Education*. New York: Monthly Review Press. P. 31. [b] –. (2002). "Technology and the Commodification of Higher Education." *Monthly Review*. 53(10). March.

resources, without overwhelming the scarce resource or debasing its quality; the opportunity to build on reputation, without, at the same time, diluting it. Devising convergent strategies to reconcile inconsistent or conflicting goals, and securing the support of internal communities for their implementation, is a challenge for all universities – but can be particularly acute in research-intensive universities with a prized reputation or a tradition of consensual governance. However, universities – long recognised as both agents and subjects of change – are collectively well practised in resolving divergence, not least in serving the contemporary needs of their (internal and external) communities while maintaining their traditional commitment to the ethical, cultural, and intellectual values that are their *raison d'être*.

The differences in the strategic approaches to e-learning adopted by universities – sometimes superficially slight, but consequential in terms of deeper differences in academic culture between institutions – point to a high degree of adaptability on the part of e-learning in application. They suggest that the e-learning strategies adopted by institutions may *reflect*, rather than *influence*, institutional ethos. If so, e-learning, by virtue of its capacity to adapt to different contexts, may be more adaptable – and ultimately less threatening – to academic mores than some observers fear. Overall, the speed and scale of institutional response to online technology suggests that e-learning is relevant to the challenges and opportunities now confronting universities; more significant still, it suggests that investment in e-learning is compatible with the ethos, institutional aims, and internal decision-making processes of the universities in which it is deployed. It is, perhaps, in that relevance and compatibility – and in its characteristic adaptability in use – that the ultimate significance of e-learning essentially resides, and on which its longer-term impact on universities ultimately depends.