Universities and knowledge economies: a paradigmatic change?

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Universities multiply, but have a common teaching style. There are exceptions, but most work within a model based on meeting of teacher and students – often with the teacher as lecturer – supported by published books and teachers' notes. It is a model that can be traced back to the time, around 640BC, when students first came to Assurbanipal's royal library at Nineveh. Central to this classical conception is the ideal of creating, evaluating, preserving and disseminating knowledge; and the condition that learners will travel to where teachers and information are – to a place called a university.

Two thousand years later, as we move toward knowledge-based economies, that movement is reversing. Knowledge, in its various forms, has become endogenous to advanced economies. It is a prime creator of value, and 'knowledge-effectiveness' is now a central measure of wealth creation (wealth which may, of course, be shared in highly unequal ways). Another issue for universities is the handling of information, which (unlike knowledge) is exponentially increasing: an increase which can be dealt with only by handling it in digital forms.

Such digitised media, in associated developments, mean that university students are no longer confined by what we may call the bi-millennial university paradigm. They no longer need to be in a particular place to share new knowledge. Information flow is changing its traditional direction – 'and with it, the university structure, making it ready to collapse in slow motion as alternatives to its function become possible'.[i]

At the beginning of the twenty-first century, those functional alternatives increase yearly. Interestingly, it is the classical form of university teaching – the lecture – which, as we shall see, is the first to be outdated by digital technologies. But other alternatives are not distant. With high-level interactivity we can now offer learning resources which are (if properly prepared) heuristically powerful and intellectually challenging. At this level, there are not yet many exemplars: but those we do have respond and adapt to the student. The growth in affordable computing power, and of adaptive programming, mean we are on the threshold of software which supports educational dialogue. Such programs will, in a sense, converse with the learner; they will comprehend the range of human discourse. That is the interactive, 'intelligent' aspect: the crucial difference between what went before and what is to come. This is another arena in which the bi-millennial paradigm shifts.

Adaptive programs change the learning matrix; broadband networking alters the information flow. As networks extend we can bring adaptive resources to students wherever in the world they are. When networks have spread through the developed world – in the next decade – higher education will enter a period of profound and, to some, disturbing change.[ii] As Eli Noam remarks of universities, if you 'change the technology and the economics, the institutions will change eventually'.[iii] It is impossible to predict how slow, or fast, the change will be. We can predict it will be comprehensive.

There are two main reasons for this. First, it is already established, in these early days of knowledge economies, that whatever is digitally delivered to the user will modify, and tend to displace, what cannot be delivered. Take television as one of many possible analogies (electricity, the telephone, radio, e-commerce, m-commerce, business-to-business networking and email are others). Clearly analogue TV did not kill theatre or newspapers, but did radically change them. Its digital successors will continue the process. What television has also done is to widen immensely the audience for news, drama and entertainment. When these are openly accessible, and brought *to* us – rather than our having to make a journey – the audience grows exponentially. (As we shall see, the quality of offering also changes.) In the same way, networked adaptivity will create a new class of learners, and new ways of learning.

Mediated instruction will not displace teachers; or not all of them. It will qualitatively alter the way, and the places, in which they work.

The second driver of structural change is economic. We consider later whether mediated education can match face-to-face teaching. Whatever the answer, the deciding factor in setting the pattern of higher education will be cost, and cost-effectiveness, rather than quality alone. It is a commonplace that electronic instruction 'is not a money-saving option'. It is not when it is added to a university's existing services. But the economics change radically if we consider virtual universities. Leaving quality aside for the moment, they can provide 'university education' at dramatically lower cost than traditional universities – and a cost that will proportionately decrease as the online audience expands. This, more than any other consideration, will weaken existing universities' hold on higher education.

As change accelerates, academics will have to decide what they want to preserve. Do universities fight for their traditional concerns: the scholarly critique of received knowledge; the furtherance of independent research? Do they hope to maintain the integrity of academic institutions as they now exist? Do they try to preserve present styles of teaching? There is a choice to be made; triage perhaps; for changing information flows will mean that not all the qualities we value will continue in the coming century. Indeed, as we shall see, without foresight and intelligent adaptation none may survive.

We can put the question another way and ask what should stay, what will certainly go, and what will be transformed, in the years ahead. What should stay, to take that first, is some (not all) hands-on laboratory work and face-to-face teaching, both carried on in small groups: that which Diana Laurillard terms a 'conversational' style of teaching.[iv] As noted earlier, the most obvious candidate for extinction is the lecture room. The networking of broadcast-standard interactive video opens the possibility of higher quality 'lectures' delivered both to distant and local places. (In the US, the first enthusiastic users of 'distance learning' are often on the home campus. They see that mediated teaching is more accessible and interesting than anything offered live in the university's lecture rooms.')

In mediated form a 'lecture' can be prepared (and indeed delivered) better than if live, since the recorded version is a single performance, not one of a repetitive series. It can be supported (if the lecturer chooses) by those devices – graphics, archive material, microscopy, satellite photography, documentary film footage – familiar to us from 'serious television'. More: it can be hypertextually linked, so that students may go straight from the digitally 'printed' version of the lecture to its references, in whatever medium. The original document opens on to a hypertextual world. And the mediated lecture will be interactive, so that students can, when they choose, interrogate it. *'What does that mean?' 'Could I have a fuller explanation of this?' 'What else has been similar?'* Repeated interruptions which would be intolerable in a lecture room can be accommodated by its networked, interactive equivalent. If the 'lecture' leaves questions unanswered, students may email their queries to the lecturer (which will mean new types of organisation for academic staff) or raise them in real or virtual seminars.[vi] Finally, students will see and hear the 'lecture' when they wish; more than once, if need be. In that respect it has the qualities of a printed book (though in future most books may be electronic, changing our conception of what constitutes a permanent record).

This scenario of online lectures suggests what many academics wish to believe: that in years to come they will do pretty much what they do now – give lectures, for instance – but in different ways. It seems likely they are wrong. It is always difficult, even in tutorials, to help students understand the structures of higher-order knowledge. It is more difficult to create mediated teaching to do the same thing. Adaptive learning programs are, by an order of magnitude, more difficult still. (Correspondingly, they are expensive to develop and evaluate.) But first some, and then many, universities will create them. So will knowledge corporations. Difficulty and cost will initially be balanced, as networking improves, by the possibility of a global audience, without the physical limits of university accommodation.
At a later stage universities will need networked publication in order to survive. Academics, thereafter, will live in different landscapes.

Consider, for a moment, what this means for the university as an institution. We will be able to see, from outside, not just the subjects taught in higher education – but the teaching itself. This is a quite radical development. For the first time in their bi-millennial history, universities will move, in the fashionable term, toward transparency.

Transparency has implications for several groups of people: first, for potential students choosing where to study. In richer countries there seems to be increasing choice in higher education. New universities mean more places a student can enrol. But this choice is still of a frustrating and limited kind: rather like choosing a hotel abroad from a travel brochure. What is true of hotels is also true of universities. As a prospective student, you might visit; but the quality of education will be elusive, until you have enrolled and experienced it. By then you are, in a sense, captive. Under our present system it is not easy to move to another university.

That will change when teaching programs in higher education are globally networked. Students may 'enrol' at more than one university; or may receive a 'university education' from some institution that is not formally a university. They will be able to experience their chosen 'university's' teaching before they enrol; and will probably read, or hear, on an adjacent website, comments on every course from current students. They may engage in online dialogue with their peers about the quality of teaching. But then, there is another scenario. After scanning the Web, a student may decide the original choice is not for her.
She may have intended to do an MBA at the college down the road. But she will find she has on offer MBAs (in networked, adaptive form) from INSEAD, from Harvard, from Stanford, from Princeton. The local college is close, but proximity will no longer persuade if Princeton is even closer – in the living room; and if the student can see that both French and American courses are better than what her own town offers.

In other words, networking will bring to universities a type of Darwinian competition they have never known, and may find disconcerting. Among many other effects, competition and adaptive programming will bring new emphasis to the skills of teaching – skills which universities have always undervalued because (unlike research publication) they have been experienced only by a captive audience of students.

The combination of transparency and connectivity will change universities' internal structures. Academically, it will dissolve disciplinary boundaries – which increasingly seem to offer security to academics, rather than explaining the world around them. Institutional frontiers will also erode. Researchers will, more and more, be part of virtual, invisible colleges without geographical limits; and the same will probably apply to the creation of adaptive teaching programs. It will no longer be enough to reject learning resources which exist (or are in development) simply on the grounds that they were 'not invented here'. As we move beyond word-processor-and-photocopier lecture notes, it will not be possible to invent everything here, wherever 'here' may be. At that stage, connectivity will offer academics several options. One is to use existing interactive learning resources: those which approximately fit with current teaching. Another is to modify what exists – which will of course raise questions around multimedia editing skills and the ownership of intellectual capital. A third option is for academics to collaborate, perhaps synchronously, on interactive documents tailored to their way of working. More than anything else, that will undermine disciplinary and geographical boundaries. For academia, this is truly the death of distance,[vii] and the end of the university as a coherent physical entity. In a fully networked world it will not be more difficult to work with a colleague in Canada than one down the hall. (The difficulty is in the mindset; we are used to collaborating in real time with people not just in the same country, but in the same room.) But the advantages of collaboration across borders – whether disciplinary or geographic – will, for some, outweigh physical proximity; which raises questions of institutional 'ownership'. If academics who are nominally at, say, Brunel University,

spend more time working online with colleagues on Columbia's faculty than they do with their 'own department' – then which institution 'employs' them? Which 'owns' the consequent intellectual capital?

There will come a point, indeed, where some boundaries – between and within universities – no longer make sense. Technology drives mergers in finance and industry. It may eventually do the same in academia. University staffs, like any self-respecting professionals, will resist such change – though their own work patterns may have made it inevitable. At the University of Washington, in 1998, for example, more than 700 faculty members denounced 'visions of education with bricks and mortar ... [and] education by the Internet'.[viii] There is no sign that such resistance changed the course of the state's increasingly high-tech higher education policy.

Universities' transparency and connectivity must also change their relationship with other institutions. Higher education is moving warily into closer partnership with business. In the United States it is already estimated that 'forty per cent of large corporate training groups plan to create corporate-university partnerships this year [1998] ... allowing corporations to negotiate contracts that will encourage colleges and universities to provide courses and technical degrees customised for a particular business'.[ix] Further, we shall see legal changes already in hand in the US) to make distance learning programmes eligible for the same funding as campus courses – which will 'shift the rules of the game, [to] give new [technology-driven] entrants sources of funding, and increase buying power for non-traditional students'. This foreshadows wider corporate entry to the academic market place. To quote from the same report, 'imagine the Chairman of Microsoft contacting the Governor of California and proposing to serve more students at higher performance standards at two thirds the amount currently paid to the California State University System'.[x] As we shall see, this might, at current tuition rates, be an attractive deal for Microsoft – and for a number of other information industries.

With interpenetration of business and higher education in knowledge economies (and closer scrutiny of the one by the other) businesses will seek to influence university teaching, which will increasingly be open to corporate oversight. Some of the fastest-moving corporations are now moving toward their own type of transparency: opening their databases, for instance, to clients and service-providers. When university teaching becomes transparent, the relationship between higher education and business further changes. Some corporations will, from outside, make their own assessments of university courses and departments before supporting employees to take them, or granting research contracts. Others already opt for more active intervention. In particular, information industries – which may next century mean most industries – are concerned with knowledge obsolescence, in ways universities are not. The information sector sees certain types of knowledge as having a limited shelf-life. It will want higher education to share that perception; and this will make for some uneasy partnerships. From where we now stand, the prospects are not good for an even balance of influence between business and academia. While a few of the leading high-technology parks – in northern California, on Route 128, in North Carolina – are linked with universities, most of the tertiary sector lags, in the information arena, behind corporate research. Business will move into areas of education where universities are not keeping pace with the growth and obsolescence of knowledge. It will try to contain scientific research in corporate laboratories, where findings can be patented. Elsewhere, as privatisation proceeds, some corporations may find it easier to buy 'name-brand' universities, rather than starting their own. If that happens, the new owners are unlikely to preserve existing curricula.

The state too will scrutinise higher education more closely. On the principle of paying the piper, governments will in future be inclined to suggest new tunes. Universities may argue that the traditional campus offers conviviality and collegiality, in ways a network never could. They are right; but even now most students do not experience a traditional campus, wherever they enrol. And when networked learning becomes more educationally effective, and more cost-effective, the question will arise as to what our taxes should fund. Clearly governments' desire to expand post-school education is not matched by proportionate increases in subvention. In these circumstances – and offered a working alternative – the state may question how much extra it should pay for campus and collegiality. There

are obvious attractions for government in having students also in paid employment, whether they are taking academic courses, or just-in-time training in the workplace.

As with any significant change, networking opens the possibility of alternative futures: one (which we consider first) more optimistic than the other. This scenario includes wider access to higher-order knowledge, partly through universities' increasing openness and partly through the improvement of teaching. Most universities can point to one or two 'inspirational teachers'; but this serves only to obscure the fact that much teaching in higher education is at best mediocre and at worst slipshod: often a heuristic minefield for the student. 'It is truly a miracle, and a tribute to human ingenuity, that any student ever learns anything worthwhile in such a system.'[xi] Well prepared adaptive programs, the argument runs, *must* be of higher standard; they could hardly be otherwise. New ways of teaching will treat students as active participants in the educational process; will take into account student perceptions and ways of learning and, in so doing, will break open universities' walled garden of knowledge – where the walls are those of academic obscurity as much as of intellectual difficulty.

In the same context, it's argued that institutional change will be healthy. Transparency will, it's argued, do for universities what it has sometimes done for the ossified structures of government and commercial oligopoly: it will (unlikely as the terms sound in this context) produce leaner, flatter, delayered, more responsive university organisation, focused on core business and ready to compete in a global marketplace.

But other factors, beyond universities' control, make the future less promising. One is commercial competition – going beyond the global, inter-university competition networking will bring. The ultimate providers of an electronic curriculum 'will not be universities becoming televersities (they will merely break the ice) but rather commercial firms'. The real cost of university tuition is around £40 ($60) per student-hour at current prices. With such a financial incentive, 'alternative providers will inevitably enter. Today's students, if they seek prestigious jobs or entry-restricted professions, usually have no other choice than taking the university route.[xii] But that is a weak legal reed for universities to lean on. If this gatekeeper control weakens,' then, in deregulated academia, commercial corporations 'will be able to compete with traditional universities, without bearing the substantial overhead of physical institutions'.[xiii]

Britain's universities fare worse in this pessimistic scenario than those in America. Structurally, they are ill suited to a change of educational style. This was belatedly recognised in a report by the Committee of Vice-Chancellors and Principals which warned that 'there are a growing number of focused, targeted institutions of high quality which are delivering fully accredited distance learning, such as the University of Phoenix, a for-profit franchise organisation which is developing dominance in slices of the market. Such developments could fundamentally challenge UK [academic] activity in some areas'[xiv].

The Open University is currently Britain's standard-bearer in academic distance learning. It took a significant step forward with its adoption of course teams, but so far shows little sign of adapting with equal skill to Web-based interactive education. Traditional universities are a stage further back. With some justice they feel that moving to the creation of adaptive learning programs will force British academics to exchange something they generally do quite well – face-to-face teaching in tutorials and small groups – for something they will do reluctantly and badly. And by the time academia has adaptive programs ready to be networked globally there may be commercial products in the field which, while popular, will fall short of the standards most universities think acceptable. (At another level this is already true: most commercial 'educational' software on the market is either educationally trivial or unapologetically regressive. These are products based on cognitive psychologies which confuse instruction with learning, just as the programs' content confuses information – which is relatively easy to present – with knowledge, which is relatively hard to achieve.) As Britain's vice-