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FROM MASS HIGHER EDUCATION TO UNIVERSAL ACCESS:
The American Advantage
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The history of higher education since the Second World War both in the United States and Europe has been a history of the expansion of access and its consequences. In Europe, the growth was initially beyond the tiny numbers enrolled in a few European universities before the war to the 30 to 40 per cent of the age grade currently enrolled in all forms of postsecondary education. This large and rapid expansion has been in part through expansion of the elite universities, in part through the creation of non-university sectors and institutions. Both responses to the demand for places reflected the growth in all modern societies of occupations demanding more than a secondary school education, and it has been marked, especially in recent decades, by a growth in the numbers of non-traditional students – mature, employed, studying part time and aiming at employment in the rapidly growing semi-professions and knowledge-based service industries. These students, defining by their origins and aspirations the emerging systems of mass higher education, have been oriented chiefly towards gaining useful skills and knowledge rather than towards membership in a cultural elite marked by common bodies of arcane knowledge and cultivated ways of thinking and feeling.

The growth of mass higher education in Europe has been the subject of most of the commentary on higher education over the past half-century. Increased numbers have occasioned a host of related problems – of funding, organization and governance, and of quite different conditions for teaching new kinds of students with diverse aspirations and academic talents. But the focus on the enormous problems of creating systems of mass higher education has not allowed much thought on the next stage of postsecondary higher education: the extension of access beyond a third or a half of a population to a situation in which access to some form of postsecondary education is universally available throughout life and in homes and workplaces. The development of the new information technologies (IT) over the past few years creates new possibilities and problems for European systems of higher education even before they have fully solved those associated with the creation of mass systems – a process which is still under way.[1]

I reflect here on some of the main issues facing research universities as they strive to simultaneously complete the creation of systems of mass higher education and also move towards Internet-based universal access. I view these issues inevitably from an American perspective, but in comparative context. Universities on both sides of the Atlantic face problems, but they take different (though similar) forms and evoke different responses. They are part of a larger crisis in higher education in Western societies. That these problems flow from the partial success in creating and adapting systems of mass higher education over the past half-century make them no less threatening to the institutions which achieved that success.

Among the major problems facing higher education at the turn of the millennium is, first, the impact of the new information technologies on traditional forms of higher education. I put this first, both because it is the most destabilising or transforming development in higher education, and also because it is implicated in all the others. One effect of developments in IT technology is to put the survival of

research universities at risk. Recently three American university presidents expressed that same view in almost identical words: "We cannot even be certain whether the university as we know it will survive at all, nor, if so, in what form . . . . The existence of the university as it is now and as we know it is in doubt."[2] Leaders of European universities agree: "It is not an exaggeration to say that the issue of new information and communication technologies questions the basic functions of the university."[3]

Second, I would place the escalating costs of higher education in the face of public fiscal stringency, and the resulting tendency towards significant underfunding almost everywhere, but most dramatically in Europe. Despite the large increase in numbers, European governments resist the imposition of student tuition fees. With some exceptions, the funding arrangements for mass institutions and systems still resemble the ways central governments supported universities 50 years ago – except that state support has not kept pace with the growth in numbers. The result throughout Europe is a marked underfunding of higher education in which productivity gains are claimed (if not demonstrated) on the grounds that more students are being educated for the same or less money. To put further pressure on education budgets, in modern science every advance in knowledge in a given field is more expensive than the last – a serious problem for countries like the United Kingdom, where basic research is still largely carried out in universities.

The growth of numbers without a parallel increase in state support threatens the quality of instruction and research. As enrollments grew, staff-student ratios declined in most European systems of higher education. The response of governments was to demand greater productivity. The rationalization of university life and management, the pressures for "efficiency" in operation and outcome, the consequent loss of "slack" resources, the imposition of the criteria and language of business and industry, all threaten the autonomy of the university and the capacity of its scholars and scientists to pursue long-term studies that do not promise short-term results. In some countries, the growth of managerial control mechanisms by central government works in the same direction.

Third, a variety of problems arise in creating or adapting structures of governance of elite research universities to institutions of mass higher education – a problem especially acute for European universities. A leading example, one of many, is the problem of establishing strong institutional leadership which can act quickly and decisively in the face of rapidly developing problems and initiatives. Another is what role if any research universities can play in developing institutions of universal access and lifelong learning through the new information technologies.

Fourth – a problem for all advanced societies, but perhaps especially severe in the United States – is the decline in cultural levels, shared knowledge and literacy of students entering higher education. A "new" post-linear generation, immersed from early childhood in video and audio cultures, is less able or inclined to read. This phenomenon is visible everywhere. In the United States, the situation is made much worse by the near-collapse in the US of systems of elementary and secondary schools. It is widely held that the United States has the most successful system of higher education in world, and the worst primary and secondary schools.[4] The two facts may well be related.

Fifth, over the past two decades, the globalization of economies and research systems, the intensification of international industrial competition, and the rise of IT have all accelerated the commercialization of research and teaching, and the movement of both increasingly outside the institutions of higher education.[5] The short-term problem here is the maintenance of the integrity and autonomy of universities; the longer-term problem (i.e., over decades not centuries) is the survival of research universities. Some of the developments behind these trends – the closer relations between universities and private business in both Europe and the United States, and the decline of the distinction between pure and applied research – can be welcomed;[6] certainly the rapid movement of research findings into the market has many positive effects, for consumers as for national economies. Similarly, the emerging transformation of continuing education through IT enormously extends access, and gives new meaning to the notion of a "learning society." But both developments pose significant problems for existing structures of teaching and research.

Sixth, there are important and disquieting changes in the culture of the university. Some countries show a serious decline in morale among academics arising out of their increasing workloads and a general deprofessionalization of the university teacher and lecturer – Britain offers the clearest example here.[7] Elsewhere, we see a decline in the university as a community,[8] marked by the weakening of the identification of academic scientists and scholars with their institutions, their growing reluctance to serve on academic senate or faculty committees and the like as they turn more and more to their scholarly communities and subdisciplines, and, in science, to research teams and industrial partners and consortia. This is accompanied by a loss of authority of the academic community and its committees to increasingly powerful university administrators and state authorities and to the market through the commercialization

of research and teaching. It is not a matter of administrators seizing power from academics; rather the size and complexity of universities, the variety of specialized problems that confront them, and above all the speed of change, together increase the necessity for central administration to act decisively and rapidly. Academic committees have many virtues, among them the capacity to give legitimacy to decisions and policies, and sometimes even to add wisdom to decisions and quality to policy. But decisiveness and speed are not among them, and they are more and more required of academic administrators.

This is not an exhaustive inventory of problems facing modern research universities; others will have their own lists. It is a way of beginning an exploration of the modern crisis of the university, in the United States as in other advanced societies.

The Emerging Crisis of Higher Education

These and related problems add up to a crisis, in the strict sense of a major turning point in the nature of our higher education institutions. In Europe the crisis arises out of the incomplete transformation of systems of elite universities into systems of mass higher education, and in the United States out of strong pressures on higher education to expand further in order to provide universal access to some form of postsecondary education.

Crises of this order do not happen every day. The leading American universities experienced one after the Civil War when over two or three decades from roughly 1865 to 1890 they transformed themselves from liberal arts colleges into the research universities recognizable today. Similarly, European universities faced a crisis in the 1960s and 1970s under the impact of growth and democratization, for which they were structurally unfitted. But while they are still adapting to the growth in mass enrollments of the past three decades, they have been quite suddenly overtaken by pressures for universal access, and the transformation of the concept of a learning society from a rhetorical flourish into the beginnings of reality under the impact of the new technologies of information. (Universal access to postsecondary education leading to a “learning society” is not the same as open access to university for those who earn an Abitur or baccalaureate.)

The development of IT requires that we rethink the nature of “universal access,” the third of the major forms of development which higher education continues to undergo in all advanced societies. The distinctions among elite, mass and universal access forms of higher education have become part of the ordinary discourse about education in rich societies, wherever they are found. My paper for the OECD was based on experience of the growth of higher education in the United States, on what I could see of the beginnings of movement beyond elite forms in the United Kingdom and Western European societies, and on my first experience of Japanese higher education at about that time.[9]

But just as forces outside higher education drove the expansion of elite universities into mass systems, so current developments are driving all national systems towards broader and broader access. The growing demand for lifelong learning is independent of the development of IT, which simply accelerates it. Rapid technological change (of which IT is a part) and international competition increase the value and importance of a well-educated citizenry and workforce to every country. Advanced economies now live and die by their educated labor forces, and how they are employed.

The rapid development of IT makes possible what was once merely an educator’s dream: that is, lifelong access to education for all, in subjects and at times and places of individual convenience. It also requires a new conception of universal access – a change from my original conception of higher and higher levels of enrolment in colleges and universities by students of traditional college age, to one of participation in lifelong learning online in homes and workplaces.

Freeing education and training from the constraints of time and place in ways hardly imaginable in the early 1970s enormously broadens the potential scope and range of lifelong learning. Of course this has long been possible on a limited scale through correspondence courses, and latterly in several countries with the help of television. But IT changes the nature and potentialities of distance learning dramatically and qualitatively. The move towards universal participation in postsecondary education, already under way but not everywhere recognized, will surely have revolutionary consequences for existing institutions and systems of higher education, as well as for the larger societies which sustain and depend on them.

Information technology is involved in each of the major problems mentioned above. By liberating learning from constraints of time and space, it opens teaching to the same forces for commercialization already seen in research as the distinction between pure and applied research has diminished.[10] Moreover, even before IT takes hold, the rapid expansion of enrollments, the diversification of student

interests and talents, and the volatility of their academic preferences has led to an enormous expansion in part-time non-tenured teachers on annual contract, a reserve army of workers who give university administrators the flexibility they need under the new conditions of constant uncertainty and change. In the United States, roughly 45 per cent of teachers in postsecondary institutions are part-time non-tenured staff, though the proportions are much smaller in research universities. Their numbers have grown in all countries with the expansion of enrollments. Bu these teachers cannot develop genuine mentoring relationships with students as they run between classes and even institutions; they may therefore be the first to be replaced by teaching over the Internet, especially since they have no security of employment. The role of these part-time instructors, and their vulnerability, is not changed by the fact that many of them prefer that status for personal and family reasons.

Increased enrollments, both on campus and at a distance, strain traditional forms of quality control and the confidence of governmental authorities in institution-based quality control procedures, in turn leading to demands for external assessments and control – a trend carried to its greatest lengths in the United Kingdom.[11] The constraints on state support for higher education drive up student-staff ratios, in the face of the broad consensus among teachers almost everywhere that students enter university more poorly prepared and less inclined to read than previously – a natural consequence of broadening access, and of changes in secondary education and its graduation requirements which have made that broadening possible. Both these tendencies make traditional academic standards more problematic – especially in European systems which still assume governmental responsibility for a uniform quality of university qualifications. And now education through the Internet poses special problems for quality control and for the accreditation of courses and programs.[12]

One could expand the links among these new problems. Behind them all lies the long secular trend seen in the fundamental democratization of modern life, marked by the weakening of elite hierarchies, values and prerogatives. Universities inherently are to some degree elite institutions: they admit students of higher than average talent to study difficult subjects taught by teachers with academic qualifications gained through long and severe education and training. The growth of enrollments, and the extension of the name and status of university to formerly less prestigious institutions, has changed the relation of universities to governments, industry and society. The spread of postsecondary education through IT, some of it awarding university-level qualifications and degrees, accelerates these democratizing tendencies, and poses problems for all the arrangements, especially of governance and finance, traditionally associated with research universities.

These problems take very different forms in American and European universities, though they share many features: that is not surprising, since American universities had their origins in England, Scotland and Germany, and still show family resemblances. But behind these most visible, and in some respects substantial similarities, lie quite fundamental differences. While American higher education shows its origins in European models, it developed under different circumstances, in response to quite different historical, social, political, cultural and economic forces. There are lessons in that experience, but they are limited, and there is a danger of learning the wrong lessons and drawing inappropriate conclusions from the American experience.[13]

One example: the central principle of curricular organization in American colleges and universities is the modular course, the cumulation of unit credits earned therein, and the banking and transferability of these credits among most of the 3,700 colleges and universities in the United States. This arrangement, dominant in all but a handful of American institutions, introduces an extraordinary degree of flexibility within the system. Course credits, banked in each student's "transcript," allow relatively easy transfer within an institution between major fields and between institutions. It enables students to "stop out" of formal education temporarily for work or travel, and return to the same or a different institution, picking up his or her course of study without loss of time towards the degree.

Of course, the few highly selective institutions will not always accept a transfer from a less selective institution or a student with a poor academic record. But most American colleges and universities are not highly selective, or selective at all, and transfer with acceptance by the new institution of all or most of the credits earned elsewhere is very common. The very ease of "stopping out" and credit transfer not only allows but encourages stopping out and transfer. It also greatly facilitates lifelong learning, within institutions and at a distance. Students can combine credits earned in traditional courses in traditional institutions with credits earned miles away and years later in other institutions through courses online.

Distance learning raises special problems. Which distance courses will be awarded credit towards a degree by the institution offering the course? Who will accredit the institutions offering distance courses and assess the courses? What other institutions will accept credits earned thus as credits

towards their own degrees? These are all questions currently under discussion in the United States, where there is no broad governmental authority to answer them. But they are fundamentally the same kinds of questions that attach to the transferability of credits earned in traditional institutions. While distance learning introduces special difficulties, they will doubtless be answered, with the answers varying among the relatively autonomous colleges and universities that make up the American system.

However while the modular course and unit credit system has many advantages for systems of mass higher education, and even more for emerging systems of universal access, these come at a price – chiefly to the coherence of the course of study, and especially to the general education comprising the bulk of the study for most students during the first half of their work towards a degree. While most American institutions have "general education" requirements, they tend to be broad and easily fulfilled, placing little constraint on the preferences of students, who often choose courses for how they fit in with the demands of their work and leisure as much as for content. A few American institutions require courses comprising a small "core" of general studies; in other cases a major field, often in the sciences, imposes one or two introductory courses as preparation. But on the whole the range of "elective" courses is large; the constraint on the wholly free choice of the student may be no more than that she choose from the tens or hundreds of courses labeled "humanities" or "the social sciences" – a widely employed device known as "breadth requirements" to discourage "premature specialization."

Even these mild constraints have been weakening rapidly. A recent study by the National Academy of Sciences of changes in the undergraduate curriculum in 50 leading American colleges and universities in this century, finds that over this period there has been a steady de-emphasis on a common core of knowledge marked by a "precipitous drop in the number of basic courses that students are required to take. The average number of these mandatory courses fell from 9.9 in 1914, to 6.9 in 1964, to 2.5 in 1993."[14] "Moreover, it also found that the average percentage of the overall graduation requirement composed by general education requirements dropped from 55 percent in 1914, to 46 percent in 1964, to 33 percent in 1993."[15]

The result is that in the "general education" part of their studies it is rare that any two students at an American university have taken the same array of courses, or that at the beginning of a course any two students will have read any of the same books. A teacher, especially in mass institutions, cannot assume a common body of knowledge, or even of interest, among students in their introductory courses; every course before the specialized studies of the major starts from square one. The only common culture among beginning students, even in traditional institutions, is likely to be that of popular entertainment or sports, or the shared fascination with their search for friends and mates and identity. The enormous flexibility and responsiveness of American higher education to student preferences and market demand is bought in part at the price of intellectual incoherence in the curriculum.

The radical voluntariness and self-selection to distance courses may compensate somewhat for the thinness of the student cultures on the campuses of American mass institutions of education; that will surely vary with the nature of the course and subject. But European educators are wary about paying the price of incoherence that may come with moving towards American models. It is not just the inherent conservatism of academic institutions, or the insensitivity of state-funded European universities to market pressures. There are also good pedagogical reasons for Europeans to be skeptical about the apparent virtues of American higher education – so visible and attractive in its leading liberal arts colleges, research universities and their graduate schools and departments.

Nevertheless, the flow of influence about forms and structures of higher education is today, as it has been since the Second World War, very much from the United States to Europe. Despite their deep-rooted distaste for American populism, and for what they see as the commercialization of science and culture and the threat to universities posed by the domination of markets and their interests, European academics and leaders are fascinated by American colleges and universities. This intense interest is accompanied by a reluctance to surrender so much to markets and their mechanisms.

A fundamental difference is that in Europe higher education is a highly regulated industry, while in the United States it is much less so, the market performing many of the functions that in Europe are performed by bureaucracies, law and regulation. Americans are on the whole far less worried by the dangers of commercialization in intellectual life; historically, in America the market preceded the society. While many European innovations are adaptations of American models, they operate under circumstances in which these elements come to serve quite different functions, or function quite differently. While European countries can borrow many American institutional arrangements, such as the modular course and transferable academic credits, they have difficulty in reproducing the cluster of structural and cultural features which add up to a distinct American advantage in the move first to mass higher education and then to universal access.

The American Advantage

One could approach the American advantage from the perspective of other broad aspects of the economy and social structure. For example, in Silicon Valley and its counterparts, an entrepreneur with a new idea can find a broad support infrastructure nearby, and can outsource design and production problems at low cost. Moreover, nearby there is an aggressive community of venture capital to get small firms started. This is also related to the abundance of educated people with various skills who combine their talents in multidisciplinary problem-solving groups outside universities in what we have called the Mode 2 form of knowledge production.[16] But my focus here is on the American advantage arising more directly from the history and organization of its higher educational system.

American higher education today has quite different functions and structures from those elsewhere. In most countries, higher education trained and educated the ruling strata, selected and recruited to government service and the learned professions. Conferred status on those who earned degrees and qualified them in various ways for the society's most challenging (and prestigious) jobs and occupations. In recent decades it has expanded those functions to provide education and training in a wide range of new and semi-professions. In the United States, colleges and universities perform those functions, but also, and most importantly, they give substance to the idea that anything is possible to those with talent, energy and motivation. This sense of society with limitless possibilities for all, largely (though not exclusively) through higher education, is what is usually meant by "the American dream." The end of the American dream is continually proclaimed, usually by intellectuals who never believed in it to begin with, and wished no one else would. But this faith, fundamental to the American political system, survives hostility and cynicism, and underpins America's peculiar mixture of conservatism and radical populism. Through its role in fostering social mobility and the belief in a society open to talents, American higher education legitimates the social and political system, and thus is a central element in the society as it is nowhere else.[17]

European models of higher education – the German, the French, the British, the Mediterranean – reflect their elite origins and functions in their structures, even as they grow toward mass access. All characteristically are perched on top of an upper secondary system which both prepares and qualifies students for university entry. Students have their "general education" in secondary school, and in some systems, like the English, will already have begun to narrow their studies there, basically between the sciences and the "arts." Their university studies will not ordinarily include a period of "general education," though there are exceptions and will be more in the future. Broadly speaking, a university education in European systems has been a preparation for a professional career in the civil service, the learned professions, and in upper secondary and higher education. Only now is it expanding into the preparation of business managers and the semi-professions. The first degree in a European university, where it is offered (BA, B.Phil., Candidat., etc.) is ordinarily at a higher standard in their specialties than an American first degree – though such generalizations are increasingly problematic. Postgraduate studies, particularly the doctorate, are ordinarily linked directly and immediately to the dissertation, without the postgraduate course work required in American universities.

Much of what is done in American universities, especially but not only in the first two years, strikes Europeans as serving the function of their upper secondary schools. Indeed, historically American universities and colleges did a lot of secondary school work because there was no developed system of public secondary education before the end of the nineteenth century. And while the principle of in loco parentis is formally dead in most American colleges and universities, the spirit of responsibility for the physical and spiritual welfare of students is still strong, in a way that it is not in European universities. English universities are a half-way house in this respect, but my sense is that they are also moving towards Continental models, both because of the influence of the European Union and its educational schemes, and also because the old nurturing relationship of teachers and students in British universities required a high teacher-student ratio that has been lost in recent decades. Elite American colleges and universities still have relatively rich teacher-student ratios; others employ armies of para-educators – professional counselors, deans of student life, remedial specialists, and the like – whom Europeans do not employ, certainly not in the same numbers. These para-academics preserve the pastoral function as the academics themselves increasingly surrender that function in response to the increased emphasis on research and publication.

However, the enormous diversity of American higher education, and the rapid growth and increasing diversity of European higher education systems, make all such generalizations less true than they were even a decade ago. European systems are moving towards American models: not because

the United States is rich and a superpower, or because of the power of American popular culture – elements in the Americanization of so many other institutions in other countries. It is because American higher education as a system is simply better adapted, normatively and structurally, to the requirements of a "post-industrial" age, which puts a great premium on the creation and wide distribution of knowledge and skill, and is marked by such rapid social and technological change that decision-makers in all countries begin to see (or at least believe in) the necessity for broader access to postsecondary education.

So the new crisis of universal access arises, I suggest, while European universities are still trying to adapt their organizational, governance and funding arrangements to their relatively new mass numbers. The United States, by contrast, had the structures for mass higher education in place long before they actually had mass higher education, which came with the GI Bill just after the Second World War, and never went away.

The First System of Mass Higher Education

Why is it that the United States developed a system of mass higher education so much earlier than anyone else? What have been the impediments to the transformation of elite European systems into systems of mass higher education? And how are the United States and other countries moving towards universal access, lifelong learning, the learning society? These phrases all point in the same direction, towards the breakdown of the boundaries between formal learning in the institutions of postsecondary education and the rest of life, the assimilation of postsecondary education into the ordinary life of the society.

The modern system of higher education in the United States was already in place a century ago; the emergence of modern European systems of higher education is still under way. By 1900, when only 4 per cent of Americans of college age were attending college, almost all of the central structural characteristics of American higher education were already evident: the lay board of trustees, the strong president and his administrative staff, the well-defined structure of faculty ranks; and in the selective institutions, promotion through academic reputation linked to publication and a readiness to move from institution to institution in pursuit of a career. On the side of the curriculum, the elective system, the modular course, credit accumulation and transfer based on the transcript of grades were in place by 1900, as were the academic departments covering the known spheres of knowledge, and some not so well known.

Underpinning all was the spirit of competition, institutional diversity, responsiveness to markets and especially to the market for students, and institutional autonomy marked by strong leadership and a diversity of sources of support. The United States had the organizational and structural framework for a system of mass higher education long before it had mass enrollments. Only growth was needed. That happened in plenty, and with surprisingly little strain on a system already adapted to growth and change. Indeed, until this decade, my view is that the only major structural change in American higher education over the past century was the invention and spread of the community colleges, linked easily and casually to four-year institutions through credit transfer, and in some places, through strong encouragement to strengthen those ties by state and local governments.[18] Of course American higher education differs in many ways from what it was in 1900, but growth and development has not required changes in the basic structure of the system. It is those structural changes that are now taking place, with great difficulty, in Europe and the United Kingdom.

Europe Struggles Towards Mass Higher Education

How far have European systems created or introduced some of the chief elements of American mass higher education? The latter may be summarized as: size and access beyond 15 per cent of the age grade; diversity of the forms of higher education beyond elite universities; diversity of students in respect to social class, age, and ethnicity – including a large proportion of older part-time employed students; a substantial component of vocational/professional education; a high measure of institutional autonomy; modular courses, credit accumulation and transfer; a strong chief executive and administrative staff; multiple sources of support; a relatively flat academic hierarchy rather than a powerful guild of full professors.

European nations have in the past decade moved sharply towards mass numbers – in most countries upwards of 30 per cent of the traditional college age cohorts are enrolled in some form of higher education. Many countries have a more diversified student population than just a decade ago, having

seen marked increases in mature and part-time students. Some, like France, have a more diversified system of institutions; the United Kingdom (and Australia) have unified their systems, at least formally reducing the measure of diversity that was previously in place.

Most European nations have tried to give their universities a larger measure of autonomy in curriculum development and the appointment of academic staff, but the limitations are still greater than in most American research universities. They move slowly towards modular courses and the accumulation of course credits, and even more slowly towards credit transfer. There are movements in several countries towards the rationalization of academic ranks, but that is resisted, in some countries successfully. Almost everywhere there is an increasing use of part-time, casual academic labor without job security as a way of dealing with declining resources and rapid unpredictable change, as in the United States.[19]

For example, France, like every other European country, struggles to transform its traditional elite system into one of mass higher education – and is doing better than most, having diversified more successfully, and having moved towards greater institutional autonomy while broadening the resource base. The French speak of a revolution in the culture of the universities, which seems to refer to the changes associated with diversification, autonomy and a greater involvement of teaching staff in the development of institutional mission and identity. But when assessing what has been achieved, it is clear that there is still far to go. For example, France suffers overcrowding in many universities to a degree almost unknown in the United States; there is less student/teacher contact; they have not solved the problem of credit transfer between French universities, much less among EU countries; nor is there easy movement between major fields. Few French universities provide extension courses and continuing education. Moreover, they are only beginning to make the connections between universities and local government, business and industry that are common in the United States. The traditional marked separation between teaching in the university and research elsewhere remains. France is trying to overcome this last separation by appointment of university and grande école teachers to research groups in the CNRS, though it seems the students see little of this until the few who pursue research enter doctoral programs.[20]

In Germany, a former minister of science and culture in Hesse writes about "governmental failures to support adequately the transformation of the German university into a system of mass higher education by failing to grant sufficient financial support or to contribute reform concepts."[21] Indeed the resistance to basic reform has prevented Germany from creating a first degree, developing a mechanism for controlling access to its universities, or charging tuition fees – problems shared with other European countries and all substantial handicaps to developing a coherent system of mass higher education while preserving the elite sector.

Moreover, many academics and administrators in Europe are aware that mass higher education and institutional autonomy require stronger institutional leadership, but resistance by the academic guilds and governmental bureaucracies is in most countries very strong; rectors (by whatever name) with some few exceptions are still elected by the academic community, serve short terms, and have little power to initiate reforms. What reforms have been introduced have come mainly from governmental ministries and serve their interests, especially in shifting responsibility for the increasingly apparent shortcomings of underfunded institutions. The then vice-president of the German Conference of University Rectors noted recently that: "The latest reforms in the German system of higher education have been introduced primarily for more effective management of scarce resources and with a view to shifting the onus for the functional shortcomings of the overcrowded and underfunded schools from the government onto the institutions of higher education."[22]

On the crucial issue (for Americans) of the diversity of sources of financial support, for Europeans – while there is a great deal of rhetoric about the desirability of wider support for higher education from the private sector, again with many glances in the direction of the United States – it is still the case that central governments provide most of the financial support for higher education.[23] In Germany, Evelies Mayer and many others complain about inadequate resources, and indeed, per capita support for university students declined in almost every European country during the rapid expansion of enrollments over the past quarter century, in some cases dramatically. But Mayer's assumption, and those of most commentators in Europe, is that the key lies in additional support from central or regional government. While private industry in Europe has increased its support for university-based research, it is a small fraction of governmental support. Moreover, there are still few private colleges or universities in Europe, and resistance to their creation remains strong.[24] In this important respect Japan has an advantage over Europe in its large and varied private sector, enrolling about three quarters of all students in four-year colleges and universities, and 90 per cent when one includes the students in two-year

colleges. Like Europe, Japan has preeminent state universities wholly funded by central government, sand therefore not highly responsive to the market. But in Japan the private sector defeated government efforts to restrict the growth of higher education in the late 1980s and early 1990s.[25] The private sector in Japan is likely to be even more important in the future than it has been in the recent past.

Most important is the continuing refusal by European governments, supported by the majority of academics, to allow universities to charge tuition fees, and to retain these funds for their own development and use. "Free tuition" – "free" only in the sense that the costs of university education are met by taxpayers rather than by the recipients – constitutes a significant entitlement for the mostly middle and upper middle class families whose children go to university, and it is fiercely defended by them and their children. The idea of setting aside a portion of tuition payments for aid to poorer students is not on the table in Europe – indeed, in many countries the issue cannot even be raised, much less introduced. The resulting underfunding of higher education in most European nations greatly handicaps their capacity to respond creatively to growth, both of knowledge and of enrollments.

Of course, "underfunding" is a comparative concept. In 1993, from the latest data available, the United States spent 2.5 per cent of its GNP on higher education, over twice the proportion spent by France (1.1 per cent), Germany (1.0 per cent), the United Kingdom and Italy (0.9 per cent in both countries). Only Canada at 2.6 per cent was higher among the leading industrial nations reported. Canada is exceptional in its very high commitment to higher education from public sources: 2.2 per cent of its 2.6 per cent total; Japan only commits about 1.0 per cent of its GNP to higher education, but over half of that, 0.6 per cent, comes from private sources – the only country among this group similar to the United States in this respect.

The GNP figures are also reported by the OECD by the proportion of support from public and private sources. With respect to the commitment of public resources, the United States at 1.3 per cent of GNP is not far from the European countries named, all of which are at 0.9 per cent of GNP except for Italy at 0.8 per cent. Indeed, if we consider that the 1.3 per cent from public sources in the United States includes support for a broad system of mostly public community colleges whose counterparts (where they exist) elsewhere are not counted as "higher education," we would probably find that public support in the United States is close to that in these other countries for similar kinds of institutions.

The difference lies in the very great discrepancy in the support for higher education from the private sector: student tuition fees, gifts, endowments, the sale of services of all kinds. In the United States the 1.3 per cent of GNP provided by private sources almost doubled the public commitment of 1.4 per cent, as compared with the 0.2 per cent of GNP in France, 0.1 per cent in Germany, and a reported "nil" in the United Kingdom.[26] (The reported figures for the United States do not include the substantial tax credits by federal and state governments given for private contributions to higher education, a form of concealed subsidy by government to both public and private institutions, and to research in universities and other non-profit institutions.) These figures from private sources would probably be slightly higher for 1999 in all countries, including the United States, but the discrepancy would remain. Indeed, in the UK the Dearing Report of 1997 observes that "none of the [European] countries considered were expecting to change significantly the proportion of GDP [gross domestic product] which they devote to higher education."[27]

The advantages the United States has had in coping with the emergence of mass higher education, including the greater financial support by its society, persists as universities on both sides of the Atlantic face the challenges of the new information technologies and their promise of universal access to postsecondary education.

Challenges Posed: Speed of Change as the Enemy of Policy

All the emerging problems call out for thoughtful and sweeping responses in higher educational policies. But the very forces generating the new problems hinder the development of broad encompassing policies in response. The rate of change of information technology outruns our capacity to develop sensible policies for its management. All these countries have had educational policies; some have even been successful, like the Land Grant Act of 1862 and the GI Bill after the Second World War in the United States. But policies for higher education have not until now been undermined by the sudden eruption of new technologies. So I suggest that the unprecedented speed of technological development in this area is an independent force posing a severe challenge to policy-makers.

One indicator of the speed of technological development can be seen in the decline in the costs of computer memory and in the speed with which information can be transmitted across the Web – the latter known as bandwidth. Both are crucial to the ease and flexibility of applications of IT, in education as

in commercial activity. The tremendous expansion of bandwidth in the past few years is less visible than the fall in the price of personal computers and memory, but is at least as important as distance learning becomes more interactive and employs more audio and video elements alongside text.[28]

Equally dramatic for its implications for higher education is the capacity to print single copies of books through the Internet and fast printers, paste and bind them in board covers, and sell them for the same price as in longer runs. The development of this new technology – "books on demand" – raises difficult problems for authors and publishers of books still under copyright, but few for books already in the public domain and long out of print – the kind that scholars commonly need and use.[29] Major publishers advertise on-demand titles whose copyrights they own. The Library of Congress and other bodies are putting whole libraries on the Internet, and these will also be available on demand. Commercial bookstores are already promising a book on demand in about 15 minutes at the same price as a traditionally produced book. The Council of Europe claims that the print-on-demand technology is "now capable of producing perfect books at astonishing speeds and with minimum effort."[30] It may soon be easier and cheaper for a university library to print a book and give it to the user than to order, record, shelve, retrieve, lend, etc., as currently.

Libraries have been the heart of the university – laboratories were latecomers. They have been a powerful centripetal force, bringing scholars and students together and keeping them in physical proximity. But storage on the Internet of books, manuscripts and other scholarly material, including sounds and pictures, is transforming scholarly research, profoundly reducing the importance of the library as the repository of printed scholarly materials. (It reduces the significance of the museum for similar reasons.) A Stanford historian has reported that he spent ten years in his spare time in the Library of Congress archives locating material for a book on the first meetings of the American Congress. He can now find all the documents he needed on the Internet. The kind of research he did will never be done again for studies using materials that are stored online. As we know from research on, for example, medieval manuscripts, such study can be more accurate and detailed since the manuscript on the Internet allows high magnifications of small illuminations and blurred passages.

A leading computer scientist recently observed that "now that memory and bandwidth are essentially free, we can turn to the issues of what to do with our freedom." Though memory and bandwidth are not literally free for ordinary users, costs are falling so rapidly that they will soon seem "free" in the way as electricity to light our houses is regarded. As for "what to do with our freedom," the applications pour out of university and commercial laboratories, and many will have large consequences for both the public and the private aspects of higher education – for organization, structure and finance as well as for teaching and learning. The speed of development of software and applications defeats the efforts of scholars to report or analyze it in books; only journalism can seem to keep abreast of the rapidly changing IT world. For example, in the Fall of 1999 The New York Times linked several special reports to capture the nature of developments.[31] While the articles are about the use of the Web in commercial life, one important aspect of distance learning is as a form of e-commerce, with the same concerns about start-up costs, the nature of the market, the labor force, the quality and attractiveness of the product to its consumers, its delivery, pricing, competition, and all the rest of the problems of commercial activity.

The very terms of description of this aspect of higher education are offensive to many who entered academic life to escape the ethos of buying and selling which governs so much of modern life. While some tenured professors may escape it for a while, these developments will transform the relations of teachers with students, of teachers with teachers and of students with students. How it will do so is still unclear.

Our capacity to plan rationally is reduced by the uncertainties of technological developments – a separate matter from the speed of development. We cannot accurately predict developments in this field even three years ahead. The new technologies being tested suggest capacities beyond anything we have seen: the rapid delivery of massive amounts of information over ordinary telephone lines and cable installations has already been achieved. Television sets are a cheap and familiar vehicle for Internet communications. Most experts anticipate the convergence of technologies, blurring the lines between different appliances, bringing costs down.

But that extrapolates from existing technologies. We may see more fundamental developments in the organization and transfer of information. Sun Microsystems has already announced "a product called Jini that uses Sun's Java programming language to harness the power of millions of computers, from mainframes to palm-sized devices. We now have all the ingredients to build a distributed computing fabric which approaches science fiction."[32] Technological developments carry powerful challenges for higher education – though few have begun to think of their implications.

But how quickly or widely will the changing technologies be adopted in different societies? They may require substantial time and effort to master, which could slow their adoption, especially if older technologies fill needs that do not grow rapidly. But the new technologies themselves generate "needs" competitively. Moreover, the new technologies may be so much easier and cheaper to use that they transform the population of users and the nature of use.

Apart from the acquisition and adoption of new information technology, is the question of what individuals and institutions will use them for. For many in affluent societies, how they choose to use their time will determine how they spend their money. But not all choices will be by individuals deciding how to use their leisure. Many consequential decisions will be made by large corporate bodies: by business and industry on IT for training and educating their workforce during working hours; by governments through the regulations imposed on educational institutions which might want to provide continuing education for the labor force; and by colleges and universities and others which will compete to provide continuing education and will be making decisions about whether or not to offer credits towards their degrees for courses taken online, as well as about ownership of intellectual property displayed online.

Information technology is developing fastest in the United States, where openness encourages innovations which challenge elite structures and attitudes. But everywhere the earliest use of IT for lifelong learning is by less prestigious or marginal institutions, and by institutions – often the same ones – most strongly oriented to the market for students and other forms of external support. Outside the United States, that is likely to be in the private sector, where one exists.

Since lifelong learning by IT threatens traditional structures in such areas as funding and organization, quality assessment, examinations and the criteria for earning degrees, it threatens the control that European governments exercise over higher education. Will European governments encourage the development of lifelong learning through IT in all their universities and colleges, or, as is more likely, try to restrict it to non-elite forms of higher education, and to emerging private or semi-private universities for whose quality and products governments take little responsibility? Or will IT, in its inherent responsiveness to the market, accelerate the partial privatization of state-supported universities where they exist, not least in European countries? These uncertainties confound our capacity to see ahead, and that in turn affects the capacity to plan as social institutions might do for a development of such enormous importance.

A researcher in this field today has both to look at the emerging scene and also do what I have suggested is impossible: peer into the future to problems and conditions that may obtain in five or ten years' time. Some colleagues and I have been trying to do that in California, attempting first to find out what is going on in our institutions and their neighbors, and then to detect underlying patterns that might provide clues to the development of these technologies in colleges and universities, and in the new institutions growing up inside and around the familiar ones[33] Our early studies suggest two sets of observations, one on the diversification of the new forms of instruction that reflects the enormous diversity of students and subjects; the second bearing on the implications of that diversity for governmental and institutional policy in this area.

First, both for analysis and policy, we must disaggregate the patterns of use of IT very finely along at least four crucial dimensions: the nature of the subject taught; the location of the student – on campus, at home or workplace, or elsewhere; the primary purpose of the instruction – to transmit skills and knowledge or to cultivate mind and character, or some combination; and the academic talents and motivations of the learner. There may be other important dimensions, but these at least establish the principle of disaggregation.[34]

Second, our policies must reflect the diversity of education, no longer an effort to educate a small segment of the population for leading positions in society, but something close to a continuing education of the whole population for life in the twenty-first century. If lifelong learning is to be as varied as its student populations, then policies must be responsive to the nature and goals of the education offered, almost course by course, to the market for knowledge and information among consumers, and to the judgments of the academics who know best who they are teaching and how their students learn.

A central policy issue for research universities is whether and how they will be involved in distance learning through the new technologies. European nations are showing a growing interest in continuing education "not as a luxury but as a personal and national strategy for survival in a highly competitive global economy. Officials also see it as one way to combat Europe's persistently high unemployment rate . . . "[35] The first answer of research universities, which is mostly to pass continuing education on to other agencies, is unlikely to be their last. Pressures will surely lead some European universities more deeply into distance learning. In Norway a decision has already been made by the

universities and colleges, and confirmed by the ministry in May 1999, to the effect "that responsibility for all lifelong learning at a higher-education level will stay with the higher-education institutions."[36]

How these conflicting requirements of function, demand and pedagogy balance out cannot be the subject of general rules or state policy. On the contrary, policies must encourage experimentation by those who introduce these technologies into higher education, and especially into distance learning. Such policies would give institutions and the people in them the freedom and resources to initiate from below, and to experiment in many different directions. But the other side of that coin is that policy-makers must accept that experiments may fail, in social and educational life as in the laboratory.

Policy as Experimentation

"Policy as experimentation" as a doctrine is hard for modern governments to accept, gripped as they are by the importance of this area of public life, prepared and willing to make large investments in it for the commonweal, but inherently unwilling to give it piecemeal to providers who are "experimenting."

Nevertheless, I believe the expansion of access to lifelong learning through the new technologies, as far ahead as we can see, will take the form of a continuing series of experiments. The three elements defining experiments in higher education are: that programs are not standardized, but vary sharply in character, funding, pedagogy, function, etc.; they are transitory, on trial, not firmly institutionalized; and they are under continual assessment for costs and effectiveness.

The development of IT in higher education as elsewhere is such that we cannot standardize and freeze delivery systems or policies on the basis of what is already successful. Technological developments alone will continually confound efforts to freeze or standardize educational forms. In addition, other factors – for example, variations among academic subjects, in the places and conditions of delivery, and in students' talents and motivations – will make standardization of forms and procedures impossible. This is in fact what we have been finding in California where we have tried to draw out the implications for the future.

Another American Advantage: The Idea of University Service

Most observers recognize the existence in the United States of a broad consensus around the notion that everyone should be involved in formal education for as long as possible. This fundamental value underlies the inclusive sentiments and commitments to service and useful instruction that are the defining features of American higher education. It was captured a century and a half ago in Ezra Cornell's statement: "I would found an institution in which any person can find instruction in any study." [37] It found expression also in the Federal Land Grant Act of 1862 which provided federal support for a college in every state "where the leading object shall be, without excluding other scientific or classical studies, to teach such branches of learning as are related to agriculture and the mechanic arts." It was also embodied in the Wisconsin idea of service by the university to the wider community.[38]

The "Wisconsin idea" is of special importance in understanding American attitudes towards "lifelong learning" and useful studies of all kinds; it is summarized in the University of Wisconsin's motto: "The boundaries of the University are the boundaries of the State." The motto (and it was a commitment as well) incorporated two ideas keyed to service to the community: an elite notion of building more expertise into the affairs of state, and "the development of popular nontechnical lectures which carried the university to the people." This latter development, which took the name of "extension courses," later added technical courses. Indeed, there was almost immediately "an acceleration of how-to courses which, if they did not show how to make American democracy more democratic, did show many an American who otherwise would have been beyond the effective range of the university how to make himself a more effective farmer or worker."[39] A century later that is a central motivation of the Western Governors' University (WGU), and of its many competitors.[40] The WGU is a "virtual" university without a campus or classrooms, all of whose courses, developed by the faculty members of the member land-grant universities, are "online," delivered electronically to students. For the Western Governors, their university is merely an adaptation of the extension idea to the potentialities of the new information technologies. The crucial difference with the European experience is that in America, extension has been university extension; hardly a university in the country, and certainly no great public university, does not have an extension division, providing courses "for any person in [nearly] any study."

These perspectives are very like those which introduce a multitude of books and papers on the information revolution. That literature, though often instructive, is produced for the most part by people who are excited by their work in the area, and by the potentialities of IT for higher education, both inside

and outside traditional institutions. It is imbued with the excitement and fundamental optimism that C.P. Snow identified as the emotional climate of engineers and scientists, by contrast with the pervasive pessimism of humanistic writing in our time.[41]

The Search for Meaning: On the Survival of Elite Research Universities

Like the enthusiasts, I believe that we are in a revolution in higher and continuing education, although one in its early stages. Some of its enormous positive potentialities are clear, but also that it may have negative effects on central elements of the higher learning, and on traditional institutions and relationships which have long been associated with the pursuit of wisdom as well as of information and knowledge. Most new forms of distance learning thus far are found in elementary language or mathematics courses, or in business-related subjects, where they are used to transfer specific skills and knowledge rather than, in historian Gertrude Himmelfarb's words, helping students to appreciate a poem, understand an idea, find significance in an historical event, follow the logic of an argument, inquire into ethical dilemmas, make rational and moral judgments –" all of which require an exercise of mind that calls upon all the human faculties and which no technology, however sophisticated, can satisfy."[42] Research and reflection on the impact of these new technologies must recognize their limitations and disadvantages as well as their undeniable advantages. And among the latter, not least is the potential of the new technologies to enable large parts of our populations to be involved, even if intermittently, in some kind of formal education or organized learning all their lives.

A former president of the Johns Hopkins University, Steven Muller, has speculated on what continuing functions elite universities will have in the future.[43] He believes much library-based scholarship will no longer need to be based inside a university, and much undergraduate education also will be carried effectively on the Internet. A question already under discussion, in California as elsewhere, is "how much is much." California public universities, already facing an enormous growth of enrollments in coming decades, and the resulting shortage of student housing, and hopelessly crowded classrooms, libraries and labs, are beginning to discuss whether some fraction of undergraduate studies cannot be completed by students for full university credit off campus somewhere – at home or on less expensive "satellite" campuses. Of course those alternative venues are not the same, either in cost or in their effects on students. Such courses would be taught by regular academic staff online and supported by IT staff. Early speculation mentions anything from 10% to 25% of the student's time at the university taken in study at a distance, the latter representing a full year of the traditional four year course delivered over the Net. On the other hand, Muller reminds us that laboratory work and training cannot be divorced from direct personal interaction; nor can the students' desire for each other's company be satisfied in virtual classrooms. The advantages of not overcrowding existing university sites or having to build new general purpose campuses are obvious and compelling. The drawbacks are less visible and uncertain, especially when we project these moves into the next generation of information technologies, including interactive video links or visible virtual classrooms and seminars.

But a central and continuing function of the university is carried by the humanist scholar and teacher, concerned not primarily with the transfer of information or knowledge, but with the cultivation of critical and independent perspectives and the exploration of meaning. Gertrude Himmelfarb, reflecting on the technological revolution and its implications for humanistic studies, observes that "It takes a discriminating mind, a mind that is already stocked with knowledge and trained in critical discernment, to distinguish between . . . the trivial and the important, the ephemeral and the enduring, the true and the false. It is just this sense of discrimination that the humanities have traditionally cultivated, and that they must now cultivate even more strenuously, if the electronic revolution is to do more good than bad." [44] She warns of the loss of the capacity to read a book, "to study it, to think about it, to reflect upon it . . .." To do that "we should have it in our hands, for that is the only way of letting it into our minds and our hearts." [45]

These are the classic concerns of the humanist scholar in the face of any technologies that come between learner and book, or teacher and learner. While we may watch with concern, we need not assume that those values and the relationships that sustain them require that teacher, book and student must share the same small physical space. The possibilities for elite forms of higher education through distance learning should not be foreclosed. We already see on the Internet advanced scholarly seminars that bring together students and scholars across a continent around an illuminated manuscript on a screen. To deepen those relationships beyond scholarship and research to character-forming may require another leap in the technology to make prolonged audio/visual interactive connections cheap and easy. It will depend on the motivation and intelligence of teachers and students to make those distant connections

a vehicle for the shaping of mind, character and sensibility, rather than the mere transmission of information and knowledge at present associated with lifelong distance learning.

Conclusion

A knowledgeable European observer of European higher education has suggested that on the whole it is "about 20 or 30 years back" on a continuum which has led the United States toward universal access to higher education. I have taken that as a starting point for inquiry. The same cultural, political and institutional characteristics that account for the lag of two or three decades in the emergence of mass higher education in Europe also make for a lag in the emergence of universal access. This is not a lag in the technology or its applications, much of which has been invented and developed by Europeans. It is a lag in the political, legal, economic and organizational structures that would allow some form of postsecondary education to be made available to the whole society through the use of these new technologies. But this lag cannot be found in the European private sector, where competition in markets of all kinds forces business and industry to develop the resources of IT for training and instruction. Indeed, it may well be that universal access to life-long learning will come to Europe by way of work-based instruction over the web for upgrading the skills and knowledge needed by an educated labor force in a global economy.

The elite-mass-universal access model I set forth in the early 1970s assumed that universal access to higher education would come through increased numbers of students in all countries enrolling and attending – much of it part -time or at night – in non-elite institutions that might eventually and for some provide further links through credit transfer to degree-granting institutions.[46] That has been happening, though still on a modest scale. Information technology now forces a revision of our conception of the conditions making for universal access: IT allows, and becomes the vehicle for, universal access to higher education of a different order of magnitude, with courses of every kind and description available over the Internet in people's homes and workplaces. That involves profound changes in both institutional structures and attitudes regarding higher education. And that is where Europe is lagging.

While most European countries are still struggling to complete the structural reforms necessary to institutionalize mass higher education, few university-based academics or administrators have fully appreciated the implications of IT for universal access. Research universities both in the United States and Europe are exploiting the Internet for scientific research and scholarship, and increasingly for the enrichment of their taught courses and seminars. But IT will have consequences far beyond those already visible in our institutions. Information technology is already corroding boundaries – national, institutional, disciplinary. It is weakening the links of academics to their institutions, faculties, departments and disciplines. Since so much research can be done outside universities or colleges in the contexts of use, it blurs the distinction between pure and applied research. The library as a central institution of the research university is drastically weakened. Research can be done anywhere, so the distinction between research universities and other kinds of higher education institutions shrinks. Since IT strengthens the market for education it strengthens students in relation to teachers, and blurs the distinction between learning and entertainment.

The new technologies are having a myriad of other consequences – for accountability and assessment, for the ownership of intellectual property and publication, for the use of publication for meritocratic assessment, and thus for the whole machinery of institutional controls put in place in many European countries during their expansion. The most profound effects of IT will be to weaken the distinction between life and learning. As more postsecondary education goes on line, the character of our familiar universities and colleges, in both Europe and the United States, will inevitably change. The question remains: to what extent can elite forms of higher education survive in the leading colleges and universities on both continents under the pressure of the new technologies, universal access, and changing cultural attitudes. This has been a continuing and disturbing question for the past four decades, and remains so as institutions of higher education everywhere move into uncharted waters.[47]

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[1] Trow, M., "Problems in the Transition from Elite to Mass Higher Education", in Policies for Higher Education, from the General Report on the Conference on Future Structures of Post-Secondary Education (Paris: OECD, 1974), pp. 55-101.

[2] Muller, Steven, "The Management of the Modern University", in Muller-Boling, Detlef et al. (eds.), University in Transition (Guttersloh: Bertelsmann Foundation Publishers, 1998), pp. 222-230. That view was echoed by Berkeley's

chancellor Robert Berdahl at his inauguration in April 1998, and by President Gerhard Casper of Stanford at Berkeley on the same day.

[3] Edwards, Kenneth, New Technologies for Teaching and Learning, Association of European Universities, CRE Guide No. 1 (April 1998), p. 25.

[4] E.g., "I have [been] talking about the great success story of higher education in the United States. By contrast, the public K-12 system has been a disaster, a shocking deterioration of a once quite competent enterprise." Pings, Cornelius, "The Ongoing Evolution of the American Research University", in Muller-Boling, D. et al. (eds.), University in Transition, op. cit., p. 69.

[5] This process is explored in Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P. and Trow, M., The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies (London: Sage Publications, 1994).

[6] E.g., in 1997 the chancellor of the University of California at Berkeley observed that in his university "industrial funding is moving up the research stream", and described the process in detail. See Tien, Chang-Lin, "Research Funding and its Effect on the Research Agenda", in Muller-Boling, D. et al. (eds.), University in Transition, op. cit., pp. 45-46.

[7] On European academics see Fulton, Oliver, "Unity or Fragmentation, Convergence or Diversity", in Bowen, William and Shapiro, Harold (eds.), Universities and Their Leadership (Princeton: Princeton University Press, 1998). For comparative essays, see Clark, B.R., ed. The Academic Professions, (Berkeley: University of California Press, 1987), and for the United States, his "Small Worlds, Different Worlds: The Uniqueness and Troubles of American Academic Professions", Daedalus, CXXVI (Fall 1997), pp. 21-42, esp. pp. 31-37. A moving account of changes experienced by academics, especially in the humanities departments in American elite research universities over the past half-century, can be found in Alvin Kernan, In Plato's Cave, (New Haven: Yale University Press: 1999), and especially pp. 246-275.

[8] Clark Kerr is the most notable critic of these trends, on which most commentators agree. See his "Knowledge, Ethics and the New Academic Culture", pt IV, Higher Education Cannot Escape History: Issues for the Twenty-First Century (Albany: SUNY Press, 1994), pp. 131-156. On the ambivalence of some senior administrators in American research universities about external research links and consulting, see Rosovsky, Henry with Amer, Inge-Lise, "A Neglected Topic: Professional Conduct of College and University Teachers", in Bowen, W.G. and Shapiro, H.T. (eds.), Universities and Their Leadership, op. cit., p. 123.

[9] Trow, M., "Problems in the Transition from Elite to Mass Higher Education", op. cit. While national systems can be broadly described in terms of these development phases, individual institutions may provide education across all these categories, though in different proportions.

[10] See Gibbons, M. et al., The New Production of Knowledge, op. cit.

[11] See Trow, M., "American Perspectives on British Higher Education under Thatcher and Major", Oxford Review of Education (Winter 1998), pp. 111-129; and his "Trust, Markets and Accountability in Higher Education: A Comparative Perspective," Higher Education Policy, Vol. 9, No. 4, 1996, pp. 309-324.

[12] See, e.g., Olsen, Florence, "'Virtual' Institutions Challenge Accreditors to Devise New Ways of Measuring Quality", Chronicle of Higher Education (6 August, 1999); nd http://chronicle.com/free/v45/i48/48a02901.htm

[13] On the origins and development of the American system see Trow, M., "Federalism in American Higher Education", in Levine, Arthur (ed.), Higher Learning in America: 1980-2000 (Baltimore and London: Johns Hopkins University Press, 1993), pp. 39-67.

[14] National Association of Scholars, The Dissolution of General Education: 1914-1993 (Princeton, 1999); and http://www.nas.org/study.html

[15] Ibid.

[16] Gibbons, M. et al., The New Production of Knowledge, op. cit.

[17] See Trow, M., "Class, Race and Higher Education in the United States", in Diamond, Larry and Marks, Gary (eds.), Democracy in Comparative Perspective (London: Sage Publications, 1992), pp. 275-293.

[18] Others might suggest that the massive growth in federal support for university-based research, starting really during the Second World War, also qualifies as a major structural change, at least in support for the system. But the principle of federal support for research was in place much earlier; here we can debate when quantitative becomes qualitative change. See, for example, Roger Geiger, To Advance Knowledge: The Growth of American Research Universities 1900-1940, New York: Oxford University Press, 1986.

[19] On structural and funding problems in European universities, see "The Decline of German Universities", Science, CCLXXVII (12 July, 1996), pp. 172-174; and articles on higher education in Europe in ibid. (2 February, 1996), including "European Union"; see also "U.S.-Style Universities for Germany?", in ibid., CCLXXX (19 June, 1998), pp. 1826-1827.

[20] See "France: An Elite System Struggles with Mass Education", Science, CCLXXVI (2 February, 1996).

[21] Mayer, Evelies, "Whom Do German Universities Now Serve?", in Ash, Mitchell G. (ed.), German Universities Past and Future (Oxford and Providence: Berghahn Books, 1997), p. 192. See also other essays in that volume, many of which stress the continuing power of the Humboldtian ethos to block reforms needed for the transition to mass higher education in Germany.

[22] Kunzel, Rainer, "Political Control and Funding", in ibid., p. 173. Much the same could be said about the motives

behind the interventions by British governments over the past two decades.

[23] For important exceptions, and perhaps precursors of the future, see Clark, B.R., Creating Entrepreneurial Universities: Organizational Pathways of Transformation (Oxford: Pergamon/IAU Press, 1998).

[24] See "U.S.-Style Universities for Germany?", op. cit.

[25] For analysis of Japanese higher education, see Amano, Ikuo, "Education in a More Affluent Japan", Assessment in Education, IV, 1 (1997), pp. 51-66, and his "Structural Changes in Japan's Higher Education System: From a Planning to a Market Model", Higher Education, XXXIV (1997), pp. 125-139. See also Arimoto, Akiro, "Massification of Higher Education and Academic Reforms in Japan", in Academic Reforms in the World, Research Institute for Higher Education, International Seminar Reports no. 10 (Hiroshima University, July 1997), pp. 21-55; Kitamura, Kazayuki, "Policy Issue in Japanese Higher Education", Higher Education, XXXIV (1997), pp. 141-150; and Teichler, Ulrich, "Higher Education in Japan", in Burgen, Arnold (ed.), Goals and Purposes of Higher Education in the 21st Century (London: Jessica Kingsley, 1996), pp. 192-209.

[26] OECD, Centre for Educational Research and Innovation, Education At A Glance: OECD Indicators, 1996. Of course, there is some private support for British universities; e.g., Warwick, Oxford and Cambridge, LSE, gain substantial support from the sale of services, college endowments, tuition fees from overseas students, etc. But it is unlikely that they add up to more than the percentage from private sources for German and French universities.

[27] National Committee of Inquiry into Higher Education (Dearing Report), 1997, Appendix 5, Section 10, "The Role and Background to Higher Education in Europe", para. 10.32.

[28] See, e.g., Schiesel, Seth, "Jumping Off the Bandwidth Wagon", The New York Times, 11 July, 1999,

[29] See Freedom to Publish [on demand] Our Cultural Diversity (Council of Europe, 1999). See also Malcolm, Andrew, "A Very Short Run: The Arrival of 'Print on Demand' " and "The Future of the Publisher-Author Relationship", Times Literary Supplement, 18 June, 1999, pp. 14-15.

[30] "Freedom to Publish", op. cit., p. 11.

[31] "E-Commerce", The New York Times, 22 September 1999, Section D, pp. 1-69

[32] "Science Fiction Power for the PC", International Herald-Tribune, 16 July, 1998, pp. 1, 10.

[33] My colleagues on this project are Dr. Diane Harley of the Center for Studies in Higher Education at Berkeley, and Dr. Gary Matkin, associate director of UC Berkeley Extension. The first fruits of our work can be found in Trow, Martin, "The Development of Information Technology in American Higher Education", Daedalus, CXX (Fall 1997), pp. 293-314, and "Lifelong Learning Through the New Information Technologies", Higher Education Policy, XII (1999), pp. 201-217.

[34] The bearing of the diversity of higher education on distance learning deserves separate treatment. A beginning can be found in Trow, M., "The Development of Information Technology", op. cit., esp. pp. 294-298. See also Clark, B.R., "Small Worlds, Different Worlds: The Uniqueness and Troubles of American Academic Professions", in Daedalus, CXX (Fall 1997), pp. 21-42.

[35] Bollag, Burton, "In Europe, Workers and Professionals Head Back to the Classroom", Chronicle of Higher Education (3 September, 1999), p. A87.

[36] Ibid..

[37] Quoted in Hofstadter, Richard and Smith, Wilson (eds.), American Higher Education: A Documentary History (Chicago: University of Chicago Press, 1961), p. 555.

[38] On the involvement of state and land-grant universities in distance learning, see The Kellogg Commission on the Future of State and Land-Grant Universities, Returning to Our Roots: A Learning Society (September 1999).

[39] Rudolph, Frederick, The American College and University (New York: Alfred A. Knopf, 1962), pp. 363-365.

[40] These themes are developed in my "Lifelong Learning Through the New Information Technologies", op. cit.

[41] Snow, C.P., The Two Cultures: And a Second Look (Cambridge: Cambridge University Press, 1964).

[42] Himmelfarb, Gertrude, "Revolution in the Library", The American Scholar (Spring 1997), p. 204.

[43] Muller, S., "The Management of the Modern University", op. cit.

[44] Himmelfarb, G., "Revolution in the Library", op. cit. The spread of "books on demand" over the Web may somewhat reconcile the concerns of humanists with the new technologies.

[45] Ibid.

[46] Trow, M., "Problems in the Transition from Elite to Mass Higher Education", op. cit.

[47] For earlier concerns about the impact of mass on elite higher education, see Trow, M., "Elite Higher Education: An Endangered Species?", Minerva, XIV (Autumn 1976), pp. 355-376.